Draft
Environmental Impact Report
SCH# 2021020513

Volume 4
Technical Appendices D to H

Aratina Solar Project
by 64NB 8ME LLC

Zone Change Case No. 6, Map No. 192
Zone Change Case No. 3, Map No. 208-5
Zone Change Case No. 6, Map No. 208-6
Zone Change Case No. 1, Map No. 209-1
Conditional Use Permit No. 3, Map No. 208-5
Conditional Use Permit No. 7, Map No. 208-6
Conditional Use Permit No. 1, Map No. 209-1
Conditional Use Permit No. 1, Map No. 209-2
Conditional Use Permit No. 16, Map No. 192
Conditional Use Permit No. 17, Map No. 192
General Plan Amendment No. 6, Map No. 192 (Circulation)
General Plan Amendment No. 2, Map No. 192-35 (Circulation)
General Plan Amendment No. 3, Map No. 208-5 (Circulation)
General Plan Amendment No. 3, Map No. 208-6 (Circulation)
General Plan Amendment No. 1, Map No. 209-1 (Circulation)
General Plan Amendment No. 1, Map No. 209-2 (Circulation)

Kern County
Planning and Natural Resources Department
Bakersfield, California

May 2021

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May 2021

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D-2 Jurisdictional Waters and Wetlands Delineation
D-3 Western Joshua Tree Census Report
D-4 Western Joshua Tree Census CDFW Email
D-5 A Review of Avian Monitoring and Mitigation Information at Existing Utility-Scale Solar Facilities

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e-mail: torthunter@aol.com

Technical Memorandum

To: Whom It May Concern

From: Gilbert Goodlett

Date: February 18, 2021

Re: Biological impacts of reduction in the size of the Aratina Solar Farm

---

EnviroPlus Consulting, Inc. (EPC) performed biological surveys in support of the Aratina Solar Farm for 64NB 8me LLC. These surveys included protocol desert tortoise and rare plant surveys and general biological surveys with a focus on western burrowing owl, desert kit fox, and American badger. A Joshua tree census was completed according California Department of Fish and Wildlife standards contained in a 2084 permit. EPC also integrated the results of a Mohave ground squirrel habitat assessment performed by Dr. Philip Leitner into a Biological Evaluation and wildlife report prepared for the project.

The project applicant, 64NB 8me LLC has proposed to modify the project boundaries by providing large setbacks from the nearby communities of Boron and Desert Lake. The original project footprint was approximately 2,700 acres. With the proposed setbacks, the footprint is reduced to approximately 2,300 acres, all of with lie within the previously evaluated 2,700 acres.

The purpose of this technical memorandum is to supplement the prior studies and reports by assessing the impacts to the previously submitted results. All originally recommended mitigation measures remain applicable to the redesigned Aratina and no changes to the report/study are necessary.

Based on individuals observed, acreage of habitat, or number of items of sign of a particular species, the reduction in size of the Aratina Solar Farm is anticipated to reduce impacts to sensitive plants and wildlife on the project. The degree of reduction of impact varies by species but ranges from 0% to 40% reduction in impacts (table on following page). Since no desert tortoise sign was found, no impacts are anticipated as a result of project development. Therefore, reduction of the project area will not change the anticipated zero impact to desert tortoises. At the other end of the spectrum, reduction of the project area is anticipated to result in a 40% decline in impacts to burrowing owls (as measured by the number of burrows found) because three of the five burrows are within that portion of the project that is being eliminated from the project footprint.

Table. Potential reduction in impacts to sensitive plant and wildlife species by reducing the Aratina Solar Farm from 2,700 to 2,300 acres

Species or evidence of species	Federal - State - CNPS Status	Original potential impact at a project size of 2,700 acres	Units	Reduction in impacts by reducing project size to 2,300 acres	Reduced potential impacts at a project size of 2,300 acres	Percent reduction in potential impacts
Desert cymopterus	1B.2 E	132	plants	15	117	11%
Barstow woolly sunflower	1B.2 E	258	acres	9	249	3%
Mojave spineflower	4.2 E	135679	plants	500	135179	0%
Crowned muilla	4.2	938	plants	5	933	1%
Joshua tree	CT	5175	plants	487	4688	9%
Desert tortoise	FT, SE	0	individuals	0	0	0%
Mohave ground squirrel	ST	2,700	acres of potential habitat	400	2300	15%
Burowing owl burrows	BCC, SSC	5	burrows	2	3	40%
Desert kit fox dens	CCR, Title 14	152	den	16	136	11%
American badger dens	SSC	1	den	0	1	0%

Status Codes

Federal

FT - Federally listed at Threatened

BCC - Birds of Conservation Concern

State

SE - State listed as Endangered

ST - State listed as Threatened

CT - State candidate species for Threatened status

SSC - Species of Special Concern

State (cont)

Title 14 - Protected fur-bearing mammal under Title 14 of CA Code of Regulations, Section 460

California Native Plant Society (CNPS)

1B Plants Rare, Threatened, or Endangered in California and Elsewhere

4 Plants of Limited Distribution

Threat ranking

Threat Ranking:

0.2 Moderately Threatened in California

Plants with an “E” are endemic to CA

Rincon Consultants, Inc.

Environmental Scientists *Planners* *Engineers*

M E M O R A N D U M

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Riverside:	(951) 782-0061		

Date:	March 2021
To:	Kern County Planning Department
Project:	Aratina Solar Project
From:	David Daitch, Ph.D., Principal
Subject:	Addendum to September 2020 Jurisdictional Waters and Wetlands Delineation

64NB 8ME LLC has recently submitted to the Kern County Planning Department a revised project footprint associated with the Conditional Use Permit (CUP) application. This revision to the Aratina Solar Project reduces the project's proposed footprint from approximately 2,700 acres to approximately 2,300 acres. One consequence of the revised footprint is an increased setback from the nearby communities of Boron and Desert Lake. Attached for reference is a figure illustrating the previous and current proposed project footprint.

This Addendum to the Jurisdictional Waters and Wetlands Delineation (Revised September 2020) for the Aratina Solar Project has been prepared to document the above-described change in project footprint and to additionally document that the recent change in project footprint does not change the findings of the September 2020 delineation, as described below.

Potential Impacts

The September 2020 Jurisdictional Waters and Wetlands Delineation describes impacts associated with the Aratina Solar Project, which included up to 600 megawatts (MW) of alternating current (AC) photovoltaic (PV) solar energy. The revised footprint from approximately 2,700 acres to approximately 2,300 acres reduces the generating capacity of the proposed project by approximately 70 MW. As

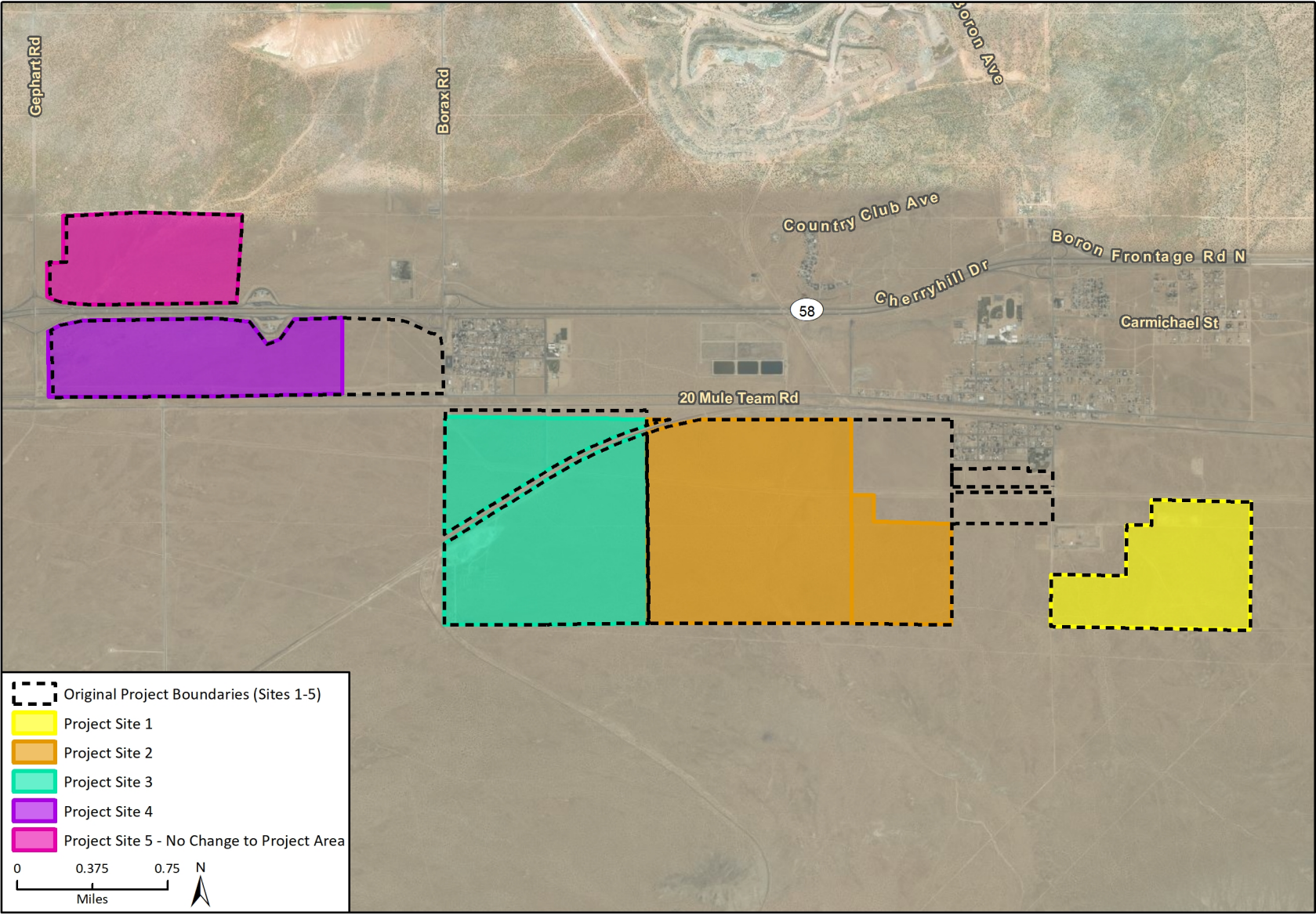
documented in the September 2020 Jurisdictional Waters and Wetland Delineation, five ephemeral drainages assumed to be under the jurisdiction of the Regional Water Quality Control Board (RWQCB) and the California Department of Fish and Wildlife (CDFW) were identified and delineated within Project Sites 2, 4, and 5. The 400-acre reduction in project footprint is associated with Project Sites 1, 2, 3, and 4. One ephemeral drainage is mapped within Project Site 2, and the footprint reduction associated with Project Site 2 does not reduce or otherwise affect this drainage. Likewise, one ephemeral drainage is mapped within Project Site 4, and the footprint reduction associated with Project Site 4 does not reduce or otherwise affect this drainage. Three ephemeral drainages are mapped within Project Site 5, the boundary of which has not changed.

Avoidance and Permitting

The September 2020 Jurisdictional Waters and Wetlands Delineation indicates that, where feasible, jurisdictional waters should be considered and avoided, and authorizations from the United States Army Corps of Engineers and RWQCB are not anticipated because project design does not call for the discharge of dredge or fill material into Waters of the United States. Following final project design, the project may require submittal of a Notification of Lake or Streambed Alteration to the CDFW. Final permitting requirements will be determined by the respective agencies at the time permits are requested.

Conclusion

The revised footprint submitted by 64NB 8ME LLC to the Kern County Planning Department for the Aratina Solar Project would reduce ground disturbance for the proposed project by approximately 400 acres and total solar energy production by 70MW. The revised footprint does not change the existing conditions, the identified and delineated features, or the proposed permitting approach in any way. As such, the September 2020 Jurisdictional Waters and Wetlands Delineation prepared for the Aratina Solar Project represents the worst-case potential impacts related to jurisdictional waters and wetlands for the proposed project and no additional analysis is required.



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Appendix D-1
Biological Evaluation

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BIOLOGICAL EVALUATION

ARATINA SOLAR FARM
BORON, KERN COUNTY, CALIFORNIA



September 2020

EnviroPlus Consulting, Inc.

Biological Evaluation
Aratina Solar Farm

Prepared for:

64NB 8ME, LLC
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Los Angeles, California 90036
Contact: Alexander Sundquist, Vice President of Land Development
(323) 525-0900

Prepared by:

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September 2020

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EXECUTIVE SUMMARY

64NB 8ME, LLC (Applicant) proposes to develop up to a 600 megawatt-alternating current (MW-ac) photovoltaic energy facility known as the Aratina Solar Farm located near the communities of Desert Lake and Boron in Kern County, California. The proposed Aratina project would be comprised of up to 2,666.7 acres on 27 accessor's parcels (Project Area). The permanent disturbance acreage associated with development of the solar facility and associated infrastructure (Project Site) would be located within but less than the gross acreage of the Project Area. The Applicant will be applying for Conditional Use Permits from Kern County for development of this project.

Power generated by Aratina would be delivered from the site with up to a 230 kilovolt (kV) overhead and/or underground electrical transmission line(s) originating from one or more on-site substation(s) and terminating at the Southern California Edison (SCE) Holgate Substation. Alternatively, Aratina may interconnect at the SCE Kramer Substation in San Bernardino County with up to a 230 kV transmission line located in an Edwards Air Force Base (Edwards AFB) utility corridor. These locations include power connections and generation tie-ins (gen-ties)[1] (Power Connections).

The proposed Aratina Project Area's eastern boundary is adjacent to San Bernardino County; its' southern boundary is adjacent to the northern boundary of Edwards AFB which also contains the Fremont-Kramer Desert Tortoise Critical Habitat Unit (CHU) (USFWS 2011); and its southeastern corner abuts the northwestern corner of the Bureau of Land Management (BLM) Fremont-Kramer Area of Critical Environmental Concern (ACEC). The entire Aratina Project Area is bisected by State Route 58 (SR58). The proposed Project Area is also included within the Desert Renewable Energy Conservation Plan (DRECP). However, the DRECP only currently applies to federally managed land.

This Biological Evaluation (BE) documents existing conditions of the proposed Aratina Project Area and the associated Power Connection locations. In February of 2019, a Mohave ground squirrel habitat assessment and a vegetation community assessment were conducted. In April and May of 2019, species specific surveys were conducted for federal or state listed rare, special status, protected, threatened, or endangered plants or wildlife. Information for this BE has been generated from literature searches, multi-agency databases, maps, and other documents to include a 20-mile radius around the proposed Project Area and associated Power Connections.

This BE incorporates the results of species specific surveys as well as an in depth review of vegetation communities; soils; the potential for state and federal special status and listed plant and wildlife species; and migratory bird and raptor species. Potential effects to these natural resources and biological species from the proposed project development have been addressed to the extent practicable. A U.S. Army Corps of Engineers (USACE) jurisdictional determination and a California Department of Fish and Wildlife (CDFW) review of waters and wetlands was not conducted by EnviroPlus Consulting, Inc. This information will be provided by another

[1] A generation tie-in is an electrical transmission line that connects the generation location (solar field) to a substation which then connects to the electrical grid.

qualified firm.

The information in this BE will be utilized to fully evaluate all effects for the determination of appropriate levels of mitigation for biological resources, excluding USACE and CDFW waters and wetlands. This will be in compliance with but not limited to, the California Environmental Quality Act (CEQA), the federal Endangered Species Act (ESA), and the California Endangered Species Act (CESA). Other regulatory requirements and compliance may be identified based on the findings of required biological surveys.

The proposed Aratina Solar Project Area is located within the Mojave Desert Region of the Desert Floristic Province. Landforms in the region include granite-derived flood plains, alluvial flats and fans, and small clay pans. Of the entire 2,666.7 acres, 2,644.9 acres comprise seven (7) vegetation communities identified in February 2019. These are listed in the order of dominance of cover. One sensitive vegetation community was identified and includes Spinescale (*Atriplex spinifera*) Shrubland Alliance. Western Joshua trees are a protected plant species and were located throughout the proposed Project Area. The western Joshua trees comprise a Joshua Tree Woodland Alliance, also a sensitive natural community, which occurs within many of the other vegetation communities. Vegetation community acreages per Project Area are addressed in detail in Section 4.0 and in Table 3 and include the following:

- Creosote Bush – White Bursage (*Larrea tridentata* - *Ambrosia dumosa*) Shrubland Alliance (1,509.1 acres)
- Spinescale (*Atriplex spinifera*) Shrubland Alliance (728.1 acres)
- Creosote Bush Shrubland Alliance (184.2 acres)
- Allscale (*Atriplex polycarpa*) Shrubland Alliance (105.9 acres)
- Successional Allscale - Spinescale Scrub (56.2 acres)
- Successional Spinescale Scrub (40.4 acres)
- White Bursage Shrubland Alliance (21.0 acres)
- Unvegetated, developed, and disturbed (21.8 acres)
- Joshua Tree Woodland Alliance (occurs within other vegetation communities)

A total of 30 sensitive, special status, and listed species potentially occur within or in close proximity to the proposed Project Area. Of the 30 species, a total of 17 special status plants were identified during the literature review and database searches; 11 wildlife species were identified, including the state Threatened Mohave ground squirrel and the state and federal Threatened Agassiz's desert tortoise; and two insect species.

A sensitive, special status, and listed plant species protocol survey was conducted in April 2019. USFWS protocol Agassiz's desert tortoise and CDFW protocol western burrowing owl protocol surveys were conducted in April and May of 2019. The desert tortoise and burrowing owl surveys were conducted at the same time, over the same Project Area footprint, and included all other sensitive, special status, and general wildlife species observations.

Survey results included: five rare plant species; four plant species protected by the California Desert Native Plants Act; no live desert tortoise but inactive burrows and one carcass; no live burrowing owls but two active burrows and three inactive burrows; 152 desert kit fox dens to include four pupping dens, 11 active dens, and 137 inactive dens; no live American badgers but one inactive den; and a total of 44 vertebrate species that included 28 bird species, eight mammal species to include Mohave ground squirrel and desert kit fox, and eight reptile species.

Based on the survey findings, the BE includes an analysis of impacts and a total of 22 recommended mitigation measures that should reduce the potential for adverse significant impacts to a less-than-significant impact for a majority of the listed, sensitive, special status species, and sensitive vegetation communities (Section 7.0). The recommended mitigation measures will require review by local, state, and federal agencies, of which their approvals will be needed in order to meet the required elements of CEQA, CESA, ESA, Kern County, and all other identified regulatory requirements.

1.0 INTRODUCTION

1.1 Project Description and Land Ownership

64NB 8ME, LLC (Applicant) proposes to develop up to a 600 megawatt-alternating electrical current (MW-AC) photovoltaic energy facility known as the Aratina Solar Farm located near the communities of Desert Lake and Boron in Kern County, California. Power generated by Aratina would be delivered from the site with up to a 230 kilovolt (kV) overhead and/or underground electrical transmission line(s) originating from one or more on-site substation(s) and terminating at the Southern California Edison (SCE) Holgate Substation. Alternatively, Aratina may interconnect at the SCE Kramer Substation in San Bernardino County with up to a 230 kV transmission line located in an Edwards Air Force Base (Edwards AFB) utility corridor. These locations include power connections and generation tie-ins (gen-ties)[1] (Power Connections). Ownership of lands outside of the proposed Project Site include a mix of municipal (i.e., Kern County, San Bernardino County, and the communities of Boron and Desert Lake), state (i.e., Caltrans and California Department of Fish and Wildlife's [CDFW] West Mohave Desert Ecological Reserve), federal (i.e., Edwards AFB Fremont-Kramer Desert Tortoise Critical Habitat Unit [CHU] and Bureau of Land Management [BLM] Fremont-Kramer Area of Critical Environmental Concern [ACEC]), and privately owned parcels of various sizes and County zoning designations.

The proposed Project Site, to include the associated Power Connections, is located west and south of the communities of Desert Lake and Boron; south of the Rio Tinto Borates Mine; north and south of State Route 58 (SR58), and north of Edwards Air Force Base (Edwards AFB) (Figure 1).

The Applicant is applying for Conditional Use Permits from Kern County for the construction and operation of the Aratina Solar Farm. Each of five Aratina Project Areas may include operations and maintenance (O&M) buildings, substations, energy storage systems (ESSs), and/or transmission facilities, as necessary, or it may share such facilities with each other or with any future energy projects in the area, and/or it may be remotely operated. Any "unused" O&M building, substation, and/or transmission facility areas on-site may be covered by solar panels under such scenarios.

The proposed Aratina project comprises 27 assessor's parcels (Project Area) totaling 2,666.7 acres of privately owned lands (Appendix A). The permanent disturbance acreage associated with development of the solar facility and associated infrastructure (Project Site) would be located within and less than the gross acreage of the Project Area.

The construction period for the proposed Aratina project, from site preparation through construction, testing, and commercial operation, is expected to commence as early as the fourth quarter of 2021 and will extend for approximately 12 to 18 months.

Construction of the facility will include the following activities:

- Site preparation
- Grading and earthwork
- Concrete foundations
- Structural steel work
- Electrical/instrumentation work
- Collector line installation
- Architecture and landscaping

No public roadways will be affected by Aratina, except during the Project's construction period. Construction traffic will access the Project Site from Gephart Road, Del Oro Street, Boron Avenue, and/or Twenty Mule Team Road. It is estimated that up to 1,000 workers per day (during peak construction periods) will be required during the construction of the Project.

Heavy construction is expected to occur between 6:00 am and 5:00 pm, Monday through Friday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities. Some activities may continue 24 hours per day, seven days per week. Low level noise activities may potentially occur between the hours of 10:00 pm and 7:00 am. Nighttime activities could potentially include, but are not limited to, refueling equipment, staging material for the following day's construction activities, quality assurance/control, and commissioning.

Materials and supplies will be delivered to the Project Site by truck. Truck deliveries will normally occur during daylight hours. However, there will be offloading and/or transporting to the Project Site on weekends and during evening hours.

Earthmoving activities are expected to be limited to the construction of the access roads, any O&M building, any substation, any energy storage systems, and any storm water protection or storage (detention) facilities. Final grading may include revegetation or applying earth-binding materials to disturbed areas.

Each Aratina Project Area could require an operational staff of up to five full-time employees. As noted earlier, it is possible that the Project would share O&M, substation, and/or transmission facilities with each other, or with any future energy projects nearby. In such a scenario, the projects would share personnel, thereby potentially reducing the Project's on-site staff.

The facility would operate seven days a week, 24 hours a day, generating electricity during normal daylight hours when the solar energy is available. Maintenance activities may occur seven days a week, 24 hours a day to ensure PV panel output when solar energy is available.

After the useful life of the Project, the panels will be disassembled from the mounting frames and the Site restored to its pre-development condition.

1.2 Project Area Description

The Project Area lies within an unincorporated area in the southeastern corner of Kern County, California, to the south and west of the unincorporated community of Boron (Figure 1). The Project Area is located on private land located on the Boron and Leuhman Ridge USGS 1:24000 quadrangles. The cadastral description of the Project Area is as follows:

- Township 11N, Range 8W – portions of Sections 27, 33, 34
- Township 10N, Range 8W – Sections 1 and 2
- Township 10N, Range 7W – portions of Sections 5 and 6

The Project Area is bounded as follows:

- North – an Antelope Valley East Kern Water Agency pipeline right-of-way
- West – Gephart Road
- South – Edwards AFB
- East – the Kern-San Bernardino County line

The Project Area lies outside of designated desert tortoise critical habitat. The nearest critical habitat is the Fremont-Kramer ACEC that lies adjacent to the southeast corner of the Project Area (Figure 2, USFWS 2011) on Edwards AFB lands.

The Project Area is within the Antelope Valley which generally lies between the Tehachapi and San Gabriel Mountains. Elevations within the Project Area range from 2,542 feet in the southeast corner to 2,340 feet in the southwest corner. The Project Area is relatively flat with some slight undulations in the western area. Drainage in the western area is to the north and northwest. Further to the west the drainage pattern transitions to westerly and then southwesterly drainage towards Rogers Dry Lake located three miles southwest of the Project Area within Edwards AFB.

Due to the relatively flat terrain over most of the Project Area, hydrology is largely characterized by percolation. However, there are a couple of small to medium washes that provide drainage. One is located in Project Area #2 and drains to the north while the other is in Project Area #4 and #5 and drains to the southwest.

There are several constructed features within and in the vicinity of the Project Area. The unincorporated community of Boron (population 2,253 in 2010 census) is located adjacent to and north of Project Area #1 and adjacent to and east of Project Area #2. The unincorporated community of Desert Lake (no population data) is located adjacent to and north of Project Area #3 and adjacent to and east of Project Area #4. A Kern County waste disposal site is located along Boron Avenue in the vicinity of Project Area #1.

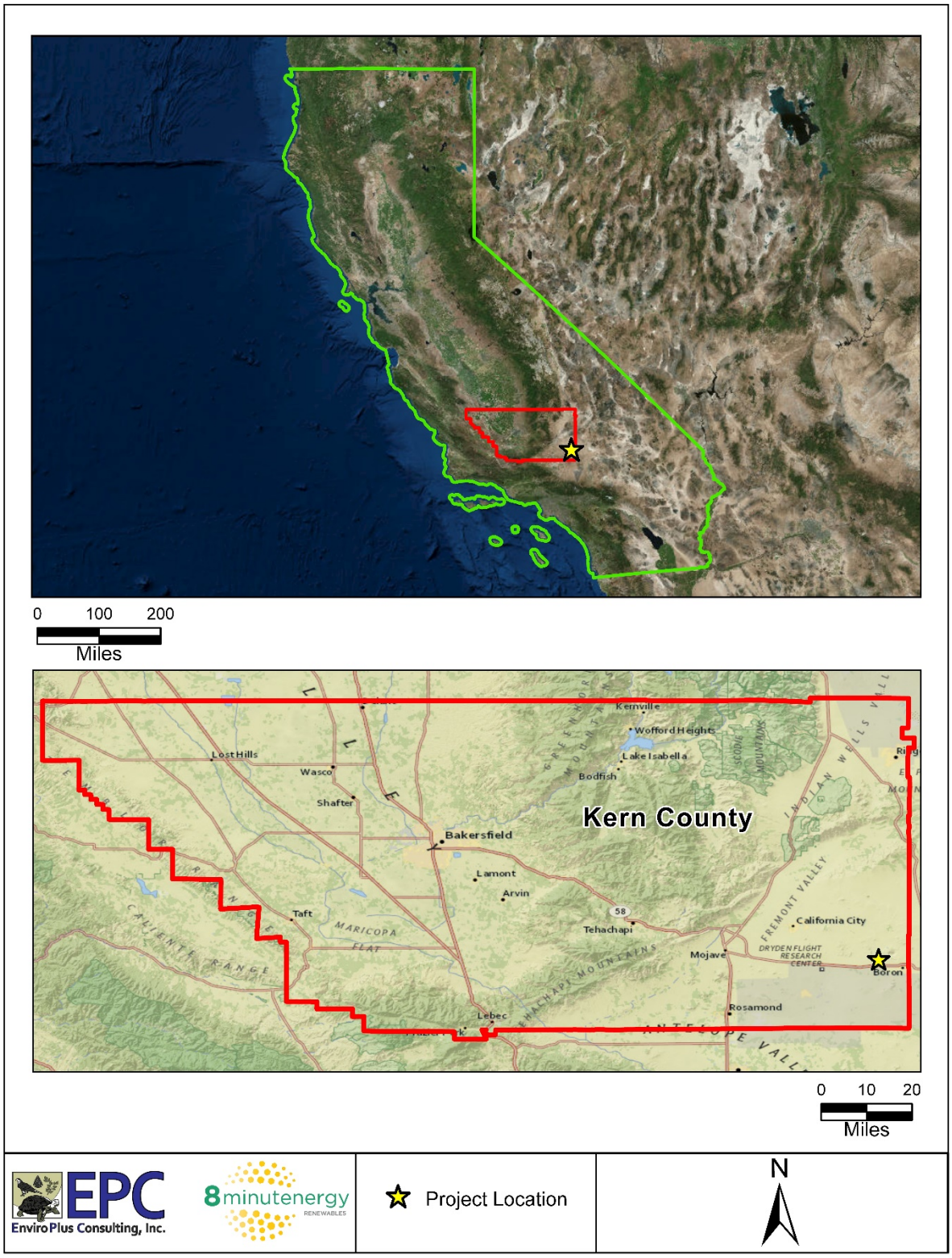


Figure 1. Proposed Aratina Solar Project Area Vicinity Map

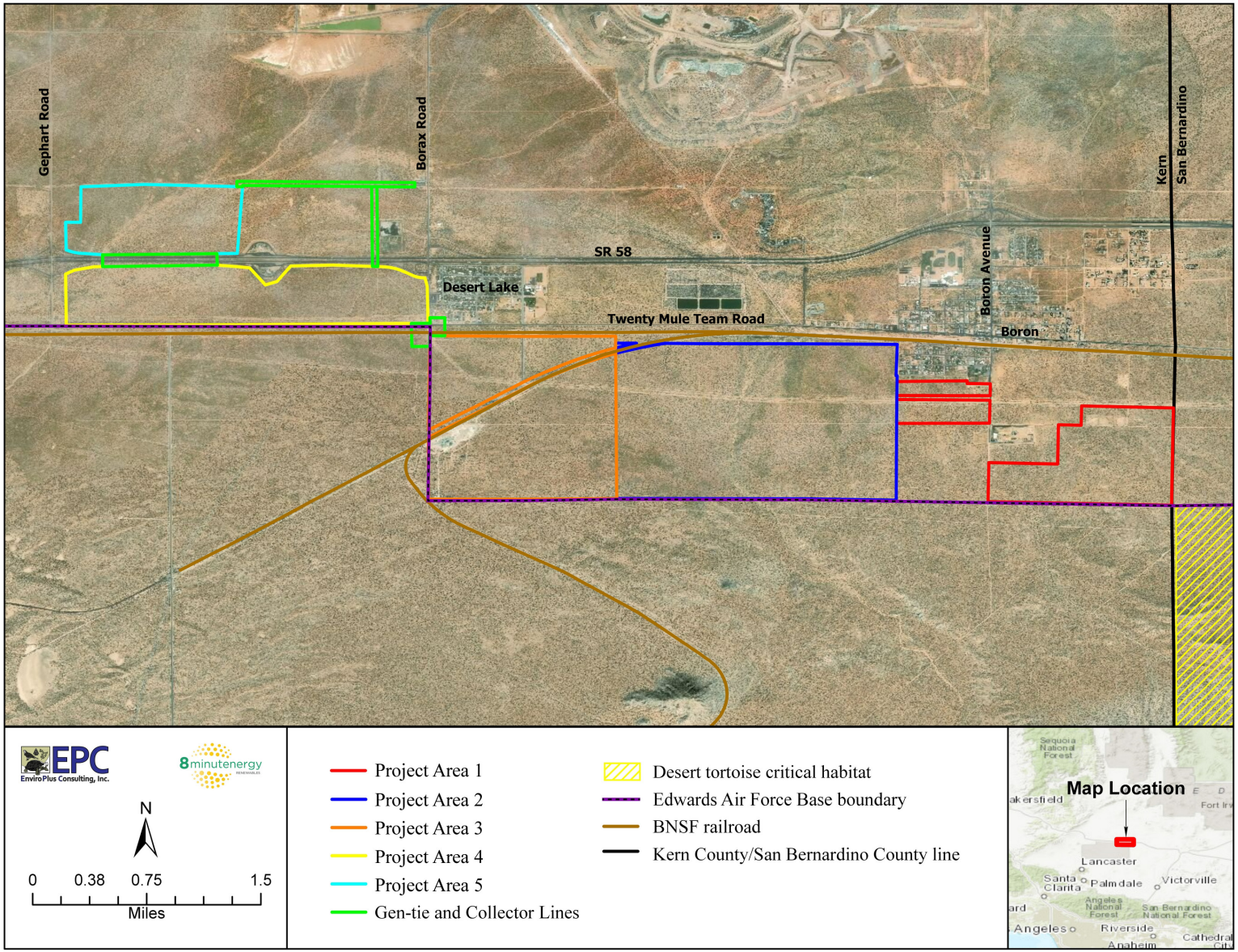


Figure 2. Proposed Aratina Solar Project Area Map

SR58, a four-lane divided highway traverses east-west between Project Area #4 and Project Area #5 with a rest area between the two Project Areas. Twenty Mule Team Road, a two-lane paved road that becomes a four-lane road within Boron, is an east-west road that forms the southern boundary of Project Area #4 and the northern boundary of Project Areas #2 and #3. Gephart Road, a two-lane paved north-south paved road forms the western boundary of the Project Area and generally provides access to the Rio Tinto Borate Mine (largest Borax mine in the world) located a mile to the north. Two miles east of Gephart Road, Borax Road, another two-lane paved road, provides primary access to the Rio Tinto facility and forms the eastern boundary of Project Area #4. An unnamed paved road connects Twenty Mule Team Road to a small railroad transfer facility within Project Area #3. There are also numerous dirt roads throughout the Project Area typically associated with utility corridors.

A single line railroad track (Burlington Northern and Santa Fe Railway formerly Atchison, Topeka, and Santa Fe Railway) parallels Twenty Mule Team Road to the south along the northern boundary of Project Areas #2 and #3 and along the southern boundary of Project Area #4. A spur line of this railroad cuts through the northwestern corner of Project Area #2 and traverses southwesterly through Project Area #3 bisecting it into two areas. Adjacent to this spur within Project Area #3 is a large area of whitish material that is approximately 15 acres in size. Near this area is a small transfer facility designed to convey bulk materials from trucks to railroad cars.

Multiple utilities including a water pipeline, electrical transmission and distribution lines and gas pipelines traverse the Project Area. The Antelope Valley East Kern Water Agency water pipeline and its associated right-of-way road form the northern boundary of Project Area #5 and traverses through the gen-tie route to the Holgate substation.

Two transmission lines parallel the north-south collector line between Project Area #4 and the gen-tie line to the Holgate substation. These include SCE's Edwards – Holgate – Southbase 115 kV line and the Kramer – Holgate 115 kV line. The Kramer to Holgate line and its associated right-of-way road also traverses east-west through Project Areas #1, #2 and #3. A smaller SCE distribution line (Paxton 4 kV) is located along Boron Avenue along a portion of Project Area #1.

Multiple gas pipelines and their associated right-of-way roads pass through the Project Area. The Mojave Gas Pipeline and a Pacific Gas and Electric pipeline parallel one another east-west through the southern portion of Project Area #4 just north of Twenty Mule Team Road. The Mojave Gas Pipeline also passes through Project Areas #1, #2, and #3. Within Project Area #1 and #2, the Mojave Gas Pipeline parallels another gas pipeline along the same utility corridor. Within Project Area #3 these pipelines diverge with the Mojave Gas pipeline turning to the north while the other pipeline continues traversing generally in an east-west direction. No human habitation is found on any of the parcels however, evidence of human activity is prevalent throughout the Project Area based on the proximity of the Project Area to Boron and Desert Lake. An informal but commonly used shooting range was located in the southeast corner of Project Area #1. Evidence of shooting activity was also found sporadically through the Project Area. Illegal dumping was observed during surveys and evidence of past illegal dumping was seen in low density primarily in Project Areas #1, #2, and #3. Off highway vehicles, trucks, and SUV-type vehicles were commonly observed both during the day and at night primarily in Project Areas #1, #2, and #3.

2.0 Literature Review and Database Search

Information on potential species occurrences has been obtained from existing databases and published and non-published resources. Databases were reviewed to assess whether occurrences of special status species have been documented in the vicinity of the proposed Aratina Solar Project Area and included the Leuhman Ridge and Kramer Junction 7.5-minute topographical USGS quadrangles (Figure 2 and Table 1) within the proposed Project Area. A 20-mile radius around the Project Area included a review of all surrounding USGS maps to include Astley Rancho, Boron, Boron NE, Boron NW, California City North, California City South, Edwards, Galileo Hill, Jackrabbit Hill, Kramer Hills, North Edwards, Red Buttes, Rodgers Lake North, Rodgers Lake South, Saddleback Mountain, and The Buttes.

Databases and resources reviewed and researched included the following:

- The California Natural Diversity Database (CNDDB) and CNDDB QuickView (CNDDB 2019) within a 20-mile radius of the proposed Project Area
- CDFW Natural Communities List (CDFW 2018a) and California Wildlife Habitat Relationships System Maps and Descriptions (CDFW 2018b)
- CDFW California Native Plant Society (CNPS) database (CNPS 2019) and CNPS website (CNPS 2019)
- CDFW Special Vascular Plants, Bryophytes, and Lichen List (CDFW 2018c)
- California Desert Native Plants Act (CDNPA) (Division 23 of the California Food and Agricultural Code, Section 80071-80075) (California Food and Agricultural Code 2005)
- Bureau of Land Management (BLM 2015) species databases
- California Department of Fish and Wildlife (CDFW) Special Animals List (CDFW 2018d) and the CDFW and USFWS Threatened or Endangered Animal Species List (CDFW 2018e)
- USFWS National Wetlands Inventory (NWI) Map (USFWS 2018)
- Desert Renewable Energy Conservation Plan (DRECP) (Dudek 2014), DRECP Data Basin (Dudek 2014), and DRECP Kern County Gateway (Dudek 2014)
- CDFW West Mohave Desert Ecological Reserve (CDFW 2019)
- U.S. Department of Agriculture (USDA) Web Soil Survey (USDA 1982)
- Federal Emergency Management Agency (FEMA) 100-year floodplain database (FEMA 2018)
- Regional hydrologic information was obtained from the Geospatial Data Gateway website of the Natural Resources Conservation Service (NRCS) (USDA 2019)
- Weather and precipitation data were obtained from the Western Regional Climate Center (2018).

Table 1. Federal and State Sensitive, Special Status, and Listed Species; IUCN Red List Species; CNPS Listed Species; and DRECP Species Identified for the Proposed Aratina Solar Project Area, Kern County, CA.[2]

SPECIES	ESA	CESA	G-RANK / S-RANK	CNPS RANK	DRECP
Mohave Ground Squirrel (*Xerospermophilus mohavensis*)		ST	G2G3 / S2S3		X
Desert Kit Fox (*Vulpes macrotis arsipus*)		CCR, Title 14[3]			
American Badger (*Taxidea taxus*)		SSC	G55 / S3		
Agassiz's Desert Tortoise (*Gopherus agassizii*)	FT	ST	G3 / S2S3		X
Golden Eagle (*Aquila chrysaetos*)	BCC BGEPA	FP WL	G5 / S3		X
Prairie Falcon (*Falco mexicanus*)	BCC	WL	G5 / S4		
Mountain Plover (*Charadrius montanus*)	BCC	SSC	G3 / S2S3		X
Burrowing Owl (*Athene cunicularia*)	BCC	SSC	G4 / S3		X
Gray Vireo (*Vireo vicinior*)	BCC	SSC	G4 / S2		
San Joaquin LeConte's Thrasher (*Taxostoma lecontei macmillanorum*)	BCC	SSC	G4 / S3		
Tricolored Blackbird (*Agelaius tricolor*)	SC BCC	SSC	G2G3 / S1S2		X
Crotch Bumble Bee (*Bombus crotchii*)		SCE[4]	G3G4 / S1S2 IUCN[5] - Endangered (EN)		
Western Bumble Bee (*Bombus occidentalis*)		SCE[4]	G2G3 / S1 IUCN[6] – Vulnerable (VU)		
Rosamond Eriastrum (*Eriastrum rosamondense*)			G1 / S1	1B.1 E	
Alkali Mariposa Lilly (*Calochortus striatus*)			G3 / S2S3	1B.2	X
Desert Cymopterus (*Cymopterus deserticola*)			G2 / S2	1B.2 E	X
Recurved Larkspur (*Delphinium recurvatum*)			G2 / S2	1B.2 E	
Barstow Woolly Sunflower (*Eriophyllum mohavense*)			G2 / S2	1B.2 E	X
Red Rock Poppy (*Eschscholzia minutiflora* ssp. *twisselmannii*)			G5 / S2	1B.2 E	
Beaver Dam Breadroot (*Pediomelum castoreum*)			G3 / S2	1B.2	
Sagebrush Loeflingia (*Loeflingia squarrosa* var. *artemisiarum*)			G5 / S2	2B.2	
Cove's Cassia (*Senna covesii*)			G5 / S3	2B.2	
Booth's Evening-primrose			G5 / S3	2B.3	

[2] See Appendix B for the definition of all Rank codes.
[3] Desert kit fox are a protected fur-bearing mammal under Title 14 of the California Code of Regulations, Section 460 (
[4] SCE = Candidate Species for Listing as Endangered under the California Endangered Species Act (CESA) (California Fish and Game Commission 2019).
[5] IUCN (International Union for Conservation of Nature) Red List (Hatfield et al. 2015a) and IUCN Red List Criteria (2020).
[6] IUCN (International Union for Conservation of Nature) Red List (Hatfield et al. 2015b) and IUCN Red List Criteria (2020).

SPECIES	ESA	CESA	G-RANK / S-RANK	CNPS RANK	DRECP
(*Eremothera boothii* ssp. *boothii*)					
White Pygmy-poppy (*Canbya candida*)			G3G4 / S3S4	4.2 E	
Mojave Spineflower (*Chorizanthe spinosa*)			S4	4.2 E	
Golden Goodmania (*Goodmania luteola*)			S3	4.2	
Torrey's Box-thorn (*Lycium torreyi*)			S3	4.2	
Crowned Muilla (*Muilla coronata*)			S3	4.2	
Graceful Nemacladus (*Nemacladus gracilis*)			S4	4.3	
Western Joshua Tree (*Yucca brevifolia*)		PL[7]			

The proposed Aratina Solar Project Area occurs within the DRECP Plan area. Renewable energy development activities proposed on public lands within the DRECP Plan area would be required to conform to federal, state, and local laws and regulations that protect biological resources, such as, but not limited to: Endangered Species Act (ESA), Clean Water Act, Clean Air Act, Migratory Bird Treaty Act, Eagle Act, California Endangered Species Act (CESA), California Fish and Game Code (1600–1616), Porter-Cologne Water Quality Act, Native Plant Protection Act, and local authorities and administering agencies.

Current conservation strategies and mitigation measures for renewable energy projects on federal lands have been defined within Phase I of the DRECP. Phase I compliance will apply if the project Power Connections extend into the Edwards AFB utility corridor.

Phase II of the DRECP will define conservation strategies and mitigation measures for non-federal lands with the intent that the county in which the project would occur would administer and implement compliance with Phase II DRECP agreements. Phase II of the DRECP has not been completed and it is unknown as to when this may occur.

3.0 GENERAL SITE CONDITIONS

3.1 Geographic Area and Climate

The proposed Aratina Solar Project Area is located in southeastern Kern County (Figure 1). Kern County encompasses 8,161 square miles and is bordered by Kings County to the northwest, Tulare County to the north, Inyo County to the northwest, San Bernardino County to the east, Los Angeles County to the south, Ventura County to the southwest, Santa Barbara County to the southwest, and San Luis Obispo County to the west. The climate of the region varies greatly from the foothills of the Sierra Mountains to the foothills of Coastal Ranges.

The proposed Project Area would be located west and south of the communities of Boron and Desert Lake (Figure 2). These communities are census-designated places (CDP) within Kern County (Wikipedia 2019). The population was 2,253 at the 2010 census, up from 2,025 at the 2000 census. Boron and Desert Lake are on the border of Kern and San Bernardino Counties along SR58 at an elevation of 2,467 feet (mean sea level). Boron is 65-miles north of Palmdale, 85-miles east of Bakersfield, and 40-miles west of Barstow in the Antelope Valley region of the

[7] PL = Petitioned for Listing as Threatened under the California Endangered Species Act (CESA) (California Fish and Game Commission 2020).

Mojave Desert. According to the United States Census Bureau, the CDP has a total area of 13.8 square miles, over 99 percent of its land base.

The desert area around Boron and Desert Lake has an average annual temperature ranging from 55 degrees Fahrenheit (F) to 75 degrees F (weatherandclimate.com 2019). The coldest month is December and average temperatures range between 46 degrees F and 68 degrees F. The warmest month is August and average temperatures range between 63 degrees F and 84 degrees F. The mean precipitation is approximately 4 inches. Most of the annual precipitation, in the form of rain, falls between the months of December and March.

3.2 Soils

Soils identified within the proposed Aratina Solar Project Area include Cajon loamy coarse sand (105), Cajon-Norob complex (109), Cajon loamy sand (114), Cajon gravelly loamy sand (116), Norob complex (137), Neuralia sandy loam (154), and Norob-Neuralia complex (155) (Table 2 and Figure 3). These soil types are found throughout the Project Area with Cajon loamy sand (114), Norob-Neuralia complex (155), and Cajon-Norob complex (109) being the dominant soils present. Soils Series descriptions are as follows:

Cajon Series: The Cajon Series of soils consist of very deep, somewhat excessively drained soils that formed in sandy alluvium from dominantly granitic rocks (USDA 2019a). The textures can be coarse sand, loamy coarse sand, sand, loamy sand, fine sand, or loamy fine sand or their gravelly or cobbly equivalents.

Cajon soils are on alluvial fans, fan aprons, fan skirts, inset fans and river terraces at elevations of 200 to 4,300 feet. Slopes are 0 to 15 percent. The climate is arid with hot dry summers and somewhat moist winters. Average annual precipitation is 2 to 9 inches, mostly in the form of winter rain. Mean January temperature is 43 degrees to 48 degrees F., mean July temperature is 82 degrees to 84 degrees F., mean annual temperature is 57 degrees to 70 degrees F. Frost-free season is 150 to 340 days. The profile is slightly alkaline or strongly alkaline and mildly saline-alkali to strongly saline-alkali. Cajon soils are somewhat excessively drained; negligible to low runoff; with rapid permeability. Cajon soils with sandy loam surface textures have moderately rapid over rapid permeability. Flooding is none to rare. Vegetation is mostly desert shrubs including creosote bush (*Larrea tridentata*), saltbush (*Atriplex* spp.), Mormon-tea (*Ephedra* sp.), western Joshua tree (*Yucca brevifolia*), sand rice grass (*Stipa hymenoides*), and other annual grasses and forbs.

Norob Series: The Norob series consists of very deep, moderately well drained soils that formed from mixed alluvium, with many areas having eolian deposits on the soil surface (USDA 2019c). Norob soils are on alluvial plains and alluvial flats in the Mojave Desert. Slopes are 0 to 5 percent. Elevations are 2,300 to 3,200 feet. The climate is characterized by hot, dry summers and cool, slightly moist winters. The mean annual precipitation is 4 to 6 inches. The average January temperature is 44 degrees F.; the average July temperature is 87 degrees F.; and the mean annual temperature is 62 to 65 degrees F. The frost-free season is 200 to 250 days. This soils series is moderately well drained; negligible to medium runoff with some ponding during occasional heavy rainstorms; and slow permeability. Natural vegetation occurring within this series includes saltbush, creosote bush, and scattered annual grasses and forbs.

Neuralia Series: The Neuralia Series consists of very deep, well drained soils formed in alluvium from mixed sources. Neuralia soils are on alluvial fans, fan terraces, and plains and

have slopes of 0 to 15 percent. Elevations are 2,300 to 4,200 feet. The climate is arid with hot, dry summers and cool, moist winters. Mean annual precipitation is 4 to 6 inches, some as snow. The mean January temperature is about 45 degrees F. and the mean July temperature is about 88 degrees F., and the mean annual temperature is 57 to 62 degrees F. Frost-free season is 200 to 250 days. The mean annual soil temperature is 59 to 65 degrees F. and the difference between mean summer and mean winter soil temperature is 35 to 45 degrees F. The soil temperature is below 47 degrees F. from about December 1 to March 1 and is below 41 degrees F. from about January 1 to February 1 in most years. The surface is covered with about 30 to 60 percent fine (2 to 25 mm) gravel. Reaction is neutral to moderately alkaline to a depth of 10 inches and slightly alkaline or moderately alkaline below. Well drained; slow and medium runoff; and moderately slow permeability. Natural vegetation occurring within this series includes white bursage, creosote bush, and scattered annual grasses and forbs.

Table 2. Soil Mapping Units Identified Within the Proposed Aratina Solar Project Area, Kern County, CA

Soil Mapping Unit	Soil Mapping Unit Name	Slopes Associated with Unit (%)	Elevation where Found (ft)	Landforms Associated with Unit	Parent Material Associated with Unit
105	Cajon loamy coarse sand	0-5	2,000-3,000	inset fans	aeolian deposits derived from granite
109	Cajon-Norob complex	2-9	2,000-3,000	sand sheets, alluvial flats	aeolian deposits derived from granite
114	Cajon loamy sand	0-5	400-4,000	flood plains, alluvial fans	alluvium derived from granite
116	Cajon gravelly loamy sand	0-9	400-4,000	flood plains, alluvial fans	alluvium derived from granite
137	Norob complex, overblown	0-5	2,290-2,320	alluvial flats	alluvium derived from mixed sources
154	Neuralia sandy loam	2-5	2,300-2,800	alluvial fans	alluvium derived from granite
155	Norob-Neuralia complex	0-5	2,000-2,800	flood plains, alluvial fans	alluvium derived from mixed sources or granite
157	Pits (i.e., borrow pits)	-	-	-	-

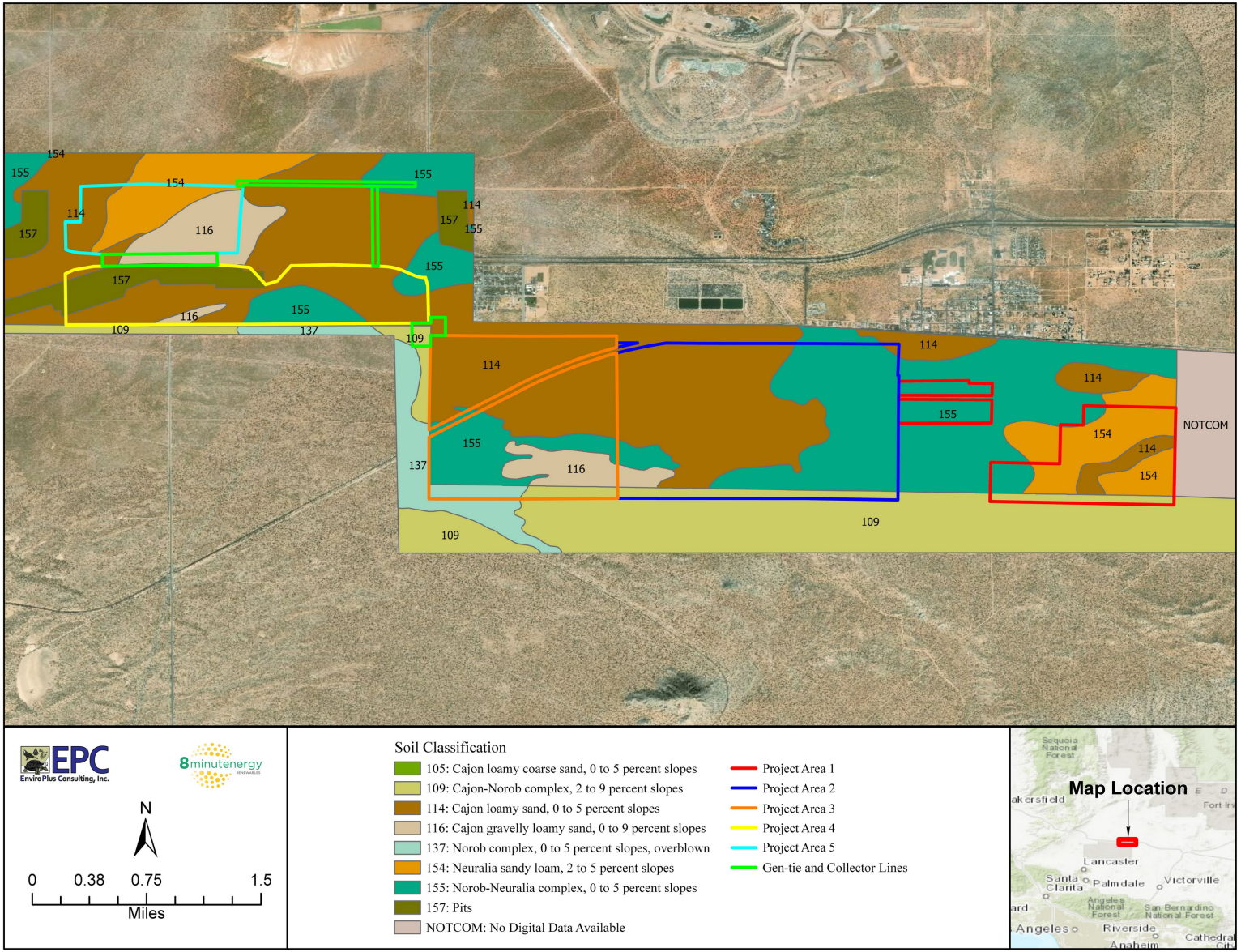


Figure 3. Proposed Aratina Solar Project Area Soils Map

3.3 Vegetation Communities and Botanical Species

The proposed Aratina Solar Project Area is located within the Mojave Desert Region of the Desert Floristic Province. Landforms in the region included granite-derived flood plains, alluvial flats and fans, and small clay pans. Seven (7) vegetation communities were identified on site and account for 2,644.9 acres of the total 2,666.7 acres. These vegetation communities include Creosote Bush – White Bursage (*Larrea tridentata - Ambrosia dumosa*) Shrubland Alliance; Spinescale (*Atriplex spinifera*) Shrubland Alliance; Creosote Bush Shrubland Alliance; Allscale (*Atriplex polycarpa*) Shrubland Alliance; Successional Allscale - Spinescale Scrub; Successional Spinescale Scrub; White Bursage Shrubland Alliance; and Joshua Tree Woodland Alliance. A vegetation community assessment was conducted for the proposed project in February 2019 and is discussed in detail in Section 4.0.

A total of 17 (seventeen) special status botanical species were identified during the literature review and database search efforts for the Project as discussed in Section 2.0 and depicted in Table 1. Potentially occurring sensitive and special status botanical species are discussed in detail in Section 5.1 and the April 2019 survey results are summarized in Section 6.1 with the completed *Rare Plant Survey at the Proposed Aratina Solar Farm, Kern County, California* report appended to this BE (Appendix E).

3.4 Wildlife

General and protocol wildlife surveys were conducted at the proposed Aratina Solar Project Area in April and May of 2019. Based on the results of the literature review and database research (Section 2.0) a total of two (2) federal and/or state listed species were identified as having a moderate to high potential for occurrence within the Project Area. These species included the state listed as Threatened Mohave ground squirrel (MGS) and the federal and state listed as Threatened Agassiz's desert tortoise (ADT).

A habitat assessment for the potential for MGS occurrence was conducted by Dr. Philip Leitner in February 2019 and the species is acknowledged to support an MGS population on site based on this habitat assessment. Life history information is discussed in Section 5.2 and the results of the habitat assessment are discussed in detail in Section 6.2.

ADT was also presumed to be present within the Project Area as well based on literature reviews. Protocol presence/absence surveys were conducted in April and May of 2019 to determine the status of this species on site. ADT life history is discussed in Section 5.2 and the results of the survey are discussed in Section 6.2.

In addition to MGS and ADT, a total of 11 other special status species were identified during the literature review and database research as discussed in Section 2.0 and depicted in Table 1. These species include 7 species of birds, 2 species of mammals, and 2 species of insects and are discussed in Section 5.3. The results of the April and May 2019 protocol and general wildlife surveys are discussed in Section 6.3 with the completed *Wildlife Survey of the Proposed Aratina Solar Project, Kern County, California* report appended to this BE (Appendix F).

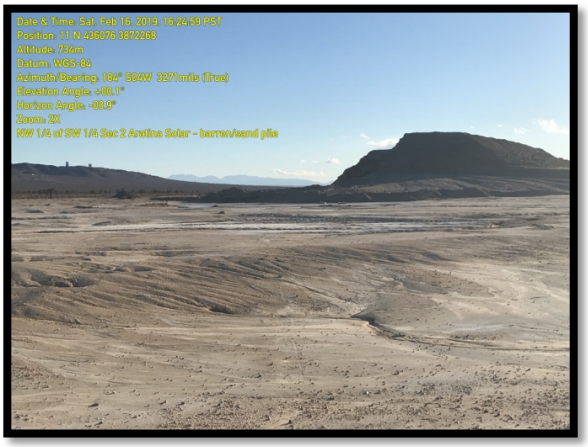
4.0 Vegetation Community Assessment

4.1 Methodology

As discussed in Section 2.0 various agency databases and recorded documents were reviewed and researched for the proposed Aratina Solar Project Area and surrounding lands for the presence of vegetation communities and associated botanical species. Sensitive natural communities or vegetation communities are presumed to occur within the proposed Project Area if there were locality records, either historic or recent, indicating presence. In order to determine which vegetation communities occur on site, a reconnaissance-level vegetation community assessment was conducted by Mr. Mark Bagley, Senior Botanist, between February 12 and 18, 2019.

Mr. Bagley mapped the vegetation community types occurring within the proposed Aratina solar Project Area, he identified habitats that may include special status plants, and he identified sensitive natural communities occurring on-site. Mr. Bagley either walked or drove throughout the Project Area and visited all habitats and topographic features in the area.

Mr. Bagley recorded plant alliance, dominant shrubs, other shrubs, soil texture, and habitat disturbances. Photographs were taken of each habitat type. Occurrence potential for each special status plant identified during the database search was ranked "present", "likely", "possible", or "unlikely" based on the habitat evaluation. The survey was not floristic in nature and was not intended to replace one that is. A floristically-based, protocol-level survey (BLM 2009, CDFW 2009) in all natural (or naturalized) habitats within the proposed Project Area was conducted in April of 2019 to identify every plant taxon that occurs on site, at least to the taxonomic level necessary to determine rarity and listing status (Appendix E).



Photograph 1. Disturbed, Bladed Area

4.2 Results

The proposed Aratina Solar Project Area is located within the Mojave Desert Region of the Desert Floristic Province. Landforms in the region included granite-derived flood plains, alluvial flats and fans, and small clay pans. The entire area drains southwesterly towards Rogers Lake on Edwards AFB.

Desert vegetation occurs throughout most of the proposed project's footprint and is largely intact with little disturbances occurring throughout with the exception of paved and dirt roadways, above and below ground utility lines, railroad track and spur, limited development and disturbance (i.e., a Caltrans borrow pit location) (Photographs 1 and 2), and scattered trash dumping (Photograph 3). It should be noted that noxious weeds such as non-



Photograph 2. Caltrans Borrow Pit

native mustards (*Brassica* spp. and *symbrium* spp.) and Russian thistle (*Salsola tragus*) were noted during the habitat assessment along dirt road shoulders and along the railroad tracks.

Scattered in the western portion of the proposed Project Area, but not mapped, were small clay pans (Photograph 4). Clay pans have a high clay content and are dense, compact, and slowly permeable. They are usually barren of shrubs but may contain several annual plants, including special status annuals.



Photograph 3. Trash Dump Site



Photograph 4. Representative Clay Pan

The vegetation is comprised of two major types: Mojave Creosote Bush Shrubland and Mojave Desert Saltbush Shrubland. The Mojave Creosote Bush Shrubland contains creosote bush and white bursage and the Mojave Desert Saltbush Shrubland contains spinescale and allscale. These desert vegetation communities are defined by the predominant vegetation present on site. Where dominant plant species coincide and the majority of the land coverage is comprised of more than one dominant vegetation type, it is considered an Alliance, as in the case of the Creosote Bush-White Bursage Scrub Shrubland Alliance or the Joshua Tree Woodland Alliance. Table 3 provides the acreage of each vegetation community and the acreage of disturbed and developed features within each Project Area on the proposed 2,666.7 acre Aratina Solar Project Site and Figure 4 depicts the vegetation communities mapped within each Project Area on the proposed Aratina Project Site.

The vegetation communities present on site are further defined as follows with nomenclature following *The Jepson Manual, 2nd Ed.* (Baldwin et al. 2012). A list of perennial plant species recorded during the vegetation community assessment is provided in Appendix C of this BE.

Table 3. Acreage of Vegetation Communities and Unvegetated Features on the Proposed Aratina Solar Project Area, Kern County, California.

VEGETATION COMMUNITY*	PROJECT AREA #1 ACRES (%)	PROJECT AREA #2 ACRES (%)	PROJECT AREA #3 ACRES (%)	PROJECT AREA #4 ACRES (%)	PROJECT AREA #5 ACRES (%)
Creosote Bush - White Bursage (*Larrea tridentata – Ambrosia dumosa*) Shrubland Alliance	209.6 (56%)	743.9 (78%)	462.2 (72%)	93.4 (21%)	
Spinescale (*Atriplex spinifera*) Shrubland Alliance (CDFW Sensitive)	155.1 (42%)	192.4 (20%)	129.2 (20%)	186.6 (42%)	64.8 (26%)
Creosote Bush Shrubland Alliance					184.2 (74%)
Allscale (*Atriplex polycarpa*) Shrubland Alliance				105.9 (24%)	
Successional Allscale - Spinescale Scrub				56.2 (13%)	
Successional Spinescale Scrub	6.4 (2%)		34.0 (5%)		
White Bursage Shrubland Alliance		21.0 (2%)			
Unvegetated (developed: paved roadways, structures, or other features and disturbed: dirt roadways)	1.1 (0%)		20.7 (3%)		
TOTAL ACRES	**372.4 (100%)**	**957.3 (100%)**	**646.0 (100%)**	**442.0 (100%)**	**249.0 (100%)**

* Joshua Tree (*Yucca brevifolia*) Woodland Alliance occurred in small patches within other vegetation communities but was not separately quantified.

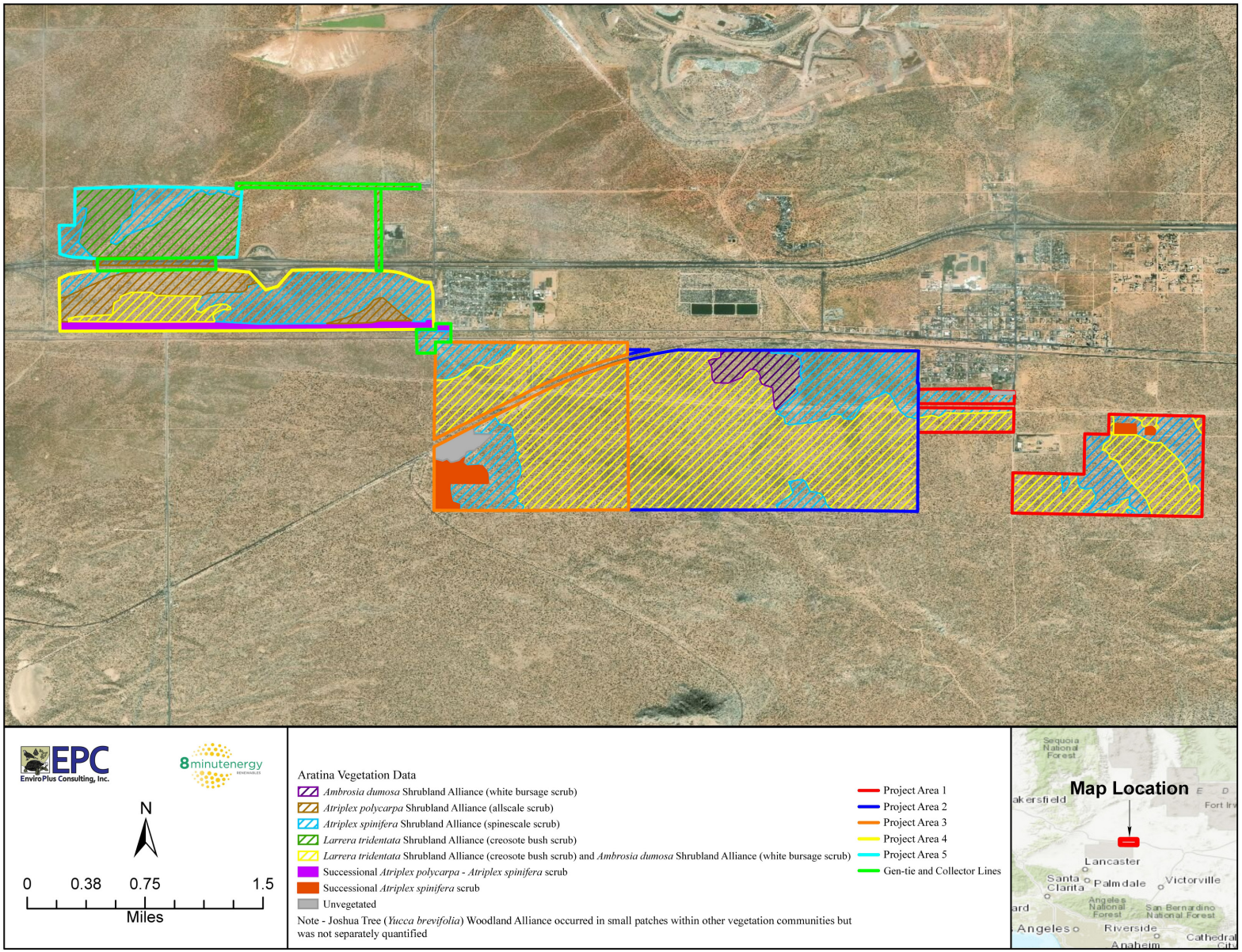


Figure 4. Proposed Aratina Solar Project Area Vegetation Communities

4.2.1 Non-sensitive Vegetation Communities

***Larrea tridentata* - *Ambrosia dumosa* Shrubland Alliance (creosote bush - white bursage scrub).** This vegetation community comprises 1,509.1 acres or approximately 56.6% of the 2,666.7 acre proposed Project Area. Within the 372.4 acre Project Area #1 it comprises 209.6 acres or 56%; within the 957.3 acre Project Area #2 it comprises 743.9 acres or 78%; within the 646.0 acre Project Area #3 it comprises 462.2 acres or 72%; and within the 442.0 acre Project Area #4 it comprises 93.4 acres or 21%. It does not occur within Project Area #5.



Photograph 5. ***Larrea tridentata – Ambrosia dumosa* Shrubland Alliance**

The *Larrea tridentata – Ambrosia dumosa* Shrubland Alliance commonly occurs on well-drained alluvial or colluvial soils, with or without a desert pavement surface, in minor washes and rills and on alluvial fans, bajadas, and upland slopes throughout the Mojave Desert, from below sea level to 1,200 meters in elevation (Sawyer et al. 2009). This alliance is the dominant vegetation community within the proposed Aratina Project Area (Figure 3 and Photograph 5). Other plants found in this alliance include cheesebush (*Ambrosia salsola*), goldenhead (*Acamptopappus sphaerocephalus* var. *hirtellus*), Cooper's goldenbush (*Ericameria cooperi* var. *cooperi*), horsebrush (*Tetradymia stenolepis*), spinescale, spiny hop-sage (*Grayia spinosa*), winter fat (*Krascheninnikovia lanata*), desert tomato (*Lycium andersonii*), box-thorn (*Lycium cooperi*), and western Joshua tree. This alliance and its shrub associations that occur on the proposed Project Area are not considered sensitive natural communities by CDFW (CDFW 2018a).

***Larrea tridentata* Shrubland Alliance (creosote bush scrub).** This vegetation community comprises 184.2 acres or approximately 7% of the 2,666.7 acre proposed Project Area. Within the 249.0 acre Project Area #5 it comprises 184.2 acres or 74%. It does not occur within Project Areas #1, #2, #3, or #4.

Creosote bush scrub typically occurs in well-drained soils on alluvial fans, bajadas, upland slopes and in minor, intermittent washes at an elevational range of below sea level to 1,000 meters (Sawyer et al. 2009). This vegetation community is restricted to a small area in the western portion of the proposed Project Area (Figure 4). Other shrubs recorded on site include white bursage, allscale, spinescale, and bush peppergrass (*Lepidium fremontii*). Western Joshua trees are scattered throughout the area. This alliance and its shrub associations that occur within the proposed Project Area are not considered sensitive natural communities by CDFW (CDFW 2018a).

***Atriplex polycarpa* Shrubland Alliance (allscale scrub) and Successional *Atriplex polycarpa* – *Atriplex spinifera* Scrub.** The *Atriplex polycarpa* Shrubland Alliance vegetation community comprises 105.9 acres or approximately 4% of the 2,666.7 acre proposed Project Area. Within the 442.0 acre Project Area #4 it comprises 105.9 acres or 24%. It does not occur within Project Areas #1, #2, #3, or #5.

The Successional *Atriplex polycarpa* – *Atriplex spinifera* Scrub vegetation community comprises 56.2 acres or approximately 2.1% of the 2,666.7 acre proposed Project Area. Within the 442.0 acre Project Area #4 it comprises 56.2 acres or 13%. It does not occur within Project Areas #1, #2, #3, or #5.

Allscale scrub is typically found in washes and on playa lake beds and shores, dissected alluvial fans, rolling hills, terraces, and edges of large, low gradient washes at an elevation of -75 meters to 1500 meters. Soils may be carbonate-rich, alkaline, sandy, or sandy loam (Sawyer et al. 2009). This habitat type occurs primarily in the western portion of the proposed Project Area and is strongly dominated by allscale (Figure 4 and Photograph 6). Other shrubs are widely scattered and include white bursage, cheesebush, spinescale, winter fat, desert tomato, box-thorn, and creosote bush. Western Joshua trees are also present. This alliance and its shrub associations that occur within the proposed Project Area are not considered sensitive natural communities by CDFW (CDFW 2018a).



Photograph 6. *Atriplex polycarpa* Shrubland Alliance with Joshua Tree Woodland Alliance

***Ambrosia dumosa* Shrubland Alliance (white bursage scrub).** This vegetation community comprises 21.0 acres or approximately < 1% of the 2,666.7 acre proposed Project Area. Within the 957.3 acre Project Area #2 it comprises 21.0 acres or 2%. It does not occur within Project Areas #1, #3, #4, or #5.

White bursage scrub commonly occurs on alluvial fans, bajadas, rocky hills, partially-stabilized and stabilized sand fields, and upland slopes, between 0 and 1,700 meters in elevation. Soils are typically sandy, clay-rich, or calcareous and may have pavement surfaces (Sawyer et al. 2009). This alliance is confined to a small area near the center of the proposed Project Area (Figure 4 and Photograph 7). Other shrubs recorded on site include goldenhead, cheesebush, allscale, box-thorn, and creosote bush. Western Joshua trees are also present. The white bursage – goldenhead



Photograph 7. *Ambrosia dumosa* Shrubland Alliance

plant association, a sensitive natural community (CDFW 2018a), was not identified within the proposed Project Area.

4.2.2 Sensitive Vegetation Communities

***Atriplex spinifera* Shrubland Alliance (spinescale scrub) and Successional Atriplex spinifera Scrub.** The *Atriplex spinifera* Shrubland Alliance vegetation community comprises 728.1 acres or approximately 27.3% of the 2,666.7 acre proposed Project Area. Within the 372.4 acre Project Area #1 it comprises 155.1 acres or 42%; within the 957.3 acre Project Area #2 it comprises 192.4 acres or 20%; within the 646.0 acre Project Area #3 it comprises 129.2 acres or 20%; within the 442.0 acre Project Area #4 it comprises 186.6 acres or 42%; and within the 249.0 acre Project Area #5 it comprises 64.8 acres or 26%.



Photograph 8. *Atriplex spinifera* Shrubland Alliance

The Successional *Atriplex spinifera* Scrub vegetation community comprises 40.4 acres or approximately 1.5% of the 2,666.7 acre proposed Project Area. Within the 372.4 acre Project Area #1 it comprises 6.4 acres or 2% and within the 646.0 acre Project Area #3 it comprises 34.0 acres or 5%. It does not occur within Project Areas #2, #4, or #5.

This scrub habitat is found between 50 and 800 meters in elevation on alluvial fans and on old lake beds perched above current drainages. Soils are moderately sandy clay loams to fine, silty clays that may be carbonate rich (Sawyer et al. 2009). Within the proposed Project Area, it was the second most common shrubland alliance (Figure 4 and Photograph 8). Although largely intact, there are areas within the proposed Project Area that contain successional spinescale – allscale, spinescale, and allscale scrub (Photograph 9). Other shrubs recorded within this vegetation community include white bursage, cheesebush, goldenhead, horsebrush, allscale, winter fat, box-thorn, and creosote bush. Western Joshua trees are also present. *Atriplex spinifera* Shrubland Alliance is designated as a sensitive natural community by CDFW (CDFW 2018a).



Photograph 9. Successional *Atriplex spinifera* Shrubland Alliance

***Yucca brevifolia* Woodland Alliance (Joshua tree woodland)**

Joshua tree woodland, a sensitive natural community (CDFW 2018a), occurs in small patches (up to 10-20 acres) within the creosote bush – white bursage scrub shrubland

alliance, within white bursage scrub vegetation communities, and within the allscale and spinescale scrub shrubland alliances (Photograph 6). This habitat type is recognized when Joshua trees are evenly distributed at greater than or equal to one percent cover over the landscape. Joshua tree woodland generally occurs at an elevation of 750-1,800 meters on alluvial fans, ridges, and gentle to moderate slopes with soils that are comprised of coarse sands, very fine silts, gravel, or sandy loams (Sawyer et al. 2009).

Joshua tree woodland was not mapped during the vegetation community assessment, however, all individual western Joshua trees were recorded and mapped during the special status plant species protocol surveys in April 2019 (Appendix E). Results from this survey are discussed in Section 6.1.

The vegetation communities present on site are known to support a variety of wildlife and botanical species, some of which are sensitive, special status, or state and/or federal listed (Table 1). These species are discussed in detail in Sections 5.0 and 6.0.

5.0 POTENTIAL SENSITIVE, SPECIAL STATUS, AND LISTED BIOLOGICAL SPECIES

As discussed above in Section 2.0, various agency databases and recorded documents were reviewed and researched for the proposed Aratina Solar Project Area and surrounding lands to identify the potential occurrence of sensitive, special status, and federal and/or state listed plant and wildlife species. Sensitive, special status, and listed plant and wildlife species are presumed to occur within the proposed Aratina Project Area if there were locality records, either historic or recent, indicating presence, discovered through the research and literature review efforts.

A total of 17 special status plant species were identified (Table 1). No federal or state listed plants were identified during the literature review and database search. One species petitioned for listing as state Threatened, the western Joshua tree, was identified as occupying the Aratina Solar Project Area. These findings are discussed in detail in Section 5.1.

A total of 11 potentially occurring wildlife species and two insect species were identified during the literature review and database search (Table 1). Of the 11 wildlife species identified, two are state and/or federal listed as Threatened and include the state listed as Threatened MGS and the state and federal listed as Threatened ADT. A habitat assessment was conducted for the MGS in February 2019 by Dr. Philip Leitner. MGS and ADT are discussed in detail in Section 5.2.

The remaining 9 wildlife species and the 2 insect species are state and/or federal special status species. These findings are discussed in detail in Section 5.3.

5.1 Potentially Occurring Botanical Species

5.1.1 Methods

Section 2.0 details the various agency databases and recorded documents that were reviewed and researched for the proposed Aratina Solar Project Area and surrounding lands for special status plant species. Special status plant species are presumed to occur within the proposed Project Area if there were locality records, either historic or recent, indicating presence, discovered through the research and literature review efforts.

Seventeen (17) special status plant species have the potential to occur within the boundaries of the proposed Project Area. These species are included on special status lists where they meet one or more of the following categories (CDFW 2018b, 2018c; CNPS 2019; USFWS 2017):

- Taxa that are officially listed or proposed for listing under the State and/or Federal Endangered Species Acts;
- Taxa that are State or Federal candidates for possible listing;
- Taxa that are State or Federal petitioned for possible listing;
- Taxa listed in the California Native Plant Society's (CNPS) *Inventory of Rare and Endangered Plants of California*;
- 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) Guidelines (e.g., all CNPS Rank 1 and 2 and some Rank 3 and 4 plants may fall under Section 15380 of CEQA);

- Taxa that are biologically rare, very restricted in distribution, or declining throughout their range but not currently threatened with extirpation;
- Populations in California that may be on the periphery of a taxon's range, but are threatened with extirpation in California; and
- Taxa closely associated with a habitat that is declining in California at a significant rate (e.g., wetlands, riparian, old growth forests, desert aquatic systems, native grasslands, vernal pools, etc.).

In addition, taxa protected under the CDNPA (Division 23 of the California Food and Agricultural Code, Section 80071-80075) (California Food and Agricultural Code 2005) were also considered. These taxa include:

- Smoke tree (*Psorothamnus spinosus*);
- All native species in the genus *Prosopis*, i.e., mesquites;
- All native species in the genus *Nolina*, i.e. beargrass;
- All native species in the family *Cactaceae*, i.e., cacti; and
- All native species in the family *Agavaceae*, i.e., century plants (*Agave* spp.), Joshua trees and other *Yucca* spp., and desert lilies (*Hesperocallis undulata*)

Although federal and/or state threatened or endangered species or proposed threatened or endangered species receive legal protection, special status species do not. However, local, state, and federal resource agencies typically require that these species be considered during the planning process for projects because 1) they either are declining at a rate that could result in a state and/or federal listing or they have historically occurred in low numbers, and 2) known threats to their persistence currently exist. Designations and rankings of special status species are intended to focus attention on the species to help avert the need for costly listing and recovery efforts required under federal and/or state endangered species laws.

The CNDDB and CNDDB QuickView searches found records of three (3) special status plants within the proposed Aratina Project Area (Figure 5, Table 4). These species were desert cymopterus, recurved larkspur, and Barstow woolly sunflower. Another 14 special status plants were identified as occurring in the general area (Figure 5, Table 4). None of these species are listed under the Federal ESA or the CESA (CDFW 2018a, FWS 2017). The western Joshua tree is a petitioned species for listing as Threatened under the CESA (California Fish and Game Commission 2020a).

Of the 17 special status plant species identified, one species is petitioned for listing as Threatened; seven species are listed as CNPS Rank 1B, defined as plants that are rare and endangered in California and elsewhere; three species are listed as CNPS Rank 2B, defined as plants that are rare, threatened, or endangered in California, but are more common elsewhere; and the remaining six species are listed as CNPS Rank 4, a watch list of plants with limited distribution and limited information (CNPS 2019). For this reason, CNPS Rank 4 plants, except for white pygmy-poppy, are not included on Figure 5.

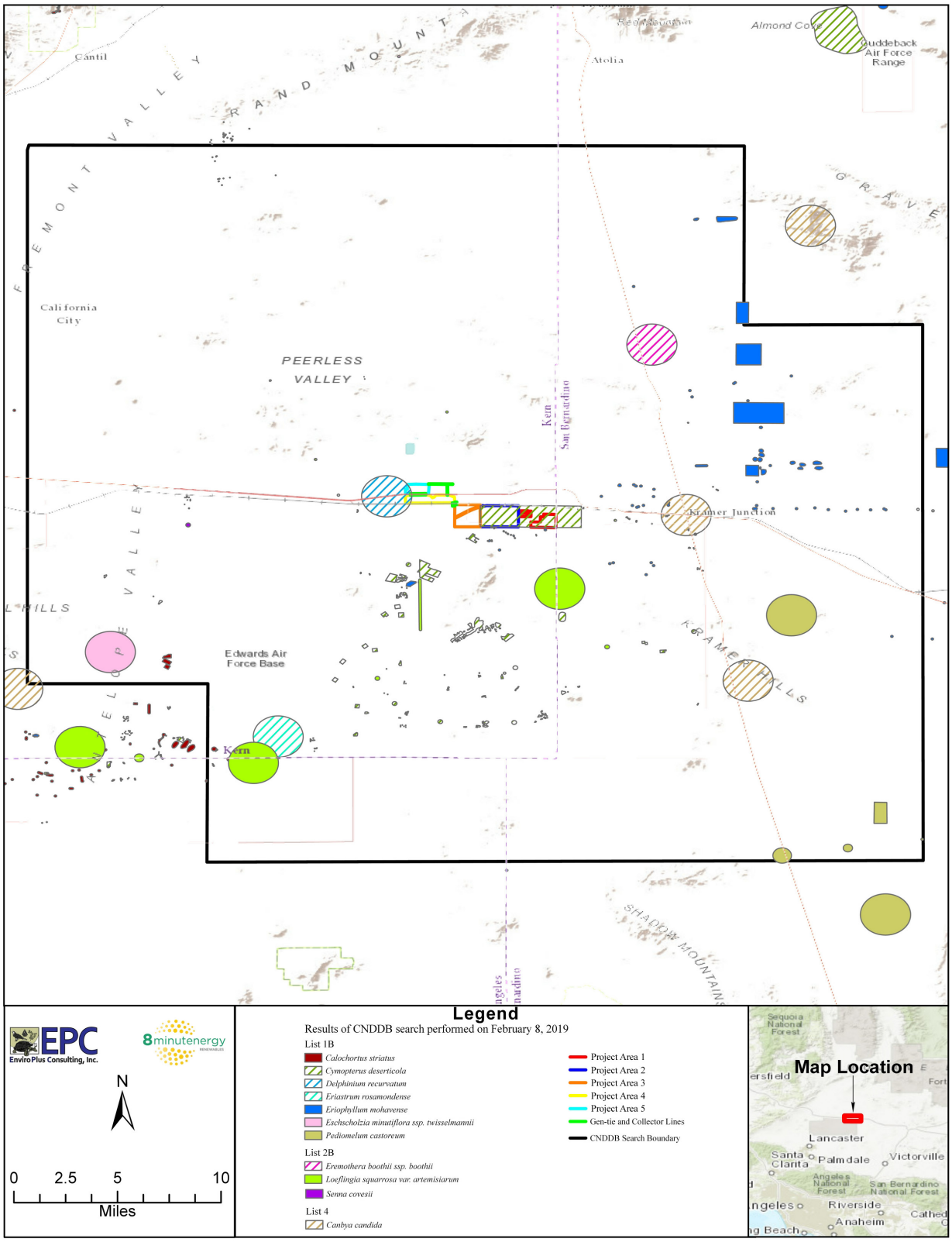


Figure 5. Proposed Aratina Solar Project Area Special Status Plants, CNDDB Search Results

Table 4. Special Status Plant Species with Potential to Occur in the Region and within the Proposed Aratina Solar Project Area.

SCIENTIFIC NAME COMMON NAME PLANT FAMILY, LIFE FORM	RANK OR STATUS[8] FWS	CDFW	G-RANK	CNDDB S-RANK	CNPS	FLOWERING PERIOD	HABITAT AND DISTRIBUTION NOTES	OCCURRENCE POTENTIAL WITHIN THE PROJECT AREA
State Petitioned for Listing								
Yucca brevifolia **western Joshua tree** Asparagaceae, shrub- or tree-like	–	PL	–	–	–	April-May	400-2000 m. Desert flats, slopes. Chenopod scrub, Mojavean desert scrub, Joshua tree woodland. Known to occur on the Project Area.	**PRESENT** – occurs throughout the Project Area
CNPS Rank 1B								
Eriastrum rosamondense **Rosamond eriastrum** Polemoniaceae, annual herb	–	–	G1	S1	1B.1 E	April-May	700-715 m. Alkaline hummocks, often sandy. Chenopod scrub (openings), vernal pools (edges). Known only from the Rosamond and Rogers Dry Lake areas.	**UNLIKELY** – Project Area does not contain alkaline hummocks
Calochortus striatus **alkali mariposa-lily** Liliaceae, perennial bulbiferous herb	–	–	G3	S2S3	1B.2	April-June	70-1595 m. Alkaline, mesic. Chaparral, chenopod scrub, Mojavean desert scrub, meadows and seeps. Known to occur south and southwest of Project Area along edge of Rogers Dry Lake.	**UNLIKELY** – Project Area does not contain the mesic habitat necessary for this species
Cymopterus deserticola **desert cymopterus** Apiaceae, perennial herb	–	–	G2	S2	1B.2 E	March-May	630-1500 m. Sandy. Joshua tree woodland, Mojavean desert scrub. Known to occur on the Project Area.	**PRESENT**[9] – known occurrences on and near the Project Area
Delphinium recurvatum **recurved larkspur** Ranunculaceae, perennial herb	–	–	G2	S2	1B.2 E	March-June	3-790 m. Alkaline. Chenopod scrub, cismontane woodland, valley and foothill grassland. Old record on or near west portion of Project	**PRESENT** – old, imprecise record on or near the Project Area

[8] See Appendix B for the definition of all Rank codes.

[9] Desert cymopterus was confirmed as Present in the Project Area during the Vegetation Community Assessment and the Rare Plant Survey. See Section 6.1 for survey results.

SCIENTIFIC NAME COMMON NAME PLANT FAMILY, LIFE FORM	RANK OR STATUS[8]					FLOWERING PERIOD	HABITAT AND DISTRIBUTION NOTES	OCCURRENCE POTENTIAL WITHIN THE PROJECT AREA
	FWS	CDFW	G-RANK	CNDDB S-RANK	CNPS			
							Area.	
Eriophyllum mohavense **Barstow woolly sunflower** Asteraceae, annual herb	–	–	G2	S2	1B.2 E	March-May	500-950 m. Gravelly, silty, sandy, or clay soils on level or sloping terrain, as well as in low-lying areas. Chenopod scrub, Mojavean scrub, playas. Several occurrences are in close proximity to Project Area.	**PRESENT**[10] – known occurrences on and near the Project Area
Eschscholzia minutiflora* ssp. *twisselmannii **Red Rock poppy** Papaveraceae, annual herb	–	–	G5	S2	1B.2 E	March-May	680-1230 m. Volcanic tuff. Mohavean desert scrub. Possible location on Edwards Air Force Base, south-southwest of the Project Area.	**UNLIKELY** – Project Area does not contain volcanic tuff
Pediomelum castoreum **Beaver Dam breadroot** Fabaceae, perennial herb	–	–	G3	S2	1B.2	April-May	610-1525 m. Sandy, washes and roadcuts. Joshua tree woodland, Mojavean scrub. Known to occur east and southeast of the Project Area.	**UNLIKELY** – Project Area is west and northwest of known range of the species
CNPS Rank 2B								
Loeflingia squarrosa* var. *artemisiarium **sagebrush loeflingia** Caryophyllaceae, annual herb	–	–	G5	S2	2B.2	April-May	700-1615 m. Sandy. Desert dunes, Great Basin scrub, Sonoran Desert scrub. Known to occur south of the Project Area on Edwards AFB.	**LIKELY** – Project Area contains potential habitat; known to occur nearby

[10] Barstow woolly sunflower was confirmed as Present in the Project Area during the Vegetation Community Assessment and the Rare Plant Survey. See Section 6.1 for survey results.

SCIENTIFIC NAME COMMON NAME PLANT FAMILY, LIFE FORM	RANK OR STATUS[8]					FLOWERING PERIOD	HABITAT AND DISTRIBUTION NOTES	OCCURRENCE POTENTIAL WITHIN THE PROJECT AREA
	FWS	CDFW	G-RANK	CNDDB S-RANK	CNPS			
Senna covesii **Cove's cassia** Fabaceae, perennial herb	–	–	G5	S3	2B.2	March-June	225-1295 m. Dry, sandy desert washes and slopes. Sonoran desert scrub. Known from north end of Edwards Air Force Base; seeds may have been accidentally brought to this site.	**UNLIKELY** – Project Area is outside the native range of the species
Eremothera boothii* ssp. *boothii **Booth's evening-primrose** Onagraceae, annual herb	–	–	G5	S3	2B.3	April-September	815-2400 m. Sandy flats, steep loose slopes. Joshua tree woodland, pinyon and juniper woodland. Known to occur north of Kramer Junction, northeast of Project Area.	**POSSIBLE** – Project Area contains potential habitat
CNPS Rank 4								
Canbya candida **white pygmy-poppy** Papaveraceae, annual herb	–	–	G3 G4	S3S4	4.2 E	March-June	600-1460 m. Gravelly, sandy, granitic. Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland. Known from vicinity of Kramer Junction and on Edwards Air Force Base.	**LIKELY** – Project Area contains potential habitat; known to occur nearby
Chorizanthe spinosa **Mojave spineflower** Polygonaceae, annual herb	–	–	G4	S4	4.2 E	March-July	6-1300 m. Sometimes alkaline. Chenopod scrub, Joshua tree woodland, Mojavean desert scrub, playas. Known to occur in surrounding areas.	**LIKELY**[11] – known occurrences on and near the Project Area
Goodmania luteola **golden goodmania** Polygonaceae, annual herb	–	–	G3	S3	4.2	April-August	20-2200 m. Alkaline or clay. Mojavean desert scrub, meadows and seeps, playas, valley and foothill grassland. Known from North Edwards and Edwards Air Force Base.	**POSSIBLE** – Project Area contains potential habitat

[11] Mojave spineflower was found in the Project Area during the Rare Plant Survey. See Section 6.1 for survey results.

SCIENTIFIC NAME COMMON NAME PLANT FAMILY, LIFE FORM	RANK OR STATUS[8]					FLOWERING PERIOD	HABITAT AND DISTRIBUTION NOTES	OCCURRENCE POTENTIAL WITHIN THE PROJECT AREA
	FWS	CDFW	G-RANK	CNDDB S-RANK	CNPS			
Lycium torreyi **Torrey's box-thorn** Solanaceae, shrub	–	–	G4 G5	S3	4.2	March-June	-50-1220 m. Sandy, rocky, washes, streambanks, desert valleys. Mojavean desert scrub, Sonoran desert scrub. Known from east of Project Area.	**UNLIKELY** – Project Area is west of known range of the species
Muilla coronata **crowned muilla** Themidaceae, perennial bulbiferous herb	–	–	G3	S3	4.2	March-April	670-1960 m. Chenopod scrub, Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland. Known to occur east of the Project Area.	**POSSIBLE**[12] – known occurrences on and near the Project Area
Nemacladus gracilis **graceful nemacladus** Campanulaceae, annual herb	–	–	G4	S4	4.3	March-May	120-1900 m. Sandy or gravelly. Cismontane woodland, valley and foothill grassland. Known from south of the Project Area.	**POSSIBLE** – known to occur near Project Area

[12] Crowned muilla was found in the Project Area during the Rare Plant Survey. See Section 6.1 for survey results.

Plants protected by the CDNPA that may occur within the proposed Project Area include golden cholla (*Cylindropuntia echinocarpa*), beavertail cactus (*Opuntia basilaris* var. *basilaris*), and western Joshua tree. Most of these plant species are all fairly common and widespread throughout the West Mojave Desert.

5.1.2 Results

During the course of the vegetation community assessment conducted by Mr. Bagley in February 2019 (see Section 4.0), each of the special status plant species identified as having the potential to occur on site were notated as "present" or "likely," "possible," or "unlikely" to occur on site (Table 4). Further consideration of potential occurrence included vegetation communities, soils, and landforms.

It should be noted that the vegetation community assessment did not include a floristic survey. A floristically-based, protocol-level survey (CDFW 2009) in all natural (or naturalized) habitats within the proposed Project Area was conducted in April 2019 to identify every plant taxon that occurs on site, at least to the taxonomic level necessary to determine rarity and listing status (Section 6.0 and Appendix E).

Of the 17 special status plant species 11 have the best potential of occurring within the proposed Aratina Project Area. These 11 plant species are further described as follows. The other six species are unlikely to occur. Nomenclature throughout this report follows *The Jepson Manual, 2nd Ed.* (Baldwin et al. 2012).

Western Joshua Tree (*Yucca brevifolia*)

Western Joshua tree is an evergreen, tree-like plant that can grow to 15 m in height and be extensively branched. Its leaves are stiff, 15-35 cm long, and dark green. Leaf margins are yellow and minutely serrate. Flowers are 4-7 cm long, cream to pale green, fleshy, and erect. Fruits are 6-8.5 cm long and dry, spongy, or leathery. Western Joshua trees occur on flats and slopes in a variety of plant communities in the Mojave Desert (Baldwin et al. 2012). They can form a Joshua Tree Woodland Alliance when they are evenly distributed on the landscape and their absolute cover is at least one percent (Sawyer et al. 2009). Joshua trees add a three-dimensionality to the landscape, providing additional habitat structure and food resources for many wildlife species, especially birds. The single greatest threat to western Joshua trees is climate change. Other threats include wildfires, habitat loss to development, invasive species, and predation (Center for Biological Diversity. 2019a). Western Joshua trees occur in the Aratina Solar Project Area.

Western Joshua tree is a petitioned species for listing as Threatened under CESA. On 15 October 2019, a petition was submitted to the California Fish and Game Commission (the Commission) to list the western Joshua tree as a Threatened Species under CESA (Center for Biological Diversity 2019). The Commission referred the petition to the CDFW for evaluation. In February of 2020, CDFW determined that the petition provides sufficient scientific information to indicate that the petitioned actions may be warranted and recommended that the Commission accept the petition for further consideration under CESA (California Fish and Game Commission 2020a). On September 22, 2020, the Commission is scheduled to consider the petition (California Fish and Game Commission

2020b).

Additionally, western Joshua trees were petitioned for listing with the USFWS as an endangered or threatened species on 28 September 2015. The USFWS posted a 90-Day Finding of their review of the petition on 14 September 2016 and found that "…the petition presents substantial scientific or commercial information indicating that listing the Joshua tree (*Yucca brevifolia*) may be warranted…" (USFWS 2016). However, in August of 2019 the USFWS released their Notice of 12-month Petition Findings and determined that listing of the Joshua tree was not warranted at that time (USFWS 2019a).

The western Joshua tree is also a protected species under the CDNPA and the desert native plant species pursuant to Kern County's Department of Agriculture and Measurement Standards. Harvesting, cutting, and salvaging of western Joshua trees in Kern County may only be completed under an approved permit by submitting a California Desert Native Plants Application to Harvest Native Plants (Kern County 2002).

Desert Cymopterus (*Cymopterus deserticola*)

The desert cymopterus is a deep-rooted, stemless perennial that usually grows to a height of 15 cm. Its leaf blades are 4-8 cm long, highly dissected and hairless. The inflorescence is compact and spherical with numerous purple flowers. The fruit is 5-7 mm long with narrowly winged ribs. With a flowering season from late March to early May, this rare species occurs at an elevation of 700 - 1,310 m. It grows in fine to coarse, sandy soil on flats in old dune areas that have deep, well-drained sand, typically in creosote bush scrub and Joshua tree woodland. The CNPS rank for the desert cymopterus is 1B and it is a covered species under the DRECP. Threats to the desert cymopterus include grazing, off-highway vehicles, and development (Baldwin et al. 2012, CNPS 1978, 2019). Records show that it occurs from east of Victorville to Kramer Junction and Edwards AFB, in Kern, Los Angeles and San Bernardino Counties. The majority of known populations occur on Edwards AFB and vicinity. This species is also known from the proposed Aratina Project Area in a large area south of Twenty Mule Team Road (Figure 5). This species was found at this location during the Rare Plant Survey.

Recurved Larkspur (*Delphinium recuvatum*)

Found in poorly drained, fine, alkaline soils in *Atriplex* scrub, this larkspur has light blue, reflexed sepals with lower petals that are white. It has somewhat glabrous herbage and grows to 18-85 cm. Recurved larkspur is endemic to California, with most populations occurring west of the Sierra Nevada crest. Two populations are historically known from the West Mojave Desert, one in Antelope Valley and one in an imprecise location on or near the west side of the proposed Project Area (Figure 5). Its CNPS rank is 1B.

Barstow Woolly Sunflower (*Eriophyllum mohavense*)

The Barstow woolly sunflower is a woolly, tufted, dwarf annual, measuring 1-2.5 cm tall and 2-3 cm wide. Leaves are spoon-to-wedge-shaped and sharply 3-toothed. Flower

heads have 3-4 yellow disk flowers. It is found in fine gravelly, silty, sandy, or clay soils on level or sloping terrain, as well as in low-lying depressions/desert playas. It grows in creosote bush or saltbush scrub at elevations of 500-800 m and typically flowers between April and May. The Barstow woolly sunflower occurs largely in west-central San Bernardino County and eastern Kern County; known locations range from California City and northern Edwards AFB to Boron, Kramer Hills, the Harper Dry Lake area, Opal Mountain, and Cuddeback Lake. Partly because it occurs in such a limited area, the CNPS rank is 1B. It is also a covered species under the DRECP. In general, threats to this rare species include energy development, military activities, vehicles/road construction, and grazing (Baldwin et al. 2012, CNPS 2019). Populations are known to occur along the southern boundary of the proposed Project Area (Figure 5) and may be found in areas surrounding the small clay pans. This species was confirmed in the proposed Project Area during the Rare Plant Survey.

Booth's Evening-primrose (*Eremothera boothii* ssp. *boothii*)

Booth's evening-primrose is an annual herb in the Onagraceae family and is 15-40 cm tall with glandular and spreading hairs. Leaf blades are 30-80 mm, lanceolate to narrowly ovate with serrate edges. Flowers are white. Fruits measure 1.4-2 mm wide and are strongly wavy and twisted. The plant occurs on sandy flats and steep loose slopes in Joshua tree woodland (Baldwin et al. 2012). This species is known to occur at scattered locations across the Mojave Desert. The nearest population to the Project Area is about 15 km to the northeast (Figure 5). Potential habitat for this species occurs throughout the proposed Project Area.

Sagebrush Loeflingia (*Loeflingia squarrosa* var. *artemisiarium*)

Sagebrush loeflingia is a CNPS 2B plant, one that is rare or endangered in California but common elsewhere. It is an annual plant, 1-7 mm tall, much branched at base and glandular-hairy and somewhat fleshy. Leaf blade is 2-4 mm, oblong, and erect to somewhat spreading. It is distinguished from the other variety (*Loeflingia squarrosa* var. *squarrosa*) by shorter and wider leaf blades, shorter sepals (with straighter tips when fruiting), shorter stipules, no lateral spurs, and smaller fruit. It flowers in April and May and occurs on sandy flats and sand dunes at 700-1615 m in elevation. It occurs in southeast Kern County and northeast Los Angeles County as well as the Great Basin Desert region of California, Oregon, and Wyoming. Threats to this plant include grazing and vehicles (Baldwin et al. 2012, CNPS 2019). Populations are known from Edwards AFB, south and southwest of the proposed Project Area. It possibly occurs near the small clay pans in the Project Area (Figure 5).

White Pygmy-Poppy (*Canbya candida*)

The white pygmy-poppy is a diminutive, tufted, hairless annual that grows 10-30 mm tall. Its basal leaves are fleshy and linear-oblong. Each flower has six separate petals that are ovate and white. The fruit is a small capsule with tiny brown seeds. Flowering occurs from April to May/June. It grows on sandy soil from 600 to 1,200 m elevation in

creosote-bush scrub, saltbush scrub, Joshua tree woodland, and pinyon-juniper woodland. It tends to be encountered in sandy wash areas where the mountains reach the desert floor. This plant is ranked CNPS 4, a watch list that includes plants of limited distribution. Endemic to California, white pygmy-poppy populations have been found in Inyo, Kern, Los Angeles and San Bernardino Counties. The nearest known populations to proposed Project Area are approximately 8 km east and 21 km southeast (Figure 5). Although it is not considered threatened at this time, it has been placed on the CNPS "watch list" because of its tiny size and limited range. This poppy could be affected in the future by urbanization and invasive non-native plant species (Baldwin et al. 2012, CNPS 2019). Potential habitat for white pygmy-poppy occurs throughout the proposed Project Area.

Mojave Spineflower (*Chorizanthe spinosa*)

Mojave spineflower is ranked CNPS 4. It is an annual and member of the buckwheat family. It grows 3-40 cm tall: stems are prostate to ascending, with oblong leaves that can vary from 3-20 mm in length. Bracts of the inflorescence are usually 3 per node and lanceolate. The involucral tube is 2-2.5 mm, urn shaped, with one of five bracts longer than the others. Its white flowers are generally hairless, and the seeds are black. It blooms from April through July at elevations ranging from 600-1,300 m elevation. Because of its stout stems and involucres, Mojave spineflower skeletal remains persist in the environment long after the flowering period. This species is endemic to California and is known from Rabbit Springs in Lucerne Valley, San Bernardino County, northwest to Red Rock Canyon, Kern County. It was once considered a rare plant before thousands of plants were reported from Rosamond to Boron, Kern County. It prefers sandy areas or low-lying open soils with fine gravels in desert scrub plant communities. Threats to the spineflower include surface mining, energy development, vehicles, and grazing (Baldwin et al. 2012, Charlton 1992, CNPS 2019). It is expected to occur near the small scattered clay pans that occur in the western portion of the proposed Project Area (Photograph 4). Clay pans have a high clay content and are dense, compact, and slowly permeable. They are usually barren of shrubs but may contain several annual plants, including special status annuals like Mojave spineflower. Mojave spineflower was identified as occurring within the Project Area during the Rare Plant Survey.

Golden Goodmania (*Goodmania luteola*)

Golden goodmania is ranked CNPS 4. In the buckwheat family, the golden goodmania is a spreading annual herb, 0.5 cm to 15 cm tall and wide. Leaves are opposite; the basal leaves are generally rounded while the cauline leaves are generally linear and awned. Inflorescences are terminal and cyme-like. The 5 involucral bracts are in one whorl and are narrow, glabrous and awned. The perianth consists of 6 yellow, entire lobes, and it has 9 stamens. The fruit is obconic and glabrous. Golden goodmania blooms from April to August and occurs in alkaline or clay soils in Mojavean desert scrub, meadows and seeps, and on playas at 20-2200 m elevation. Formerly known from the southern San Joaquin Valley, it is now extirpated there. Possible threats to the species include non-native plants, groundwater lowering, trampling by livestock, and development.

Populations nearest to the proposed Project Area occur to the southwest, on Edwards AFB (Baldwin et al. 2012, CNPS 2019). It possibly occurs near the small scattered clay pans that occur in the western portion of the proposed Project Area (Photograph 4). Clay pans have a high clay content and are dense, compact, and slowly permeable. They are usually barren of shrubs but may contain several annual plants, including special status annuals like golden goodmania.

Crowned Muilla (*Muilla coronata*)

Crowned muilla is a diminutive monocot, approximately 3-5 cm tall, in the Brodiaea family. Its perianth is whitish to bluish with a green abaxial midvein. Stamens are 2-4 mm; filaments are dilated throughout with wide, overlapping margins forming the nectar tube with cylindric crown. It occurs in open desert scrub and Joshua Tree woodland from 670-1960 m in elevation. A CNPS Rank 4 plant, it occurs in scattered locations throughout the Mojave Desert, including east and southeast of the proposed Project Area (Baldwin et al. 2012, CNPS 2019) and was identified as occurring within the Project Area during the Rare Plant Survey.

Graceful Nemacladus (*Nemacladus gracilis*)

Graceful nemacladus is ranked CNPS 4. In the bellflower family, this species is often overlooked due to its small stature and slender stems. Its inflorescence axis is straight or weakly zigzag. The corolla is white to lavender with lavender midveins. It inhabits rocky slopes and sandy washes from 120 m to 1900 m elevation. It is known from a few locations in the Mojave Desert, from Joshua Tree National Park to Edwards AFB, and in the Tremblor Range. This plant is expected at other locations in suitable habitat. South of the proposed Project Area, it is known from the Leuhman Ridge area (Baldwin et al. 2012, CNPS 2019) and it may occur in sandy washes within the Project Area.

Besides western Joshua trees, plants protected under the CDNPA, and within Kern County that occur or are expected to occur on site include golden cholla and beavertail, both in the cactus family. Golden cholla was noted at scattered locations during the habitat assessment. No beavertail was observed but it is expected to occur infrequently throughout the area. All CDNPA individuals were located, recorded, and mapped during the April 2019 protocol special status plant surveys. These results are summarized in Section 6.1 within the completed *Rare Plant Survey* located in Appendix E.

5.2 Potentially Occurring Listed Wildlife Species

5.2.1 Mohave Ground Squirrel

The MGS was listed by the State of California as a Threatened species throughout its endemic range in the northwestern Mojave Desert in San Bernardino, Los Angeles, Kern, and Inyo counties (Best 1995) and is a covered species under the DRECP.

Habitat for MGS has been reduced by the development of agriculture, livestock grazing, urbanization, military activities, utility projects, and recreation. Additional impacts also include

increased presence of domestic (pet dogs [*Canis familiaris*] and cats [*Felis* spp.), feral (wild and semi-wild dogs and cats), and wild predators (e.g., fox [*Vulpes* sp.], coyote [*Canis latrans*], American badger [*Taxidea taxus*], golden eagle [*Aquila chrysaetos*], prairie falcon [*Falco mexicanus*], owls [*Asio*, *Athene*, or *Bubo* species], snakes [*Crotalus*, *Masticophis*, *Pituophis* species], etc.).

Decades of studies and trapping efforts have been largely concentrated in the southern part of MGS range south of SR58, however, no range-wide systematic or statistically based random sampling have been conducted to characterize the status of MGS throughout its range (Dudek 2014).

The MGS occurs in a variety of desert shrubland habitats. Although most often found in creosote bush scrub it has also been recorded in desert saltbush scrub, desert sink scrub, desert greasewood scrub, shadscale scrub, Joshua tree woodland, and Mojave mixed woody scrub (Best 1995). MGS typically occupies areas with open vegetative cover and small bushes (< 0.6 meter (2 feet) in height) spaced approximately 6 to 9 meters (20 to 30 feet) apart (Best 1995). MGS prefers deep, sandy to gravelly soils on flat to moderately sloping terrain and will avoid rocky areas for the most part (Best 1995). The species is not known to occupy areas of desert pavement. Soil characteristics are particularly important because MGS construct burrows to provide temperature regulation, avoid predators, and use during the inactive season.

The MGS primarily feeds on plant material and specializes in foraging on certain plant species, but as these sources become less available throughout the active season, the MGS adapts its foraging strategy to maximize energy intake, exploiting food sources that are intermittently available (75 FR 22063–22070). High water content may be a component of their food selection as plants are eaten at different times depending on their water content (Best 1995; 75 FR 22063–22070). MGS consume the leaves, fruits, and seeds of a variety of annual and perennial plants, fungi, and arthropods, including butterfly larvae. At various times of the year and depending on location, they may consume leaves, forbs, shrubs, and grasses of several species and genera, including creosote bush, winter fat, spiny hopsage, freckled milk-vetch (*Astragalus lentiginosus*), white mallow (*Eremalche exilis*), desert-marigold (*Baileya pleniradiata*), langloisia (*Langloisia setosissima*), Mojave monardella (*Monardella exilis*), saltbush, gilia (*Gilia* spp.), golden leptosiphon (*Leptosiphon aureus*), and Mediterranean grass (*Schismus arabicus*), as well as seeds of box thorn (*Lycium* spp.) (Best 1995; 75 FR 22063–22070).

The MGS breeding season is from mid-February to mid-March (Best 1995; Laabs 2006). Males emerge from hibernation in February, up to two weeks before females, and during this time they may be territorial (Best 1995). Females generally only occupy male territories for one or two days then establish their own home ranges after copulation. Pregnant females are present from March through April and gestation lasts from 29 to 30 days (Best 1995). Litter sizes range from four to nine (Best 1995), though mortality of juveniles is high during the first year, especially for juvenile males (MGSWG 2011). Parental care and lactation continue through mid-May. Litters generally appear above ground in early May (Harris and Leitner 2004). Females will breed at 1 year of age if environmental conditions are suitable, but males do not mate until 2 years of age. Because of the small geographic range of the species, low rainfall can lead to reproductive failure throughout the range (MGSWG 2011). During these periods, all available forage may be converted to body fat and squirrels can enter dormancy as early as April (Leitner 1999).

Based on the vegetative and soil characteristics of the proposed Aratina Solar Project Area, as

well as the extensive information available for MGS throughout the general region of the Project Area, the potential for occurrence was determined to be moderately high to high (Figure 6) based on the habitat assessment. The habitat assessment results and analysis of project related direct and indirect impacts and recommended mitigation measures are discussed in Sections 6.0 and 7.0.

5.2.2 Agassiz's Desert Tortoise

The ADT was listed by the U.S. Fish and Wildlife Service (USFWS) and the State of California as a Threatened species throughout its endemic range in the Sonoran and Mojave Deserts north and west from the Colorado River. It is a covered species under the DRECP. It extends from the desert areas of California south of the San Joaquin Valley, eastward across the Mojave Desert into southern Nevada, the extreme southwestern corner of Utah (i.e., the Beaver Dam Slope), and the extreme northwestern corner of Arizona, as well as southeast across the Colorado Desert to the Colorado River.

The proposed Project Area is located north of and adjacent to the Fremont-Kramer Desert Tortoise CHU (USFWS 2011) (Figure 2). The CHU within Edwards AFB abuts the Fremont-Kramer ACEC along its eastern boundary. The ACEC is under the control of BLM and is also included within the DRECP.

Habitat for ADT has been reduced by the development of agriculture, livestock grazing, urbanization and highway and other infrastructure development, military activities, utility projects, recreation and off-highway vehicle use, collecting, invasive species, and disease. Additional impacts also include increased presence of domestic (pet dogs), feral (wild and semi-wild dogs), and wild predators (e.g., fox [*Vulpes macrotis*], coyote, badger, mountain lion [*Felis concolor*], and common raven [*Corvus corax*]). Young tortoises are routinely preyed upon by kit fox and common raven.

ADT can be found in a wide variety of desert habitats, such as alluvial fans, washes, canyons, and saltbush plains (Coachella Valley Conservation Commission 2007; Woodbury and Hardy 1948; Lovich and Daniels 2000; USFWS 1994). Whereas most tortoises in the Mojave Desert are usually associated with creosote scrub on alluvial fans and bajadas (USFWS 2011), they can also be found in saltbush scrub (Stewart 1991). The presence of shrubs in tortoise habitat is extremely important. Shrubs supply shade for the tortoises during hot weather (Marlow 1979), but their roots also provide support and protection for tortoise burrows. Several studies have also shown that edaphic (soil) conditions are important for desert tortoises. Tortoises spend up to 98% of their lives underground (Nagy and Medica 1986). Where soils are so sandy that they cannot support the roof of a burrow, tortoises are unlikely to utilize the area (Baxter 1988). Desert tortoise burrows supply important shade and thermoregulatory resources for a variety of species, including many species of snakes, insects and spiders, and small mammals.

Tortoises are herbivores and wildflowers, grasses, and in some cases, cacti make up the bulk of their diet (USFWS 2010; Woodbury and Hardy 1948). Some of the more common herbaceous species utilized by the tortoise include desert dandelion (*Malacothrix glabrata*), evening-primrose (*Camissonia* spp., *Chylismia* spp., *Eremothera* spp., *Oenothera* spp.), gilia, desert marigold, and filaree (*Erodium* spp.). Additionally, tortoises may eat some grasses, such as sand rice grass or galleta grass (*Hilaria rigida*), although the nutritional value may be less. Tortoises are known to eat some cacti such as prickly pear (*Opuntia mohavensis*), beavertail, and various cholla cacti (*Cylindropuntia* spp.). Spring desert annuals and grasses are particularly important in

that they supply tortoises with much needed water (USFWS 2010), which can be stored in the bladder of tortoises for long periods of time (Marlow 1979; Woodbury and Hardy 1948).

The desert tortoise breeds in the late summer and fall, before going into hibernation for the winter. Males will "joust" to establish loosely defined home ranges, but these can overlap and are not exclusive. Home range size can vary dramatically, from 10 to over 450 acres (USFWS 1994). Females begin breeding at about 15 to 20 years of age and will store the male's sperm (Gist and Fisher 1993; Turner and Berry 1984). Egg laying occurs in the spring, but occasionally may also take place in the fall. Incubation is typically about 100 days, with the eggs hatching in the late summer and early fall. There is little or no parental care of the nest or the young. The sex of the offspring is determined by the incubation temperature; females being hatched at higher ground temperatures (above 89°F) while males are hatched below this temperature (Spotila et al. 1994). Average clutch size is 4.5 eggs (Turner et al. 1984, 1986).

Tortoise activity is focused on its home range and is primarily determined by temperature (USFWS 1994). Nevertheless, some relocated tortoises have moved significant distances from their release point, including crossing major highways (Stewart 1991). Duda et al. (1999) found that tortoise home ranges tend to shrink during periods of drought compared to years of high rains. Following winter hibernation, tortoises become active as low temperatures abate in the spring months. During the spring, tortoises are active throughout the day, foraging on the fresh shoots of annual plants. But as the heat continues to increase into the summer months, tortoises are active only in the cooler morning, late afternoon, and evening hours. During the hot daytime temperatures, tortoises retreat to burrows to wait out the heat or, in some cases, will aestivate through the summer.

Based on the vegetative and soil characteristics of the proposed Aratina Solar Project Area, as well as the extensive information available for ADT throughout the general region of the Project Area, the potential for occurrence was determined to be moderately high to high (Figure 6). USFWS protocol surveys (USFWS 2017) were conducted in April and May of 2019 within the proposed Project Area to determine the extent of ADT presence, potential movement corridors, project related footprint and direct and indirect impacts, and resultant mitigation measures. These results and recommended mitigation measures are discussed in Sections 6.0 and 7.0 with the completed report included as Appendix F.

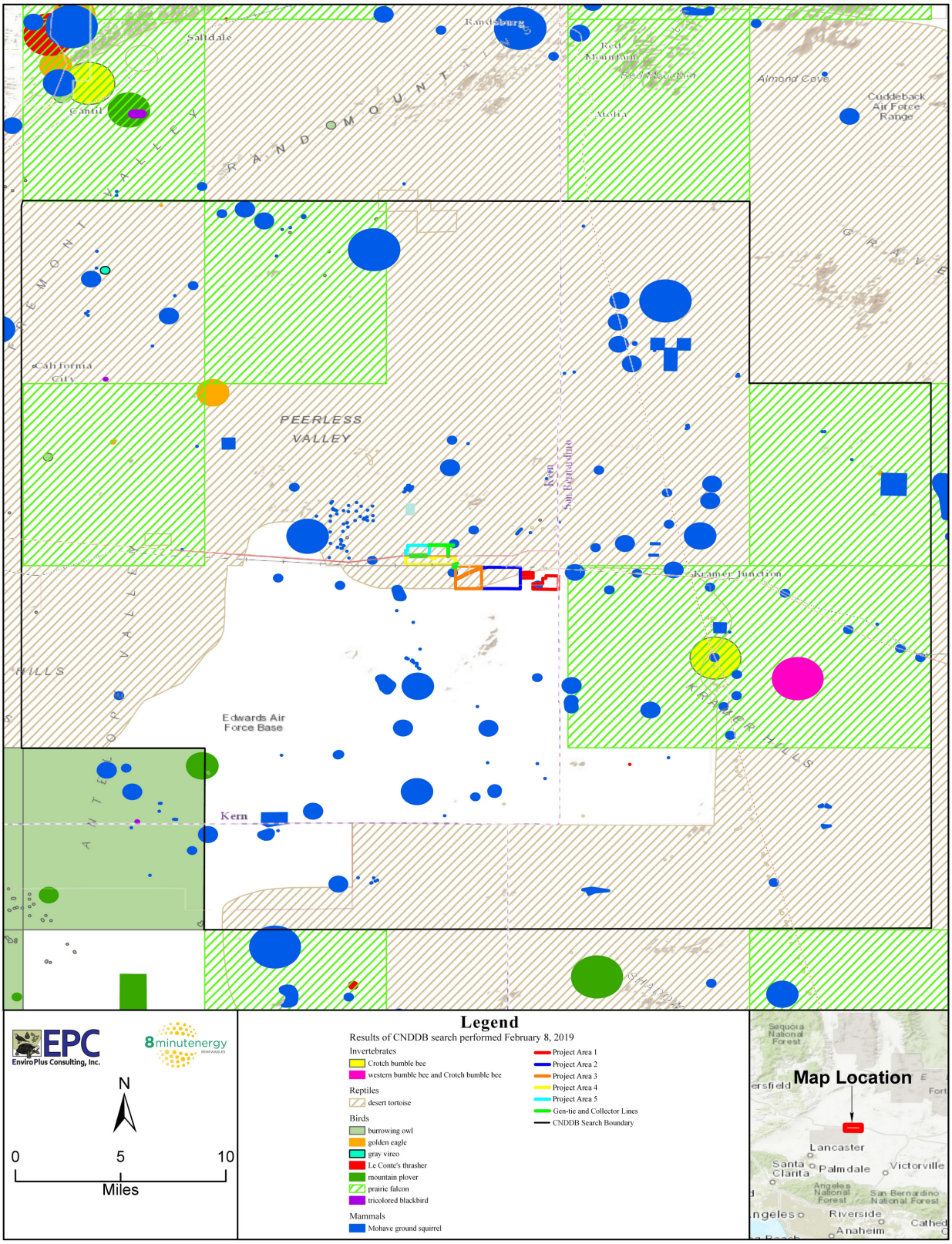


Figure 6. Proposed Aratina Project Area Special Status and Listed Wildlife Observations Reported in CNDDB

5.3 Potentially Occurring Special Status Wildlife Species

Special status wildlife species are presumed to occur within the proposed Project Area if there were locality records, either historic or recent, indicating presence, discovered through the research and literature review efforts (Section 2.0 and Table 1). Special status wildlife species are also referred to by CDFW as Special Animals (CDFW 2018d).

"Special Animals" is a broad term used to refer to all the animal taxa tracked by CDFW's CNDDB, regardless of their legal or protective status. This list is also referred to as the list of "species at risk" or "special status species". The Special Animals list includes species, subspecies, or Evolutionarily Significant Units where at least one of the following conditions applies:

- Officially listed or proposed for listing under the State and/or Federal Endangered Species Acts;
- Taxa considered by CDFW to be a Species of Special Concern (SSC);
- Taxa which meet the criteria for listing, even if not currently included on any list, as described in Section 15380 of the CEQA Guidelines (more information on CEQA is available at: http://resources.ca.gov/ceqa/guidelines);
- Taxa that are biologically rare, very restricted in distribution, or declining throughout their range but not currently threatened with extirpation;
- Population(s) in California that may be peripheral to the major portion of a taxon's range but are threatened with extirpation in California;
- Taxa closely associated with a habitat that is declining in California at a significant rate (e.g. wetlands, riparian, vernal pools, old growth forests, desert aquatic systems, native grasslands, valley shrubland habitats, etc.);
- Taxa designated as a special status, sensitive, or declining species by other state or federal agencies, or a non-governmental organization (NGO) and determined by the CNDDB to be rare, restricted, declining, or threatened across their range in California.

Eleven special status wildlife species and two insect species were identified during the literature review and database searches (Figure 6). Avian species comprise seven of the wildlife species and include golden eagle (Figure 7), prairie falcon, mountain plover, burrowing owl, gray vireo, San Joaquin LeConte's thrasher, and tricolored blackbird. The desert kit fox and the American badger comprise the two mammal species and the Crotch and western bumble bees comprise the two insect species. These species and their potential for presence on site are discussed below. Surveys for these species were conducted in April and May of 2019 and the results are discussed in Section 6.0 with the completed report included as Appendix F.

Golden Eagle (*Aquila chrysaetos)*

The golden eagle occurs in open habitats, especially in the mountains and hills, where it can spot prey from the air. Its diet in the desert regions consists mainly of rabbits (*Lepus* spp.) and ground squirrels but also includes small mammals; birds; reptiles; insects; and newborn or juvenile mule deer, bighorn sheep, and domestic livestock. It will also eat carrion to include roadkill animals.

Golden eagles nest atop tall trees, high on rocky cliffs, or on electrical transmission towers. Often, a breeding pair uses 2-3 or more nests, alternately, over their lifetime. Consequently, the nests can become very large. In the western United States, territories are occupied year-round and can be 20-30 sq km in size.

Major threats to this species include habitat destruction and fragmentation, especially the conversion of grasslands to agriculture, shooting, and human disturbances at nest sites (Remsen 1978, Zeiner et al. 1990).

The golden eagle is a California Fully Protected species (CDFW 2018); a USFWS Bird of Conservation Concern (USFWS 2008); is on the California Watch List of Species of Special Concern (Shuford and Gardali 2008); is designated as sensitive by the California Department of Forestry and Fire Protection (CALFIRE); and is a covered species under the DRECP (see Appendix B for definitions of state and federal designations).

The golden eagle is also protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act, both of which prohibit take of individual eagles or their active nests. Take, under the ESA federal definition, means pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb.

Prior to authorizing activities at a site proposed for development, state and federal agencies require information on golden eagle activity in the area, including locations of nest sites, roosts, and territories, and identifying and evaluating foraging locations during the breeding and non-breeding periods. They also require a discussion of potential project impacts on golden eagles and mitigation measures to minimize these impacts.

The literature search and database review (Section 2.0) also included contact with Edwards AFB (Zimmerman 2019). The CNDDB database search included the following USGS topographic 7.5-minute quadrangle maps to obtain golden eagle records within at least 20 miles of the proposed Aratina Project Area: Adobe Mtn., Alpine Butte, Astley Rancho, Bird Spring, Bissell, Boron, Boron NE, Boron NW, California City North, California City South, Cantil, Cinco, Cuddeback Lake, Edwards, Fremont Peak, Galileo Hill, Helendale, Hi Vista, Jackrabbit Hill, Johannesburg, Kramer Hills, Kramer Junction, Leuhman Ridge, Lockhart, Mojave NE, North Edwards, Red Buttes, Redman, Red Mountain, Rodgers Lake North, Rogers Lake South, Saddleback Mtn., Saltdale NE, Sanborn, Shadow Mountains, The Buttes, Twelve Gauge Lake, Victorville NW, and Wild Crossing.

The CNDDB and CNDDB QuickView database searches resulted in nine nesting locations for golden eagles in the region surrounding the proposed Project Area (Figures 6 and 7). The most recent record of nesting was in 2012 at a location south of Jawbone Canyon, 27 miles northwest of the proposed Aratina Project Area. Nesting at locations nearest to the Project Area, in California City, have not been recorded since the 1970s (CNDDB 2019). No additional nesting information was provided by the BLM (Woods 2019) or Edwards AFB (Zimmerman 2019).

While there is no nesting habitat on-site, the proposed Project Area may be within the home range of an unknown number of nesting golden eagles. Foraging several kilometers from nest sites, golden eagles may use the Project Area for foraging as it likely supports

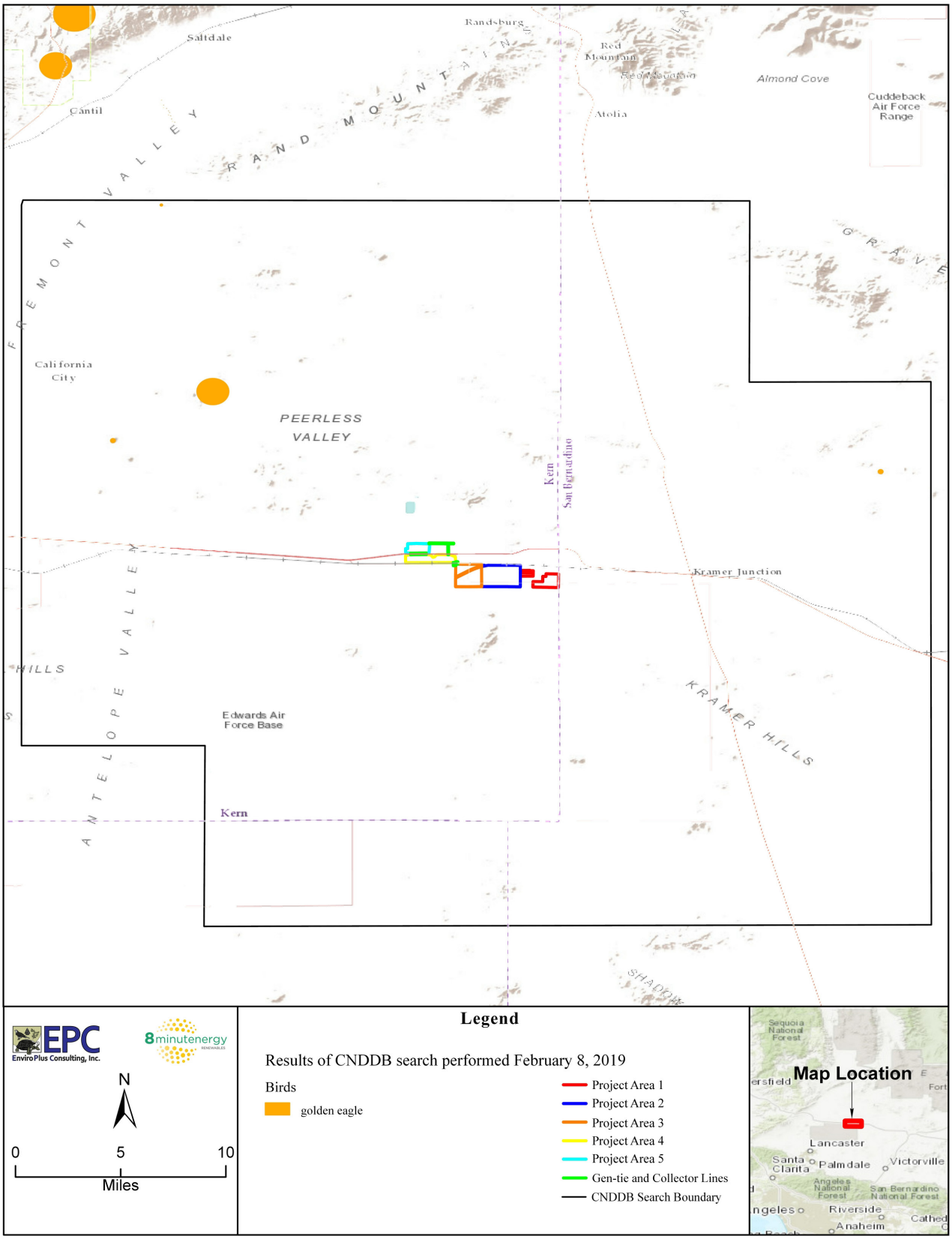


Figure 7. Proposed Aratina Project Area Golden Eagle Nesting Locations Map

populations of black-tailed jackrabbits (*Lepus californicus*), California ground squirrels (*Otospermophilus beecheyi*), and other ground squirrel species. During the vegetation community assessment performed in February 2019, no golden eagles were observed using the Project Area or surrounding areas.

Prairie Falcon (*Falco mexicanus*)

Prairie falcons are uncommon permanent resident birds that range from the southeastern deserts, northwest throughout the Central Valley and along the inner Coast Ranges and Sierra Nevada Mountains. This species is distributed from annual grasslands to alpine meadows and is primarily associated with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub.

They require sheltered cliff ledges for cover and nesting where they nest in a scrape or utilize an old raven or eagle stick nest on cliff, bluff, or rock outcrop. Males will perform aerial courtship displays near the nest site. Prairie falcons breed from mid-February through mid-September, with the peak in April to early August. Clutch size is 3 to 6 eggs with an average of 5. Young birds begin to disperse in June and July.

Water sources near the nest sites may be important (Denton 1975). The average home range of a breeding pair of prairie falcons in California is from 59-288 km^2 (Harmata 1978, Haak 1982).

Prairie falcons mostly consume small mammals, small birds, and reptiles where the terrain is open or sparsely vegetated. They catch their prey in the air as well as on the ground, from either a perch or while in flight 15-90 m (50-300 feet) above the ground.

Threats to this species include poisoning by consuming rodents affected by poisoned baits; egg and nestling predation by mammals, owls, and golden eagles; and recreational uses in and around nest sites by rock climbers, hunters, and others.

The prairie falcon is a USFWS Bird of Conservation Concern (USFWS 2008) and is on the California Watch List of Species of Special Concern (Shuford and Gardali 2008) (see Appendix B for definitions of state and federal designations).

The prairie falcon is protected under the MBTA which prohibits take of individual falcons or their active nests. Take, under the Endangered Species Act federal definition, means pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb.

The CNDDB database search included the same USGS topographic maps (USGS quadrangles, 7.5-minute series) used to obtain golden eagle records within at least 16 km (10 miles) of the proposed Aratina Project Area.

While there is no nesting habitat on-site, the proposed Project Area may be within the home range of an unknown number of foraging and/or nesting prairie falcons based on species accounts to the north, west, and east of the Project Area (Figure 6). Foraging several kilometers from nest sites, prairie falcons may use the Project Area for foraging as it likely supports populations of black-tailed jackrabbits (*Lepus californicus*), California ground squirrels (*Otospermophilus beecheyi*), and other small mammal,

reptile, and avian species.

Mountain Plover (*Charadrius montanus*) (Audubon 2019)

Mountain plovers are migratory birds that winter in California between September and March. Their populations are declining due to habitat loss and fragmentation in the United States on their breeding grounds where short-grass prairie has been converted to farmland or has been developed. In some areas, their decline may be linked to the decline in prairie dog (*Cynomys* spp.) colonies.

Mountain plovers are found in semi-arid plains, grasslands, and plateaus where they favor areas of very short grass and bare soils for nesting. Their nests are associated with prairie dog colonies. Their winter habitats include desert flats and plowed fields where they range widely in winter flocks of up to 100 or more individuals. Their diet consists primarily of insects such as grasshoppers, beetles, flies, and crickets. Water availability is not a factor.

The mountain plover is a USFWS Bird of Conservation Concern (USFWS 2008); is designated by CDFW as a Species of Special Concern (CDFW 2018); and is a covered species under the DRECP (see Appendix B for definitions of state and federal designations).

The mountain plover is protected under the MBTA which prohibits take of individual plovers or their active nests. Take, under the Endangered Species Act federal definition, means pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb.

The CNDDB database search included the same USGS topographic maps (USGS quadrangles, 7.5-minute series) used to obtain golden eagle records within at least 16 km (10 miles) of the proposed Aratina Project Area.

Wintering mountain plover have been recorded in the CNDDB as occurring more than 10-miles southwest of the proposed Project Area on and off Edwards AFB in the Antelope Valley area as well as northwest of the project over 20-miles in distance east of Cantil (Figure 6). The potential for occurrence of mountain plover within the Project Area may be low but not improbable and winter surveys may need to be conducted to confirm their presence or absence from the site.

Western Burrowing Owl (*Athene cunicularia* ssp. *hypugaea*)

The burrowing owl is declining in numbers throughout its range due to fragmentation and loss of habitat in resident, breeding, or wintering grounds within the United States. Other threats include predation by domestic or feral dogs and cats, poisoning, urbanization, utility developments, and wild predators such as fox, coyote, bobcat, skunk, eagles, falcons, and even reptiles such as snakes that might predate on the eggs or chicks. Burrowing owls located within or adjacent to suburban or urbanized areas suffer a high mortality from vehicle strikes.

Human alteration of the landscape can inadvertently or intentionally create suitable

habitat, but it can also make potential habitat unsuitable by way of "habitat loss, associated prey reduction, and human disturbance" (Lincer and Bloom 2007) and various pesticides are known to adversely affect burrowing owls, directly or indirectly (James and Fox 1987; Haug and Oliphant 1987). Agriculture and surface irrigation systems (i.e., earthen canals and ditches) can create habitat by providing bankside burrow sites and prey in the adjacent fields (Gervais et al. 2008; Poulin et al. 2011).

Burrowing owls typically utilize a variety of arid and semi-arid environments with well-drained, level to gently sloping areas characterized by sparse vegetation and bare ground. It occurs in a wide variety of habitats including annual and perennial grasslands, deserts, and scrublands with low-growing vegetation. Suitable habitat may include trees and shrubs if the canopy cover is less than 30%. Burrows are an essential habitat component for this species, and both natural and artificial burrows will be used for nesting. The western burrowing owl typically uses burrows made by desert tortoise, ground squirrels, or badgers, but also may use structures such as cement culverts, wood debris piles; openings beneath cement or asphalt pavement, soil embankments, agricultural fields and canal embankments, stored pipe, and stored shipping pallets.

Nesting generally occurs between February and August, with peak activity from March to July (Zeiner et al. 1990; Thomsen 1971; Gervais et al. 2008). Nesting sites always have available perching sites, such as fences or raised rodent mounds (Johnsgard 1988). They are primarily monogamous and typically breed once per year (Poulin et al. 2011). One clutch per year of 6-12 eggs is produced and within approximately 44 days young burrowing owls fledge.

Approximately 6% of the California population of western burrowing owls occurs within the Western Mojave Desert (Wilkerson and Siegel 2010). California supports both year-round and resident burrowing owls as well as overwintering migrants (Gervais et al. 2008). Many owls remain resident throughout the year in their breeding locales (especially in central and southern California) while some apparently migrate or disperse in the fall (Haug et al. 1993; Poulin et al. 2011; Coulombe 1971; Barclay 2007).

The burrowing owl is a USFWS Bird of Conservation Concern (USFWS 2008); is designated by CDFW as a Species of Special Concern (CDFW 2018); and is a covered species under the DRECP (see Appendix B for definitions of state and federal designations). Under its designation as a CDFW Species of Special Concern, this species must be observed at a burrow site or evidence of recent occupation such as whitewash and feathers must be present in order to positively determine its presence.

The burrowing owl is protected under the MBTA which prohibits take of individual owls or their active nests. Take, under the Endangered Species Act federal definition, means pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb.

Resident burrowing owls have been recorded more than 10 miles southwest of the proposed Aratina Project Area in the Antelope Valley; more than 10 miles west of the Project Area south of California City; and more than 15 miles north of the Project Area in the Rand Mountains (Figure 6). These owls are typically associated with agricultural activities and other suburban and urban developments. The potential for burrowing owl to be present on the proposed Project Area is low to moderate based on the current and

historical CNDDB records. CDFW protocol surveys were conducted in April and May of 2019 to determine this species presence or absence on site. Survey results are discussed in Section 6.0.

Gray Vireo (*Vireo vicinior*) (Audubon 2019b)

The population status of gray vireo is not well known throughout its range. This small songbird inhabits brushy mountain slopes, mesas, open chaparral, scrub oak, and juniper habitats. It breeds in dry thorn scrub, chaparral, pinyon-juniper and oak-juniper scrub, or sagebrush and mesquites of arid foothills and mesas, between 2,000-6,500 feet in elevation in the eastern and southern portions of California. The gray vireo is a short-distance migrant that winters in northwestern Mexico near the coast in dry thorn scrub of elephant trees and giant cacti. It migrates to Mexico at the end of August and returns to the southwestern U.S. between March and early May.

The gray vireo forages within 5 feet of the ground, moving actively through the brush on dry slopes seeking out insects and fruits. It nests in shrubs, usually oak or juniper, and lays 3 to 5 eggs and has two broods per year. Nests are parasitized by brown-headed cowbirds (*Molothus ater*) but the female may build a second nest on top of the cowbird eggs to keep them from hatching. Young birds fledge the nest 13 to 14 days after hatching.

The gray vireo is a USFWS Bird of Conservation Concern (USFWS 2008) and is designated by CDFW as a Species of Special Concern (CDFW 2018) (see Appendix B for definitions of state and federal designations).

The gray vireo is protected under the Migratory Bird Treaty Act which prohibits take of individual owls or their active nests. Take, under the Endangered Species Act federal definition, means pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb.

There is one CNDDB record of gray vireo over 20 miles northwest of the proposed Aratina Project Area. The location is in Fremont Valley area north of California City (Figure 6). The potential for gray vireo to be present on the proposed Project Area is low and they may only be detected during migration between nesting areas to wintering locations in Mexico.

San Joaquin Population of LeConte's Thrasher (*Taxostoma lecontei macmillanorum*) (Phillips, AR, 1966; Audubon 2019c)

LeConte's thrashers in the San Joaquin Valley appear to be isolated geographically from other populations (Shuford and Gardali 2008). They occur entirely within California, residing only in the southern San Joaquin Valley and adjacent Cuyama Valley and Carrizo Plain (Grinnell and Miller 1944, Sheppard 1996). The highest densities occur in the Maricopa area of southwestern Kern County followed by the McKittrick area in western Kern County and then by the Carrizo-Elkhorn Plains of San Luis Obispo County (Sheppard 1996).

This species is a permanent resident and breeds from early February to late June

(Sheppard 1996). The breeding and wintering habitat requirements of this thrasher are specialized and nesting areas must have at least a few larger, dense shrubs for nest placement. (Sheppard 1996).

The current distribution of the LeConte's thrasher in the San Joaquin Valley is likely determined by the presence, structure, and vigor of saltbush, the size of habitat fragments, and the proximity to other saltbush areas. Birds seek gentle to rolling, well-drained slopes bisected with dry washes, conditions found most often on bajadas or alluvial fans. Occupied habitats are generally moderately to sparsely vegetated by Allscale, Spinescale, or rarely—in a small area in the Carrizo Plain and Cuyama Valley—Desert Tea (*Ephedra* sp.). The ground is bare or has patches of sparse, low-growing grass.

Foraging areas must be well drained and have a significant percentage of bare ground and a well-developed litter layer near shrubs. Arthropods are the primary food source, though thrashers occasionally eat plant seeds, bird eggs, and small lizards (Sheppard 1996). They forage mainly by digging into the ground or through leaf litter under and near shrubs (Sheppard 1996).

Habitat loss and degradation have been and continue to be the major population-level threats to this species in addition to fire and livestock grazing that converts shrublands to non-native grasslands. Habitat conversion to agriculture appears to be the single biggest factor in reducing the amount of habitat available to this species and in isolating currently occupied areas (Laudenslayer et al. 1992).

The San Joaquin population of LeConte's thrasher is a USFWS Bird of Conservation Concern (USFWS 2008) and is designated by CDFW as a Species of Special Concern (CDFW 2018) (see Appendix B for definitions of state and federal designations).

The LeConte's thrasher is protected under the MBTA which prohibits take of individual owls or their active nests. Take, under the Endangered Species Act federal definition, means pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb.

There is one CNDDB record of LeConte's thrasher within 10 miles southeast of the proposed Aratina Project Area on Edwards AFB and another record further south of Edwards AFB (Figure 6). Neither of these observations are likely to be LeConte's thrashers of the San Joaquin population. The potential for LeConte's thrasher of the San Joaquin population to be present on the proposed Project Area is not possible due to this species endemic occurrence within the western portions of Kern County.

Tricolored Blackbird (*Agelaius tricolor*) (Audubon 2019d)

Tricolored blackbird populations have declined seriously in recent decades due to loss of freshwater habitats which include freshwater marshes with dense stands of cattails or bulrushes which they require for breeding and rearing young. The tricolored blackbird breeds throughout California west of the Sierra Nevada Mountains and the eastern desert areas.

They congregate in dense colonies during the breeding season. They forage in flocks in open areas nearby that include farm fields, pastures, cattle pens, and large lawns that will

include other similar bird species such as red-winged blackbird (*A. phoeniceus*) and European starlings (*Sturnus vulgaris*). Their diet consists of mostly insects and seeds and in the winter, they will feed on grass seeds, weed seed, and waste grain.

During the breeding season hundreds to tens of thousands will colonize a freshwater marsh area in extremely small territories that are only 1 to 2 feet apart from each other. They will lay between 3 to 5 eggs and the young will fledge from the nest in 11 to 14 days after hatching.

Tricolored blackbird is a USFWS Bird of Conservation Concern (USFWS 2008); is designated by CDFW as a Species of Special Concern (CDFW 2018); and is a covered species under the DRECP (see Appendix B for definitions of state and federal designations).

The tricolored blackbird is protected under the MBTA which prohibits take of individual blackbirds or their active nests. Take, under the Endangered Species Act federal definition, means pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb.

There are CNDDB records of tricolored blackbirds over 20 miles northwest of the proposed Aratina Project Area in Fremont Valley east of Cantil and east of California City; and over 20 miles southwest of the Project Area in the Antelope Valley (Figure 6). The potential for tricolored blackbird to be present on the proposed Project Area is very low due to the lack of appropriate breeding habitat and foraging areas. This species should be surveyed for during the breeding season when it may be more detectable if freshwater marshes are located in close proximity to the project vicinity.

Desert Kit Fox

The desert kit fox currently does not have federal or State of California special status designation, however, it is protected from "take" as a furbearing mammal pursuant to the California Code of Regulations (CCR), Title 14 [Natural Resources], Division 1 [Fish and Game Commission-Department of Fish and Game], Subdivision 2 [Game, Furbearers, Nongame, and Depredators], Chapter 5 [Furbearing Mammals], Section 460 [Fisher, Marten, River Otter, Desert Kit Fox and Red Fox] (Westlaw 2019a). Section 460 specifically states that desert kit fox "…may not be taken at any time."

In the California desert region, desert kit fox populations are closely associated with creosote bush scrub communities (McGrew 1979). In California, the desert kit fox lives in the Mojave and Colorado deserts in inland Southern California from Inyo County to the Mexican border. Desert kit fox range extends into southern Nevada, western Arizona, the southwest tip of Utah, and Mexico.

Kit foxes are semi fossorial and primarily nocturnal, residing in subterranean dens with typical keyhole shaped entrances. They generally require friable soils with little or no relief for excavating dens which they use throughout the year for cover, thermoregulation, water conservation, and raising young (CEC 2012). Kit foxes prefer the presence of short, patchy vegetation in their denning habitat (Egoscue 1962, O'Farrell and Gilbertson 1986).

Kit foxes are also able to adapt to open habitats including creosote flats and grasslands (Rodrick and Mathews 1999). Egoscue (1962) suggested kit foxes can also utilize sandy dune habitat for foraging.

Kit foxes are "opportunistic primary, secondary and tertiary consumers and scavengers, likely regulated by prey abundance" (Cypher 2003 in Meaney et al. 2006). The primary prey of kit foxes are kangaroo rats (*Dipodomys* spp.) that are locally abundant. Several authors have emphasized the correlation between the ecological and geographical distribution of kit foxes and *Dipodomys* spp. (Meaney et al. 2006). Merriam's Kangaroo rat (*Dipodomys merriami*) is the primary prey of the desert kit fox in the Californian Desert (NPS 2012). Other common prey species include leporids (rabbits and hares), rodents, and insects. Kit foxes also consume birds, reptiles, carrion, and rarely, plant material such as cactus fruits (List and Cypher 2004). Kit foxes are known to cache food and consume anthropogenic food (Cypher 2003).

Nightly foraging distance is greater in males than females, home range sizes between sexes do not differ, with estimates of home range varying from 251 ha to 1,160 ha (Cypher 2003 in Meaney et al. 2006). Difference in the size of home ranges may be related to food availability (Spiegel 1996).

Litters of three to five young are born in February or March (Egoscue 1962; McGrew 1979). Kit foxes can live for about seven years in the wild.

The desert kit fox is primarily threatened by large-scale industrial energy development, which causes habitat loss, degradation, and fragmentation (Kadaba 2014). This species is also affected by increased nonnative plant cover, urbanization, mortality from roads and off-road vehicles, increased competition with other canids and depredation, agriculture, grazing, climate change, and disease such as rabies and canine distemper.

Due to a lack of population monitoring, population trends for the desert kit fox in California are unknown. The accelerating loss of habitat is likely to be contributing to population declines across the fox's range, concentrated in regions with the greatest habitat impacts (Center For Biological Diversity 2019b). Domestic and feral dogs that come in contact with desert kit fox can transmit canine distemper which can decimate the affected kit fox population.

The CNDDB does not track the occurrence of desert kit fox. However, the potential for their occurrence on site is moderate to high. Surveys for this species were included in the April and May 2019 wildlife surveys of the Project Area. The results of this survey are discussed in Section 6.3 with the completed report included as Appendix F.

American Badger

The American badger is a furbearing mammal that is designated as a California Species of Special Concern (CDFW 2018) and is also subject to hunting regulations under CCR, Title 14, Division 1, Subdivision 2, Chapter 5, Section 641 (Westlaw 2019b).

It occurs throughout most of California and is an uncommon and permanent resident of open desert shrublands, interior and coastal shrublands, forests, herbaceous habitats, and open areas in grasslands and agricultural areas. It digs large burrows in dry, friable soils

and feeds mainly on fossorial mammals such as ground squirrels, gophers, rats, and mice. They may reuse older burrows, dig new a den every night (Messick and Hornocker 1981), or use the burrows of other animals such as coyote, desert tortoise, and kit fox. The American badger is primarily active during the day but may become somewhat nocturnal when occurring in close proximity to humans. They will go into various stages of torpor during the winter months (Long 1973).

They are non-migratory and the home range of badgers varies both geographically and seasonally. Home range has been measured to be 1,327 to 1,549 acres for males and 338 to 751 acres for females in Utah (Lindzey 1978) and 400 to 600 acres in Idaho (Messick and Hornocker 1981). Males are generally solitary except during the breeding season in summer through early fall. Litters of 2 to 3 are born in March and April (Long 1973).

Threats to the American badger include road mortality, habitat loss, loss of prey base, poisoning of prey base, predator control/depredation, indiscriminate trapping, and largescale development that fragments its habitat.

Although there are no CNDDB records for American badger in the proposed Aratina Project Area, the potential for their occurrence on site is low to moderately high. Due to the mobility of this species and its preferred foraging habitat, this species is anticipated to potentially occur on site as an occasional transient or forager if no active dens are discovered. Surveys for this species were included in the April and May 2019 wildlife surveys of the Project Area. The results of this survey are discussed in Section 6.3 with the completed report included as Appendix F.

Crotch Bumble Bee (*Bombus crotchii*)

The Crotch bumble bee is an important pollinator of wild flowering plants and agricultural crops. Bumble bees are able to fly in cooler temperatures and lower light levels than many other bees, making them excellent pollinators, especially at higher elevations and latitudes. They also perform a behavior called "buzz pollination," in which the bee grabs the flower in her jaws and vibrates her wing muscles to dislodge pollen from the flower. Many plants, including a number of wildflowers and crops like tomatoes, peppers, and cranberries, benefit from buzz pollination. Because bumble bees are essential pollinators, their population declines can have far ranging ecological consequences. Recent collaboration between the Xerces Society and the International Union for Conservation of Nature (IUCN) Bumble Bee Specialist Group, indicates that some species have experienced rapid and dramatic declines, with more than one quarter (28%) of all North American bumble bees facing some degree of extinction risk (Xerces Society 2020a). The Crotch bumble bee is listed as Endangered on the IUCN Red List (Hatfield et al. 2015a).

The Xerces Society, Defenders of Wildlife, and the Center for Food Safety submitted *A Petition to the State of California Fish and Game Commission to List the Crotch bumble bee (Bombus crotchii), Franklin's bumble bee (Bombus franklini), Suckley cuckoo bumble bee (Bombus suckleyi), and western bumble bee (Bombus occidentalis occidentalis) as Endangered under the California Endangered Species Act* in October of 2018 (Xerces Society et al. 2018). The Commission designated all 4 of the petitioned

bumble bees as candidate species for listing under CESA on June 12, 2019 in their Notice of Findings (Fish and Game Commission 2019). CDFW will prepare and publish a status review report before the end of 2020 (CDFW 2020).

Bumble bees face many threats including habitat loss, disease, pesticide use, and climate change to include severe weather, drought, temperature extremes, flooding and habitat shifts. Unlike honeybees which have large (>10,000 individuals) perennial hives, bumble bees produce smaller annual colonies (50-1,500 individuals). Due to their smaller annual population sizes, life cycle, and genetic makeup, they are uniquely susceptible to extinction.

Although their combined historic ranges span most of the state of California, they currently exist in only a few areas.

California has recognized the importance of conserving important pollinators such as Crotch bumble bee by preparing and issuing the Biodiversity Initiative in November 2018, which calls for fallowed agricultural lands to be transformed into habitat for bees, thus creating "pollinator highways" across the state (California Governor's Office of Planning and Research 2018).

Listing these bumble bees under the CESA will protect them from 'take', including activities that could cause them to go extinct, and will allow for additional conservation measures to be implemented. Efforts are already underway to restore habitat for bees on farms and in cities throughout California. An increased investment in pollinator habitat, along with protection from insecticides and pathogens, will be required to prevent extinction of these bumble bees.

Currently, the Crotch bumble bee only persists in 20% of its historic range and has declined by 98% in relative abundance (its abundance relative to other species of bumble bees) (Xerces Society 2019). Analysis suggests sharp declines in both relative abundance and persistence over the last ten years. This species was historically common in the Central Valley of California, but now appears to be absent from most of it, especially in the center of its historic range. Current range size relative to historic range is 74.67% (Xerces Society 2020b). This species occurs primarily in California, including the Mediterranean region, Pacific Coast, Western Desert, Great Valley, and adjacent foothills through most of southwestern C0alifornia. It has also been documented in southwest Nevada, near the California border.

Potential for occurrence within or in close proximity to the proposed Aratina Project Area is low to moderate based on CNDDB records of 5 to 10 miles to the southeast, south of Kramer Junction (Figure 6).

Western Bumble Bee (*Bombus occidentalis*)

Like the Crotch bumble bee discussed above, the western bumble bee is an important pollinator of agricultural crops and wild plants. It too is imperiled by habitat loss, disease, pesticide use, and climate change to include severe weather, drought, temperature extremes, flooding and habitat shifts.

Historically, the western bumble bee was broadly distributed throughout western North

America. The western bumble bee was one of the most common bumble bees within its range prior to the late-1990s, but in California is now found only in a few sites in the Sierra Nevada and the northern coast. Outside of California it is known to occur in the western interior of North America, from Arizona, New Mexico, north through the Pacific Northwest and into Alaska. Eastward, the distribution stretches to the northwestern Great Plains and southern Saskatchewan (Xerces Society 2020c). Its relative abundance has declined by 84%. The western bumble bee is listed as Vulnerable on the IUCN Red List (Hatfield et al. 2015b).

The Xerces Society, Defenders of Wildlife, and the Center for Food Safety submitted *A Petition to the State of California Fish and Game Commission to List the Crotch bumble bee (Bombus crotchii), Franklin's bumble bee (Bombus franklini), Suckley cuckoo bumble bee (Bombus suckleyi), and western bumble bee (Bombus occidentalis occidentalis) as Endangered under the California Endangered Species Act* in October of 2018 (Xerces Society et al. 2018). The Commission designated all 4 of the petitioned bumble bees as candidate species for listing under CESA on June 12, 2019 in their Notice of Findings (Fish and Game Commission 2019). CDFW will prepare and publish a status review report before the end of 2020 (CDFW 2020).Although their combined historic ranges span most of the state of California, they currently exist in only a few areas.

California has recognized the importance of conserving important pollinators such as the western bumble bee by preparing and issuing the Biodiversity Initiative in November 2018, which calls for fallowed agricultural lands to be transformed into habitat for bees, thus creating "pollinator highways" across the state (California Governor's Office of Planning and Research 2018).

Potential for occurrence of the western bumble bee within or in close proximity to the proposed Aratina Project Area is low to moderate based on CNDDB records of 5 to 10 miles to the southeast, southeast of Kramer Junction (Figure 6).

6.0 SENSITIVE, SPECIAL STATUS, AND LISTED BIOLOGICAL SPECIES SURVEY RESULTS

6.1 Plant Species Survey Results

As discussed in Section 2.0 various agency databases and recorded documents were reviewed and researched for the proposed Aratina solar Project Area and surrounding lands for special status plant species. Special status plant species are presumed to occur within the proposed Project Area if there were locality records, either historic or recent, indicating presence, discovered through the research and literature review efforts.

Section 5.1 discusses the potential for a total of seventeen (17) special status plant species occurring within the boundaries of the proposed Project Area. Of the 17 special status plant species, 11 were identified as occurring or potentially occurring within the proposed Aratina Project Area. These include western Joshua tree, desert cymopterus, recurved larkspur, Barstow woolly sunflower, Booth's evening-primrose, sagebrush loeflingia, white pygmy-poppy, Mojave spineflower, golden goodmania, crowned muilla, and graceful nemacladus.

6.1.1 Survey Methodology

EREMICO Biological Services performed the special status plant surveys on the Project Area between April 1 and April 14, 2019. Surveyors included Denise LaBerteaux, Bruce Garlinger, Mark Bagley, Cecile Shohet, Youssef Atallah, and Susan Moore.

Prior to conducting the special status plant survey on the Project Area, the field crew reviewed the physical description, habitat description, drawings, and photographs of each potentially occurring special status plant species. The crew also developed a list of known locations for rare plants in the general vicinity of the Project Area from information in the California Natural Diversity Database (CNDDB 2019). The crew visited some of these locations immediately prior to the survey to become familiar with each plant's appearance and habitat and to determine if it would be identifiable at the time of the survey.

The special status plant survey consisted of a 100% coverage survey following protocols recommended by CDFW (CDFW 2009). The field crew systematically walked 15-meter wide parallel line transects over the entire area to achieve full coverage. The width of each transect was determined by the density of shrubs in the area. Each special status plant and CDNPA plant encountered were recorded with a Garmin hand-held GPS unit. California Native Species Field Survey Forms were completed for each special status plant, excluding CDNPA plants.

The special status plant survey was floristically based, wherein the field crew identified all plant species, whether fresh or dried, that were encountered in the Project Area to at least genus and to the level necessary to ensure that they were not plant species of concern. The crew collected plants that were not readily identifiable in the field for later identification in a laboratory setting.

The complete and final EREMICO Biological Services *Rare Plant Survey* report is included in this BE as Appendix E. Nomenclature follows *The Jepson Manual, 2nd Ed.* (Baldwin et al. 2012).

6.1.2 Survey Results

EREMICO Biological Services conducted the special status plant surveys between April 1 and April 14, 2019. Plants identified in the Project Area totaled 145 species in 31 plant families. The field crew recorded 125 native species, 18 non-native weedy species, and 2 non-native

ornamentals. The annual flora of the Project Area was likely well represented due to above normal precipitation during the previous fall and winter.

The results of this survey found presence of western Joshua tree, a state petitioned species for listing as Threatened and a CDNPA species, and four CNPS ranked plant species: desert cymopterus, Barstow woolly sunflower, Mojave spineflower, and crowned muilla, for a total of 141,094 individual plants. Western Joshua trees totaled 4,276 plants. Project Area #2 had the highest recorded number of western Joshua trees. Project Area #5 had the highest recorded number of Mojave spineflower at 131,223 plants (Table 5). In addition to western Joshua tree, the survey also found three CDNPA plant species: silver cholla, diamond cholla (*Cylindropuntia ramosissima*), and beavertail, which totaled 224 plants (Table 5). Project Area #2 had the highest recorded number of cacti.

Table 5 summarizes these findings and the number of plants detected within each Project Area and within the gen-ties. Figure 8 shows the locations of western Joshua trees, Figure 9 includes other rare plant species, and Figure 10 depicts the locations of each of the cactus plant species within the proposed Project Area. Recommendations for mitigation measures for impacts to special status plant species are discussed in Section 7.0.

6.2 Listed Wildlife Species

As discussed in Section 2.0 various agency databases and recorded documents were reviewed and researched for the proposed Aratina Solar Project Area and surrounding lands for listed wildlife species. These wildlife species are presumed to occur within the proposed Project Area if there were locality records, either historic or recent, indicating presence, discovered through the research and literature review efforts.

Two out of the 11 total species identified as potentially occurring within the Project Area are state and/or federal listed as Threatened. These are the state listed as Threatened MGS and the state and federal listed as Threatened ADT. The potential for occurrence of MGS and ADT within the Project Area is discussed in detail in Section 5.2 and the results of the April and May 2019 wildlife surveys are summarized below. The complete *Wildlife Survey of the Proposed Aratina Solar Project, Kern County, California* report can be found in Appendix F.

6.2.1 Mohave Ground Squirrel

6.2.1.1 Habitat Assessment Methodology

A habitat assessment was conducted for the state listed as Threatened, MGS, by Dr. Philip Leitner between February 9 and 12, 2019. This habitat assessment was completed to determine the potential for occurrence as well as impacts to this species from proposed project development. Potential habitat is land within or adjacent to the geographic range of the MGS that supports desert shrub vegetation.

The habitat assessment also included a review of the CNDDB database and maps for MGS occurrences within the project vicinity (Figure 6) and this species life history is discussed in Section 5.2.

Table 5. Special Status Plant Species and CDNPA Plants Occurring within the Proposed Aratina Solar Project Area, Kern County, California, April 2019.

SPECIES	PROJECT AREA #1	PROJECT AREA #2	PROJECT AREA #3	PROJECT AREA #4	PROJECT AREA #5	GEN-TIES AND COLLECTOR LINE AREAS	TOTAL
Western Joshua Tree	460	2,443	936	324	81	32	**4,276**
Desert Cymopterus	61	61	10	0	0	0	**132**
Barstow Woolly Sunflower	1	68	0	0	0	0	**69**
Mojave Spineflower	146	207	0	103	131,223	4,000	**135,679**
Crowned Muilla	20	392	521	4	1	0	**938**
Silver Cholla	34	98	36	6	20	2	**196**
Diamond Cholla	0	1	1	0	0	0	**2**
Beavertail	4	12	10	0	0	0	**26**
TOTAL	**726**	**3,282**	**1,514**	**437**	**131,325**	**4,034**	**141,318**

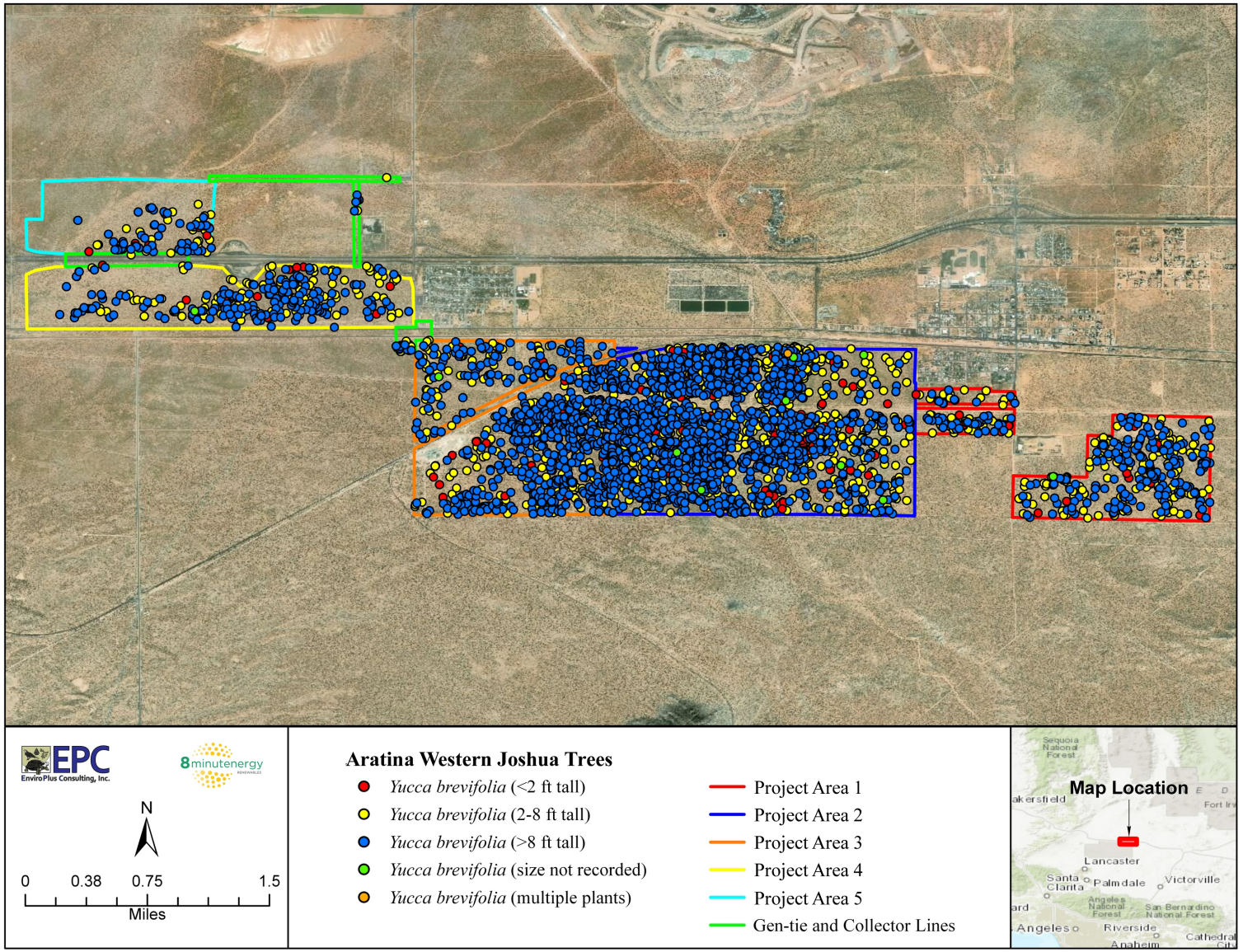


Figure 8. Proposed Aratina Project Area Western Joshua Tree Map

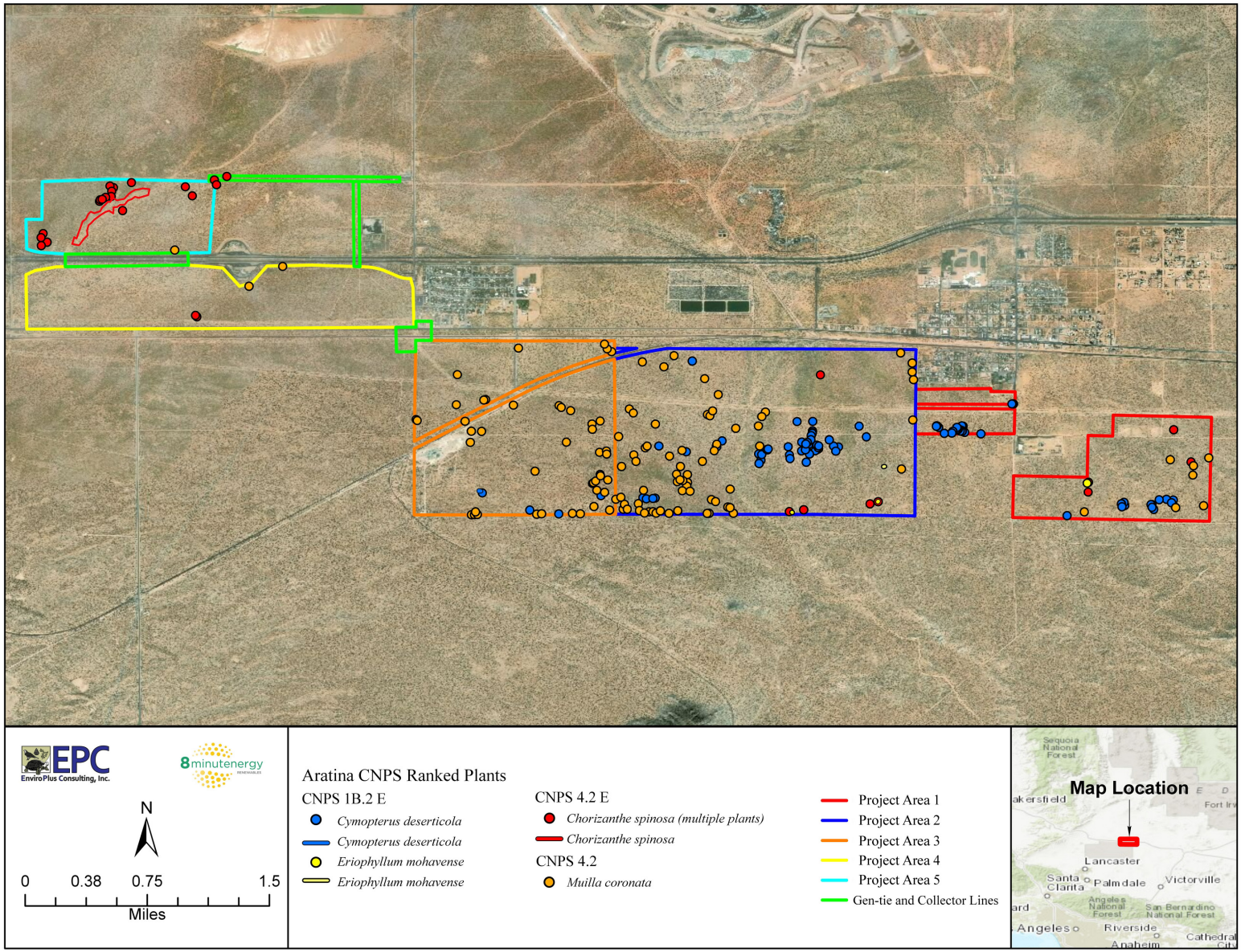


Figure 9. Proposed Aratina Project Area CNPS Ranked Plant Species Map

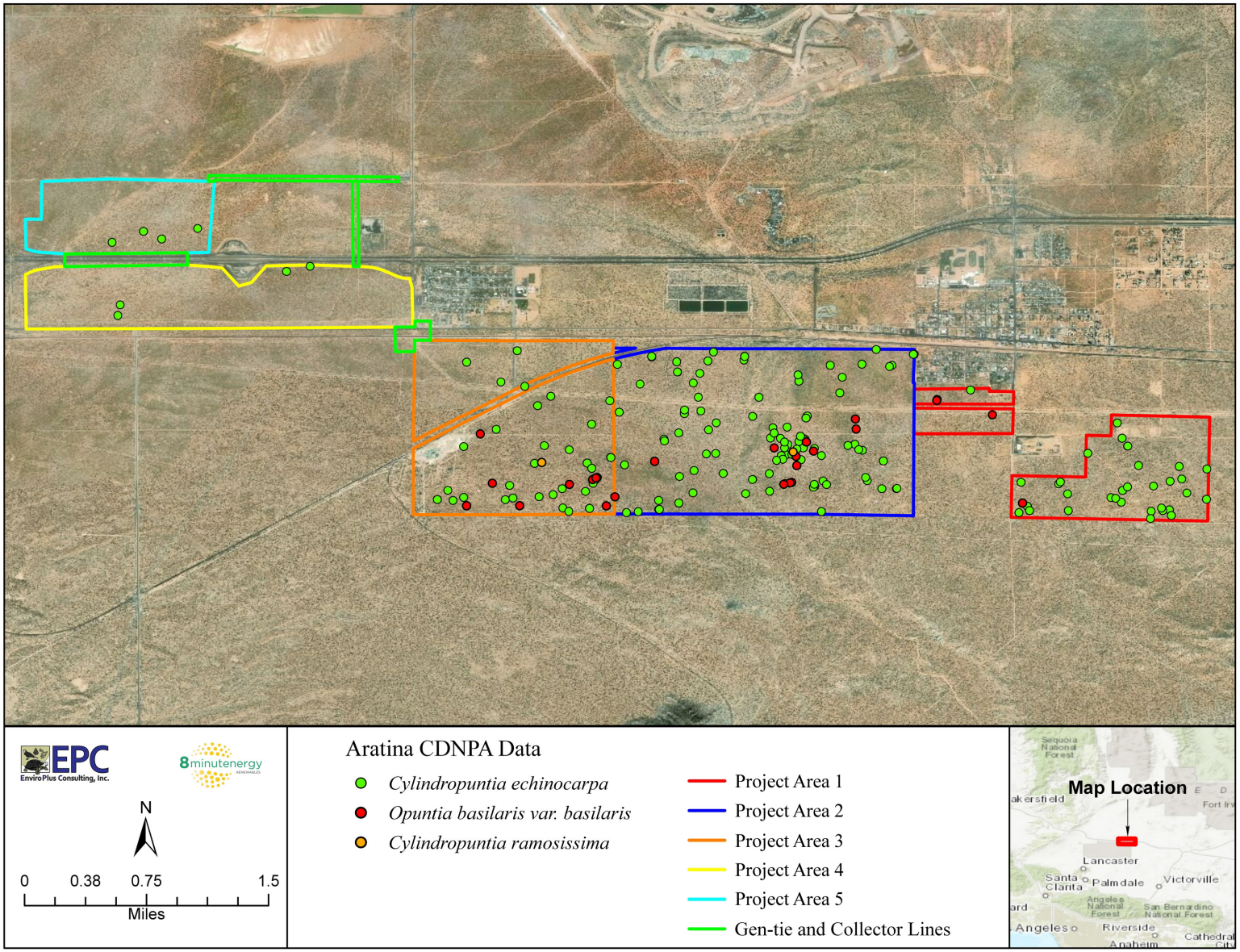


Figure 10. Proposed Aratina Project Area Cactus Species Map

6.2.1.2 Habitat Assessment Results and On-Site Incidental Observation

The proposed Aratina Solar Project Area is within the geographic range of MGS and there are multiple records of this species being trapped and identified during surveys within the general vicinity of the proposed Project Area. The current CNDDB contains multiple records of MGS within the proposed Aratina Solar project footprint, along the approximate boundary of the proposed project, and within 2 miles of the proposed project boundary. Given the intact nature of the vegetation communities, limited human disturbances, the appropriate soil types for burrow construction, and the availability of forage and cover from predators and weather events, the proposed Aratina Solar Project Area is acknowledged to support an MGS population.

During the course of the April 2019 special status plant surveys conducted by EREMICO Biological Services, Denise LaBerteaux, who is also experienced with MGS, heard a MGS eliciting a call (D. LaBerteaux, personal communication, May 17, 2019). This auditory identification further supports Dr. Leitner's habitat assessment and the acknowledgement of MGS presence within the proposed Project Area.

Because of its state Threatened status, CDFW is responsible for evaluating project impacts to the species and ensuring that such impacts are fully mitigated. MGS live trapping protocol surveys are not a requirement by CDFW, and the applicant is allowed to presume the presence of MGS and mitigate for impacts accordingly. The applicant may decide to have live trapping protocol surveys conducted instead if they determine that they would prefer more information on the extent of impacts and potential population loss.

Local and state agencies will be involved in the final determination of mitigation for impacts to MGS from the proposed project. Recommended mitigation measures for MGS are discussed in Section 7.0.

6.2.2 Agassiz's Desert Tortoise

6.2.2.1 Protocol Survey Methodology

EnviroPlus Consulting, Inc. performed the listed, sensitive, and special status wildlife surveys on the Project Area between April 7 and May 16, 2019. USFWS protocol surveys for ADT (USFWS 2017) included a concurrent survey for all other potentially occurring sensitive and special status wildlife species to include CDFW protocol surveys for burrowing owl (CDFG 2012). Incidental observations were recorded of all vertebrate species observed to develop a comprehensive species list (Appendix D). Additionally, detailed notes and locations were recorded if sign of any special status species were noted. Focus species included desert kit fox, American badger, MGS, and a variety of other special status bird species. Surveyors included Gilbert Goodlett, Ellen Schafhauser, and Fabio Fortunat (team members).

The USFWS protocols (USFWS 2017) define the "action area" of a project to include all areas to be affected directly or indirectly by a project action. For the proposed Aratina Project Area, the action area was defined as the Project Area plus access routes to the Project Area. All of the access routes are existing public use paved roads and the action area is therefore essentially the same as the Project Area (Figure 2).

A 100% coverage survey as defined in the USFWS's 2017 protocol (USFWS 2017) was conducted for ADT within the action area. In brief, these protocols specify the following:

- An option to conduct 100% coverage surveys or probabilistic sampling if the site is large enough. The threshold to allow probabilistic sampling for the Western Mojave Desert is 3,290 acres.
- Transects spaced at 10-meter intervals if 100% coverage surveys are utilized.
- Surveys to be conducted during tortoise's active periods, April 1 to May 31 or September 1 to October 31 when the shaded air temperatures are below 40ºC (104ºF) at 5 cm (2 inches) above ground.
- Surveys to cover the "action area" which includes all areas to be affected directly or indirectly by a project action.

EnviroPlus Consulting, Inc. surveyed the entire action area at 10-meter intervals for a total of 783.2 transect miles. All transects were walked in a north-south direction except for east-west oriented gen-tie routes and east-west burrowing owl buffer areas. North-south transects were preferred to increase visibility by reducing glare from walking directly into the sun in the early morning. All transects and the boundaries of the survey area were downloaded to handheld GPS units for ease of navigation. Each team member was equipped with a GPS unit. For efficiency, team members worked independently. Team members nominally completed 8 miles of transects per day.

Team members focused their search within an approximate 180º arc and 5-meter radius centered in front of them. The survey team generally remained on their transect centerline except to investigate shrubs, trees, and other landscape features which prevented the biologist from seeing an item of interest. After investigation of a feature, the biologist returned to the transect centerline. This insured accurate coverage of the survey area. Biologists avoided staring at the GPS units to maintain their track. Instead they selected an object on the horizon to use as a target and occasionally checked the GPS for their position with respect to the intended transect. Less than 10% of the biologist's time was spent looking at the GPS. Each team member has substantial prior experience in this type of GPS navigation.

Standard ADT data collection information included:

- Location of observation (GPS)
- Burrows and cover sites to include classes of burrows, burrow dimensions, and burrow aspect
- Scat to include class and number
- Live tortoises to include maximum carapace length (MCL), sex, location, activity, and health
- Carcasses to include MCL, sex, sun exposure, position, cause of death, and time since death; and
- Other sign such as tracks, drinking depressions, courtship rings, etc.

This data was collected using an iPhone® and the application Avenza Maps for which a custom data collection schema was developed. The cumulative data were uploaded daily to a cloud storage site (Dropbox.com). Photographs were taken of every item of sign trackable to a unique sequential sign identification number assigned in Avenza Maps. Photographs were also taken of typical habitat features. The application Theodolite was used to take all photographs. Theodolite imprints data to a digital photograph. These data include the date and time, location in Universal Transverse Mercator (UTM) coordinates, altitude, datum, direction the camera is pointed, elevation and horizon angles, zoom level, and custom notes.

No desert tortoises were handled during the survey. All burrows and potential cover sites were investigated by using a mirror to reflect sunlight into the burrow. Neither probes nor downhole cameras were utilized to investigate burrows to prevent potentially harassing tortoises.

At 0800 and 1200, weather conditions were recorded. Weather conditions included the shaded air temperature at 1.5-meters measured with a 0.1 °C precision thermometer, the visually estimated percentage of cloud cover and type of clouds, and wind speeds and direction. Winds speeds were measured with a Kestrel® brand electronic wind meter. Measurements were taken until average wind speeds stabilized. The average and maximum wind speeds were recorded. Wind direction was estimated by observing the drift direction of a handful of fine soil that was dropped. These data are presented in the complete survey report in Appendix F.

In addition to recorded temperature data, 5 cm shaded air temperatures were routinely taken on warm days during the active survey time period to ensure that the peak desert tortoise survey temperature of 40 ºC at 5 cm was not exceeded. Cooler temperatures prevailed during the survey and the 5 cm temperature never approached the maximum.

6.2.2.2 Survey Results

No definitive sign of desert tortoise habitation of the Project Area was detected. One carcass was located within Project Area #3 (Photograph 10; Table 6; Figure 11). The disarticulated carcass remains were of an adult female tortoise with a maximum carapace length of 240 mm. The animal was estimated to have died over 4 years prior to the observation (Berry and Woodman 1984). The cause of death could not be determined. Approximately 50 meters to the south-southeast, a Class 3 burrow (deteriorated condition, definitely tortoise) was located. It appeared likely that this burrow belonged to the tortoise whose carcass was located.



Photograph 10. ADT Carcass in Project Area #3 Over 4 Years Since Death

The only other potential tortoise sign detected included seven Class 4 burrows (deteriorated condition, possibly tortoise) seen in Project Areas #1, #3, and #4. When burrows deteriorate from weathering and disuse, it is often difficult to determine the species that created or last inhabited the burrow and the observation of Class 4 burrows alone is not indicative of desert tortoise habitation.

No live tortoises, scat, high quality burrows, tracks, courtship rings, or eggs or fragments thereof, or drinking depressions were detected. Observation of any of these items would indicate current habitation by the species.

Additionally, EREMICO Biological Services did not detect any sign of desert tortoise during their April 2019 special status plant surveys that covered the same Project Area footprint as the protocol ADT survey conducted by EnviroPlus Consulting, Inc.

Table 6. Desert Tortoise Sign Detected on the Proposed Aratina Solar Project Area, Kern County, California, April and May 2019

Project Area #	BURROWS*						CARCASS**		
	Class	Length (mm)	Width (mm)	Height (mm)	Soil Cover (mm)	Burrow Aspect	MCL (mm)	Sex	Time Since Death
3	3	Unknown	260	180	50	NE			
1	4	< 1000	300	250	175	NE			
1	4	1000	200	120	100	E			
3	4	< 1m	200	130	250	E			
3	4	Unknown	280	200	20	N			
3	4	>1m	165	110	30	S			
3	4	< 1m	190	130	70	E			
4	4	700	250	110	50	E			
3							240	Unknown	>4 Years

Burrow Class
Class 1 – Currently Active, with tortoise or recent tortoise sign
Class 2 – Good condition, definitely tortoise, no evidence of recent use
Class 3 – Deteriorated condition; definitely tortoise
Class 4 – Deteriorated condition; possibly tortoise
Class 5 – Good condition; possibly tortoise
Soil Cover – Distance between top of burrow and surface at burrow entrance
Burrow Aspect – Direction mouth of burrow is facing

****Carcass***
MCL – maximum carapace length in mm or size class
Sex – male or female
Time Since Death – based on Berry and Woodman, 1984
<1 Year
1-2 Years
2-4 Years
>4 Years

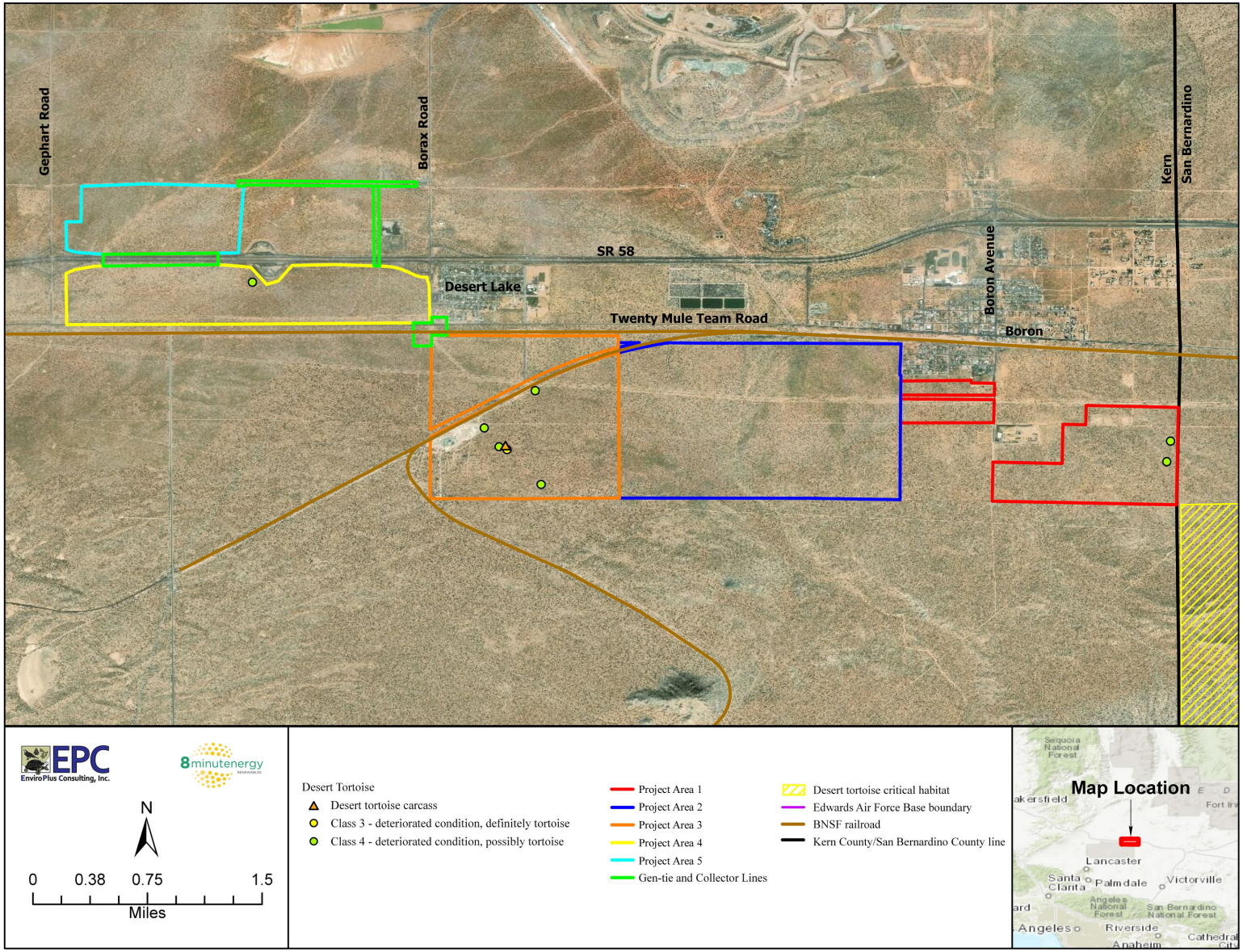


Figure 11. Proposed Aratina Project Area Agassiz's Desert Tortoise Location Map

6.3 Sensitive and Special Status Wildlife Species

As discussed in Section 2.0 various agency databases and recorded documents were reviewed and researched for the proposed Aratina solar Project Area and surrounding lands for listed, sensitive, and special status wildlife species. These wildlife species are presumed to occur within the proposed Project Area if there were locality records, either historic or recent, indicating presence, discovered through the research and literature review efforts.

A total of 11 potentially occurring wildlife species and two insect species were identified during the literature review and database search (Table 1). Of the 11 wildlife species identified two are state and/or federal listed as Threatened. These are the state listed as Threatened MGS and the state and federal listed as Threatened ADT which have been discussed in Sections 5.2 and 6.2.

The remaining nine wildlife species and two insect species are designated as state and/or federal special status species and include golden eagle, prairie falcon, mountain plover, burrowing owl, gray vireo, the San Joaquin Population of LeConte's thrasher, and tricolored blackbird. The two mammal species include desert kit fox and American badger and the Crotch and western bumble bees comprise the two insect species. The potential for occurrence of these species within the Project Area are discussed in detail in Section 5.3.

Protocol surveys for ADT and burrowing owl included all observations and recordings of these potentially occurring sensitive and special status species as well as all other general species. Surveys were conducted between April 7 and May 16, 2019.

6.3.1 Burrowing Owl

6.3.1.1 Protocol Survey Methodology

As stated above in Section 6.2.2.1 Protocol Survey Methodology for ADT, the same area within the proposed Project Area was surveyed for burrowing owl. However, the CDFG 2012 protocol for burrowing owl is different than for ADT and specifies the following instructions:

Conduct 4 survey visits: 1) at least one site visit between 15 February and 15 April, 2) a minimum of three survey visits, at least three weeks apart, between 15 April and 15 July, with at least one visit after 15 June. The survey methodology will include the following:

- Transects spaced at 7 to 20 meters apart and adjusted for vegetation height and density.
- Recording all potential burrows used by burrowing owls as determined by the presence of one or more burrowing owls, pellets, prey remains, whitewash, or decoration.
- Survey of a 150-meter wide buffer outside of the Project Area.
- A provision by CDFW to propose alternate survey methods for large projects.

EnviroPlus Consulting, Inc. conducted one breeding season survey in accordance with CDFW burrowing owl methodology that included a 150-meter wide buffer area survey adjacent to Project Areas. The 150-meter wide buffer area was surveyed at 20-meter intervals. Burrowing owl buffers were not walked adjacent to the gen-ties. A total of 50.9 miles of burrowing owl buffer transects were walked. The location of burrowing owl survey buffers are depicted in Figure 12. Burrowing owl buffers were established around the entire project perimeter where possible. Exceptions included the southern boundary of Project Areas #1, #2, and #3 and the western boundary of Project Area #3 where the Project Area abuts Edwards AFB property. A portion of the buffer south of Project Area #4 was also narrowed because of Edwards AFB lands. Burrowing owl buffers were also not established where the project abutted the communities of Boron and Desert Lake and along SR58.

All transects were walked in a north-south direction except for east-west oriented gen-tie routes and east-west burrowing owl buffer areas. North-south transects were preferred to increase visibility by reducing glare from walking directly into the sun in the early morning. All other methodology for burrowing owls follows that as described above in Section 6.2.2.1 unless otherwise specified within this Section.

Standard data collected for burrowing owl and burrowing owl sign observations included the following:

- Location of observation (GPS)
- Status of burrow – active or inactive
- Burrowing owl sign observed at burrow
- Observation of a live burrowing owl

Active burrowing owl burrows are of an appropriate size for use by a burrowing owl and one or more of the following recent items of sign are present – whitewash (uric acid excretions which are the equivalent of urine in mammals), owl feathers, pellets (undigested parts of owl's food that are regurgitated), remains of prey items, and disturbed area in the mouth of a burrow consistent with owls. Inactive burrows are similar to active burrowing owl burrows except that the sign is not recent. Inactive burrows are often difficult to determine because the sign persists for only a limited time after a burrow becomes inactive.

6.3.1.2 Survey Results

No live burrowing owls were observed within the Project Area. Two active burrowing owl burrows were located within 10-meters of each other in Project Area #1 (Figure 13 and Photograph 11). No other active burrowing owl burrows were detected.



Photograph 11. Active Burrowing Owl Burrow

Three inactive burrowing owl burrows (Figure 13) were observed within Project Area #2. All were within 150-meters of each other. No additional burrowing owl sign was found within the proposed Project Area or the 150-meter wide burrowing owl buffer survey area.

Burrowing owl sign was not observed in Project Areas #3, #4, or #5.

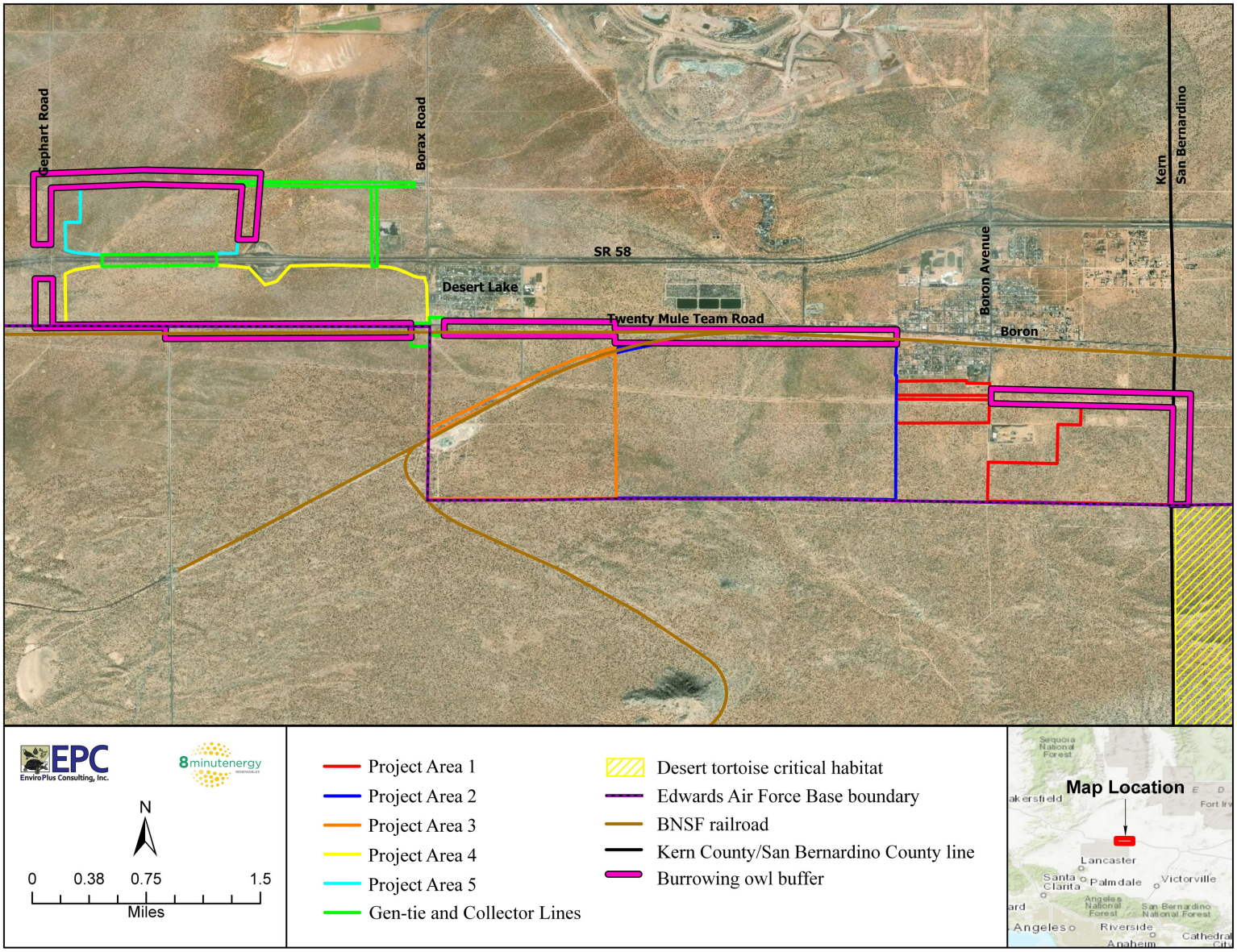


Figure 12. Proposed Aratina Project Area Western Burrowing Owl Survey Buffer Map

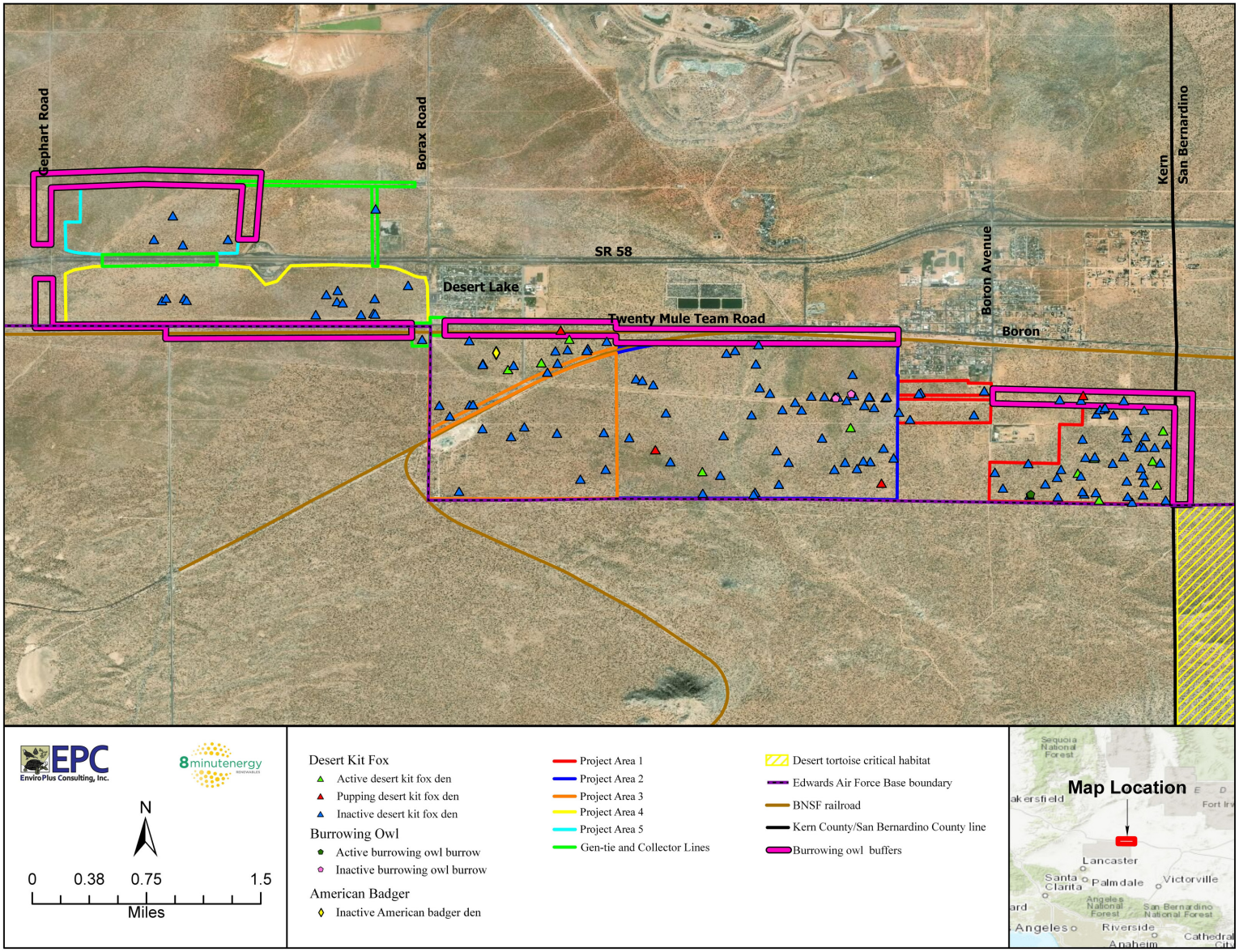


Figure 13. Proposed Aratina Project Area Western Burrowing Owl, Desert Kit Fox, and American Badger Location Map

6.3.2 Desert Kit Fox

The desert kit fox currently does not have federal or State of California special status designation, however, it is protected from hunting as a fur-bearing mammal under Title 14 of the California Code of Regulations, Section 460. For this reason, all observations were recorded during the protocol ADT and burrowing owl survey. This included, but was not limited to, the collection of the following data:

- Location of observation (GPS)
- Status of den – active, inactive, pupping
- Number of entrances to den

An active kit fox den was identified as an appropriately sized den with a typically narrow entrance, often with multiple access points, and with one of more of the following recent items of sign present – disturbance in one or more entrances showing recent use, fox tracks in the vicinity, remains of prey items nearby, live foxes heard or seen in den, or flies in the burrow indicating a likely prey item inside. The desert kit fox diet consists mostly of small rodents, especially kangaroo rats, but it will also prey upon rabbits, lizards, insects, and berries.

Inactive kit fox dens possess the same general characteristics less the recent sign and are more difficult to identify than active kit fox dens.

Pupping or natal dens were identified by observation of pups, hearing pups in the den, or den characteristics. Pupping den characteristics include multiple entrances to a den that show evidence of heavy use. The presence of prey items and scat also assisted with determining a den's designation as a pupping den. Litters of three to five young are born in February or March (Egoscue 1962; McGrew 1979).

6.3.2.1 Survey Results

A total of 152 desert kit fox dens were located within the Project Area and within burrowing owl buffer survey areas. This included four pupping dens (Photograph 12), 11 active dens, and 137 inactive dens (Figure 13 and Table 7).



Photograph 12. Active Desert Kit Fox Pupping Den

Portions of the Project Area are occupied by desert kit fox and their dens were found throughout the proposed Aratina Project Area. However, they appeared to generally transition from higher to lower density moving from east to west. Most of the dens, which may persist for years, were inactive (n=137) but 11 active dens and four pupping dens were also recorded. All of the active dens were in Project Areas #1, #2, and #3 while the two pupping dens were located in Project Area #2 and two were located in the burrowing owl buffer survey areas.

Table 7. Desert Kit Fox Dens Detected in the Proposed Aratina Solar Project Area, Kern County, California, April and May 2019

PROJECT AREA #	PUPPING DENS	ACTIVE DENS	INACTIVE DENS	TOTALS WITHIN EACH PROJECT AREA
1		6	46	**52**
2	2	2	46	**50**
3		3	22	**25**
4			14	**14**
5			4	**4**
Burrowing Owl Buffer Survey Areas	2		3	**5**
Gen-ties and Collector Line Areas			2	**2**
TOTALS	**4**	**11**	**137**	**152**

6.3.3 Other Special Status and General Wildlife Species Survey Results

6.3.3.1 American Badger

One inactive American badger den was observed in Project Area #3 (Figure 13). There were no observations of live badgers or any other badger sign detected. Although the American badger den located in Project Area #3 appeared inactive, badgers are wide-ranging species that will excavate their own dens or modify existing burrows of other species such as desert kit fox, making them sometimes difficult to distinguish from a large desert kit fox den or a coyote den. Due to the mobility of this species and its preferred foraging habitat, the American badger is anticipated to potentially occur on the proposed Project Area as an occasional transient, dispersing young adult, or forager.

6.3.3.2 General Wildlife Observations

A total of 44 vertebrate species were detected within the proposed Project Area and burrowing owl buffer survey areas (Appendix D). These included 28 avian species, eight mammal species to include MGS and desert kit fox, and eight reptile species.

The observed avian species are protected under the MBTA and various provisions of the California Fish and Game Code. Many of these species are likely to forage within or adjacent to the proposed Project Area; establish nesting territories (i.e., resident and migratory songbirds such as verdin, blue-gray gnatcatcher, black-throated sparrow, greater roadrunner, Costa's hummingbird, etc.); or migrate through during spring and fall migrations. Raptors, such as red-tailed hawk, northern harrier, Cooper's hawk, and American kestrel, were not observed nesting within the Project Area but were observed flying over and may potentially forage within the Project Area.

Larger stemmed western Joshua trees within the Project Area may provide perching (hunting), roosting, or nesting opportunities for raptor as well as songbird species. The western Joshua trees will also provide adequate ladder-backed woodpecker nesting cavities as well as foraging opportunities. Adjacent power line poles may provide raptor species with additional perching, roosting, or nesting locations.

6.3.4 Biological Species Survey Results Summary

Table 8 provides a summary of all listed, sensitive, and special status wildlife species occurring within each Project Area and within gen-ties on the proposed Aratina Solar Project Area.

Table 8. Listed and Special Status Wildlife Species Detected in the Proposed Aratina Solar Project Areas, Kern County, California, April and May 2019

SPECIES	PROJECT AREA #1	PROJECT AREA #2	PROJECT AREA #3	PROJECT AREA #4	PROJECT AREA #5	BURROWING OWL BUFFER SURVEY AREA	GEN-TIES AND COLLECTOR LINE AREAS
Mohave Ground Squirrel	Presence Acknowledged		Presence Acknowledged				Presence Acknowledged
Agassiz's Desert Tortoise	2 Class 4 Burrows		1 Class 3 Burrow and 4 Class 4 Burrows 1 Carcass	1 Class 4 Burrow			
Burrowing Owl	2 Active Burrows	3 Inactive Burrows					
Desert Kit Fox	6 Active Dens 46 Inactive Dens	2 Pupping Dens and 2 Active Dens 46 Inactive Dens	3 Active Dens 22 Inactive Dens	14 Inactive Dens	4 Inactive Dens	2 Pupping Dens 3 Inactive Dens	2 Inactive Dens
American Badger			1 Inactive Den				

7.0 ANALYSIS OF IMPACTS AND RECOMMENDED MITIGATION MEASURES

The purpose of the CEQA is to identify the environmental effects of a project, to identify project alternatives, and to indicate the manner in which significant adverse effects can be mitigated or avoided. CEQA guidelines require that significant adverse impacts to wetlands, sensitive natural communities, and special status plant and wildlife species be fully analyzed (Appendix G of the *CEQA Guidelines*). Kern County adheres to these CEQA guidelines pursuant to their CEQA Implementation Document and Kern County Environmental Checklist.

The following CEQA analysis discusses potential impacts to biological species associated with the development of the proposed Aratina Solar project and recommends feasible mitigation measures, where appropriate. An analysis of impacts to Waters of the U.S., wetlands, and CDFW waters will be provided under separate cover by the Applicant.

A significant impact to biological species would occur if the project would:

1. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by CDFW and USFWS.
2. Have a substantial adverse effect on any sensitive natural communities identified in local or regional plans, policies, and regulations or by CDFW or USFWS.
3. Interfere substantially with the movement of any native resident or migratory wildlife species or with established native resident or migratory wildlife corridors or impede the use of native wildlife nursery sites.
4. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policies or ordinance.
5. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state Habitat Conservation Plan.

7.1 Relevant Habitat Conservation Plans and Nearby Solar Projects

7.1.1 Rio Tinto Borates Mine Habitat Conservation Plan

Located within two miles north of the proposed Aratina Solar Project Area is the Rio Tinto Borates Mine (Figure 2). The Rio Tinto Mine was issued a 50-year Habitat Conservation Plan (HCP) in 1999 by the USFWS (U.S. Borax Mine, ECOS 2019). The HCP covers 3,465 acres of primarily alkali scrub habitat and includes some of the same species identified as potentially occurring and occurring on the Aratina Project Area. Mitigation for mining impacts include habitat reclamation and compensation, protection of 2,274 acres of high-quality creosote bush scrub habitat, and provision of a management endowment for that habitat (USFWS 1998). The HCP covers the following species: San Clemente loggerhead shrike (*Lanius ludovicianus mearnsi*), ADT, MGS, American badger, burrowing owl, San Joaquin LeConte's thrasher, Mojave spineflower, and greenest tiger beetle (*Cicindela tranquebarica viridissima*).

7.1.2 Eland 1 Solar Project Draft Supplemental Environmental Impact Report and General Plan Amendments

The Eland 1 Solar Project Draft Supplemental Environmental Impact Report (DSEIR) was completed in 2018 and submitted to Kern County for review and project approval (Kern County 2018) by the Applicant. The DSEIR supplements the previously certified Final Environmental Impact Report for the Beacon Photovoltaic Project.

The Eland 1 Solar Project is very similar in scope to the proposed Aratina Solar Project and is located approximately 30 miles northwest of the Aratina Project Area. Eland 1 is located on private lands and includes 2,652.7 acres.

The Eland 1 project mitigation measures for impacts to biological resources include but are not limited to avoidance and minimization measures for MGS, ADT, desert kit fox, American badger, burrowing owls, nesting raptor and other migratory bird species, other special status wildlife species, a raven (*Corvus corax*) management plan, sensitive plant species and a habitat mitigation plan (if required), Joshua tree woodland, and sensitive natural communities.

The DSEIR determines that significant cumulative impacts are unavoidable to biological resources, even with compliance of mitigation measures, due to continued urbanization pressures when considered with other past, present, and probable future projects in the general region (DSEIR, Chapter 5).

Because of the similarities of the Eland 1 and the Aratina solar projects, the following recommendations for mitigation measures will generally follow those as prescribed for the Eland 1 DSEIR (Chapter 4).

7.2 Project Impacts Analysis

Listed, sensitive, and special status plant and wildlife surveys were conducted on the 2,666.7 acre proposed Aratina Solar Project Area in April and May 2019 (Section 6.0). The results of these surveys found the following biological resources (plants, live animals, carcasses, burrow sites, denning sites, and other associated wildlife sign) at the Project Area (Table1; Table 8):

Western Joshua Tree [State Candidate for Listing as Threatened, CDNPA]

Desert Cymopterus [CNPS 1B.2 E]

Barstow Woolly Sunflower [CNPS 1B.2 E]

Mojave Spineflower [CNPS 4.2 E]

Crowned Muilla [CNPS 4.2]

Silver Cholla [CDNPA]

Diamond Cholla [CDNPA]

Beavertail [CDNPA]

Mohave Ground Squirrel
[State Threatened] - CNDDB, previous trapping efforts, auditory observation

Agassiz's Desert Tortoise
[State and Federal Threatened] - Class 3 and Class 4 burrows and one carcass over 4 years since time of death

Burrowing Owl [BCC and SSC] - Active and Inactive Burrows

Desert Kit Fox [CCR Title 14] - Active, Inactive, and Active Pupping Dens

American Badger [SSC] - Inactive Den

Botanical surveys are considered a "snapshot in time," and species can be missed during surveys due to various factors, a lack of observation of special status and CDNPA plant species does not negate their potential presence within the Project Area. Mitigation measures for special status plant species include general provisions for protection of these species. Species that have a low potential or no potential for occurrence on the Project Area are not considered further.

Other than the recording of desert kit fox pupping dens, there were no live sightings of the listed or special status wildlife species surveyed for during the USFWS protocol ADT survey and the CDFW protocol burrowing owl survey. Presence of wildlife sign recorded during the April and May 2019 survey does not negate the fact that those species may currently reside or may reside in the future on the Project Area. Absence of other potentially occurring special status wildlife species during the April and May 2019 survey likewise does not indicate that those species do not presently occur or may occur in the future on the Project Area. Wildlife surveys are considered a "snapshot in time," and species can be missed during surveys due to various factors. Species or sign that were detected during the April and May 2019 survey as well as those with moderate to high potential for occurrence are addressed in the following discussion of recommended mitigation measures. Species that have a low potential or no potential for occurrence on the Project Area are not considered further.

7.2.1 Special Status Plant Species

Potential permanent, direct impacts to special status and other protected plants, where present, could occur in association with habitat loss from implementation of the proposed project by removal of existing vegetation and permanent development of the solar facility and associated transmission line. In addition, grading associated with these activities could result in mortality of special status plant individuals. Potential permanent, indirect impacts to special status plant species, if present, may arise from population fragmentation and introduction of nonnative weeds. Population fragmentation could affect pollinator activity and adversely affect gene flow. Introduction and establishment of invasive weeds within, or adjacent to, special status plant populations can adversely affect native species by reducing growth and recruitment. Such impacts would be avoided or reduced to less-than-significant through implementation of Mitigation Measures BIO-1 through BIO-8, which include a Construction Worker Environmental Awareness Training program, general protective measures, requirements for pre-construction rare plant surveys, and development of a Habitat Mitigation Plan, if required by wildlife agencies, to ensure adequate knowledge, management and conservation of botanical resources, control weed infestations, and limit worker access to habitat outside designated work areas.

Loss of more than 10 percent of habitat occupied by special status plant species (i.e., desert cymopterus, Barstow woolly sunflower, Mojave spineflower, and crowned muilla), where present within the Project Area or potentially occurring within the Project Area (Figures 5 and 8), would be considered significant. However, this potentially significant impact can be mitigated to less than significant through the implementation of Mitigation Measure BIO-12.

Loss of plants protected under the CDNPA (i.e., silver cholla, diamond cholla, beavertail, and western Joshua tree), where present within the Project Area or potentially occurring within the Project Area (Figures 5 and 8), would be considered significant if their removal was undertaken. Kern County requires that the California Desert Native Plants Application to Harvest Native

Plants be submitted and approved prior to the harvesting, cutting, and salvaging of CDNPA plants (Kern County 2002). This potentially significant impact can be mitigated to less than significant through the implementation of Mitigation Measure BIO-13. At the time of the writing of this BE the legal status of the western Joshua tree was still undetermined at the state level (see Section 5.1.2 for a detailed discussion). Should the Commission determine that the western Joshua tree be listed as a threatened or endangered plant species or be designated as rare plant prior to the approval of the Aratina Solar Project, the mitigation measures herein may undergo revision to reflect an increased effort to protect, conserve, replace, and/or mitigate project impacts.

Impacts to sensitive natural communities such as *Atriplex spinifera* Shrubland Alliance (spinescale scrub) (Figure 4) and Joshua Tree Woodland Alliance are addressed in Mitigation Measure BIO-14.

In addition, potential temporary, indirect significant impacts to special status plant species located off-site could arise from runoff and sedimentation, erosion, fugitive dust, and unauthorized access by construction workers. Runoff, sedimentation, and erosion can adversely affect plant populations by damaging individuals or by altering site conditions sufficiently to favor other species that could competitively displace the special status species. Construction-generated fugitive dust can adversely affect plants by reducing the rates of metabolic processes such as photosynthesis and respiration. Unauthorized access by construction workers and their vehicles could trample and destroy individuals outside of, but immediately adjacent to, the proposed construction areas. These impacts would be avoided or reduced to less-than-significant levels, however, through implementation of the general project avoidance and minimization measures as proposed below (see Mitigation Measures BIO-1, and BIO-9 through BIO-11), as well as proposed Mitigation Measures for Air Quality; Hazards and Hazardous Materials; and Hydrology and Water Quality designed to control fugitive dust and particulate emissions, control and contain hazardous materials spills, and minimize site erosion and runoff.

7.2.2 Listed and Special Status Wildlife Species

Mohave Ground Squirrel.

MGS are acknowledged to occur within the proposed Project Area (Figure 6) and potential direct impacts to MGS include the potential for mortality of individuals during construction, operation, and decommissioning activities. MGS are subject to similar direct impacts that could also occur to ADT, burrowing owls, desert kit fox, and American badger. Direct impacts from construction activities include site grading, heavy equipment operation, and general vehicle traffic that could kill or injure MGS as a result of collisions with construction equipment or entombment in burrows. Construction activities could also result in disturbance or harassment.

Indirect impacts to MGS could include increased predator depredation resulting from increases in coyote, badger, domestic or feral dog, raven, and raptor population numbers increasing. Increases in predator populations can be due to various factors and conditions which may include but not be limited to the provision of new perching sites and temporarily ponding water from solar panel cleaning and in the proposed infiltration basins, as well as potential food items in unsecured trash containers. Such impacts would be considered significant.

Implementation of Mitigation Measures BIO-1 through BIO-11, BIO-14 through BIO-16, and BIO-22, which avoid and minimize impacts to MGS and other wildlife, includes acquisition of compensatory lands to mitigate for the loss of any suitable MGS habitat that would reduce potential project related impacts to this species to less-than-significant levels.

Agassiz's Desert Tortoise.

Potential direct impacts to ADT include the potential for mortality of individuals during construction, operation, and decommissioning activities. ADT are subject to similar direct impacts that could also occur to MGS, desert kit fox, American badger, and burrowing owl. Direct impacts from construction activities include site grading, heavy equipment operation, and general vehicle traffic that could kill or injure ADT as a result of collisions with construction equipment or entombment in burrows. Construction activities could also result in disturbance or harassment. Although no live ADT were detected during the April and May 2019 USFWS protocol survey (Figure 11), appropriate measures should be implemented to ensure no incidental take occurs during construction activities as described in Mitigation Measures BIO-1 through BIO-11, BIO-15, and BIO-22.

Indirect impacts to ADT could include increased common raven depredation resulting from increases in raven population numbers due to the provision of new perching sites and temporarily ponding water from solar panel cleaning and in the proposed infiltration basins, as well as potential food items in unsecured trash containers. New project development can also increase the presence of other ADT predators such as coyote, badger, and domestic or feral dogs. Such impacts would be considered significant.

Common ravens are a common predator of ADT and their population numbers in the Mojave Desert have been enhanced through human development, posing a threat to ADT populations. The project operator may be required to implement Mitigation Measure BIO-22, which includes project specific measures to manage raven populations during construction and operations of the proposed project. Impacts to ADT and other wildlife resulting from potential increases in common raven populations in the Project Area as a result of the proposed project are addressed further in the Common Raven Management discussion below.

With implementation of Mitigation Measures BIO-1 through BIO-11, BIO-15, and BIO-22, potential impacts on ADT would be reduced to less-than-significant levels.

Burrowing Owl.

Although only 2 active and 3 inactive burrows were detected during the April and May 2019 CDFW protocol survey (Figures 11 and 12), this species could winter, breed, or forage within or adjacent to the proposed Project Area.

Vehicle traffic during construction, site operations and maintenance, and decommissioning activities could result in vehicle strikes and mortality of burrowing owls. Site grading could collapse or fill occupied burrows, potentially trapping and killing burrowing owls, as well as affecting reproductive success through nest destruction. The take of breeding and wintering habitat through the development of the solar arrays, associated facilities and access roads, transmission lines, and substations would also be considered a direct impact.

Indirect impacts could include degradation of breeding and wintering habitat off-site through increases in noise and light due to project construction and operations, potentially affecting breeding and wintering burrowing owls. The project activities could result in reproductive failure should nests be located near to the project footprint as well as resulting in the potential loss of foraging habitat for this species.

Potentially significant impacts on western burrowing owl would be reduced to less-than-significant levels through the implementation of Mitigation Measures BIO-1 through BIO-11, BIO-17, BIO-18, and BIO-22.

Desert Kit Fox.

Desert kit fox active, inactive, and pupping dens were observed throughout the entire proposed Project Area during the April and May 2019 wildlife survey (Figure 13). A total of 15 active and pupping dens were recorded. Since the potential for desert kit fox has a moderate to high occurrence throughout the Project Area, construction activities, including site grading, heavy equipment operation, and general vehicle traffic could kill or injure desert kit fox as a result of collisions with construction equipment or entombment in dens. Construction activities could also result in disturbance or harassment of individuals. Conversion of potential habitat to a solar facility would result in local reductions in foraging and dispersal habitat for desert kit fox. However, with implementation of Mitigation Measures BIO-1 through BIO-11, and BIO-19, potential impacts on desert kit fox would be reduced to less-than-significant levels.

American Badger.

Although one inactive burrow was detected during the April and May 2019 wildlife survey (Figure 13), American badger may forage on, disperse through, or move through the proposed Project Area. Because their potential for occurrence on the Project Area is low to moderate, construction activities, including site grading, heavy equipment operation, and general vehicle traffic could kill or injure badgers as a result of collisions with construction equipment or entombment in dens. Construction activities could also result in disturbance or harassment of individuals. Conversion of potential habitat to a solar facility would result in local reductions in foraging and dispersal habitat for American badger. However, with implementation of Mitigation Measures BIO-1 through BIO-11, and BIO-19, potential impacts on American badger would be reduced to less-than-significant levels.

Golden Eagle, Prairie Falcon, and Other Raptors.

Neither golden eagle nor prairie falcon (Section 5.3) were observed during the April and May 2019 wildlife survey. However, there is potential for these species to utilize the Project Area for foraging and perching. The SR 58 corridor could be a source for carrion for the golden eagle and the presence of MGS, other diurnal and crepuscular small mammals (i.e., cottontails and ground squirrels), lizards and snakes, and small birds could be a foraging source for both the eagle and the falcon. Access to power poles and other tall perching structures can provide these two species with an excellent view of the desert landscape for detecting prey as well as utilizing the perch to consume their prey. Shorter perch locations may include the many large stemmed western Joshua trees on site and could be of foraging benefit for the red-tailed hawk, Cooper's hawk, northern harrier, and the American kestrel; all were observed during the April and May 2019 wildlife survey. Some raptors, such as red-tailed hawk, may nest in trees in nearby Boron or at rural residences nearby. The close proximity between nesting sites and foraging opportunities are important factors for raptors such as red-tailed hawk. The same conditions that factor into the potential presence of golden eagle and prairie falcon also factor into the presence of the observed species.

Potential direct impacts to these raptor species include construction of gen-tie lines and collector transmission lines, which could provide additional perching structures that pose a high risk of electrocution and death for large birds. This potentially significant impact would be mitigated to less-than-significant levels through the implementation of Mitigation Measures BIO-20 through BIO-22.

Potential indirect impacts to raptors include the loss of foraging habitat and interference with reproductive success at nearby or potential on site nests due to noise and human activity

associated with project construction. For instance, if red-tailed hawks were nesting within 500 feet or line of sight, project-related activities could potentially result in a nest failure.

Mountain Plover, Gray Vireo, and Other Migratory or Nesting Migratory Songbirds.

A total of 28 avian species were detected during the April and May 2019 wildlife survey. These species are protected under the MBTA and various provisions of the California Fish and Game Code. Many of these species are likely to forage within or adjacent to the proposed Project Area; establish nesting territories (i.e., resident and migratory songbirds such as verdin, blue-gray gnatcatcher, black-throated sparrow, greater roadrunner, Costa's hummingbird, etc.); or migrate through during spring and fall migrations.

Project-related direct impacts on nesting birds could include mortality of individuals and destruction of nests and eggs. Indirect impacts could include interference with reproductive success and nest abandonment due to construction noise and increases in human activity. Artificial lighting could increase predation on individuals and eggs and disrupt reproductive behaviors. The conversion of open land to a solar facility would result in loss of some potential breeding and foraging habitat. Some birds, such as mourning dove and other ground nesting birds may continue to nest beneath the constructed arrays. The installation of transmission lines and buildings could provide new perches for predators, such as ravens and raptors, which could contribute to declines in local songbird populations. Finally, the installation of uncapped vertical, hollow poles, such as may be used to mount the solar panels and are used in chain link fencing, could result in entrapment and death of songbirds. These would be considered significant impacts on nesting birds. However, with the implementation of Mitigation Measures BIO-1 through BIO-11, BIO-20, and BIO-22, potential impacts to nesting birds would be reduced to less-than-significant levels.

Common Raven Management

Common raven numbers have grown substantially in the past few decades in the west Mojave Desert. Between 1968 and 1988, the number of ravens in the Mojave Desert increased by over 1,500 percent and this increase is likely much higher in the western Mojave Desert (Boarman, 1992). Ravens are not considered a special status species, however, they are protected by the MBTA even though they are known predators of hatchling and juvenile ADT, MGS, the eggs and fledglings of burrowing owls, as well as many other songbird species, small mammal species, and reptile species. Ravens will compete with other birds such as raptors for prey and nesting sites. Raven numbers have become so great that they pose a serious threat to many desert species and the species' population growth is directly attributed to human development and the subsidies created by humans (i.e., trash and food waste at landfills, in open dumpsters and garbage cans, strip malls and fast food restaurants, highway rest stops, etc.) that support this adaptable species. Ravens were observed on a daily basis during the April and May 2019 wildlife survey at the eastern end of the proposed Aratina Project Area due to the close proximity of a local landfill, the town of Boron and SR58.

The project could provide new roosting, nesting, and perching sites for the common raven from the installation of new facilities (e.g., transmission towers, PV panels, fences, and buildings). The proposed project could potentially contribute to maintaining artificially high numbers of common ravens, which threatens desert wildlife, including federal and state listed species. However, this significant impact would be reduced to less-than-significant levels by implementation of Mitigation Measure BIO-22 that requires the project operator to prepare a Raven Management Plan in consultation with the USFWS and CDFW. Contribution to the Regional Common Raven Management Fund would also reduce the project's impacts by

common raven on desert tortoise and MGS and other desert wildlife to less-than-significant levels.

7.3 Recommended Biological Resources Mitigation Measures

A total of 22 mitigation measures are recommended for potential significant adverse impacts to biological resources associated with the construction, operation, and decommission of the proposed Aratina Solar project. Table 9 summarizes the recommended mitigation measures for each listed and special status plant and wildlife species and sensitive natural community as discussed in Sections 7.2.1 and 7.2.2.

Table 9. Recommended Mitigation Measures for Biological Species at the Proposed Aratina Solar Project Area, Kern County, California

BIOLOGICAL RESOURCES	MITIGATION MEASURES
Special Status Plant Species	BIO-1 through BIO-13
Loss of > 10% of a Special Status Plant Population	BIO-12
Loss CA Desert Native Plants Protection Act Species	BIO-13
Sensitive Natural Communities	BIO-14
Mohave Ground Squirrel	BIO-1 through BIO-11, BIO-14 through BIO-16, and BIO-22
Agassiz's Desert Tortoise	BIO-1 through BIO-11, BIO-15, and BIO-22
Western Burrowing Owl	BIO-1 through BIO-11, BIO-17, BIO-18, and BIO-22
Desert Kit Fox	BIO-1 through BIO-11, and BIO-19
American Badger	BIO-1 through BIO-11, and BIO-19
Golden Eagle, Prairie Falcon, and Other Raptors	BIO-20 through BIO-22
Mountain Plover, Gray Vireo, and Other Migratory or Nesting Migratory Songbirds	BIO-1 through BIO-11, BIO-20, and BIO-22
Raven Management Plan	BIO-22

BIO-1: General - Regulatory.

Prior to the issuance of grading or building permits, the project operator shall retain a Lead Biologist who meets the qualifications of an Authorized Biologist as defined by United States Fish and Wildlife Service to oversee compliance with protection measures for all listed and other special-status species. The project Lead Biologist shall be onsite during all fencing and ground disturbance activities throughout the construction phase. The project Lead Biologist shall have the right to halt all activities that are in violation of the special status species protection measures described herein. Work shall proceed only after hazards to special status species are removed and the species is no longer at risk. The project Lead Biologist shall have in her/his possession a copy of all the compliance measures while work is being conducted onsite.

BIO-2: Environmental Awareness Training.

Prior to the issuance of grading or building permits, and for the duration of construction activities all new construction workers at the project site shall attend a Worker Environmental Awareness Program (WEAP), developed and presented by the project Lead Biologist. As a part of the WEAP training, the project Lead Biologist shall perform the following training-related tasks:

a) Provide the training materials for WEAP training. These materials shall include the measures and mitigation requirements for protected plant and wildlife species (e.g., avoidance and buffer requirements, nighttime construction limitations, etc.); and applicable fire protection measures. WEAP training will also include driver training to avoid and minimize collision risks with protected species, and reporting protocols in the event that any dead or injured wildlife are discovered.

b) Send a copy of all WEAP training materials to the Kern County Planning and Natural Resources Department.

c) Maintain a list on-site of all employees who have undergone WEAP training. A copy of this list shall be provided to the Kern County Planning and Natural Resources Department as necessary.

BIO-3: Environmental Awareness Training.

The WEAP shall be presented by the Lead Biologist and shall include information on the life history of each federal and state-listed species, as well as other special-status wildlife, natural communities, and plant species that may be encountered during construction activities, their legal protections, the definition of "take" under the federal and state endangered species acts, measures the project operator is implementing to protect special status species, reporting requirements, specific measures that each worker shall employ to avoid take of special status wildlife species, and penalties for violation of the Acts. Training shall be documented as follows:

a) An acknowledgement form signed by each worker indicating that environmental training has been completed.

b) A sticker that shall be placed on hard hats indicating that the worker has completed the environmental training. Construction workers shall not be permitted to operate equipment within the construction area unless they have attended the training and are wearing hard hats with the required sticker.

c) A copy of the training transcript/training video and/or training video, as well as a list of the names of all personnel who attended the training and copies of the signed acknowledgement forms shall be submitted to the Kern County Planning and Community Development Department.

BIO-4: General – Construction and Decommissioning.

During construction and decommissioning the anticipated impact zones, including staging areas, equipment access, and disposal or temporary placement of spoils, shall be delineated with stakes and flagging prior to construction to avoid natural resources where possible. Construction-related activities outside of the impact zone shall be avoided. The construction crews and contractor(s) shall be held responsible for unauthorized impacts from construction activities to sensitive biological resources that are outside the areas defined as subject to impacts by project permits.

BIO-5: General - Construction.

New and existing roads that are planned for either construction or widening shall not extend beyond the planned impact area. All vehicles passing or turning around shall do so within the planned impact area or in previously disturbed areas. Where new access is required outside of existing roads or the construction zone a biological resources survey will be conducted by the Lead Biologist or by biological monitor(s) under the Lead Biologist's supervision to determine if listed or special status species would be impacted. Impacts shall be avoided to the maximum extent practicable or will be mitigated for. Construction will not begin until the route is cleared for biological resources. The route shall be clearly marked (i.e., flagged and/or staked) prior to the onset of construction and use.

BIO-6: General – Stockpile Management.

Spoils shall be stockpiled in disturbed areas presently lacking native vegetation. Stockpile areas shall be marked to define the limits where stockpiling can occur. Standard best management practices shall 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 shall be remedied within two days of discovery.

BIO-7: General – Construction and Decommissioning.

All ground disturbance construction and decommissioning activities shall be monitored by the qualified Lead Biologist or by biological monitors under the Lead Biologist's supervision to ensure compliance with avoidance and minimization measures.

BIO-8: General - Decommissioning.

The project operator and /or contractor shall implement the following during project decommissioning:

a) All applicable construction phase general protection measures shall be implemented during decommissioning.

b) A 25-mile-per-hour speed limit on paved or stabilized unpaved roads shall be applied for travel during decommissioning activities. Travel shall be confined to existing roads and previously disturbed areas.

c) If any special status wildlife is detected in the work area during decommissioning activities, no work shall be conducted until the individual moves on its own outside of the work area.

d) Work outside areas with desert tortoise exclusion fencing shall only occur during daylight hours.

BIO-9: Wildlife Exclusion Fencing.

During construction and decommissioning the Project Operator and/or contractor shall implement the following general avoidance and protective measures:

a) Prior to issuance of grading or building permits but after obtaining a project Section 2081 permit for incidental take, if required by California Department of Fish and Wildlife, the entire project site shall be fenced with a permanent desert tortoise exclusion fence to keep any desert tortoise that may be using habitat adjacent to the facility from entering during construction, operations and maintenance, and dismantling and restoration (decommissioning) phases. The fencing type shall follow current fence specifications

established by the United States Fish and Wildlife Service. Desert tortoise-proof gates shall be established at all photovoltaic solar facility entry points. Workers installing the exclusion fencing shall have undergone the worker training program mandated in Mitigation Measure MM 4.3-3 and a biological monitor under the authority of the project Lead Biologist shall be present during exclusion fencing installation.

b) The fencing shall be inspected monthly and immediately after all major rainfall events. Any damage to the fencing shall be repaired immediately or no later than 2 days following the observation.

c) Following the construction of desert tortoise exclusion fencing, around the solar facility perimeter as described above, clearance surveys shall be conducted by the Lead Biologist to ensure that no desert tortoises or other listed wildlife species are trapped within the fenced area. The Lead Biologist may be assisted by biological monitors under the supervision of the Lead Biologist. Clearance surveys shall adhere to the current United States Fish and Wildlife Service clearance survey protocols described in the Desert Tortoise Field Manual, including a minimum of two clearance passes to be completed after desert tortoise-proof fencing is installed, which shall coincide with heightened desert tortoise activity from late March through May and September through October.

d) If a desert tortoise is found on the site during project construction or operations, active construction or operations shall cease in the vicinity of the animal and the desert tortoise shall be passively restricted to the area encompassing its observed position on the construction site and its point of entry shall be determined if possible. The Lead Biologist shall install a temporary tortoise-proof fence around this area. Concurrent with this effort, United States Fish and Wildlife Service and California Department of Fish and Wildlife shall be consulted regarding any additional avoidance, minimization, or mitigation measures that may be necessary. Once the desert tortoise is observed leaving the site, work in the area can resume. A report shall be prepared by the Lead Biologist to document the activities of the desert tortoise within the site; all fence construction, modification, and repair efforts; and movements of the desert tortoise once again outside the permanent tortoise-proof fence. This report shall be submitted to wildlife and resource agency representatives and the Kern County Planning and Natural Resources Department

e) Outside permanently fenced desert tortoise exclusion areas, the project operator shall limit the areas of disturbance in desert tortoise habitat. Parking areas; new roads; pulling sites; and staging, storage, excavation, and disposal site locations shall be confined to the smallest areas possible. These areas shall be flagged and disturbance activities, vehicles, and equipment shall be confined to these flagged areas.

f) The Lead Biologist or biological monitor shall monitor any ground-disturbance activities that occur outside the desert tortoise exclusion fencing. Work outside areas with desert tortoise exclusion fencing shall only occur during daylight hours

BIO-10: General - Construction.

a) The Lead Biologist or biological monitor will monitor all ground-disturbance activities. Work shall only occur during daylight hours as practicable. Specialized testing activities and/or continuous operations (i.e. well drilling) may be conducted at night when necessary. Prior to conducting vegetation removal or grading activities inside the fenced area, a Lead Biologist or biological monitor under the supervision of a Lead Biologist

shall survey the area immediately prior to conducting these activities to ensure that no listed or special status animals or plants are present. The project Lead Biologist shall have the right to halt all activities that are in violation of the desert tortoise or other special species protection measures. Work shall proceed only after hazards to desert tortoise or other special species are removed and the species is no longer at risk. The project biologist shall have in her/his possession a copy of all the compliance measures while work is being conducted onsite.

b) At the end of each work day, the Lead Biologist shall ensure that all trenches, bores, and other excavations outside the permanently fenced area have been inspected for the presence of desert tortoise and backfilled, if no tortoise is present. If backfilling is not feasible, these excavations shall be modified to ensure that they cannot potentially entrap desert tortoises (e.g., equipped with desert tortoise escape ramps, covered to prevent desert tortoise access, enclosed with a desert tortoise exclusion fence). All construction pipes, culverts, or similar structures that are stored at a construction site for one or more overnight periods and with a diameter of four inches or greater shall be thoroughly inspected for listed and special status wildlife before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a special status animal is discovered inside a pipe, that section of pipe shall not be moved until the animal has moved off on its own. If the animal does not move in a timely manner, then the appropriate resource agency will be consulted.

c) Any construction pipe, culvert, or similar structure stored within desert tortoise habitat (i.e., outside areas with desert tortoise exclusion fencing) shall be inspected for desert tortoise before the material is moved, buried, or installed.

d) Water used for dust abatement shall be minimized, as allowed by Kern County Engineering, Surveying, and Permit Services Department, or managed in such a manner as to prevent the formation of puddles that could attract common ravens, predators, and other wildlife species to or near the site.

e) No vehicle or equipment parked outside the fenced areas shall be moved prior to inspecting the ground beneath the vehicle or equipment for the presence of desert tortoise. If present, the desert tortoise shall be left to move on its own.

f) Vehicular traffic to and from the project site shall use existing routes of travel. Cross country vehicle and equipment use outside designated work areas shall be prohibited. Vehicle speeds within the project site shall not exceed 25 miles per hour on roads within desert tortoise habitat.

g) All vehicles and equipment shall be in proper working condition to ensure that there is no potential for fugitive emissions of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials. The Lead Biologist shall be informed of any hazardous spills immediately and hazardous spills shall be cleaned up as soon as practical and the contaminated soil shall be properly disposed of at a licensed facility.

h) A long-term trash abatement program shall be established for construction, operations, and decommissioning. Trash and food items shall be contained in closed containers and removed daily to reduce the attractiveness to opportunistic predators such as common ravens, coyotes, and feral dogs.

i) Workers shall be prohibited from bringing pets and firearms to the project and from feeding wildlife.

j) Intentional killing or collection of either plant or wildlife species, including listed species, in the Project Site and surrounding areas shall be prohibited. The Lead Biologist, wildlife and resource agency representatives and Kern County Planning and Community Development Department shall be notified of any such occurrences within 24 hours.

k) Ongoing monitoring shall be conducted by either the Lead Biologist or by biological monitors under the Lead Biologist's supervision. The biological monitors shall have experience in monitoring for special-status wildlife.

l) During construction daily monitoring reports shall be prepared by the monitoring biologists. The Lead Biologist shall prepare a summary monitoring report for the wildlife and resource agencies and Kern County Planning and Community Development Department on a monthly basis, documenting the effectiveness and practicality of the protection measures that are in place and making recommendations for modifying the measures to enhance species protection, as needed. The report will also provide information on the overall biological resources-related activities conducted, including the worker awareness training, clearance/pre-activity surveys, monitoring activities, and any observed special status species, including injuries and fatalities.

BIO-11: Non-native Plant Species.

The introduction of exotic plant species shall be avoided and controlled wherever possible, and may be achieved through physical or chemical removal and prevention. Preventing exotic plants from entering the site via vehicular sources shall include measures such as implementing Track-clean or other method of vehicle cleaning for vehicles coming and going from the site. Earth-moving equipment shall be cleaned prior to transport to the project area. Weed-free rice straw or other certified weed-free straw shall be used for erosion control. Weed populations introduced into the site during construction shall be eliminated by chemical and/or mechanical means approved by California Department of Fish and Wildlife and the United States Fish and Wildlife Service.

BIO-12: Special Status Plant Species.

In the event ground disturbance does not commence within two (2) years of the last rare plant surveys, the project operator and/or contractor shall conduct preconstruction special status plant survey(s) during the appropriate blooming period in accordance with the guidelines established by California Department of Fish and Wildlife (2009). Copies of these preconstruction surveys shall be provided to the appropriate wildlife agency and to the Kern County Planning and Community Development Department.

If any special status plant species is found during the preconstruction surveys, the Project Operator and/or contractor shall develop a Habitat Mitigation Plan consistent with California Department of Fish and Wildlife guidelines. The Habitat Mitigation Plan shall include, at a minimum, the following:

a) Wherever feasible, if special status plant species are observed within the proposed project footprint, the proposed project shall be designed by the Lead Biologist, to reduce impacts to the species through the establishment of preservation areas and buffers. If avoidance or minimization measures are implemented within the project, a Habitat Mitigation Plan shall be developed to ensure adequate management and conservation of botanical resources on-site over the long term. A copy of the Habitat Mitigation Plan shall be submitted to the Kern County Planning and Community Development Department.

b) If the proposed project would eliminate more than 10 percent of a local special status plant population, the Habitat Mitigation Plan would also include the following:

   i. A figure illustrating the area of the population to be preserved, and the area of the population to be removed;

   ii. Identification of on-site or off-site preservation, restoration, or enhancement location(s);

   iii. Methods for preservation, restoration, enhancement, and/or population translocation;

   iv. A replacement ratio and success standard of 1:1 for occupied habitat lost unless a lower mitigation ratio and/or alternative mitigation is agreed to in coordination with CDFW;

   v. A five-year monitoring program to ensure mitigation success;

   vi. Adaptive management and remedial measures in the event that performance standards are not achieved; and

   vii. Financial assurances and a mechanism for conservation of any mitigation lands required in perpetuity.

Prior to the commencement of ground disturbance activities, a final set of focused botanical surveys for special status plant species, including species protected by the California Desert Native Plants Act shall be conducted. The surveys shall be conducted within potentially suitable habitat within the Project Sites and along the utility rights-of-way that would be directly affected, permanently or temporarily, by the proposed project. Copies of all surveys and communications with the appropriate agencies shall be submitted to the Kern County Planning and Community Development Department.

BIO-13: California Desert Native Plants Act Species.

Prior to the issuance of grading or building permits, the Project Operator shall:

a) Provide evidence to the Kern County Planning and Community Development Department that consultation with the Kern County Agricultural Commissioner has taken place regarding removal of plants protected under the California Desert Native Plants Act;

b) If the Agricultural Commissioner determines that a permit is not required, the project operator shall provide a letter describing the consultation process and Commissioner's determinations, indicating that such authorization is not required. The letter shall also identify the Commissioner's points of contact and contact information;

c) If required by the Agricultural Commissioner, the Project Operator shall provide evidence to the Kern County Planning and Community Development Department that a California Desert Native Plant removal permit has been obtained.

BIO-14: Sensitive Natural Communities.

The following measures shall be implemented to reduce direct impacts to sensitive natural communities. To the extent feasible, the following avoidance and minimization measures shall be implemented:

a) Where feasible, the project shall be designed to avoid disturbance of *Atriplex spinifera* Shrubland Alliance, Joshua tree woodland, and any other sensitive natural communities identified within the Project Site.

b) Where it is not feasible to avoid direct impacts to sensitive natural communities the project operator shall implement the following measures:

   i. Compensatory mitigation for impacts to sensitive natural communities shall occur either on-site or off-site and would occur at a ratio no less than 1:1 for each sensitive natural community impacted. A Habitat Mitigation and Monitoring Plan shall be prepared that outlines the compensatory mitigation in coordination with the California Department of Fish and Wildlife.

   ii. If on-site mitigation is proposed, the Habitat Mitigation and Monitoring Plan shall identify those portions of the site that contain suitable characteristics for restoration or enhancement of sensitive habitat. Determination of mitigation adequacy shall be based on comparison of the restored or enhanced habitat with similar, undisturbed habitat in the vicinity of the development site. If mitigation is implemented off-site, compensatory lands shall contain similar or more well-developed habitat and preferably be located in the vicinity of the site or watershed. Off-site land shall be preserved through a conservation easement and the Plan shall identify an approach for funding assurance for the long-term management of the compensatory land.

BIO-15: Agassiz's Desert Tortoise and Mohave Ground Squirrel.

The project operator and /or contractor shall implement the following prior to the issuance of grading or building permits:

a) Following the construction of exclusion fencing around the solar facility perimeters, clearance surveys shall be conducted by the Lead Biologist to ensure that no desert tortoises, Mohave ground squirrel, or other wildlife are trapped within the fenced area. The Lead Biologist may be assisted by biological monitors under the supervision of the Lead Biologist. Clearance surveys shall adhere to the current United States Fish and Wildlife Service clearance survey protocols described in the *Desert Tortoise Field Manual*, including a minimum of two clearance passes to be completed after desert tortoise-proof fencing is installed, which shall coincide with heightened desert tortoise activity from late March through May and September through October.

b) If a desert tortoise or Mohave ground squirrel is found on the site during project construction or operations, active construction or operations shall cease in the vicinity of the animal. The Lead Biologist shall contact United States Fish and Wildlife Service and California Department of Fish and Wildlife shall be consulted regarding any additional avoidance, minimization, or mitigation measures that may be necessary. Work shall not resume at the site until both the United States Fish and Wildlife Service and California Department of Fish and Wildlife respond, and all recommended measures are taken. A report shall be prepared by the Lead Biologist to document the activities of the desert tortoise or Mohave ground squirrel within the site; all fence construction, modification, and repair efforts; and movements of the animal once again outside the permanent tortoise-proof fence. This report shall be submitted to wildlife and resource agency representatives and the Kern County Planning and Community Development Department.

c) Outside permanently fenced desert tortoise exclusion areas, the project operator shall limit the areas of disturbance in desert tortoise and Mohave ground squirrel habitat. Parking areas, new roads, pulling sites, and locations for staging, storage, and excavation shall be confined to the smallest areas possible. These areas shall be flagged, and disturbance activities, vehicles, and equipment shall be confined to these flagged areas.

BIO-16: Compensatory Mitigation.

The measures listed below shall be implemented prior to and during construction, operations, and decommissioning at the Project Sites, to protect Mohave ground squirrel.

a) The project operator shall mitigate for permanent impacts to suitable desert tortoise and Mohave ground squirrel habitat, should an Incidental Take Permit be required from CDFW, through an approved mitigation bank, or in-lieu fee program. Compensatory mitigation acreage for permanent impacts to western burrowing owl nesting, occupied, and satellite burrows and/or western burrowing owl habitat shall be determined and acquired in consultation with the wildlife or resource agency. Compensatory mitigation lands purchased may provide habitat for all three species, as well as rare plants and State Waters (only if impacted by the project). Verification of compliance shall be submitted to the Kern County Planning and Natural Resources Department.

b) Prepare a Habitat Mitigation and Monitoring Plan (if required, should an Incidental Take Permit be required for the project) that outlines all project compensatory mitigation for desert tortoise, western burrowing owl and Mohave ground squirrel, in coordination with the California Department of Fish and Wildlife, and the Regional Water Quality Control Board.

    i. Compensatory lands shall be of similar or better quality than habitat lost, and preferably shall be located in the vicinity of the site.

    ii. Compensatory lands shall be permanently preserved through a conservation easement.

    iii. The Plan shall identify conservation actions to ensure that the compensatory lands are managed to ensure the continued existence of the species.

The Plan shall identify an approach for funding assurance for the long term management of the conserved land.

BIO-17: Western Burrowing Owl.

The following measures shall be implemented during project construction, operations, and decommissioning activities with respect to western burrowing owls.

a) A project Lead Biologist shall be onsite during all construction activities in potential burrowing owl habitat. A qualified wildlife biologist (i.e., a wildlife biologist with previous burrowing owl survey experience) shall conduct pre-construction surveys of the permanent and temporary impact areas to locate active breeding or wintering burrowing owl burrows no less than 14 days prior to construction and/or prior to desert tortoise exclusion fencing installation. The survey methodology shall be consistent with the methods outlined in the Staff Report (CDFG 2012), and shall consist of walking parallel transects 7 to 20 meters apart, adjusting for vegetation height and density as needed, and noting any potential burrows with fresh burrowing owl sign or presence of burrowing owls (and may be combined with other pre-construction surveys). As burrows are searched, biologists shall also look for signs of American badger and desert kit fox. Copies of the survey results shall be submitted to California Department of Fish and Wildlife and the Kern County Planning and Community Development Department.

b) If no burrowing owls are detected, no further mitigation is necessary. If burrowing owls are detected, no ground-disturbing activities, such as road construction or installation of solar arrays or ancillary facilities, shall be permitted within the distances specified in Table 2 of the Staff Report from an active burrow during the nesting and fledging seasons (April 1 to August 15 and August 16 to October 15, respectively), unless otherwise authorized by California Department of Fish and Wildlife. The specified buffer distance ranges from 656 feet to 1,640 feet, according to the time of year and the level of disturbance. Buffers shall be established in accordance with Table BIO-17 and occupied burrows shall not be disturbed during the nesting season unless a qualified biologist approved by California Department of Fish and Wildlife, verifies through noninvasive methods that either: (1) the birds have not begun egg-laying and incubation; or (2) juveniles from the occupied burrows are foraging independently and are capable of independent survival. Burrowing owls shall not be moved or excluded from burrows during the breeding season (April 1 to October 15).

Table BIO-17: Western Burrowing Owl Burrow Buffers

		Level of Disturbance		
Location	**Time of Year**	**Low**	**Medium**	**High**
Nesting sites	April 1–Aug 15	656 feet	1640 feet	1640 feet
Nesting sites	Aug 16–Oct 15	656 feet	656 feet	1640 feet
Any occupied burrow	Oct 16–Mar 31	164 feet	328 feet	1640 feet

Source: CDFG, 2012.

c) During the nonbreeding (winter) season (October 16 to March 31), consistent with Table BIO-17, ground-disturbing work shall maintain a distance ranging from 164 feet to 1,640 feet from any active burrows depending on the level of disturbance. If active winter burrows are found that would be directly affected by ground-disturbing activities, owls can be displaced from winter burrows according to recommendations made in the Staff Report.

d) Burrowing owls should not be excluded from burrows unless or until a Burrowing Owl Exclusion Plan is developed by the Lead Biologist and approved by the applicable local California Department of Fish and Wildlife office and submitted to the Kern County Planning and Community Development Department. The plan shall include, at a minimum:

i. Confirm by site surveillance that the burrow(s) is empty of burrowing owls and other species preceding burrow scoping;

ii. Type of scope to be used and appropriate timing of scoping to avoid impacts;

iii. Occupancy factors to look for and what shall guide determination of vacancy and excavation timing (one-way doors should be left in place 48 hours to ensure burrowing owls have left the burrow before excavation, visited twice daily and monitored for evidence that owls are inside and can't escape i.e., look for sign immediately inside the door).

iv. How the burrow(s) shall be excavated. Excavation using hand tools with refilling to prevent reoccupation is preferable whenever possible (may include using piping to

stabilize the burrow to prevent collapsing until the entire burrow has been excavated and it can be determined that no owls reside inside the burrow);

v. Removal of other potential owl burrow surrogates or refugia onsite;

vi. Photographing the excavation and closure of the burrow to demonstrate success and sufficiency;

e) Monitoring of the site to evaluate success and, if needed, to implement remedial measures to prevent subsequent owl use to avoid take;

f) How the impacted site shall continually be made inhospitable to burrowing owls and fossorial mammals (e.g., by allowing vegetation to grow tall, heavy disking, or immediate and continuous grading) until development is complete.

g) Site monitoring is conducted prior to, during, and after exclusion of burrowing owls from their burrows to ensure take is avoided. Conduct daily monitoring for one week to confirm young of the year have fledged if the exclusion shall occur immediately after the end of the breeding season.

h) Excluded burrowing owls are documented using artificial or natural burrows on an adjoining mitigation site (if able to confirm by band re-sight).

i) In accordance with the Burrowing Owl Exclusion Plan, a qualified wildlife biologist shall excavate burrows using hand tools. Sections of flexible plastic pipe or heavy material shall be inserted into the tunnels during excavation to maintain an escape route for any animals inside the burrow. One-way doors shall be installed at the entrance to the active burrow and other potentially active burrows within 160 feet of the active burrow. Forty-eight hours after the installation of the one-way doors, the doors can be removed, and ground-disturbing activities can proceed. Alternatively, burrows can be filled to prevent reoccupation. Excluded burrowing owls shall be documented if observed using artificial or natural burrows on an adjoining mitigation site (if able to confirm by band re-sight).

j) During construction activities, monthly and final compliance reports shall be provided to California Department of Fish and Wildlife, the Kern County Planning and Community Development Department, and other applicable resource agencies documenting the effectiveness of mitigation measures and the level of burrowing owl take associated with the proposed project.

BIO-18: Western Burrowing Owl Compensatory Mitigation.

a) Should burrowing owls be found on-site, compensatory mitigation for lost breeding and/or wintering habitat shall be implemented off-site in accordance with burrowing owl Staff Report guidance and in consultation with California Department of Fish and Wildlife. At a minimum, the following recommendations shall be implemented:

i. Temporarily disturbed habitat shall be restored, if feasible, to pre-project conditions, including de-compacting soil and revegetating.

ii. Permanent impacts to nesting, occupied and satellite burrows and/or burrowing owl habitat shall be mitigated such that the habitat acreage, number of burrows and burrowing owl impacted are replaced based on a site-specific analysis and shall include:

Permanent conservation of similar vegetation communities (grassland, scrublands, desert, urban, and agriculture) to provide for burrowing owl nesting, foraging, wintering, and dispersal (i.e., during breeding and non-breeding seasons) comparable to or better than that of the impact area, and with sufficiently large acreage, and presence of fossorial mammals.

iii. Permanently protect mitigation land through a conservation easement deeded to a nonprofit conservation organization or public agency with a conservation mission. If the project is located within the service area of a California Department of Fish and Wildlife approved burrowing owl conservation bank, the project operator may purchase available burrowing owl conservation bank credits.

b) Develop and implement a mitigation land management plan in accordance with burrowing owl Staff Report guidelines to address long-term ecological sustainability and maintenance of the site for burrowing owls.

i. Fund the maintenance and management of mitigation land through the establishment of a long-term funding mechanism such as an endowment.

ii. Habitat shall not be altered or destroyed, and burrowing owls shall not be excluded from burrows, until mitigation lands have been legally secured, are managed for the benefit of burrowing owls according to California Department of Fish and Wildlife-approved management, monitoring and reporting plans, and the endowment or other long-term funding mechanism is in place or security is provided until these measures are completed.

iii. Mitigation lands should be on, adjacent or proximate to the impact site where possible and where habitat is sufficient to support burrowing owls present.

iv. Consult with the California Department of Fish and Wildlife when determining off-site mitigation acreages.

BIO-19: Desert Kit Fox and American Badger.

Prior to the issuance of grading or building permit the following shall be implemented:

a) Preconstruction surveys shall be conducted by a qualified biologist for the presence of desert kit fox and American badger dens prior to installation of desert tortoise exclusion fencing. Copies of the completed surveys shall be submitted to Kern County Planning and Community Development Department.

b) The survey shall be conducted in areas of suitable habitat for American badger and desert kit fox, which includes fallow agricultural land and scrub habitats. Surveys shall not be conducted for all areas of suitable habitat at one time; they shall be phased so that surveys occur within two weeks prior to disturbance of that portion of the site. If no potential American badger or desert kit fox dens are present, no further mitigation is required.

c) If potential dens are observed, the following measures are required to avoid potential adverse effects to American badger and desert kit fox:

i. If the qualified biologist determines that potential dens are inactive, the biologist shall excavate these dens by hand with a shovel to prevent badgers or foxes from re-use during construction.

ii. Passive relocation shall be prohibited during the pupping season, which is February 15 to June 1 for both species. If the qualified biologist determines that potential dens outside the breeding season may be active, the biologist shall notify the California Department of Fish and Wildlife. Entrances to the dens shall be blocked with soil, sticks, and debris for three to five days to discourage use of these dens prior to project disturbance. The den entrances shall be blocked to an incrementally greater degree over the three- to five-day period. After the qualified biologist determines that badgers and foxes have stopped using active dens within the project boundary, the dens shall be hand-excavated with a shovel to prevent re-use during construction. The collapsing of active desert kit fox dens shall not occur without prior consultation with the California Department of Fish and Wildlife. A biologist shall remain on-call throughout construction in the event that badger or desert kit fox are present on the site.

iii. Construction activities shall not occur within 50 feet of active badger dens. The project operator shall contact California Department of Fish and Wildlife immediately if natal badger dens are detected to determine suitable buffers and other measures to avoid take.

iv. Construction activities shall not occur within 100 feet of active kit fox dens. The project operator shall contact California Department of Fish and Wildlife immediately if pupping kit fox dens are detected to determine suitable buffers and other measures to avoid take.

BIO-20: Nesting Raptor and Songbird Species.

Prior to the issuance of a grading or building permit and prior to decommissioning pre-construction avian nesting surveys shall be implemented as follows:

a) Not more than 14 days prior to site clearing and/or ground disturbance, a qualified biologist shall conduct a preconstruction avian nesting survey. Copies of the completed surveys shall be submitted to Kern County Planning and Community Development Department.

b) Surveys shall not be conducted for an entire Project Site at one time; they shall be phased so that surveys occur shortly before a portion of the site is disturbed. The surveying biologist must be qualified to determine the species, status, and nesting stage without causing intrusive disturbance. The survey shall cover all reasonably potential nesting locations on and within 300 feet of the Project Site—this includes ground nesting species.

c) If construction is scheduled to occur during the non-nesting season (August 2 to January 31), no preconstruction surveys for birds or additional measures are required.

d) If construction begins in the non-breeding season and proceeds continuously into the breeding season, no surveys are required. However, if there is a break of 14 days or more in construction activities during the breeding season, a new nesting bird survey shall be conducted before construction begins again.

e) If active nests are found a 250-foot, no-disturbance buffer (or as otherwise determined in consultation with California Department of Fish and Wildlife) shall be created around the active nests. If the nest(s) are found in an area where ground disturbance is scheduled to occur, the project operator shall avoid the area either by delaying ground disturbance in the area until a qualified wildlife biologist has determined that the birds have fledged or

by re-locating the project component(s) to avoid the area.

f) All vertical tubes used in project construction, such as solar mounts and chain link fencing poles shall be temporarily or permanently capped at the time they are installed to avoid the entrapment and death of birds.

BIO-21: Raptor Protection on Power Lines.

Prior to issuance of a grading or building permit, the project operator shall:

a) Construct all power transmission lines to the 2006 Avian Power Line Interaction Committee Guidelines specifications to protect birds from electrocution and collision. Appropriate notes regarding these specifications shall be included on any grading permit, building permit or final map.

b) Submit written documentation to the Kern County Planning and Community Development Department verifying that all power lines are constructed to Avian Power Line Interaction Committee Guidelines. The project operator shall conform to the latest practices (as outlined in the 2006 Avian Power Line Interaction Committee Guidelines document) to protect birds from electrocution and collision.

c) Install power collection and transmission facilities utilizing Avian Power Line Interaction Committee standards for collision reducing techniques as outlined in *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee, 2006).

BIO-22: Raven Management Plan.

The project operator shall develop a site-specific Common Raven Management Plan in accordance with United States Fish and Wildlife Service guidelines and shall implement management measures for ravens in the project area. These measures may include but are not limited to designing structures to eliminate perches, waste management, road kill management, management of ponded water during construction and operations, and nest removal on structures within the photovoltaic facility site and along the transmission line.

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APPENDIX A

PROJECT AREA ASSESSOR'S PARCEL NUMBER (APN), OWNER, ACREAGE, AND CURRENT ZONING, ARATINA SOLAR PROJECT, KERN COUNTY, CALIFORNIA

PROJECT AREA #1

APN	Owner	General Plan	Zoning*	Gross Acreage
244-010-04	Cho Family Trust	8.3, 8.5	R-1	72.5
244-010-19	Linda Pietrangelo	8.3	A-1	10.2
244-010-20	Linda Pietrangelo	8.3	A-1	10.2
244-010-21	Linda Pietrangelo	8.3	A-1	10.2
244-010-22	Linda Pietrangelo	8.3	A-1	10.2
244-101-36	Genus	8.3	A-1	259.3
Total Project Area #1				**372.4**

PROJECT AREA #2

APN	Owner	General Plan	Zoning*	Gross Acreage
244-010-01	Su John Rosa Chen	8.3	A-1	10.0
244-010-02	Su John Rosa Chen	8.3	A-1	10.0
244-010-33	Su John Rosa Chen	8.3	A-1, R-1	302.1
244-040-03	GM Gabrych Family	8.3	A-1	635.2
Total Project Area #2				**957.3**

PROJECT AREA #3

APN	Owner	General Plan	Zoning*	Gross Acreage
232-140-09	Crane	8.5	A-1	14.7
232-140-11	Crane	8.3	M-1	11.2
244-040-07	Doraland	7.1	M-1	155.0
244-040-10	Crane	7.1	M-1	20.0
244-040-11	John Finne	7.1	M-1	28.5
244-040-12	John Finne	7.1	M-1	28.5
244-040-14	Britton Associates LLC	7.1	M-1	120.0
244-040-15	Britton Associates LLC	7.1	M-1	158.0
244-040-17	Crane	7.1	M-1	26.1
244-040-19	John Finne	7.1	M-1	20.0
244-040-20	Crane	7.1	M-1	20.0
244-040-21	Tim Cao	7.1	M-1	17.0
244-040-22	Desert Lake Community Service District	7.1	M-1	1.0
244-040-23	Doraland	7.1	M-1	26.2
Total Project Area #3				**646.0**

PROJECT AREA #4

APN	Owner	General Plan	Zoning*	Gross Acreage
232-081-10	John Hui	8.3	A-1	221.3
232-220-36	Illy King (partial)	8.5	A-1	221.1
Total Project Area #4				**442.4**

PROJECT AREA #5

APN	Owner	General Plan	Zoning*	Gross Acreage
232-220-37	Illy King (partial)	8.5/2.5	A-1	249.0
Total Project Area #5				**249.0**

***Kern County Zoning Ordinance Codes:**

A-1 Limited Agriculture District - Combination of estate-type residential development, agricultural uses, and other compatible uses

M-1 Light Industrial District - Wholesale commercial, storage, trucking, assembly-type manufacturing, and other similar industrial uses. Processing or fabrication will be limited to activities conducted within a building that does not emit fumes, odor, dust, smoke, or gas beyond the confines of the building within which the activities occur or produce significant levels of noise or vibration.

R-1 Low-Density Residential District - Traditional small lot single-family homes and compatible uses with a maximum density limited to 10 dwelling units per acres

APPENDIX B

List of Federal, State, IUCN, and California Native Plant Society Ranking Codes for the Proposed Aratina Solar Project

USFWS / ESA Listing Codes:
FE Federally listed as Endangered
FT Federally listed as Threatened
FPE Federally proposed for listing as Endangered
FPT Federally proposed for listing as Threatened
FPD Federally proposed for delisting
FC Federal candidate species (former Category 1)
BCC Birds of Conservation Concern
BGEPA Bald and Golden Eagle Protection Act

CDFW / CESA Listing Codes:
SE State listed as Endangered
ST State listed as Threatened
SCE State candidate for listing as Endangered
SCT State candidate for listing as Threatened
SCD State candidate for delisting
R Rare
FP Fully Protected
SGCN Species of Greatest Conservation Need
PL Petitioned for listing
SSC Species of Special Concern
WL Watch List

Birds of Conservation Concern are species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973 (ESA, FWS 2008).

California Fully Project Species are identified as those animals that are rare or face extinction and require additional protection. Fully Protected species may not be taken or possessed at any time and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research and relocation of bird species for the protection of livestock (CDFW 2018).

Watch List of Species of Special Concern include species that are not on the current special concern list that 1) formerly were on the 1978 (Remsen 1978) or 1992 (CDFG 1992) special concern lists and are not currently listed as state threatened and endangered; 2) have been removed (delisted) from either the state or federal threatened and endangered lists (and remain on neither); or 3) are currently designated as Fully Protected in California (Shuford and Gardali 2008).

CALFIRE Sensitive Species are those species that warrant special protection during timber operations (CDFW 2018).

Global Rank (G-Rank):
G1 = **Critically Imperiled**—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2 = **Imperiled**—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3 = **Vulnerable**—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4 = **Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5 = **Secure**—Common; widespread and abundant.

State CNDDB Rank (S-Rank):
S1 = **Critically Imperiled**—Critically imperiled in the state because of extreme rarity (often 5 or fewer populations) or because of factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.
S2 = **Imperiled**—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.

S3 = **Vulnerable**—Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the state.
S4 = **Apparently Secure**—Uncommon but not rare in the state; some cause for long-term concern due to declines or other factors.
S5 = **Secure**—Common, widespread, and abundant in the state.

Uncertainty about the rank of an element is expressed in two major ways: 1) by expressing the rank as a range of values: e.g., S2S3 means the rank is somewhere between S2 and S3; and 2) by adding a "?" to the rank: e.g., S2? This represents more certainty than S2S3, but less than S2

IUCN Red List Criteria (IUCN 2020)**:**
EX – Extinct: A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
EW – Extinct In The Wild: A taxon is Extinct In The Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct In The Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
CR – Critically Endangered: A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.
EN – Endangered: A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.
VU — Vulnerable: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
NT – Near Threatened: A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
LC – Least Concern: A taxon is Least Concern when it has been evaluated against the Red List criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened.
DD — Data Deficient: A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking.

CNPS Rare Plant Rank (CNPS 2019)**:**
1A Plants Presumed Extirpated in California and Either Rare or Extinct Elsewhere
1B Plants Rare, Threatened, or Endangered in California and Elsewhere
2A Plants Presumed Extirpated in California But Common Elsewhere
2B Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
3 Plants About Which More Information is Needed
4 Plants of Limited Distribution

Threat Ranking:
0.1 Seriously Threatened in California
0.2 Moderately Threatened in California
0.3 Not Very Threatened in California
Plants with an "E" are endemic to CA

APPENDIX C

Perennial Plant Species Occurring on the Proposed Aratina Solar Project Area, Kern County, CA, February 2019

FAMILY / SCIENTIFIC NAME	COMMON NAME	HABIT
ASTERACEAE	**SUNFLOWER FAMILY**	
Acamptopappus sphaerocephalus var. *hirtellus*	goldenhead	shrub
Ambrosia dumosa	burro bush	shrub
Ambrosia salsola	cheesebush	shrub
Ericameria cooperi var. *cooperi*	Cooper's goldenbush	shrub
Ericameria nauseosa	rubber rabbitbrush	shrub
Stephanomeria pauciflora	wire-lettuce	perennial herb/subshrub
Tetradymia axillaris var. *longispina*	cotton-thorn	shrub
Tetradymia stenolepis	horsebrush	shrub
BRASSICACEAE	**MUSTARD FAMILY**	
Lepidium fremontii	bush peppergrass	shrub
CACTACEAE	**CACTUS FAMILY**	
Cylindropuntia echinocarpa	golden cholla	perennial stem succulent
CHENOPODIACEAE	**GOOSEFOOT FAMILY**	
Atriplex confertifolia	shadscale	shrub
Atriplex polycarpa	allscale	shrub
Atriplex spinifera	spinescale	shrub
Grayia spinosa	spiny hope-sage	shrub
Krascheninnikovia lanata	winter fat	shrub
CLEOMACEAE	**SPIDERFLOWER FAMILY**	
Peritoma arborea	bladderpod	shrub
EUPHORBIACEAE	**SPURGE FAMILY**	
Croton californicus	California croton	perennial herb/subshrub
SOLANACEAE	**NIGHTSHADE FAMILY**	
Lycium andersonii	desert tomato	shrub
Lycium cooperi	box-thorn	shrub
TAMARICACEAE	**TAMARISK FAMILY**	
†*Tamarix* sp.	saltcedar	tree
ZYGOPHYLLACEAE	**CALTROP FAMILY**	
Larrea tridentata	creosote bush	shrub
AGAVACEAE	**CENTURY PLANT FAMILY**	
Yucca brevifolia	western Joshua tree	perennial leaf succulent

† = non-native ornamental

APPENDIX D

Wildlife Species Occurring on the Proposed Aratina Solar Project Area, Kern County, California, April and May 2019

SCIENTIFIC NAME	COMMON NAME
BIRDS	
ORDER: ACCIPITRIFORMES	**HAWKS, KITES, EAGLES**
Cathartidae	**American Vultures**
Cathartes aura	Turkey Vulture
Accipitiridae	**Hawks, Kites, Eagles**
Accipiter cooperii	Cooper's Hawk
Buteo jamaicensis	Red-tailed Hawk
Circus cyaneus	Northern Harrier
ORDER: COLUMBIFORMES	**DOVES AND PIGEONS**
Columbidae	**Pigeons and Doves**
Zenaida macroura	Mourning Dove
ORDER: CUCULIFORMES	**CUCKOOS, ROADRUNNERS, ANIS**
Cuculidae	**Cuckoos, Roadrunners, Anis**
Geococcyx californianus	Greater Roadrunner
ORDER: APODIFORMES	**HUMMINGBIRDS AND SWIFTS**
Trochidae	**Hummingbirds**
Calypte costae	Costa's Hummingbird
ORDER: PICIFORMES	**WOODPECKERS**
Picidae	**Woodpeckers**
Picoides scalaris	Ladder-backed Woodpecker
ORDER: FALCONIFORMES	**FALCONS**
Falconidae	**Falcons**
Falco sparverius	American Kestrel
ORDER: PASSERIIFORMES	**PASSERINES AND PERCHING BIRDS**
Tyrannidae	**Flycatchers**
Myiarchus cinerascens	Ash Throated Flycatcher
Sayornis saya	Say's Phoebe
Tyrannus verticalis	Western Kingbird
Corvidae	**Jays, Magpies, and Crows**
Corvus corax	Common Raven
Alaudidae	**Larks**
Eremophila alpestris	Horned Lark
Remizidae	**Verdins**
Auriparus flaviceps	Verdin
Troglotytidae	**Wrens**
Campylorhynchus brunneicapillus	Cactus Wren
Polioptilidae	**Gnatcatchers**
Polioptila caerulea	Blue-gray Gnatcatcher
Mimidae	**Mimic Thrashers**
Mimus polyglottos	Northern Mockingbird
Toxostoma lecontei	LeConte's Thrasher
Parulidae	**Warblers**
Setophaga coronata	Yellow-rumped Warbler
Emberizidae	**Emberizids**
Amphispiza bilineata	Black-throated Sparrow
Artemisiospiza belli	Bell's Sparrow

SCIENTIFIC NAME	COMMON NAME
Melozone crissalis	California Towhee
Spizella breweri	Brewer's Sparrow
Zonotrichia leucophrys	White-crowned Sparrow
Cardinalidae	**Cardinals**
Piranga ludoviciana	Western Tanager
Fringillidae	**Finches**
Haemorhous mexicanus	House Finch
Passeridae	**Weaver Finches**
Passer domesticus	House Sparrow
MAMMALS	
ORDER: CARNIVORA	**FLESH-EATERS**
Canidae	**Dogs, wolves, and foxes**
Canis familiaris	Domestic Dog
Vulpes macrotis arsipus	Desert Kit Fox
ORDER: RODENTIA	**GNAWING MAMMALS**
Sciuridae	**Squirrels**
Ammosphermophilus leucurus	Whitetail Antelope Squirrel
Spermophilus beecheyi	California Ground Squirrel
Xerospermophilus mohavensis	Mohave Ground Squirrel
Heteromyidae	**Kangaroo Rats**
Dipodomys deserti	Desert Kangaroo Rat
ORDER: LAGOMORPHA	**PIKAS, HARES, AND RABBITS**
Leporidae	**Hares and Rabbits**
Lepus californicus	Black-tailed Jackrabbit
Sylvilagus auduboni	Audubon's Cottontail
REPTILES	
ORDER:SQUAMATA	**LIZARDS AND SNAKES**
Iguanidae	**Iguanids**
Dipsosaurus dorsalis	Desert Iguana
Phrynosomitidae	**Phrynomsomitids**
Phrynosoma platyrhinos	Desert Horned Lizard
Sceloporus magister	Desert Spiny Lizard
Uta stansburiana	Side-blotched Lizard
Crotaphytidae	**Collared and Leopard Lizards**
Gambelia wislizenii	Long-nosed Leopard Lizard
Teiidae	**Whiptails**
Aspidoscelis tigris	Western Whiptail
Colubridae	**Colubrids**
Pituophis melanoleucus	Gopher Snake
Viperidae	**Pit Vipers**
Crotalus scutulatus	Mojave Rattlesnake

APPENDIX E

Rare Plant Survey at the Proposed Aratina Solar Farm, Kern County, California

Rare Plant Survey at the Proposed Aratina Solar Farm, Kern County, California Spring 2019

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September 2020

EXECUTIVE SUMMARY

A protocol-level rare plant survey was conducted in April 2019 by EREMICO Biological Services for the proposed Aratina Solar Farm project near Boron, Kern County, California. The purpose of the survey was to determine the occurrence of special status plant species, sensitive natural communities, and plants protected under the California Desert Native Plant Act (CDNPA) on the project site.

During the survey four species of rare plants and four species protected under the CDNPA were observed. The rare plants were desert cymopterus (*Cymopterus deserticola*), Barstow woolly sunflower (*Eriophyllum mohavense*), Mojave spineflower (*Chorizanthe spinosa*), and crowned muilla (*Muilla coronata*). The former two species are rare and endangered in California and elsewhere (California Native Plant Society [CNPS] Rank1B plants), and the latter two species are on a watch list that includes plants with limited distribution and limited information (CNPS Rank 4 plants). Three additional rare plants were determined to have potential to occur in the project area based on habitats and include Booth's evening-primrose (*Eremothera boothii* ssp. *boothii*), sagebrush loeflingia (*Loeflingia squarrosa* var. *artemisiarium*), and graceful nemacladus (*Nemacladus gracilis*). These species were not observed during the survey but may have been overlooked or did not germinate in 2019.

The four CDNPA species included Joshua tree (*Yucca brevifolia*), silver cholla (*Cylindropuntia echinocarpa*), diamond cholla (*Cylindropuntia ramosissima*), and beavertail (*Opuntia basilaris* var. *basilaris*). Joshua tree woodland, a sensitive natural community, occurred in a few small patches (10-20 acres, each). Another sensitive natural community, spinescale (*Atriplex spinifera*) scrub, was the second most common vegetation type in the project area after creosote-bush – white bursage (*Larrea tridentata – Ambrosia dumosa*) scrub.

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APPENDICES

Appendix A. Plant List

1. INTRODUCTION

1.1 PROJECT DESCRIPTION

64NB 8ME, LLC (Applicant) proposes to develop up to a 600 megawatt-alternating electrical current (MW-AC) photovoltaic energy facility known as the Aratina Solar Farm located near the communities of Desert Lake and Boron in Kern County, California. Power generated by Aratina would be delivered from the site with up to a 230 kilovolt (kV) overhead and/or underground electrical transmission line(s) originating from one or more on-site substation(s) and terminating at the Southern California Edison (SCE) Holgate Substation. Alternatively, Aratina may interconnect at the SCE Kramer Substation in San Bernardino County with up to a 230-kV transmission line located in an Edwards Air Force Base (Edwards AFB) utility corridor. These locations include power connections and generation tie-ins (gen-ties).

The Applicant is applying for five Project Areas from Kern County for the construction and operation of the Aratina Solar Farm. Each Project Area may include operations and maintenance (O&M) buildings, substations, energy storage systems (ESSs), and/or transmission facilities, as necessary, or it may share such facilities with each other or with any future energy projects in the area, and/or it may be remotely operated. Any "unused" building, substation, and/or transmission facility areas on-site may be covered by solar panels under such scenarios.

As part of the permitting process, the California Department of Fish and Wildlife (CDFW) requires a biological resources survey of the Project Area and power connections and gen-ties. The purpose of the biological resources survey is to determine if any threatened or endangered plant or wildlife species or other special status species occur on the Project Area and to evaluate the existing habitats for their potential in supporting any sensitive species that may not be present or observable during the time of the survey. This report describes the methods and results of a protocol-level rare plant survey of the Project Area that was conducted in spring 2019. The wildlife portion of the biological resources survey was prepared by EnviroPlus Consulting, Inc. (EPC 2019).

1.2 PROJECT AREA DESCRIPTION

The Project Area lies within an unincorporated area in the southeastern corner of Kern County, California, to the south and west of the unincorporated community of Boron (Figure 1-1). The Project Area is located on private land located on the Boron and Leuhman Ridge USGS 1:24000 quadrangles. Cadastrally, the Project Area includes the following:

- Township 11N, Range 8W – portions of Sections 27, 33, 34;
- Township 10N, Range 8W – Sections 1 and 2; and
- Township 10N, Range 7W – portions of Sections 5 and 6.

The Project Area is bounded as follows:

- North – an Antelope Valley East Kern Water Agency pipeline right-of-way;
- West – Gephart Road;
- South – Edwards AFB; and
- East – the Kern-San Bernardino County line.

The proposed Aratina project comprises 27 assessor's parcels (Project Area) totaling 2,666.7 acres of privately-owned lands (Table 1-1, Figure 1-1). The permanent disturbance acreage associated with development of the solar facility and associated infrastructure would be located within and less than the gross acreage of the Project Area.

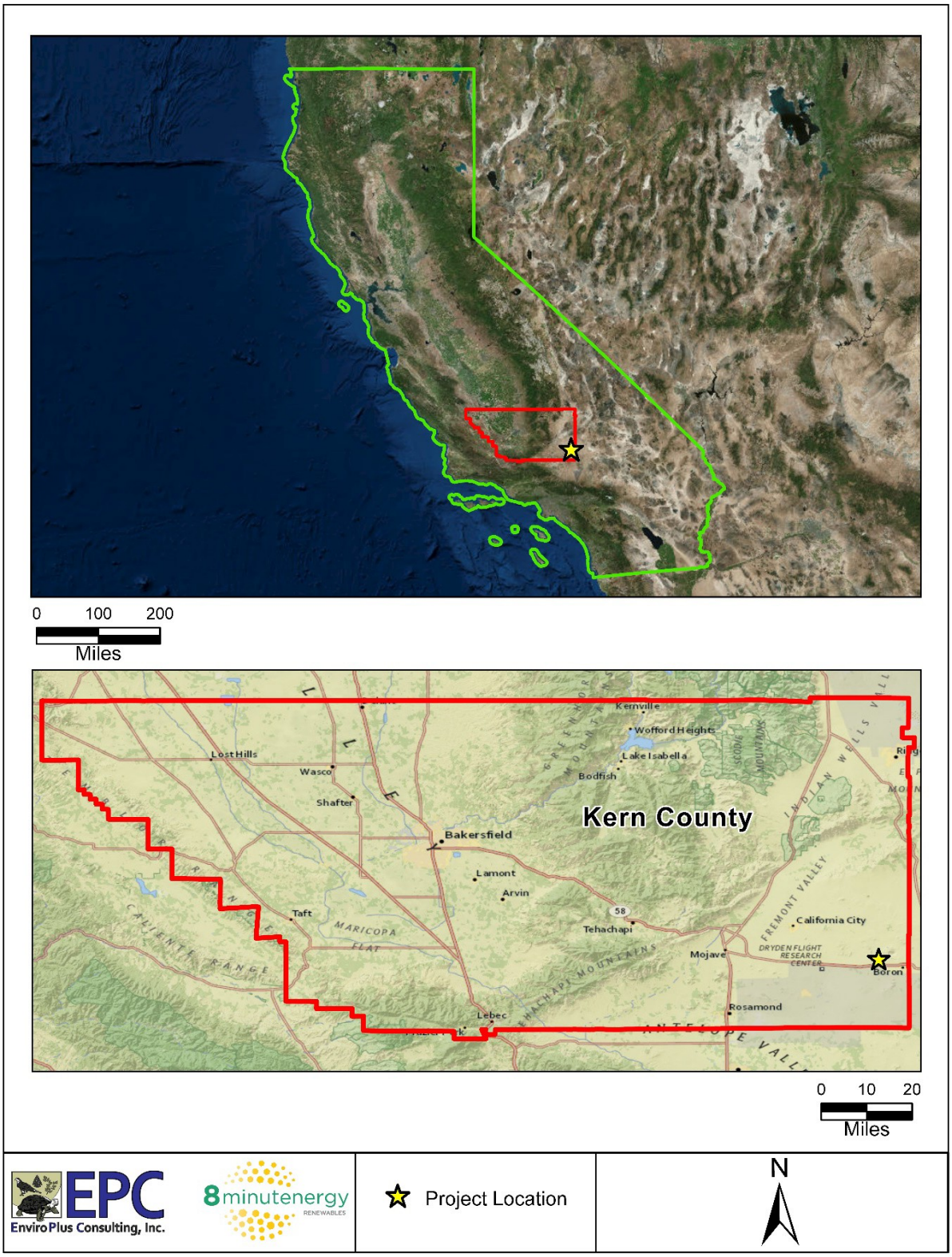


Figure 1-1. Proposed Aratina Solar Project Area Vicinity Map

Table 1-1. Assessor's Parcel Numbers (APN) for Each Project Area, Aratina Solar Farm

Project Area #1		
APN	Owner	Gross Acreage
244-010-04	Cho Family Trust	72.5
244-010-19	Linda Pietrangelo	10.2
244-010-20	Linda Pietrangelo	10.2
244-010-21	Linda Pietrangelo	10.2
244-010-22	Linda Pietrangelo	10.2
244-101-36	Genus	259.3
Total Project Area #1		**372.4**

Project Area #2		
APN	Owner	Gross Acreage
244-010-01	Su John Rosa Chen	10.0
244-010-02	Su John Rosa Chen	10.0
244-010-33	Su John Rosa Chen	302.1
244-040-03	GM Gabrych Family	635.2
Total Project Area #2		**957.3**

Project Area #3		
APN	Owner	Gross Acreage
232-140-09	Crane	14.7
232-140-11	Crane	11.2
244-040-07	Doraland	155.0
244-040-10	Crane	20.0
244-040-11	John Finne	28.5
244-040-12	John Finne	28.5
244-040-14	Britton Associates LLC	120.0
244-040-15	Britton Associates LLC	158.0
244-040-17	Crane	26.1
244-040-19	John Finne	20.0
244-040-20	Crane	20.0
244-040-21	Tim Cao	17.0
244-040-22	Desert Lake Community Service District	1.0
244-040-23	Doraland	26.2
Total CUP Area #3		**646.0**

Project Area #4		
APN	Owner	Gross Acreage
232-081-10	John Hui	221.3
232-220-36	Illy King (partial)	221.1
Total CUP Area #4		**442.4**

Project Area #5		
APN	Owner	Gross Acreage
232-220-37	Illy King (partial)	249.0
Total Project Area #5		**249.0**

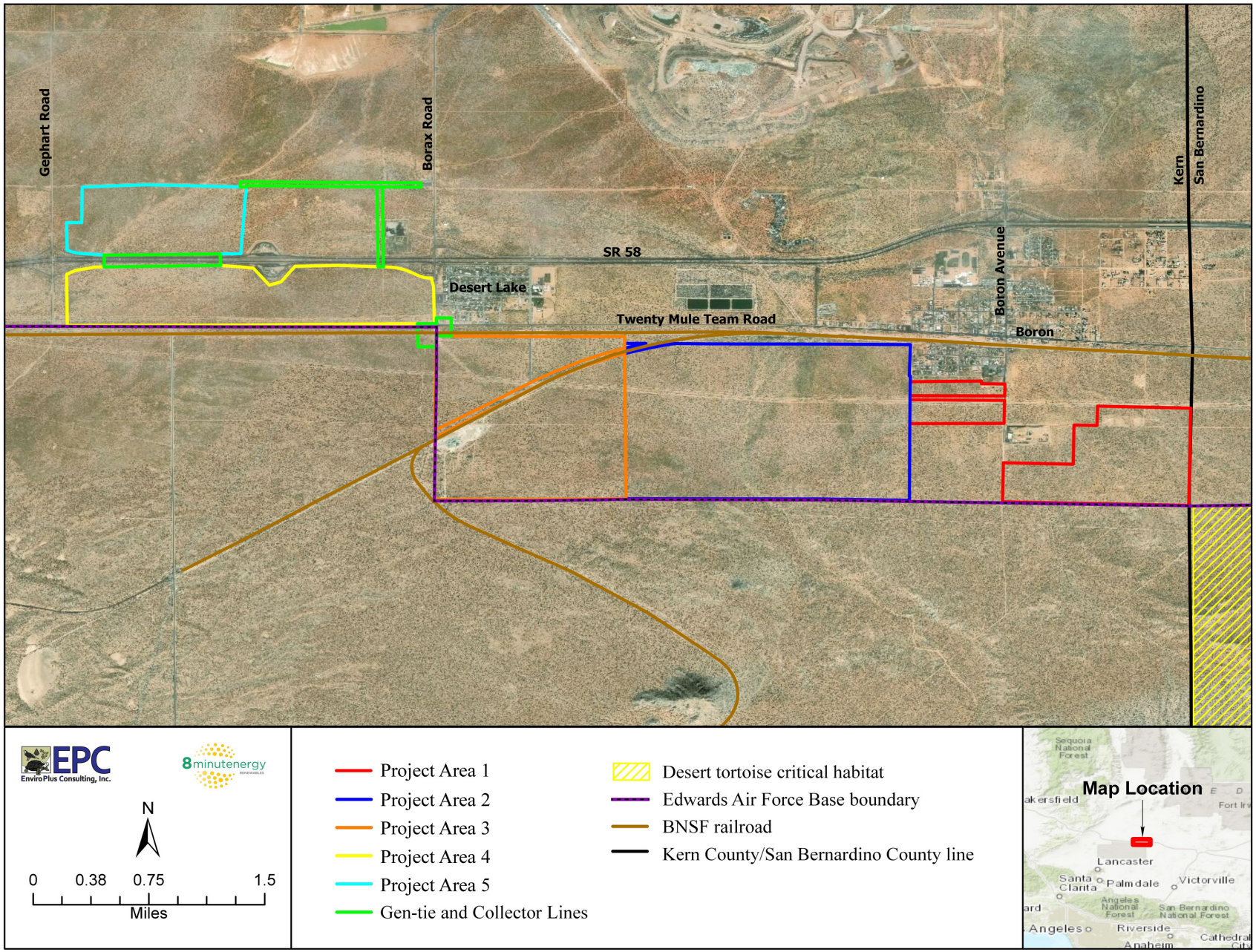


Figure 1-2. Proposed Aratina Solar Project Area Map

The Project Area is within the Antelope Valley in the West Mojave Desert. Elevations range from 2,542 feet in the southeast corner to 2,340 feet in the southwest corner. The unincorporated community of Boron is located adjacent to and north of Project Area #1 and adjacent to and east of Project Area #2. The unincorporated community of Desert Lake is located adjacent to and north of Project Area #3 and adjacent to and east of Project Area #4. A Kern County waste disposal site is located along Boron Avenue in the vicinity of Project Area #1 (Figure 1-2).

2. METHODS

2.1 DATABASE SEARCH AND LITERATURE REVIEW

A list of special status plants and sensitive natural communities that occur or appear to have some potential to occur within the Project Area was developed using information from the California Natural Diversity Database (CNDDB 2019b), the BLM (BLM 2015), and regional planning documents and biological resources survey reports. The database search included the following topographic maps (USGS quadrangles, 7.5-minute series):

Astley Rancho	Edwards	North Edwards
Boron	Galileo Hill	Red Buttes
Boron NE	Jackrabbit Hill	Rogers Lake North
Boron NW	Kramer Hills	Rogers Lake South
California City North	Kramer Junction	Saddleback Mtn.
California City South	Leuhman Ridge	The Buttes

The search also included a query of CNDDB QuickView (CNDDB 2019a), a free Internet application, to determine if there were 1) any records that have not been processed in the CNDDB or 2) any records for California Native Plant Society (CNPS) Rank 3 and Rank 4 plant species, which are often not found during the CNDDB search.

A special status plant species or sensitive natural community was judged to occur within the Project Area if there were locality records, either historic or recent, indicating its presence. A species was judged to have some potential for inhabiting the Project Area if it is known to occur in the same general area, in a similar habitat, and/or at a similar elevation as the Project Area. A species was included on the special status list if it fell into one or more of the following categories (BLM 2015; CDFW 2018a, 2018b, 2019; CNPS 2019; U.S. Fish and Wildlife Service [FWS] 2015):

- taxa that are officially listed or proposed for listing under the State and/or Federal Endangered Species Acts;
- taxa that are State or Federal candidates for possible listing;
- taxa considered sensitive by the BLM;
- taxa listed in the California Native Plant Society's (CNPS) *Inventory of Rare and Endangered Plants of California*;
- 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) Guidelines (e.g., all CNPS Rank 1 and 2 and some Rank 3 and 4 plants may fall under Section 15380 of CEQA);
- taxa that are biologically rare, very restricted in distribution, or declining throughout their range but not currently threatened with extirpation;
- populations in California that may be on the periphery of a taxon's range, but are threatened with extirpation in California; and
- taxa closely associated with a habitat that is declining in California at a significant rate (e.g., wetlands, riparian, old growth forests, desert aquatic systems, native grasslands, vernal pools, etc.).

In addition, taxa protected under the California Desert Native Plants Act (CDNPA) (Division 23

of the California Food and Agricultural Code, Section 80071-80075), which include cacti and yuccas, were also considered. These taxa include:

- Smoke tree (*Psorothamnus spinosus*);
- all native species in the genus *Prosopis*, i.e., mesquites;
- all native species in the genus *Nolina*, i.e. beargrass;
- all native species in the family *Cactaceae*, i.e., cacti; and
- all native species in the family *Agavaceae*, i.e., century plants (*Agave* spp.), Joshua trees and other *Yucca* spp., and desert lilies (*Hesperocallis undulata*).

Although federal and/or state threatened or endangered species or proposed threatened or endangered species receive legal protection, special status species do not. However, local, state, and federal resource agencies typically require that these species be considered during the planning process for projects because 1) they either are declining at a rate that could result in a state and/or federal listing or they have historically occurred in low numbers, and 2) known threats to their persistence currently exist. Designations and rankings of special status species are intended to focus attention on the species to help avert the need for costly listing and recovery efforts required under federal and/or state endangered species laws.

Prior to conducting the field survey within the Project Area, field investigators reviewed the physical description, habitat description, drawings, and photographs of each potentially occurring special status plant species. Sources for information on each species included floras (Abrams and Ferris 1923-1960, Baldwin et al. 2002, Munz 1974), field guides (Jaeger 1940, MacKay 2013), and other sources (CNPS 1978, 2019; Smithsonian Institution 1978; University of California 2017). The field crew also developed a list of known locations for rare plants in the general vicinity of the Project Area based on CNDDB records. Immediately prior to the protocol-level rare plant survey, the crew visited some of these locations to become familiar with the rare plant's appearance and habitat and to determine if it would be identifiable at the time of the survey.

2.2 HABITAT ASSESSMENT

Botanist Mark Bagley conducted a habitat assessment over 7 days, from February 12 through February 18, 2019. Because of the timing of the survey, most special status plants that have some potential to occur within the Project Area were not expected to be observable. Therefore, the purpose of this survey was to 1) map the vegetation types occurring in the Project Area; 2) identify habitats that may harbor special status plants; and 3) identify sensitive natural communities occurring on-site. Mr. Bagley either walked or drove throughout the Project Area, visiting all habitats and topographic features in the area. He recorded the following information: plant alliances, dominant shrubs, other shrubs, soil texture, and habitat disturbances. He also photographed each habitat type. Occurrence potential for each special status plant identified during the database search was ranked "likely", "possible", or "unlikely" after the habitat evaluation.

2.3 PROTOCOL-LEVEL RARE PLANT SURVEY

EREMICO Biological Services personnel Denise LaBerteaux, Cecile Shohet, Mark Bagley, Youssef Atallah, Susan Moore, and Bruce Garlinger conducted the protocol-level rare plant survey in the Project Area on April 1-14, 2019. The field survey consisted of a full coverage survey on the private lands within the Project Area following protocols recommended by the CDFW (2009). The field crew systematically walked 15-m wide parallel line transects over the entire area to

achieve full coverage. If any special status plant or CDNPA plant was encountered, its location was recorded with a Garmin hand-held GPS unit. California Native Species Field Survey Forms were completed for special status plants, excluding CDNPA plants.

The protocol-level rare plant survey was floristically based, that is, the field crew identified all plant species, whether fresh or dried, that were encountered in the Project Area to at least genus and to the level necessary to ensure that they were not plant species of concern. The crew collected and later identified plants that were not readily identifiable in the field. Nomenclature throughout this report follows *The Jepson Manual, 2nd Ed.* (Baldwin et al. 2012).

3. RESULTS

3.1 DATABASE SEARCH AND LITERATURE REVIEW

The CNDDB and CNDDB QuickView searches found records of three special status plants within the Project Area (Figure 3-1, Table 3-1). These species were desert cymopterus (*Cymopterus deserticola*), recurved larkspur (*Delphinium recurvatum*), and Barstow woolly sunflower (*Eriophyllum mohavense*). Another 13 special status plants were identified as occurring in the general area (Figure 3-1, Table 3-1). None of these species are listed under the Federal Endangered Species Act (FWS 2015) or the California Endangered Species Act (CDFW 2018b).

Of the 16 special status plant species identified, seven species are listed as CNPS Rank 1B, defined as plants that are rare and endangered in California and elsewhere; three species are listed as CNPS Rank 2B, defined as plants that are rare, threatened, or endangered in California, but are more common elsewhere; and the remaining six species are listed as CNPS Rank 4, a watch list of plants with limited distribution and limited information (CNPS 2019). For this reason, CNPS Rank 4 plants, except for white pygmy-poppy, are not included on Figure 3-1.

Plants protected by the CDNPA that may occur within the Project Area include silver cholla (*Cylindropuntia echinocarpa*), beavertail cactus (*Opuntia basilaris* var. *basilaris*), and Joshua tree (*Yucca brevifolia*). Most of these plants are fairly common in the West Mojave Desert. Finally, no sensitive natural community was identified during the database search as occurring in the vicinity of the Project Area.

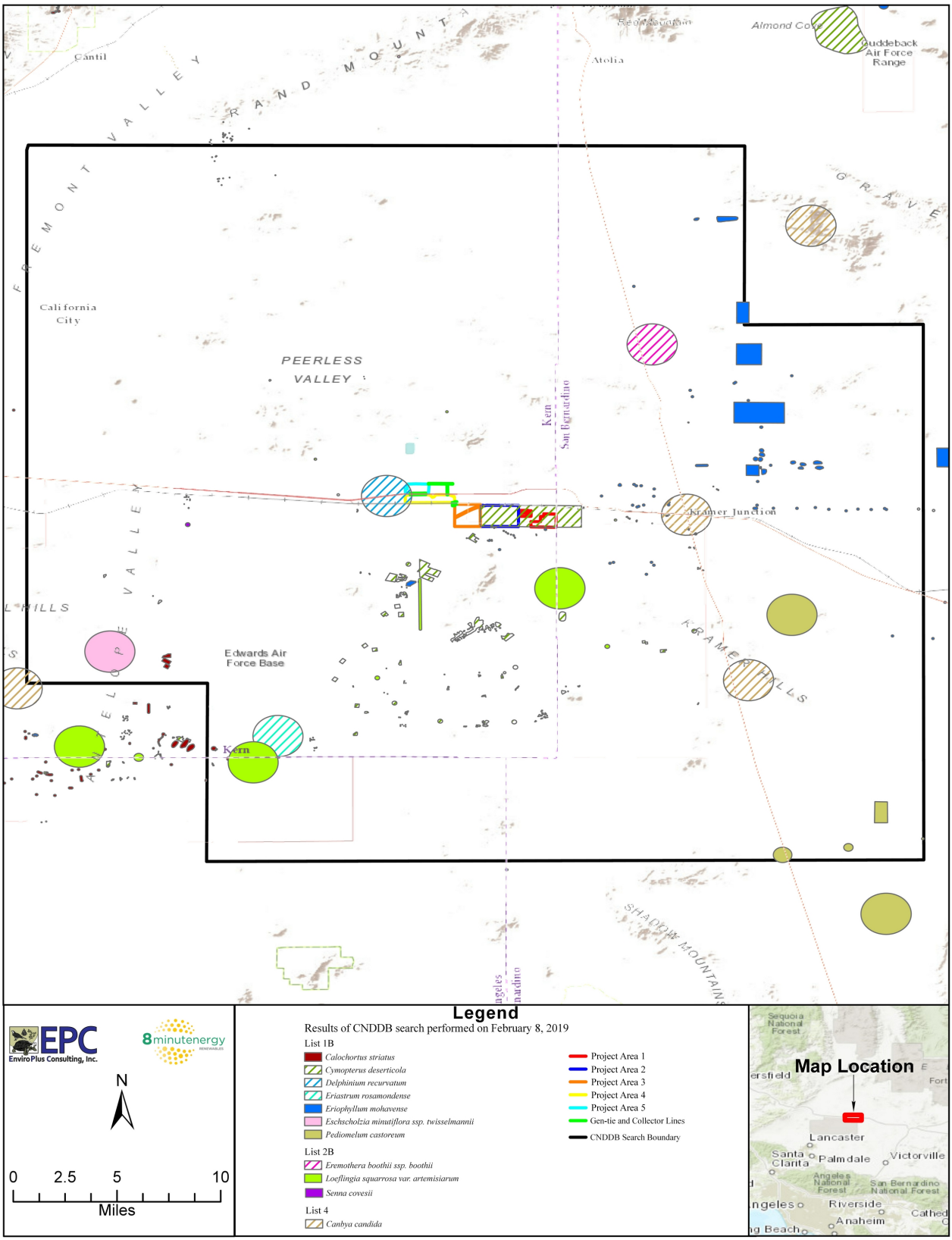


Figure 3-1. Special Status Plants, CNDDB Search Results, Aratina Solar Farm

Table 3-1. Special status plant species known to occur in the region and their occurrence potential in the Project Area[1]

Scientific name Common Name Plant Family, Life Form	Rank or Status[2]					Flowering Period	Habitat and Distribution Notes	Occurrence Potential within the Project Area
	FWS	CDFW	CNDDB	CNPS	BLM			
CNPS Rank 1B								
Calochortus striatus alkali mariposa-lily Liliaceae, perennial bulbiferous herb	–	–	S3	1B.2	Sen.	April-June	70-1595 m. Alkaline, mesic. Chaparral, chenopod scrub, Mojavean desert scrub, meadows and seeps. Known to occur south and southwest of Project Area along edge of Rogers Dry Lake.	**UNLIKELY** – Project Area does not contain the mesic habitat necessary for this species
Cymopterus deserticola desert cymopterus Apiaceae, perennial herb	–	–	S2	1B.2 E	Sen.	March-May	630-1500 m. Sandy. Joshua tree woodland, Mojavean desert scrub. Known to occur in the Project Area.	**POSSIBLE** – known occurrences in and near the Project Area
Delphinium recurvatum recurved larkspur Ranunculaceae, perennial herb	–	–	S2?	1B.2 E	Sen.	March-June	3-790 m. Alkaline. Chenopod scrub, cismontane woodland, valley and foothill grassland. Old record in or near west portion of Project Area.	**POSSIBLE** – old record in or near the Project Area
Eriastrum rosamondense Rosamond eriastrum Polemoniaceae, annual herb	–	–	S1?	1B.1 E	–	April-May	700-715 m. Alkaline hummocks, often sandy. Chenopod scrub (openings), vernal pools (edges). Known only from the Rosamond and Rogers Dry Lake areas.	**UNLIKELY** – Project Area does not contain alkaline hummocks
Eriophyllum mohavense Barstow woolly sunflower Asteraceae, annual herb	–	–	S2	1B.2 E	Sen.	March-May	500-950 m. Gravelly, silty, sandy, or clay soils on level or sloping terrain, as well as in low-lying areas. Chenopod scrub, Mojavean scrub, playas. Several occurrences are in close proximity to Project Area.	**POSSIBLE** – known occurrences near the Project Area
Eschscholzia minutiflora ssp. *twisselmannii* Red Rock poppy Papaveraceae, annual herb	–	–	S2	1B.2 E	Sen.	March-May	680-1230 m. Volcanic tuff. Mohavean desert scrub. Possible location on Edwards Air Force Base, south-southwest of the Project Area.	**UNLIKELY** – Project Area does not contain volcanic tuff
Pediomelum castoreum Beaver Dam breadroot Fabaceae, perennial herb	–	–	S2	1B.2	Sen.	April-May	610-1525 m. Sandy, washes and roadcuts. Joshua tree woodland, Mojavean scrub. Known to occur east and southeast of the Project Area.	**UNLIKELY** – Project Area is west and northwest of known range of the species

Scientific name Common Name Plant Family, Life Form	Rank or Status[2]					Flowering Period	Habitat and Distribution Notes	Occurrence Potential within the Project Area
	FWS	CDFW	CNDDB	CNPS	BLM			
CNPS Rank 2B								
Eremothera boothii ssp. *boothii* Booth's evening-primrose Onagraceae, annual herb	–	–	S2	2B.3	–	April-September	815-2400 m. Sandy flats, steep loose slopes. Joshua tree woodland, pinyon and juniper woodland. Known to occur north of Kramer Junction, northeast of Project Area.	**POSSIBLE** – Project Area contains potential habitat
Loeflingia squarrosa var. *artemisiarium* sagebrush loeflingia Caryophyllaceae, annual herb	–	–	S2	2B.2	–	April-May	700-1615 m. Sandy. Desert dunes, Great Basin scrub, Sonoran Desert scrub. Known to occur south of the Project Area on Edwards AFB.	**LIKELY** – Project Area contains potential habitat; known to occur nearby
Senna covesii Cove's cassia Fabaceae, perennial herb	–	–	S3	2B.2	–	March-June	225-1295 m. Dry, sandy desert washes and slopes. Sonoran desert scrub. Known from north end of Edwards AFB; seeds may have been accidentally brought to this site.	**UNLIKELY** – Project Area is outside the native range of the species
CNPS Rank 4								
Canbya candida white pygmy-poppy Papaveraceae, annual herb	–	–	S3S4	4.2 E	–	March-June	600-1460 m. Gravelly, sandy, granitic. Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland. Known from vicinity of Kramer Junction and on Edwards AFB.	**LIKELY** – Project Area contains potential habitat; known to occur nearby
Chorizanthe spinosa Mojave spineflower Polygonaceae, annual herb	–	–	S4	4.2 E	–	March-July	6-1300 m. Sometimes alkaline. Chenopod scrub, Joshua tree woodland, Mojavean desert scrub, playas. Known to occur in surrounding areas.	**LIKELY** – Project Area contains potential habitat; known to occur nearby
Goodmania luteola golden goodmania Polygonaceae, annual herb	–	–	S3	4.2	–	April-August	20-2200 m. Alkaline or clay. Mojavean desert scrub, meadows and seeps, playas, valley and foothill grassland. Known from North Edwards and Edwards AFB.	**POSSIBLE** – Project Area contains potential habitat
Lycium torreyi Torrey's box-thorn Solanaceae, shrub	–	–	S3	4.2	–	March-June	-50-1220 m. Sandy, rocky, washes, streambanks, desert valleys. Mojavean desert scrub, Sonoran desert scrub. Known from east of Project Area.	**UNLIKELY** – Project Area is west of known range of the species

Scientific name Common Name Plant Family, Life Form	Rank or Status[2]					Flowering Period	Habitat and Distribution Notes	Occurrence Potential within the Project Area
	FWS	CDFW	CNDDB	CNPS	BLM			
CNPS Rank 4								
Muilla coronata crowned muilla Themidaceae, perennial bulbiferous herb	–	–	S3	4.2	–	March-April	670-1960 m. Chenopod scrub, Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland. Known to occur east of the Project Area.	**POSSIBLE** – Project Area contains potential habitat
Nemacladus gracilis graceful nemacladus Campanulaceae, annual herb	–	–	S4	4.3	–	March-May	120-1900 m. Sandy or gravelly. Cismontane woodland, valley and foothill grassland. Known from south of the Project Area.	**POSSIBLE** – known to occur near Project Area

[1] Information taken from the California Natural Diversity Database (CNDDB) reports (CNNDB 2019a, 2019b); rank or status data checked in California Native Plant Society (CNPS) (2019).

[2] Rank or status abbreviations:

FWS (U.S. Fish and Wildlife Service) listings under the Endangered Species: E=Endangered; T=Threatened; – = not listed or proposed for listing (USFWS 2015).

CDFW (California Department of Fish and Wildlife) listings under California Endangered Species Act: E=Endangered; T=Threatened; R=Rare; – = not listed or proposed for listing (CDFW 2018b).

CNDDB ranks: S1= extremely endangered; S2= endangered; S3= restricted range, rare; S4= apparently secure; S5= demonstrably secure; SH= all Calif. Sites are historical. Uncertainty about the rank of an element is expressed in two major ways: 1) by expressing the rank as a range of values: e.g., S2S3 means the rank is somewhere between S2 and S3; and 2) by adding a "?" to the rank: e.g., S2? This represents more certainty than S2S3, but less than S2 (CDFW 2019, CNPS 2019).

CNPS ranks: 1A=plants presumed extinct in California; 1B=plants rare and endangered in California and elsewhere; 2A=plants presumed extirpated in California but common elsewhere; 2B=plants rare, threatened, or endangered in California but more common elsewhere; 3=plants about which more information is needed – a review list; and 4=plants of limited distribution – a watch list. The number following Rank is the Threat Code: .1=seriously endangered in CA; .2=fairly endangered in CA; .3=not very endangered in CA. Plants with an "E" are endemic to CA (CNPS 2019).

BLM (Bureau of Land Management): Sen. = sensitive species on lands administered by the BLM; – = not sensitive (BLM 2015).

3.2 HABITAT ASSESSMENT

3.2.1 EXISTING ENVIRONMENT

The Project Area is located in the Mojave Desert Region of the Desert Floristic Province. Landforms in the region included granite-derived flood plains, alluvial flats and fans, and small clay pans. The entire area drained southwesterly towards Rodgers Lake. Burrow pits, used during construction of State Route 58, occurred along the highway in the western portion of the Project Area. Soil types are described in Table 3-2 and mapped on Figure 3-2 (Natural Resources Conservation Service [NRCS] 2019).

Table 3-2. Soil Mapping Units found in the Project Area

Soil Mapping Unit	Soil Mapping Unit Name	Slopes Associated with Unit (%)	Elevation where Found (ft)	Landforms Associated with Unit	Parent Material Associated with Unit
105	Cajon loamy coarse sand	0-5	2,000-3,000	inset fans	aeolian deposits derived from granite
108	Cajon-Norob complex	0-5	2,000-3,000	sand sheets, alluvial flats	aeolian deposits derived from granite
109	Cajon-Norob complex	2-9	2,000-3,000	sand sheets, alluvial flats	aeolian deposits derived from granite
114	Cajon loamy sand	0-5	400-4,000	flood plains, alluvial fans	alluvium derived from granite
116	Cajon gravelly loamy sand	0-9	400-4,000	flood plains, alluvial fans	alluvium derived from granite
124	Lavic-Norob complex	2-9	2,290-3,100	fan piedmonts, alluvial flats	alluvium derived from granite
137	Norob complex, overblown	0-5	2,290-2,320	alluvial flats	alluvium derived from mixed sources
154	Neuralia sandy loam	2-5	2,300-2,800	alluvial fans	alluvium derived from granite
155	Norob-Neuralia complex	0-5	2,000-2,800	flood plains, alluvial fans	alluvium derived from mixed sources or granite
157	Pits (i.e., borrow pits)	-	-	-	-
NOTCOM	(no data available)	-	-	-	-

Native vegetation on-site was typical of that found throughout the Mojave Desert. Five shrubland alliances, as defined by Sawyer et al. (2009), were noted in the Project Area (Figure 3-3). Each alliance is described below. Acreage of vegetation communities and unvegetated features on each CUP Area is summarized in Table 3-3.

Table 3-3. Acreage of Vegetation Communities and Unvegetated Features in Project Area

Vegetation Community	Total Project Area Acres (%)	Project Area #1 Acres (%)	Project Area #2 Acres (%)	Project Area #3 Acres (%)	Project Area #4 Acres (%)	Project Area #5 Acres (%)
Larrea tridentata – Ambrosia dumosa Shrubland Alliance (Creosote Bush - White Bursage Scrub)	1509.1 (57%)	209.6 (56%)	743.9 (78%)	462.2 (72%)	93.4 (21%)	
Larrea tridentata Shrubland Alliance	184.2 (7%)					184.2 (74%)
Ambrosia dumosa Shrubland Alliance	21.0 (<1%)		21.0 (2%)			
Atriplex spinifera Shrubland Alliance (Spinescale Scrub)[1]	728.1 (27%)	155.1 (42%)	192.4 (20%)	129.2 (20%)	186.6 (42%)	64.8 (26%)
Atriplex polycarpa Shrubland Alliance (Allscale Scrub)	105.9 (4%)				105.9 (24%)	
Successional Allscale - Spinescale Scrub	56.2 (2%)				56.2 (13%)	
Successional Spinescale Scrub	40.4 (1.5%)	6.4 (2%)		34.0 (5%)		
Unvegetated (developed: paved roadways, structures, or other features and disturbed: dirt roadways, bladed areas)	21.8 (<1%)	1.1 (0%)		20.7 (3%)		
Total Acres	2666.7	372.4	957.3	646.0	442.0	249.0

[1]Sensitive Natural Community (CDFW 2018a)

***Larrea tridentata - Ambrosia dumosa* Shrubland Alliance** (creosote bush - white bursage scrub). This habitat type (Photograph 3-1) commonly occurs on well-drained alluvial or colluvial soils, with or without a desert pavement surface, in minor washes and rills and on alluvial fans, bajadas, and upland slopes throughout the Mojave Desert, from below sea level to 1,200 m in elevation (Sawyer et al. 2009). This alliance was the dominant vegetation community in the Project Area (Table 3-3). Other shrubs found in this habitat included cheesebush (*Ambrosia salsola*), goldenhead (*Acamptopappus sphaerocephalus* var. *hirtellus*), Cooper's goldenbush (*Ericameria cooperi* var. *cooperi*), horsebrush (*Tetradymia stenolepis*), spinescale (*Atriplex spinifera*), spiny hop-sage (*Grayia spinosa*), winter fat (*Krascheninnikovia lanata*), desert tomato (*Lycium andersonii*), and box-thorn (*Lycium cooperi*). Joshua trees (*Yucca brevifolia*) were also present. This alliance and the shrub associations that occurred in the Project Area are not sensitive natural communities (CDFW 2018a).



Photograph 3-1. *Larrea tridentata – Ambrosia dumosa* Shrubland Alliance

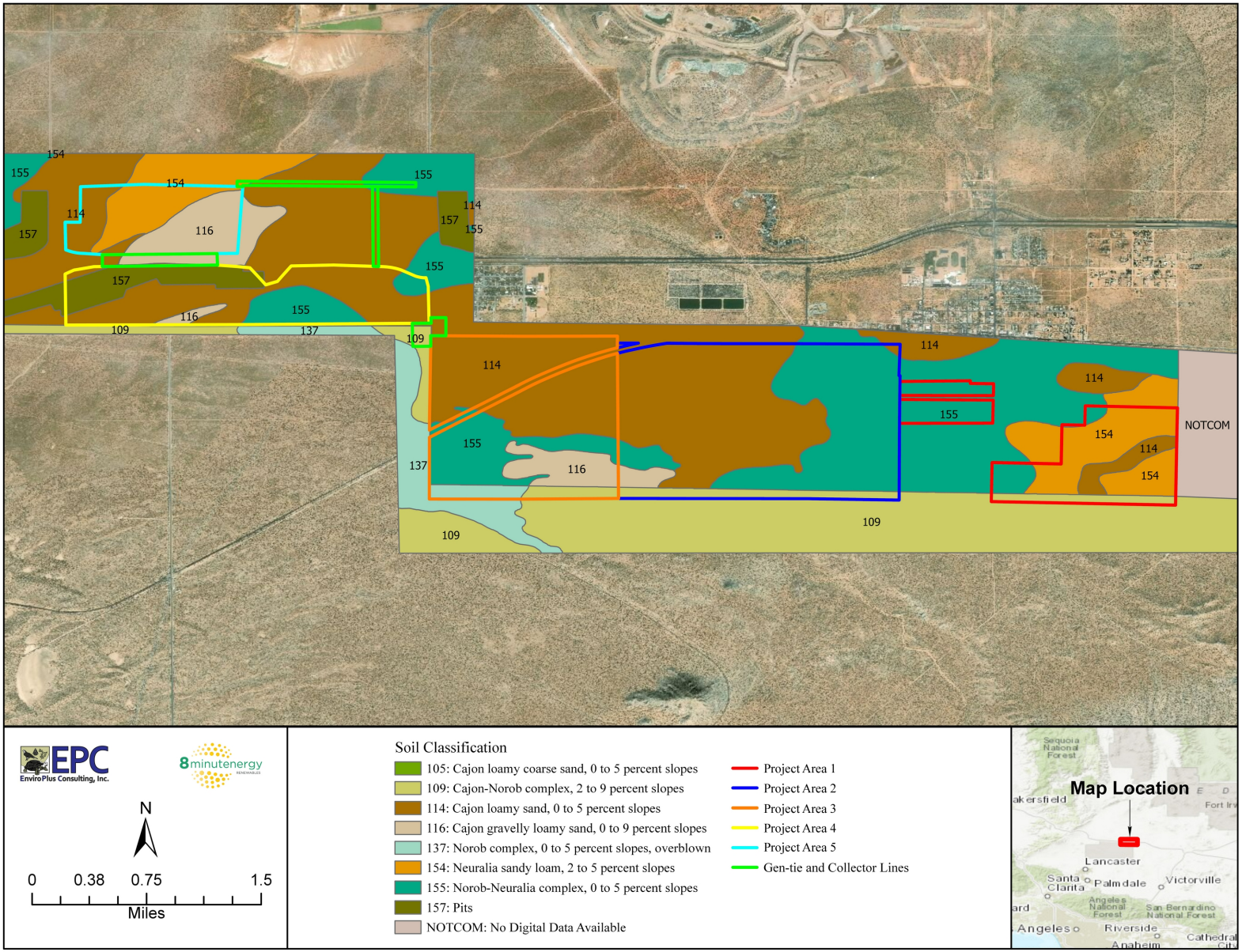


Figure 3-2. Soils Map, Aratina Solar Farm

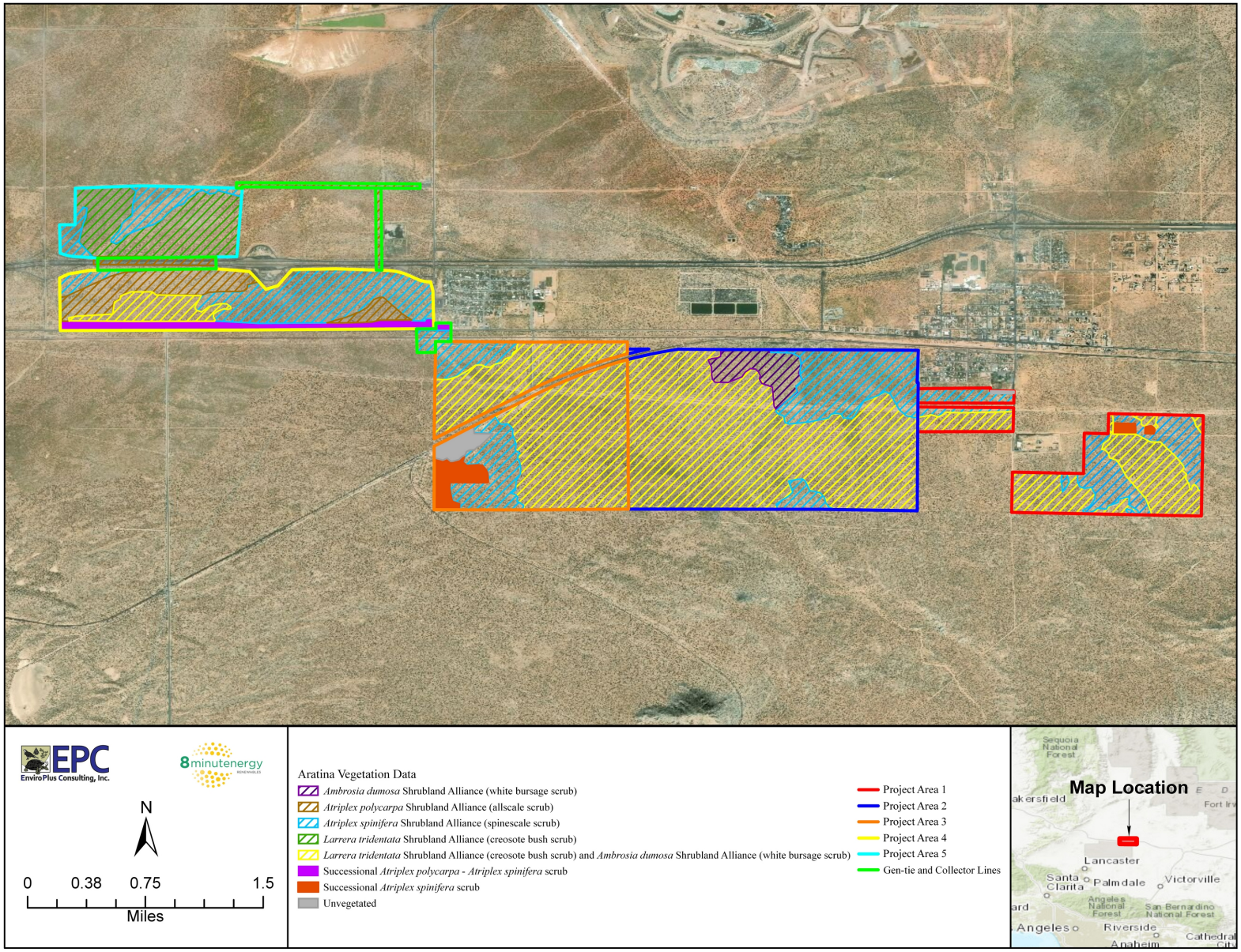


Figure 3-3. Vegetation Communities, Aratina Solar Farm

***Larrea tridentata* Shrubland Alliance** (creosote bush scrub). Creosote bush scrub typically occurs in well-drained soils on alluvial fans, bajadas, upland slopes and in minor, intermittent washes at an elevational range of below sea level to 1,000 m (Sawyer et al. 2009). In the Project Area, this habitat was restricted to Project Area #5 (Figure 3-3). Other shrubs included white bursage, allscale (*Atriplex polycarpa*), spinescale, and bush peppergrass (*Lepidium fremontii*). Joshua trees were scattered in the area. This alliance and the shrub associations that occurred in the Project Area are not sensitive natural communities (CDFW 2018a).

***Ambrosia dumosa* Shrubland Alliance** (white bursage scrub). This community (Photograph 3-2) commonly occurs on alluvial fans, bajadas, rocky hills, partially stabilized and stabilized sand fields, and upland slopes, between 0 and 1700 m in elevation. Soils are typically sandy, clay-rich, or calcareous and may have pavement surfaces (Sawyer et al. 2009). This alliance was confined to a small area in Project Area #2 (Figure 3-3). Other shrubs noted included goldenhead, cheesebush, allscale, box-thorn, and creosote bush. Joshua trees were also present. White-bursage – goldenhead plant association, a sensitive natural community (CDFW 2018a), was not identified as occurring in the Project Area.



Photograph 3-2. *Ambrosia dumosa* Shrubland Alliance

***Atriplex spinifera* Shrubland Alliance** (spinescale scrub). This scrub habitat (Photograph 3-3) is found between 50 and 800 m in elevation on alluvial fans and on old lake beds perched above current drainages. Soils are moderately sandy clay loams to fine, silty clays that may be carbonate rich (Sawyer et al. 2009). Occurring in all Project Areas, it was the second most common shrubland alliance and covered 27% of the total Project Area (Figure 3-3, Table 3-3). Other shrubs that were noted in this habitat included white bursage, cheesebush, goldenhead, horsebrush, allscale, winter fat, box-thorn, and creosote bush. Joshua trees were also present. This habitat type is a sensitive natural community (CDFW 2018a), but it is a fairly common habitat in the West Mojave Desert. It ranges from the Antelope valley to the Northern Mojave region and east to the Barstow area. It is especially concentrated around dry lakebeds and in the Kramer Junction area (Menke et al. 2013).



Photograph 3-3. *Atriplex spinifera* Shrubland Alliance

***Atriplex polycarpa* Shrubland Alliance** (allscale scrub). Allscale scrub (Photograph 3-4) is typically found in washes and on playa lake beds and shores, dissected alluvial fans, rolling hills, terraces, and edges of large, low gradient washes at an elevation of -75 m to 1500 m. Soils may be carbonate-rich, alkaline, sandy, or sandy loam (Sawyer et al. 2009). This habitat type occurred only in Project Area #4 (Figure 3-3, Table 3-3) and was strongly dominated by allscale. Other shrubs were widely scattered and included white bursage, cheesebush, spinescale, winter fat, desert tomato, box-thorn, and creosote bush. Joshua tree were also noted. This alliance and the shrub associations that occurred in the Project Area are not sensitive natural communities (CDFW 2018a).



Photograph 3-4. *Atriplex polycarpa* Shrubland Alliance

Joshua trees, a species protected under the CDNPA, were scattered throughout most of the Project Area. Joshua tree woodland (*Yucca brevifolia* Woodland Alliance), a sensitive natural community (CDFW 2018a), occurred in small patches (up to 10-20 acres) in creosote bush – white bursage scrub and white bursage scrub but were not mapped. This habitat type is recognized when Joshua trees are evenly distributed at greater than or equal to one percent cover over the landscape. It generally occurs an elevation of 750-1800 m on alluvial fans, ridges, and gentle to moderate slopes with soils that are comprised of coarse sands, very fine silts, gravel, or sandy loams (Sawyer et al. 2009).



Photograph 3-5. Clay Pan

Habitat disturbances that were noted in the Project Area included underground gas transmission lines, overhead electrical transmission lines, dirt roads, railroad spur, bladed areas, borrow pits, and several trash dumps (Photographs 3-6, 3-7). Bladed areas were primarily unvegetated but did have

Scattered throughout the Project Area, but not mapped, were small clay pans or playatitas (Photograph 3-5). Clay pans have a high clay content and are dense, compact, and slowly permeable. They are usually barren of shrubs but may contain several annual plants, including special status annuals.



Photograph 3-6. Caltrans Borrow Pit

scattered annual vegetation and a few small saltbushes (*Atriplex* spp.). Older borrow pits were revegetating and were mapped as successional spinescale scrub. The gas transmission lines were also revegetating and were mapped as successional allscale – spinescale scrub (Figure 3-3). Existing infrastructure and other habitat disturbances occurring in the Project Area are more thoroughly described in the protocol wildlife survey report (EPC 2019).



Photograph 3-7. Trash Dump Site

Few noxious weeds, e.g., non-native mustards (*Brassica* spp. and *Sisymbrium* spp.) and Russian thistle (*Salsola tragus*), were noted during the habitat assessment. They occurred primarily along shoulders of the main dirt roads and along railroad tracks.

3.2.2 POTENTIALLY OCCURRING SPECIAL STATUS PLANTS

After the habitat assessment, each special status plant identified from the database search was given an occurrence potential rank (Table 3-1). Ten species were identified as likely or possible to occur while the remaining six species were noted as unlikely to occur. The ten likely or possible species are described below.

Desert Cymopterus (*Cymopterus deserticola*). The desert cymopterus is a deep-rooted, stemless perennial that usually grows to a height of 15 cm. Its leaf blades are 4-8 cm long, highly dissected and hairless. The inflorescence is compact and spherical with numerous purple flowers. The fruit is 5-7 mm long with narrowly winged ribs. With a flowering season from late March to early May, this rare species occurs an elevation of 700-1,310 m. It grows on alluvial plains in fine to coarse, sandy soil and in old dune areas that have deep, well-drained sand, typically in creosote bush scrub and Joshua tree woodland. The CNPS rank for the desert cymopterus is 1B. Threats to the desert cymopterus include grazing, off-highway vehicles, and development (Baldwin et al. 2012; CNPS 1978, 2019). Records show that it occurs in the Harper Dry Lake basin, Rogers Dry Lake basin from Kramer Junction to Edwards AFB, and Cuddeback Dry Lake basin, in Kern, Los Angeles and San Bernardino Counties. The majority of known populations occur on Edwards AFB and vicinity. This species also is known from the Project Area, in a large area south of Twenty Mule Team Road (Figure 3-1). It may occur at other sandy locations in the Project Area.

Recurved Larkspur (*Delphinium recuvatum*). Found in poorly drained, fine, alkaline soils in *Atriplex* scrub, this larkspur has light blue, reflexed sepals with lower petals that are white. It has somewhat glabrous herbage and grows to 18-85 cm. Recurved larkspur is endemic to California, with most populations occurring west of the Sierra Nevada crest. Two populations are known from the West Mojave Desert, one near Rosamond and one at a non-specific location on or near the west side of the Project Area (Figure 3-1). CNPS rank is 1B.

Barstow Woolly Sunflower (*Eriophyllum mohavense*). The Barstow woolly sunflower is a woolly, tufted, dwarf annual, measuring 1-2.5 cm tall and 2-3 cm wide. Leaves are spoon-to-wedge-shaped and sharply 3-toothed. Flower heads have 3-4 yellow disk flowers. It is found in fine gravelly, silty, sandy, or clay soils on level or sloping terrain, as well as in low-lying

depressions/desert playas. It grows in creosote bush or saltbush scrub at elevations of 500-800 m and typically flowers between April and May. The Barstow woolly sunflower occurs largely in west-central San Bernardino County and eastern Kern County. Known locations range from California City and northern Edwards AFB to Boron, Kramer Hills, Harper Dry Lake basin, Opal Mountain, and Cuddeback Dry Lake basin. Partly because it occurs in such a limited area, the CNPS rank is 1B. In general, threats to this rare species include energy development, military activities, vehicles/road construction, and grazing (Baldwin et al. 2012, CNPS 2019). Populations are known to occur along the southern boundary of the Project Area (Figure 3-1). Other populations may be found in areas surrounding the small clay pans.

Booth's Evening-primrose (*Eremothera boothii* ssp. *boothii*). Booth's evening-primrose is an annual herb in the Onagraceae family and is 15-40 cm tall with glandular and spreading hairs. Leaf blades are 30-80 mm, lanceolate to narrowly ovate with serrate edges. Flowers are white. Fruits measure 1.4-2 mm wide and are strongly wavy and twisted. The plant occurs on sandy flats and steep loose slopes in Joshua tree woodland (Baldwin et al. 2012). This species is known to occur at scattered locations across the Mojave Desert. The nearest population to the Project Area is about 15 km to the northeast (Figure 3-1). Potential habitat for this species occurs throughout the Project Area.

Sagebrush Loeflingia (*Loeflingia squarrosa* var. *artemisiarium*). Sagebrush loeflingia is a CNPS 2B plant, one that is rare or endangered in California but common elsewhere. It is an annual plant, 1-7 mm tall, much branched at base and glandular-hairy and somewhat fleshy. Leaf blade is 2-4 mm, oblong, and erect to somewhat spreading. It is distinguished from the other variety (*Loeflingia squarrosa* var. *squarrosa*) by shorter and wider leaf blades, shorter sepals (with straighter tips when fruiting), shorter stipules, no lateral spurs, and smaller fruit. It flowers in April and May and occurs on sandy flats and sand dunes at 700-1615 m in elevation. It occurs in southeast Kern County and northeast Los Angeles County as well as the Great Basin Desert region of California, Oregon, and Wyoming. Threats to this plant include grazing and vehicles (Baldwin et al. 2012, CNPS 2019). Populations are known from EAFB, south and southwest of the Project Area. It possibly occurs near the small clay pans in the Project Area (Figure 3-1).

White Pygmy-Poppy (*Canbya candida*). The white pygmy-poppy is a diminutive, tufted, hairless annual that grows 10-30 mm tall. Its basal leaves are fleshy and linear-oblong. Each flower has six separate petals that are ovate and white. The fruit is a small capsule with tiny brown seeds. Flowering occurs from April to May/June. It grows on sandy soil from 600 to 1,200 m elevation in creosote-bush scrub, saltbush scrub, Joshua tree woodland, and pinyon-juniper woodland. It tends to be encountered in sandy wash areas where the mountains reach the desert floor. This plant is ranked CNPS 4, a watch list that includes plants of limited distribution. Endemic to California, white pygmy-poppy populations have been found in Inyo, Kern, Los Angeles and San Bernardino Counties. The nearest known populations to Project Area are approximately 8 km east and 21 km southeast (Figure 3-1). Although it is not considered threatened at this time, it has been placed on the CNPS "watch list" because of its tiny size and limited range. This poppy could be affected in the future by urbanization and invasive non-native plant species (Baldwin et al. 2012, CNPS 2019). Potential habitat for white pygmy-poppy occurs throughout the Project Area.

Mojave Spineflower (*Chorizanthe spinosa*). Mojave spineflower is ranked CNPS 4. It is an annual and member of the buckwheat family. It grows 3-40 cm tall: stems are prostate to ascending, with oblong leaves that can vary from 3-20 mm in length. Bracts of the inflorescence are usually 3 per node and lanceolate. The involucral tube is 2-2.5 mm, urn shaped, with one of

five bracts longer than the others. Its white flowers are generally hairless, and the seeds are black. It blooms from April through July at elevations ranging from 600-1,300 m elevation. Because of its stout stems and involucres, Mojave spineflower skeletal remains persist in the environment long after the flowering period. This species is endemic to California and is known from Rabbit Springs in Lucerne Valley, San Bernardino County, northwest to Red Rock Canyon, Kern County. It was once considered a rare plant before thousands of plants were reported from Rosamond to Boron, Kern County. It prefers sandy areas or low-lying open soils with fine gravels in desert scrub plant communities. Threats to the spineflower include surface mining, energy development, vehicles, and grazing (Baldwin et al. 2012, Charlton 1992, CNPS 2019). It is expected to occur near the small clay pans in the Project Area.

Golden Goodmania (*Goodmania luteola*). In the buckwheat family, the golden goodmania is a spreading annual herb, 0.5 cm to 15 cm tall and wide. Leaves are opposite; the basal leaves are generally rounded while the cauline leaves are generally linear and awned. Inflorescences are terminal and cyme-like. The 5 involucral bracts are in one whorl and are narrow, glabrous and awned. The perianth consists of 6 yellow, entire lobes, and it has 9 stamens. The fruit is obconic and glabrous. Golden goodmania blooms from April to August and occurs in alkaline or clay soils in Mojavean desert scrub, meadows and seeps, and on playas at 20-2200 m elevation. Formerly known from the southern San Joaquin Valley, it is now extirpated there. Possible threats to the species include non-native plants, groundwater lowering, trampling by livestock, and development. Populations nearest the Project Area occur to the southwest, on EAFB (Baldwin et al. 2012, CNPS 2019). It possibly occurs near the small clay pans in the Project Area.

Crowned Muilla (*Muilla coronata*). Crowned muilla is a diminutive monocot, approximately 3-5 cm tall, in the brodiaea family. It's perianth is whitish to bluish with a green abaxial midvein. Stamens are 2-4 mm; filaments are dilated throughout with wide, overlapping margins forming the nectar tube with cylindric crown. It occurs in open desert scrub and woodland from 670-1960 m in elevation. A CNPS Rank 4 plant, it occurs in scattered locations throughout the Mojave Desert, including east and southeast of the Project Area (Baldwin et al. 2012, CNPS 2019). Crowned muilla has potential to occur throughout the Project Area.

Graceful Nemacladus (*Nemacladus gracilis*). In the bellflower family, this species is often overlooked due to its small stature and slender stems. Its inflorescence axis is straight or weakly zigzag. The corolla is white to lavender with lavender midveins. This CNPS Rank 4 plant inhabits rocky slopes and sandy washes from 120 m to 1900 m elevation. It is known from a few locations in the Mojave Desert, from Joshua Tree National Park to EAFB, and in the Tremblor Range. This plant is expected at other locations in suitable habitat. South of the Project Area, it is known from the Leuhman Ridge area (Baldwin et al. 2012, CNPS 2019). It may occur in sandy washes in the Project Area.

In addition to Joshua trees, other CDNPA plants that occurred or are expected to occur in the Project Area include silver cholla (*Cylindropuntia echinocarpa*) and beavertail (*Opuntia basilaris* var. *basilaris*), both in the cactus family. Silver cholla was noted at scattered locations during the habitat assessment. No beavertail was observed but it is expected to occur infrequently throughout the area.

3.3 PROTOCOL-LEVEL RARE PLANT SURVEY

3.3.1 REFERENCE SITE VISITS

Prior to the rare plant survey, the field crew visited reference sites for the three potentially occurring CNPS Rank 1B plants. On March 21, 2019, the field crew searched recurved larkspur on the west side of the Project Area (CNDDB Occurrence #69). No larkspurs were observed at this location. On April 1, 2019, the field crew searched for desert cymopterus near Aerial Acres (CNDDB Occurrence #9) and Barstow woolly sunflower east of Boron (CNDDB Occurrence #22). Approximately 20 desert cymopterus plants, mostly in flower, were observed on a stabilized dune with loose sandy soil. The plant community was creosote bush – white bursage scrub. Cheesebush and box-thorn were common associates. About 100 Barstow woolly sunflowers were found in an open area with silty sandy soil and on a low hill with gravel and rock pebbles. Both areas had creosote bush – white bursage scrub. Spinescale was a common associate. Plants were in bud and flower. Several Mojave spineflowers, a CNPS Rank 4 species, were also present and in leaf.

The field crew did not visit reference sites for the two potentially occurring CNPS Rank 2B plants or the other four CNPS Rank 4 plants. Nearby reference locations for sagebrush loeflingia were inaccessible because they were either on Edwards AFB or on Rio Tinto Mine property. The exact location of a nearby Booth's evening-primrose record was unknown and mapped only as a best guess by CNDDB (2019b). Most records for the CNPS Rank 4 plants have not been processed by CNDDB, occur on Edwards AFB, or are at nonspecific locations (CNDDB 2019a). Field crew lead Denise LaBerteaux checked a known location for white pygmy-poppy in Kelso Canyon, approximately 74 km from the Project Area, and found several in bloom in early April.

From these visits to rare plant reference locations, the field crew determined that desert cymopterus, Barstow woolly sunflower, and Mojave spineflower and possibly white pygmy-poppy would be visible during the time of the survey. Because the West Mojave Desert received above average rainfall during the previous fall and winter seasons, the other potentially occurring rare plants would likely be visible, as well, if present in the Project Area.

3.3.2 FLORA

Plants identified in the Project Area totaled 145 species in 31 plant families (Appendix A). The field crew recorded 125 native species, 18 non-native weedy species, and 2 non-native ornamentals. The annual flora of the Project Area was likely well represented due to above normal precipitation during the previous fall and winter.

Non-native, weedy annual herbs and grasses were common in the Project Area, especially in previously disturbed areas. Arabian and Mediterranean grass (*Schismus arabicus* and *S. barbatus*) and red-stemmed filaree (*Erodium cicutarium*) were ubiquitous. Weedy mustards, primarily species in the genus *Sisymbrium*, were the most evident along paved road shoulders, railroad right-of-way, edges of dirt roads, and in other disturbed area.

3.3.3 RARE PLANTS

Four rare plant species were encountered in the Project Area during the survey. These species were desert cymopterus, Barstow woolly sunflower, Mojave spineflower, and crowned muilla and were four of the ten species that were categorized during the habitat assessment as likely or possible in the Project Area (Table 3-1). The former two species are CNPS Rank 1B plants while the latter two are CNPS Rank 4 plants. Point and polygon data for these species are mapped in Figure 3-4.

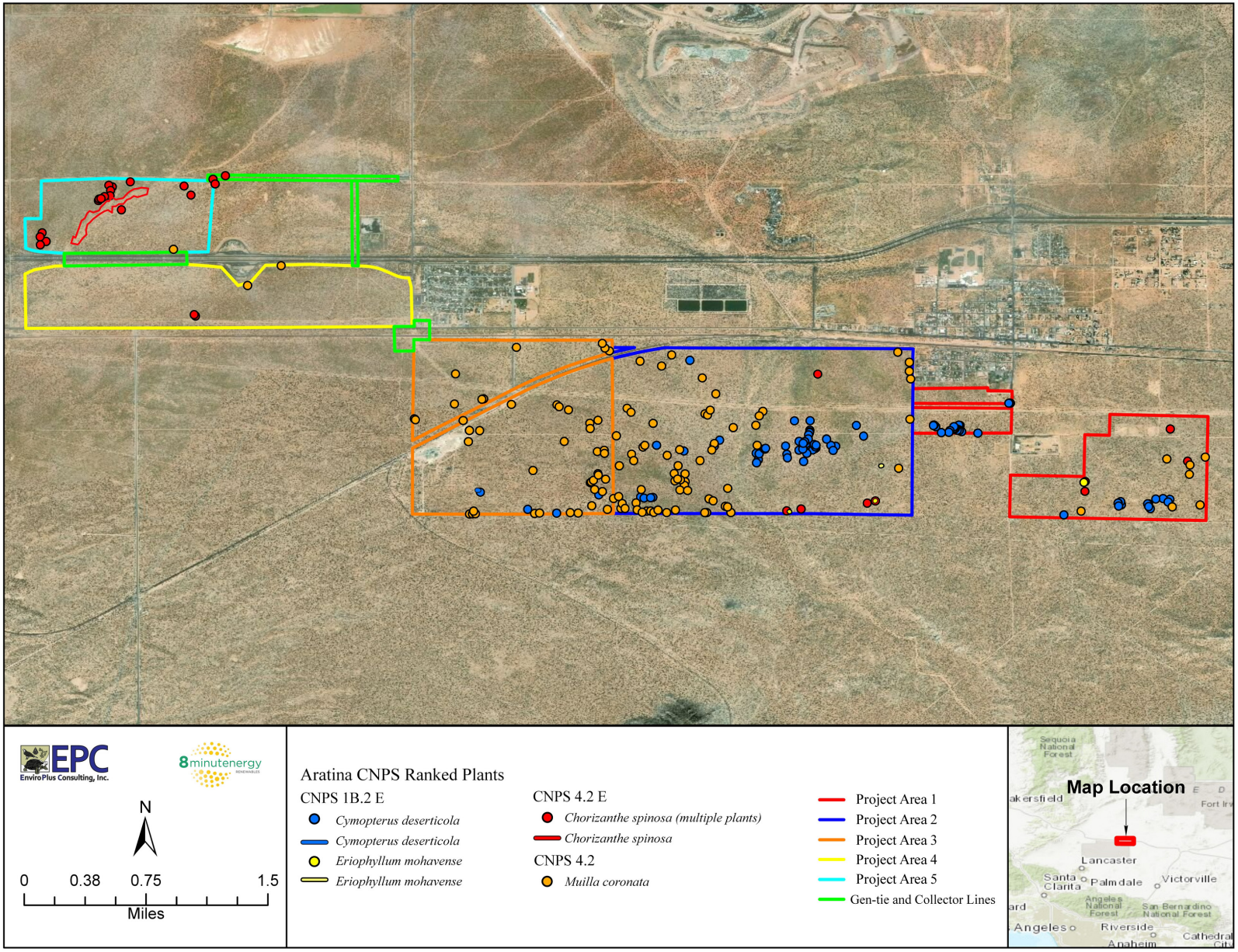


Figure 3-4. Special Status Plant Locations, Aratina Solar Farm

Desert Cymopterus. Desert cymopterus plants were found in a previously known occurrence area (CNDDB Occurrence #66; CNDDB 2019b), which contains Project Areas #1 and #2 (Figure 3-1), and in the adjacent area to the west, in Project Area #3 (Figure 3-4). A total of 132 plants were recorded. Desert cymopterus was not found in Project Areas #4 and #5 or along gen-tie routes. The number of individuals in each Project Area is listed in Table 3-4.

Table 3-4. Special Status Species and Number of Individuals in Project Area

Special Status Species	Project Area #1 # Plants	Project Area #2 # Plants	Project Area #3 # Plants	Project Area #4 # Plants	Project Area #5 # Plants	Gen-ties # Plants
Desert Cymopterus	61	61	10	0	0	0
Barstow Woolly Sunflower	1	68	0	0	0	0
Mojave Spineflower	146	207	0	103	131,223	4000
Crowned Muilla	20	392	521	4	1	0

Desert cymopterus occurred in open inter-shrub spaces with low densities of annual plants and fairly loose sandy soil (Photographs 3-8, 3-9). It did not occur in areas with extremely dense desert fiddleneck (*Amsinckia tessellata* var. *tessellata*). Desert cymopterus was primarily in creosote bush – white bursage scrub but also in creosote bush scrub and in small pockets of cheesebush scrub (*Ambrosia salsola* Shrubland Alliance). All communities had scattered Joshua trees. Commonly occurring shrub associates included box-thorn (*Lycium cooperi*), spiny hopsage (*Grayia spinosa*), desert tomato (*Lycium andersonii*), and goldenheads (*Acamptopappus sphaerocephalus*).



Photograph 3-8. Desert Cymopterus



Photograph 3-9. Desert Cymopterus Habitat

The desert cymopterus population area in the Project Area is considered a northern subpopulation of the much larger Rogers Dry Lake basin population, which primarily occurs on Edwards AFB. This mega population consists of sometimes widely separated subpopulations and extends approximately 48 km east-west from the Kramer Hills to Buckhorn Lake and about 30 km north-

south from Peerless Valley to just south of Rogers Dry Lake. A desert cymopterus survey on Edwards AFB in 1995, an exceptionally wet year, recorded 14,362 individuals at 76 subpopulation sites (Bagley 2006). Numbers previously reported in the Project Area, in the CNDDB Occurrence #66 area, were about 10 plants in the eastern portion and 38 plants in the western portion (CNDDB 2019b). The higher numbers reported in April 2019 can be attributed to above normal winter precipitation and a more thorough search for this species.

Barstow Woolly Sunflower. Barstow woolly sunflowers (Photograph 3-10) were recorded at four locations, one in Project Area #1 and three in Project Area #2 (Figure 3-4). They were not found in the other Project Areas or along gen-tie routes. The number of individuals totaled 69 (Table 3-4). Barstow woolly sunflowers occurred at the edges and in the cracks of small clay pans (Photograph 3-11). Soils consisted of sandy clay with or without a thin gravel surface of decomposed granite. Occasionally, the surface had scattered



Photograph 3-11. Barstow Woolly Sunflower Habitat

pebble-sized stones along with the gravel. Other annual species were typically sparse at these sites. Common associates, when they did occur, included Mojave spineflower, red-stemmed filaree (*Erodium cicutarium*), yellow peppergrass (*Lepidium flavum*), common goldfields (*Lasthenia californica*), and leafy-stemmed tickseed (*Leptosyne calliopsidea*). The habitat surrounding these sites was either spinescale scrub or creosote bush – white bursage scrub. As with desert cymopterus, the Barstow woolly sunflower sites in the Project Area are likely subpopulations of a much larger population of nearly 100,000 plants occurring in scattered subpopulations on Edwards AFB (CNDDB 2019b; Figure 3-1).



Photograph 3-10. Barstow Woolly Sunflower



Photograph 3-12. Mojave Spineflower

Mojave Spineflower. An estimated 135,679 Mojave spineflower plants were recorded in the Project Area. They were most abundant in Project Area #5 and along the northern gen-tie route (Figure 3-4), where an estimated 126,000 and 4,000 plants occurred (Table 3-4), respectively. Mojave spineflower habitat was similar to Barstow woolly sunflower habitat, and they co-occurred at a few locations. Mojave spineflowers were typically in clay pans and open flats of firm clayey soil with some sand on the surface or at edges of open flats in patches of goldfields (Photographs 3-12, 3-13). All locations were in spinescale scrub. Other common annuals included yellow peppergrass, snake's-head (*Malacothrix coulteri*), and red-stemmed filaree.



Photograph 3-13. Mojave Spineflower Habitat

Crowned Muilla. Crowned muilla (Photographs 3-15, 3-16) was found in all Project Areas but were most abundant in Project Areas #2 and #3 (Figure 3-4, Table 3-4). An estimated 938 plants were recorded in the Project Area. They mainly occurred in open areas in sandy soil but were also in silty loam and sometime gravel. Vegetation communities included creosote bush – white bursage scrub, creosote bush – allscale scrub, creosote bush – spinescale scrub, and spinescale scrub. Crowned muilla habitat seemed more generalized, and thus less predictable, than habitats for the other three special status plants.



Photograph 3-14. Crowned Muilla in Flower



Photograph 3-15. Crowned Muilla in Fruit

Other Potential Species. Since the field crew did not visit a reference site for every potentially occurring special status plant species, then it was not known if those species sprouted in 2019 and would be detectable during the survey. The likelihood that these species occur in the Project Area are described below:

Because desert larkspur (*Delphinium capitatum* ssp. *pauciflorum*) had sprouted and was observed in the Project Area (Appendix A), it is highly likely that recurved larkspur would have been up and visible, as well. The field crew found no recurved larkspur, so it is unlikely to occur in the Project Area.

Despite the excellent site conditions due to above normal fall/winter precipitation for many annual plant species, there were very few evening-primroses (*Eremothera boothii*). The individuals that occurred in the Project Area were identified as the common *E. b. desertorum* variety. Evening-primrose can be very abundant under certain conditions. Perhaps the conditions weren't ideal for this species in 2019. Because suitable habitat occurs, the status of the rare variety, Booth's evening-primrose, in the Project Area could not be determined.

Many loeflingia (*Loeflingia squarrosa*) plants were observed in the Project Area. Characteristics which separate the two varieties of this species are not readily visible. Individuals that were closely examined were the variety *L. s. squarrosa*, a common species in the area. However, since both varieties can co-occur (personal observation), the field crew may have overlooked the rare sagebrush loeflingia. Therefore, sagebrush loeflingia may occur in the Project Area.

The present of white pygmy-poppy at a known location in similar habitat suggests that this species should have been detectable in the Project Area during the survey. Therefore, this species likely does not occur.

Golden goodmania in other portions of the Antelope Valley occupy sites with alkaline soil. This soil type was not present in the Project Area to support a golden goodmania population.

Being an obscure, easily overlooked plant, graceful nemacladus could occur in the Project Area, in areas with sandy or gravelly soils. There is an unprocessed CNDDB QuickView record (CNDDB 2019a) to the south of the Project Area on Edwards AFB.

3.3.4 CDNPA PLANTS

Four CDNPA species were recorded in the Project Area and included silver cholla (*Cylindropuntia echinocarpa*), diamond cholla (*Cylindropuntia ramosissima*), beavertail (*Opuntia basilaris* var. *basilaris*), and Joshua tree (*Yucca brevifolia*). A total of 4,500 CDNPA plants were recorded in the Project Area during the survey. The number in each Project Area and along gen-tie routes are provided in Table 3-5. All CDNPA plants are mapped in Figures 3-5 and 3-6.

Table 3-5. CDNPA Plants and Number of Individuals in Project Area

CDNPA Plants		Project Area #1 # Plants	Project Area #2 # Plants	Project Area #3 # Plants	Project Area #4 # Plants	Project Area #5 # Plants	Gen-ties # Plants
Silver Cholla		34	98	36	6	20	2
Diamond Cholla		0	1	1	0	0	0
Beavertail		4	12	10	0	0	0
Joshua Tree	<2 ft tall	37	156	43	11	7	6
	2-8 ft tall	211	939	251	128	28	13
	>8 ft tall	211	1317	641	184	46	13
	uncategorized	1	31	1	1	0	0
	total	460	2443	936	324	81	32

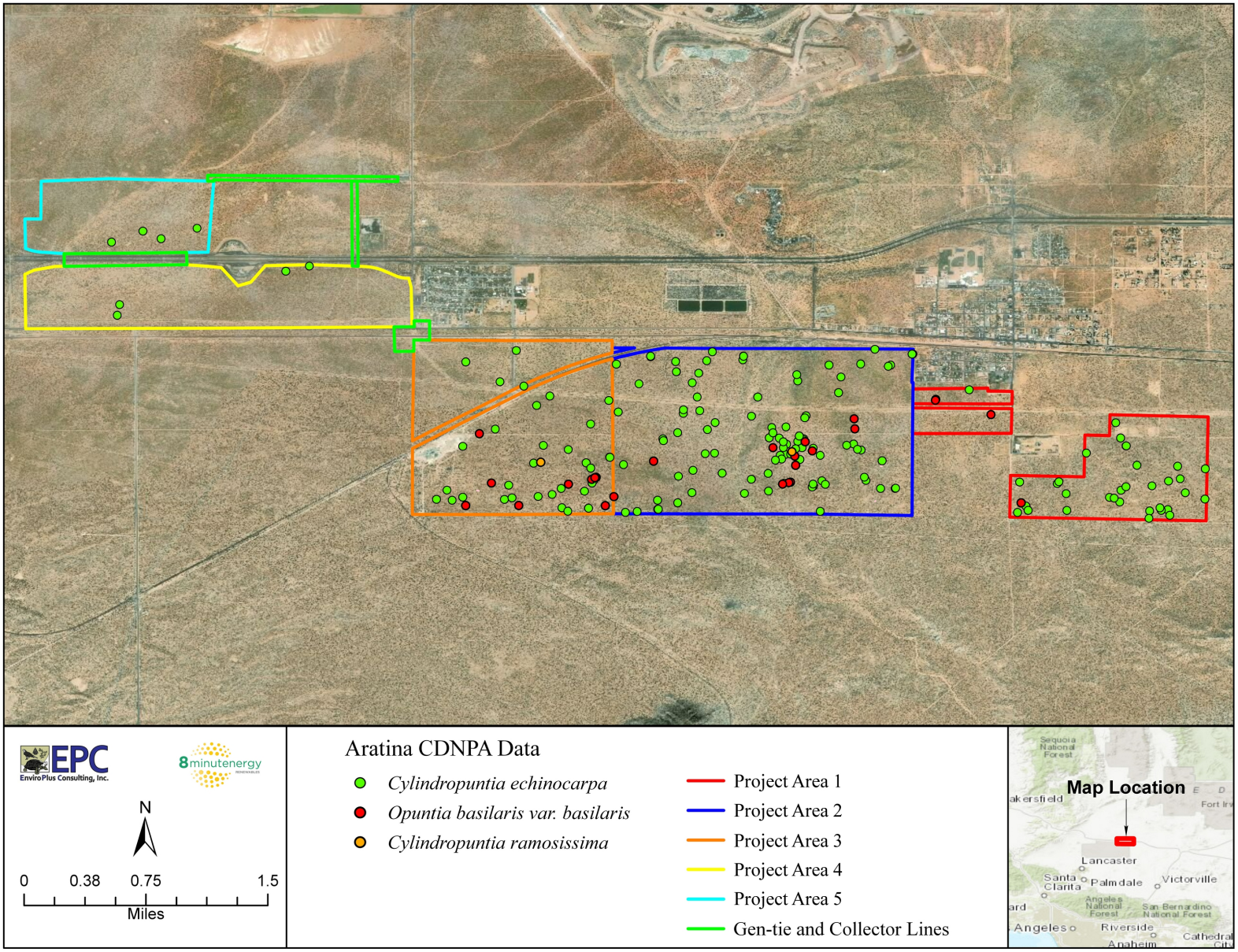


Figure 3-5. CDNPA Plants (Cacti)

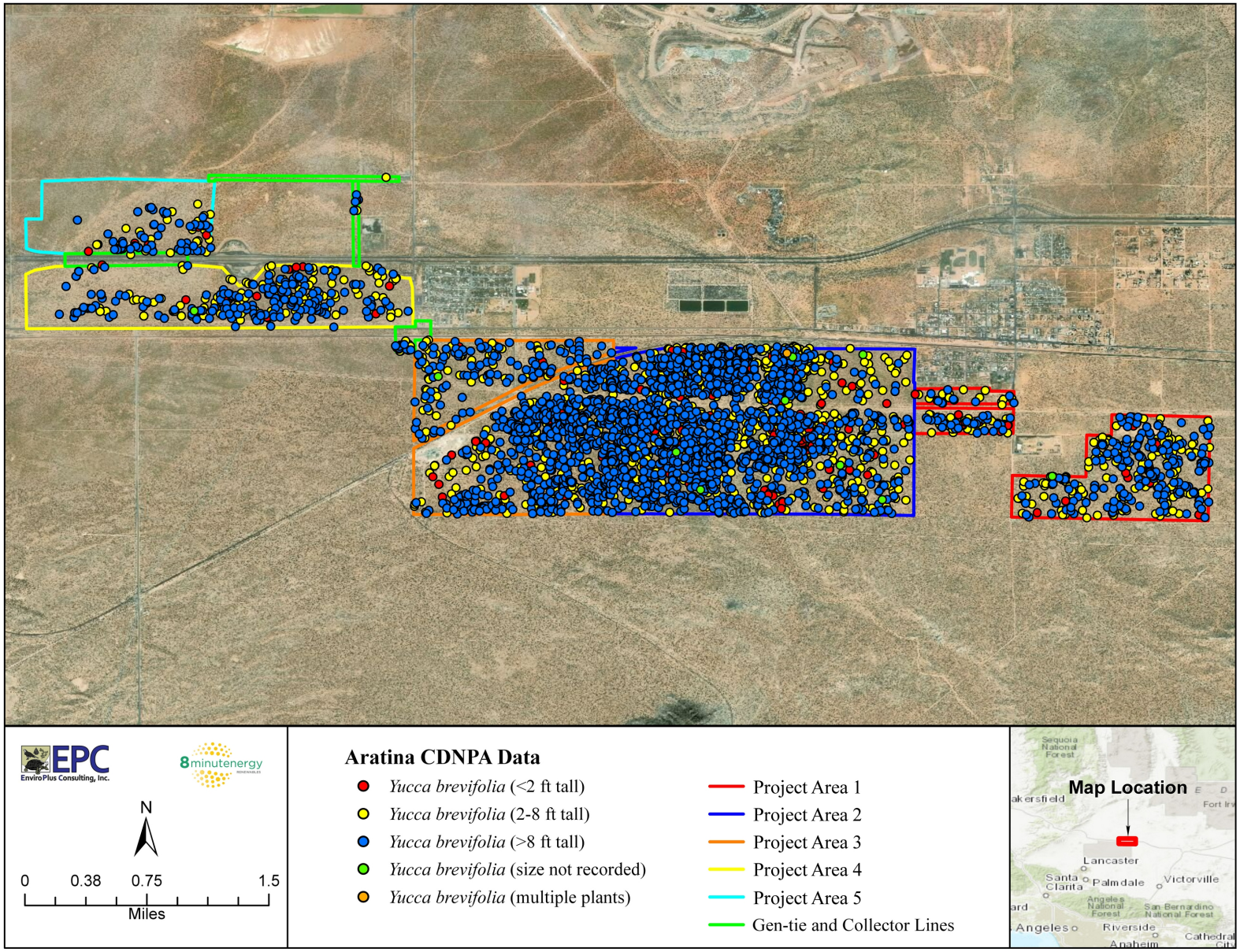


Figure 3-6. CDNPA Plants (Joshua Trees)

4. DISCUSSION

This protocol-level rare plant survey found four special status rare plant species in the proposed Aratina Solar Farm project area. The rare plants were desert cymopterus and Barstow woolly sunflower, both of which are rare and endangered in California and elsewhere (CNPS Rank 1B species), and Mojave spineflower and crowned muilla, which are on a watch list of plants with limited distribution and limited information (CNPS Rank 4 species). Most of these species were expected, as they were known to occur in or near the Project Area. Not only do these species have special status, three of them are endemic to the region (Table 3-1), occurring nowhere else in the world.

Two sensitive natural habitats, spinescale scrub and Joshua tree woodland, also occurred in the Project Area. Spinescale is another California endemic plant, only occurring from the West Mojave Desert region to the northern Transverse Range, southern San Joaquin Valley, and inner South Coast Range (Baldwin et al. 2012). Spinescale-dominated scrub communities also occur in these regions. While Joshua trees inhabited most of the Project Area, Joshua tree woodland occurred in only in small, 10-ac to 20-ac, patches and mainly in CUP Areas #2 and #3.

Four CDNPA plant species occurred in the Project Area. They may not be harvested except under a permit issued by the Kern County agricultural commissioner or sheriff as per the California Food and Agricultural Code, Section 80071-80075. Kern County requires that the California Desert Native Plants Application To Harvest Native Plants be submitted and approved prior to the harvesting, cutting, and salvaging of CDNPA plants (Kern County 2002). Avoidance of CDNPA plants may be possible along gen-tie routes. However, in the solar array areas and along collector lines, some of these plants could be relocated off-site or replanted on-site during project restoration.

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APPENDIX A
Plant List

FAMILY SCIENTIFIC NAME	COMMON NAME	HABIT
EUDICOT FLOWERING PLANTS		
APIACEAE	**CARROT FAMILY**	
Cymopterus deserticola[1]	desert cymopterus	perennial herb
Lomatium mohavense	Mojave parsley	perennial herb
ASTERACEAE	**SUNFLOWER FAMILY**	
Acamptopappus sphaerocephalus var. *hirtellus*	goldenhead	shrub
Ambrosia acanthicarpa	annual bur-sage	annual herb
Ambrosia dumosa	burro bush	shrub
Ambrosia salsola	cheesebush	shrub
Chaenactis carphoclinia var. *carphoclinia*	pebble pincushion	annual herb
Chaenactis fremontii	Fremont pincushion	annual herb
Chaenactis stevioides	desert pincushion	annual herb
Chaenactis xantiana	fleshy pincushion	annual herb
Ericameria cooperi var. *cooperi*	Cooper's goldenbush	shrub
Ericameria nauseosa	rubber rabbitbrush	shrub
Eriophyllum mohavense[1]	Barstow woolly sunflower	annual herb
Eriophyllum wallacei	Wallace's woolly daisy	annual herb
Lasthenia gracilis	common goldfields	annual herb
Layia glandulosa	white layia	annual herb
Leptosyne bigelovii	Bigelow tickseed	annual herb
Leptosyne calliopsidea	leafy-stemmed tickseed	annual herb
Lessingia glandulifera	vinegar-weed	annual herb
Malacothrix coulteri	snake's-head	annual herb
Malacothrix glabrata	desert dandelion	annual herb
Matricaria discoidea[3]	pineapple weed	annual herb
Rafinesquia neomexicana	desert chicory	annual herb
Stephanomeria exigua	annual mitra	annual herb
Stephanomeria parryi	Parry rock pink	perennial herb
Stephanomeria pauciflora	wire-lettuce	perennial herb/subshrub
Stylocline psilocarphoides	peck neststraw	annual herb
Syntrichopappus fremontii	Fremont gold	annual herb
Tetradymia axillaris var. *longispina*	cottonthorn	shrub
Tetradymia stenolepis	horsebrush	shrub
BORAGINACEAE	**BORAGE FAMILY**	
Amsinckia menziesii	common fiddleneck	annual herb
Amsinckia tessellata var. *tessellata*	desert fiddleneck	annual herb
Cryptantha circumscissa var. *circumscissa*	capped cryptantha	annual herb
Cryptantha decipiens	gravel cryptantha	annual herb
Cryptantha dumetorum	scrambling cryptantha	annual herb
Cryptantha micrantha var. *micrantha*	red-root cryptantha	annual herb
Cryptantha nevadensis var. *nevadensis*	Nevada cryptantha	annual herb
Cryptantha pterocarya var. *pterocarya*	wing-nut cryptantha	annual herb
Nama demissum var. *demissum*	purple mat	annual herb
Pectocarya heterocarpa	mixed-nut pectocarya	annual herb
Pectocarya linearis ssp. *ferocula*	narrow-toothed pectocarya	annual herb
Pectocarya penicillata	northern pectocarya	annual herb
Phacelia distans	lace-leaf phacelia	annual herb
Phacelia fremontii	yellowthroats	annual herb
Phacelia tanacetifolia	tansy phacelia	annual herb
Phacelia vallis-mortae	Death Valley phacelia	annual herb

FAMILY SCIENTIFIC NAME	COMMON NAME	HABIT
Plagiobothrys arizonicus	Arizona popcornflower	annual herb
Tiquilia plicata	fan-leaved tiquilia	annual herb
BRASSICACEAE	**MUSTARD FAMILY**	
Brassica tournefortii[3]	Saharan mustard	annual herb
Caulanthus cooperi	Cooper mustard	annual herb
Caulanthus inflatus	desert candle	annual herb
Caulanthus lasiophyllus	California mustard	annual herb
Chorispora tenella[3]	Chorispora	annual herb
Descurainia pinnata	western tansy-mustard	annual herb
Descurainia sophia[3]	flixweed	annual herb
Hirschfeldia incana[3]	Mediterranean mustard	annual/perennial herb
Lepidium dictyotum	peppergrass	annual herb
Lepidium flavum	yellow peppergrass	annual herb
Lepidium fremontii	bush peppergrass	shrub
Lepidium lasiophyllum ssp. *lasiophyllum*	modest peppergrass	annual herb
Sisymbrium altissimum[3]	tumble mustard	annual herb
Sisymbrium irio[3]	London rocket	annual herb
Sisymbrium orientale[3]	oriental hedge mustard	annual herb
Tropidoocarpum gracile	slender keel-fruit	annual herb
CACTACEAE	**CACTUS FAMILY**	
Cylindropuntia echinocarpa[2]	silver cholla	perennial stem succulent
Cylindropuntia ramosissima[2]	pencil cactus	perennial stem succulent
Opuntia basilaris var. *basilaris*[2]	beavertail	perennial stem succulent
CAMPANULACEAE	**BELLFLOWER FAMILY**	
Nemacladus sigmoides	Inyo threadplant	annual herb
CARYOPHYLLACEAE	**PINK FAMILY**	
Loeflingia squarrosa var. *squarrosa*	spreading pygmyleaf	annual herb
Spergularia sp.[3]	sand-spurrey	annual herb
CHENOPODIACEAE	**GOOSEFOOT FAMILY**	
Atriplex canescens var. *canescens*	four-wing saltbush	shrub
Atriplex confertifolia	shadscale	shrub
Atriplex polycarpa	allscale	shrub
Atriplex spinifera	spinescale	shrub
Grayia spinosa	spiny hope-sage	shrub
Kraschenninikovia lanata	winter fat	shrub
Salsola tragus[3]	Russian-thistle	annual herb
Stutzia covillei	Coville's orach	annual herb
CLEOMACEAE	**SPIDERFLOWER FAMILY**	
Cleomella obtusifolia	Mojave stinkweed	annual herb
Peritoma arborea	bladderpod	shrub
EUPHORBIACEAE	**SPURGE FAMILY**	
Croton californicus	California croton	perennial herb
Euphorbia albomarginata	rattlesnake weed	perennial herb
Stillingia paucidentata	stillingia	perennial herb
FABACEAE	**LEGUME FAMILY**	
Acmispon brachycarpus	short-podded acmispon	annual herb
Astragalus acutirostris	keel beak	annual herb
Astragalus didymocarpus	two-seeded milkvetch	annual herb
Astragalus layneae	Layne milkvetch	annual herb

FAMILY SCIENTIFIC NAME	COMMON NAME	HABIT
Astragalus lentiginosus var. *variabilis*	freckled milkvetch	perennial herb
Lupinus odoratus	Mojave lupine	annual herb
Lupinus shockleyi	desert lupine	annual herb
GERANIACEAE	**GERANIUM FAMILY**	
Erodium cicutarium[3]	red-stemmed filaree	annual herb
LAMIACEAE	**MINT FAMILY**	
Salvia carduacea	thistle sage	annual herb
LOASACEAE	**LOASA FAMILY**	
Mentzelia albicaulis	white-stemmed stick-leaf	annual herb
Mentzelia congesta	flower baskets	annual herb
MALVACEAE	**MYRTLE FAMILY**	
Eremalche exilis	white mallow	annual herb
Sphaeralcea ambigua var. *ambigua*	apricot mallow	subshrub
MONTIACEAE	**MINER"S LETTUCE FAMILY**	
Calyptridium monandrum	pussypaws	annual herb
NYCTAGINACEAE	**FOUR O'CLOCK FAMILY**	
Abonia pogonantha	Mojave sand-verbena	annual herb
Mirabilis laevis	wishbone bush	perennial herb
ONAGACEAE	**EVENING PRIMROSE FAMILY**	
Camissonia campestris ssp. *campestris*	Mojave sun cup	annual herb
Chylismia claviformis	brown-eyed evening-primrose	annual herb
Eremothera boothii ssp. *desertorum*	dwarf evening-primrose	annual herb
Oenothera deltoides	devil's lantern	annual herb
Tetrapteron palmeri	Palmer primrose	annual herb
OROBANCHACEAE	**BROOMRAPE FAMILY**	
Castilleja exserta ssp. *venusta*	purple owl's-clover	annual herb
PAPAVERACEAE	**POPPY FAMILY**	
Eschscholzia minutiflora var. *minutiflora*	little gold-poppy	annual herb
POLEMONIACEAE	**PHLOX FAMILY**	
Eriastrum eremicum ssp. *eremicum*	desert woollystar	annual herb
Gilia latiflora ssp. *davyi*	Davy's broad-flowered gilia	annual herb
Gilia minor	little gilia	annual herb
Gilia sp.	gilia	annual herb
Linanthus bigelovii	Bigelow linanthus	annual herb
Linanthus dichotomus	evening snow	annual herb
Linanthus parryae	sandblossoms	annual herb
Loeseliastrum matthewsii	desert calico	annual herb
POLYGONACEAE	**BUCKWHEAT FAMILY**	
Chorizanthe brevicornu var. *brevicornu*	brittle spineflower	annual herb
Chorizanthe rigida	devil's spineflower	annual herb
Chorizanthe spinosa[1]	Mojave spineflower	annual herb
Chorizanthe watsonii	Watson's spineflower	annual herb
Eriogonum deflexum ssp. *deflexum*	flat-topped skeleton weed	annual herb
Eriogonum gracillimum	rose-and-white wild buckwheat	annual herb
Eriogonum maculatum	spotted wild buckwheat	annual herb
Eriogonum pusillum	yellow turbans	annual herb
Eriogonum reniforme	kidney-leaf wild buckwheat	annual herb
Rumex hymenosepalus	wild-rhubarb	perennial herb

FAMILY SCIENTIFIC NAME	COMMON NAME	HABIT
SIMAROUBACEAE	**QUASSIA FAMILY**	
Ailanthus altissima[4]	tree of heaven	tree
SOLANACEAE	**NIGHTSHADE FAMILY**	
Datura wrightii	jimson weed	annual/perennial herb
Lycium andersonii	desert tomato	shrub
Lycium cooperi	box-thorn	shrub
TAMARICACEAE	**TAMARISK FAMILY**	
Tamarix aphylla[4]	athel	tree
ZYGOPHYLLACEAE	**CALTROP FAMILY**	
Larrea tridentata	creosote bush	shrub
Tribulus terrestris[3]	puncture vine	annual herb
MONOCOT FLOWERING PLANTS		
AGAVACEAE	**CENTURY PLANT FAMILY**	
Yucca brevifolia[2]	Joshua tree	perennial leaf succulent
POACEAE	**GRASS FAMILY**	
Arundo donax[3]	giant reed	perennial grass
Bromus madritensis ssp. *rubens*[3]	red brome, foxtail chess	annual grass
Bromus tectorum[3]	cheatgrass	annual grass
Elymus elymoides	squirreltail	perennial grass
Hordeum murinum ssp. *leporinum*[3]	hare barley	annual grass
Schismus arabicus[3]	Arabian grass	annual grass
Schismus barbatus[3]	Mediterranean grass	annual grass
Stipa hymenoides	sand rice grass	perennial grass
Stipa speciosa	desert needlegrass	perennial grass
MELANTHIACEAE	**FALSE-HELLBORE FAMILY**	
Toxicoscordion brevibracteatum	death camas	bulbous perennial herb
THEMIDACEAE	**BRODIAEA FAMILY**	
Dichelostemma capitatum ssp. *pauciflorum*	blue dicks	cormous perennial herb
Muilla coronata[1]	crowned muilla	cormous perennial herb
TYPHACEAE	**CATTAIL FAMILY**	
Typha sp.	cattail	perennial grass-like

[1] special status species
[2] CDNPA species
[3] non-native weed
[4] non-native ornamental

APPENDIX F

Wildlife Survey of the Proposed Aratina Solar Project, Kern County, California

Wildlife Survey of the Proposed Aratina Solar Project, Kern County, California

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EXECUTIVE SUMMARY

64NB 8ME LLC proposes to develop a photovoltaic energy facility (up to 600 megawatts-alternating current identified as the Aratina Solar Farm (Aratina). Aratina is located within an unincorporated area of southeastern Kern County, California to the south and west of the unincorporated community of Boron. The project consists of portions of 27 parcels of private land totaling 2,667.1 gross acres divided into five Project Areas. Additional project components include a transmission line (gen-tie) route to connect to the Holgate Substation and collector line alternatives to connect remote portions of the photovoltaic field to the project substation. Those portions of the Project Areas that are proposed for development, the gen-tie route alternatives, and collector line alternatives are collectively identified as the Project Area.

This report details the results of protocol wildlife surveys conducted during the spring of 2019. No definitive sign of habitation by the state and federally Threatened desert tortoise (*Gopherus agassizii*) was detected. The disarticulated carcass remains of an adult female tortoise with a maximum carapace length of 240 mm was located. The animal was estimated to have died over 4 years prior to the observation. Approximately 50 meters to the south-southeast, a Class 3 burrow (deteriorated condition, definitely tortoise) was located. It appeared likely that this burrow belonged to the tortoise whose carcass was located.

The only other potential tortoise sign detected included seven Class 4 burrows (deteriorated condition, possibly tortoise). When burrows deteriorate from weathering and disuse, it is often difficult to determine the species that created or last inhabited the burrow and the observation of Class 4 burrows alone is not indicative of desert tortoise habitation.

No live tortoises, scat, high quality burrows, tracks, courtship rings, or eggs or fragments thereof, or drinking depressions were detected. Observation of any of these items would indicate current habitation by the species.

Detection of the California Threatened Mohave ground squirrel (*Xerospermophilus mohavensis;* MGS) requires trapping surveys during specific time periods. MGS trapping was outside the scope of the current survey and not conducted. However, a habitat assessment was conducted for MGS by Dr. Philip Leitner between February 9 and 12, 2019. This habitat assessment was completed to determine the potential for occurrence as well as impacts to this species from proposed project development.

Given the intact nature of the vegetation communities, limited human disturbances, the appropriate soil types for burrow construction, and the availability of forage and cover from predators and weather events, Dr. Philip Leitner concluded that the proposed Aratina Project Area could support a MGS population. During the botanical survey, a botanist who is also experienced with MGS, heard a MGS. Additional MGS-focused work may be conducted by Dr. Leitner to quantify the potential for MGS occupation of the site.

No live burrowing owls (State Species of Special Concern) were observed within the Project Area but two active and three inactive burrows were noted. These data suggest the potential for limited habitation of the Project Area by burrowing owl.

A total of 152 desert kit fox dens were located. Of these four were pupping (natal) dens with evidence of pups present, 11 appeared active, and 137 appeared inactive. These data confirm that desert kit fox occupy portions of the site. Desert kit fox are protected under Title 14 of the California Code of Regulations, Section 460 and “may not be taken at any time”.

The survey effort followed both U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) protocols for desert tortoise and CDFW guidelines for burrowing owl. In addition to the Project Area, surveys encompassed a 150-meter wide buffer as per burrowing owl guidelines.

PROJECT DESCRIPTION

64NB 8ME LLC (Applicant) proposes to develop a photovoltaic energy facility (up to 600 MW-AC) identified as the Aratina Solar Farm (Aratina). Power generated by Aratina would be delivered from the site via up to 230 kilovolt (kV) overhead and/or underground electrical transmission line(s) (gen-tie lines) originating from one or more on-site substation(s) and terminating at the SCE Holgate Substation. Alternatively, Aratina may interconnect at the SCE Kramer Substation in San Bernardino County via an up to 230 kV transmission line located in an Edwards Air Force Base utility corridor. Electrical collector lines may be utilized to connect remote portions of the photovoltaic field to the project substation. The "Project Area" is defined as the sum of total potential area could be utilized to develop the photovoltaic energy facility, gen-tie lines, and collector lines.

Each Aratina Project Area may include an operations & maintenance (O&M) buildings, substations, energy storage systems (ESSs), and/or transmission facilities, as necessary, or it may share such facilities with each other or with any future energy projects in the area, and/or it may be remotely operated. Any "unused" O&M building, substation, and/or transmission facility areas on-site may be covered by solar panels under such scenarios.

Aratina comprises 27 assessor's parcels totaling approximately 2,700 gross acres (Table 1) that has been divided into five Project Areas. Typical habitat for each of the five Project Areas is shown in Photographs 1 to 5. The permanent disturbance acreage associated with development of the solar facility and associated infrastructure (Project Site) within the Project Area would be less than the gross acreage of the Project Area. The Project Area is south of the existing U.S. Borax mine in Boron. The topography of the Project Area is relatively flat.

Table 1. Parcel Information for Each of Five Project Areas on the Aratina Solar Farm

Project Area #1

APN[1]	Owner	General Plan	Zoning[2]	Gross Acreage
244-010-04	Cho Family Trust	8.3, 8.5	R-1	72.5
244-010-19	Linda Pietrangelo	8.3	A-1	10.2
244-010-20	Linda Pietrangelo	8.3	A-1	10.2
244-010-21	Linda Pietrangelo	8.3	A-1	10.2
244-010-22	Linda Pietrangelo	8.3	A-1	10.2
244-010-36	Genus	8.3	A-1	259.3
Total Project Area #1				**372.4**

Project Area #2

APN	Owner	General Plan	Zoning	Gross Acreage
244-010-01	Su John Rosa Chen	8.3	A-1	10.0
244-010-02	Su John Rosa Chen	8.3	A-1	10.0
244-010-33	Su John Rosa Chen	8.3	A-1, R-1	302.1
244-040-03	GM Gabrych Family	8.3	A-1	635.2
Total Project Area #2				**957.3**

Project Area #3

APN	Owner	General Plan	Zoning	Gross Acreage
232-140-09	Crane	8.5	A-1	14.7
232-140-11	Crane	8.5	M-1	11.2
244-040-07	Doraland	7.1	M-1	155.0
244-040-10	Crane	7.1	M-1	20.0
244-040-11	John Finne	7.1	M-1	28.5
244-040-12	John Finne	7.1	M-1	28.5
244-040-14	Britton Associates LLC	7.1	M-1	120.0
244-040-15	Britton Associates LLC	7.1	M-1	158.0
244-040-17	Crane	7.1	M-1	26.1
244-040-19	John Finne	7.1	M-1	20.0
244-040-20	Crane	7.1	M-1	20.0
244-040-21	Tim Cao	7.1	M-1	17.0
244-040-22	Desert Lake Comm Service Dist	7.1	M-1	1.0
244-040-23	Doraland	7.1	M-1	26.2
Total Project Area #3				**646.0**

Project Area #4

APN	Owner	General Plan	Zoning	Gross Acreage
232-081-10	John Hui	8.3	A-1	221.3
232-220-36	Illy King (partial[3])	8.5	A-1	221.1
Total Project Area #4				**442.4**

Project Area #5

APN	Owner	General Plan	Zoning	Gross Acreage
232-220-37	Illy King (partial[3])	8.5/2.5	A-1	249.0
Total Project Area #5				**249.0**

Total Aratina	**2667.1**

1 – APN – Accessor's parcel number

2 - Land use zoning codes

R-1 – Low-density residential – traditional small lot single-family homes and compatible uses with a maximum density limited to 10 dwelling units per acre

A-1 – Limited agriculture - Combination of estate-type residential development, agricultural uses, and other compatible uses

M-1 – Light industrial - wholesale commercial, storage, trucking, assembly-type manufacturing, and other similar industrial uses. Processing or fabrication will be limited to activities conducted within a building that does not emit fumes, odor, dust, smoke, or gas beyond the confines of the building within which the activities occur or produce significant levels of noise or vibration.

3 – The acreage for parcels 232-220-36 and 232-220-37 excludes portions of those areas zoned as commercial.

The construction period for Aratina, from site preparation through construction, testing, and commercial operation, is expected to commence as early as Q4 2021 and will extend for approximately 12 to 18 months.

Construction of the facility will include the following activities:

- Site preparation
- Grading and earthwork
- Concrete foundations
- Structural steel work
- Electrical/instrumentation work
- Collector line installation
- Architecture and landscaping

No roadways will be affected by Aratina, except during the Project's construction period. Construction traffic will access the Site from Gephart Road, Del Oro Street, Boron Avenue, and/or Twenty Mule Team Road. It is estimated that up to 1,000 workers per day (during peak construction periods) will be required during the construction of the Project.

Heavy construction is expected to occur between 6:00 am and 5:00 pm, Monday through Friday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities. Some activities may continue 24 hours per day, seven days per week. Low level noise activities may potentially occur between the hours of 10:00 pm and 7:00 am. Nighttime activities could potentially include, but are not limited to, refueling equipment, staging material for the following day's construction activities, quality assurance/control, and commissioning.

Materials and supplies will be delivered to the Project Area by truck. Truck deliveries will normally occur during daylight hours. However, there will be offloading and/or transporting to the Project Area on weekends and during evening hours.

Earthmoving activities are expected to be limited to the construction of the access roads, any O&M building, any substation, any energy storage systems, and any storm water protection or storage (detention) facilities. Final grading may include revegetation with low lying grass or applying earth-binding materials to disturbed areas.

Each Aratina Project Area could require an operational staff of up to five full-time employees. As noted earlier, it is possible that the Project would share O&M, substation, and/or transmission facilities with each other, or with any future energy projects nearby. In such a scenario, the projects would share personnel, thereby potentially reducing the Project's on-site staff.

The facility would operate seven days a week, 24 hours a day, generating electricity during normal daylight hours when the solar energy is available. Maintenance activities may occur seven days a week, 24 hours a day to ensure PV panel output when solar energy is available.

After the useful life of the Project, the panels will be disassembled from the mounting frames and the Site restored to its pre-development condition.

PROJECT AREA DESCRIPTION

The Project Area lies within an unincorporated area in the southeastern corner of Kern County, California, to the south and west of the unincorporated community of Boron (Figure 1). The Project Area is located on private land located on the Boron and Lehman Ridge USGS 1:24000 quadrangles. Cadastrally, the Project Area includes the following:

- Township 11N, Range 8W – portions of Sections 27, 33, 34
- Township 10N, Range 8W – Sections 1 and 2
- Township 10N, Range 7W – portions of Sections 5 and 6

The Project Area is bounded as follows:

- North – an Antelope Valley East Kern Water Agency pipeline right-of-way
- West – Gephart Road
- South – Edwards Air Force Base
- East – the Kern-San Bernardino County line

The Project Area lies outside of designated desert tortoise critical habitat. The nearest critical habitat is the Fremont-Kramer unit that lies adjacent to the southeast corner of the Project Area (Figure 2, USFWS 2011) on Edwards Air Force Base (EAFB) lands.

The Project Area is within the Antelope Valley which generally lies between the Tehachapi and San Gabriel Mountains. Elevations within the Project Area range from 2542 feet in the southeast corner to 2340 feet in the southwest corner. The Project Area is relatively flat with some slight undulations in the western area. Drainage in the western area is to the north and northwest. Further to the west the drainage pattern transitions to westerly and then southwesterly drainage towards Rogers Dry Lake located three miles southwest of the Project Area.

Due to the relatively flat terrain over most of the Project Area, hydrology is largely characterized by percolation. However, there are a couple of small to medium sized washes that provide drainage. One is located in Project Area #2 and drains to the north while the other is in Project Areas #4 and #5 (Photo 6) and drains to the southwest.

There are several constructed features within and in the vicinity of the Project Area. The unincorporated community of Boron (population 2,253 in 2010 census) is located adjacent to and north of Project Area #1 and adjacent to and east of Project Area #2. The unincorporated community of Desert Lake (no population data) is located adjacent to and north of Project Area #3 and adjacent to and east of Project Area #4. A Kern County waste disposal site is located along Boron Avenue in the vicinity of Project Area #1.

State Route (SR) 58, a four-lane divided highway traverses east-west between Project Area #4 and Project Area #5 with a rest area between the two Project Areas. Twenty Mule Team Road, a two-lane paved road that becomes four-lane within Boron, is an east-west road that forms the southern boundary of Project Area #4 and the northern boundary of Project Areas #2 and #3. Gephart Road, a two-lane paved north-south paved road forms the western boundary of the Project Area and generally provides access to the Rio Tinto Borates Mine (largest Borax mine in the world) located a mile to the north. Two miles east of Gephart Road, Borax Road, another two-lane paved road, provides primary access to the Rio Tinto facility and forms the eastern boundary of Project Area #4. An unnamed paved road connects Twenty Mule Team Road to a small railroad transfer facility within Project Area #3. There are also numerous dirt roads throughout the Project Area typically associated with utility corridors.

A single line railroad (Burlington Northern and Santa Fe Railway formerly Atchison, Topeka, and Santa Fe Railway) parallels Twenty Mule Team Road to the south along the northern boundary of Project Areas #2 and #3 and along the southern boundary of Project Area #4. A spur line of this railroad cuts through the northwestern corner of Project Area #2 and traverses southwesterly through Project Area #3 bisecting it into two areas. Adjacent to this spur within Project Area #3 is a large area of whitish material that is approximately 15 acres in size. Near this area is a small transfer facility designed to convey bulk material from trucks to railroad cars.

Multiple utilities including a water pipeline, electrical transmission and distribution lines and gas pipelines traverse the Project Area. The Antelope Valley East Kern Water Agency water pipeline and its associated right-of-way road form the northern boundary of Project Area #5 and it traverses through the gen-tie route to the Holgate substation.

Two transmission lines parallel the north-south collector line between Project Area #4 and the gen-tie line to the Holgate substation. These include Southern California Edison's (SCE) Edwards – Holgate – Southbase 115 kV line and the Kramer – Holgate 115 kV line. The Kramer to Holgate line and its associated right-of-way road also traverses east-west through Project Areas #1, #2 and #3. A smaller SCE distribution line (Paxton 4 kV) is located along Boron Avenue along a portion of Project Area #1.

Multiple gas pipelines and their associated right-of-way roads pass through the Project Area. The Mojave Gas Pipeline and a Pacific Gas and Electric pipeline parallel one another east-west through the southern portion of Project Area #4 just north of Twenty Mule Team Road. The Mojave Gas Pipeline also passes through Project Areas #1, #2, and #3. Within Project Areas #1 and #2, the Mojave Gas Pipeline parallels another gas pipeline along the same utility corridor. Within Project Area #3 these pipelines diverge with the Mojave Gas pipeline turning to the north while the other pipeline continues traversing generally in an east-west direction.

No human habitation is found on any of the parcels. However, likely owing to the proximity to Boron and Desert Lake, evidence of human activity was prevalent throughout the Project Area. An informal but commonly used shooting range was located in the southeast corner of Project Area #1. Evidence of shooting activity was also found sporadically throughout the Project Area. Illegal dumping was observed during surveys and evidence of past illegal dumping was seen in low density primarily in Project Areas #1, #2, and #3. Off highway vehicle use was commonly observed both during the day and at night primarily in Project Areas #1, #2, and #3 and trucks and SUV-type vehicles were seen driving through the areas.

The Project Area included a variety of plant communities. These are summarized in Table 2.

Table 2. Aratina Vegetation Communities by Project Area

VEGETATION COMMUNITY	PROJECT AREA #1 ACRES (%)	PROJECT AREA #2 ACRES (%)	PROJECT AREA #3 ACRES (%)	PROJECT AREA #4 ACRES (%)	PROJECT AREA #5 ACRES (%)
Creosote Bush - White Bursage (*Larrea tridentata – Ambrosia dumosa*) Shrubland Alliance	209.6 (56%)	743.9 (78%)	462.2 (72%)	93.4 (21%)	
Spinescale (*Atriplex spinifera*) Shrubland Alliance (CDFW Sensitive)	155.1 (42%)	192.4 (20%)	129.2 (20%)	186.6 (42%)	64.8 (26%)
Creosote Bush Shrubland Alliance					184.2 (74%)
Allscale (*Atriplex polycarpa*) Shrubland Alliance				105.9 (24%)	
Successional Allscale - Spinescale Scrub				56.2 (13%)	
Successional Spinescale Scrub	6.4 (2%)		34.0 (5%)		
White Bursage Shrubland Alliance		21.0 (2%)			
Unvegetated (developed: paved roadways, structures, or other features and disturbed: dirt roadways)	1.1 (0%)		20.7 (3%)		
TOTAL ACRES	**372.4** (100%)	**957.3** (100%)	**646.0** (100%)	**442.0** (100%)	**249.0** (100%)

Although not listed as a separate vegetation community, Joshua tree woodland, a sensitive natural community (CDFW 2018a), occurs in small patches (up to 10-20 acres) within the creosote bush – white bursage scrub shrubland alliance and within white bursage scrub vegetation communities. This habitat type is recognized when Joshua trees are evenly distributed at greater than or equal to one percent cover over the landscape. Joshua trees were present throughout the Project Area.

METHODS

Literature Review and Database Search

Information on potential species occurrences has been obtained from existing databases and published and non-published resources. Databases were reviewed to assess whether occurrences of special status species have been documented in the vicinity of the proposed Aratina Project Area and included the Leuhman Ridge and Kramer Junction 7.5-minute topographical USGS quadrangles) within the Project Area. A 20-mile radius around the Project Area included a review of all surrounding USGS maps to include Astley Rancho, Boron, Boron NE, Boron NW, California City North, California City South, Edwards, Galileo Hill, Jackrabbit Hill, Kramer Hills, North Edwards, Red Buttes, Rodgers Lake North, Rodgers Lake South, Saddleback Mountain, and The Buttes.

Databases and resources reviewed and researched included the following:

- The California Natural Diversity Database (CNDDB) and CNDDB QuickView (CNDDB 2019) within a 20-mile radius of the proposed Project Area
- CDFW Natural Communities List (CDFW 2018a) and California Wildlife Habitat Relationships System Maps and Descriptions (CDFW 2018b)
- CDFW California Native Plant Society (CNPS) database (CNPS 2019) and CNPS website (CNPS 2019)
- CDFW Special Vascular Plants, Bryophytes, and Lichen List (CDFW 2018c)

- California Desert Native Plants Act (CDNPA) (Division 23 of the California Food and Agricultural Code, Section 80071-80075) (California Food and Agricultural Code 2005)
- Bureau of Land Management (BLM 2015) species databases
- California Department of Fish and Wildlife (CDFW) Special Animals List (CDFW 2018d) and the CDFW and USFWS Threatened or Endangered Animal Species List (CDFW 2018e)
- USFWS National Wetlands Inventory (NWI) Map (USFWS 2018)
- Desert Renewable Energy Conservation Plan (DRECP) (Dudek 2014), DRECP Data Basin (Dudek 2014), and DRECP Kern County Gateway (Dudek 2014)
- CDFW West Mohave Desert Ecological Reserve (CDFW 2019)
- U.S. Department of Agriculture (USDA) Web Soil Survey (USDA 1982)
- Federal Emergency Management Agency (FEMA) 100-year floodplain database (FEMA 2018)

The full literature review and database search included plants, natural communities, sensitive habitats, soils, and flood potential. However, since the focus of this report is wildlife, only the wildlife aspects of the findings will be discussed.

Protocols

Desert Tortoise

Agassiz's desert tortoise (*Gopherus agassizii)* is a state and federally (USFWS 1990) listed Threatened species (Table 3). It is the only *Gopherus* species that occurs in California where it is the state reptile. In this report, the term "tortoise" or "desert tortoise" refers to Agassiz's desert tortoise.

USFWS protocols (USFWS 2017) define the "action area" of a project to include all areas to be affected directly or indirectly by a project action. For Aratina, the action area was defined as the Project Area plus access routes to the Project Area. Since all of the access routes are existing public use paved roads, the action area is essentially the same as the Project Area (Figure 2).

A 100% coverage survey as defined in the USFWS's 2017 protocol (USFWS 2017) was conducted for desert tortoise within the action area. In brief, these protocols specify the following:

- An option to conduct 100% coverage surveys or probabilistic sampling if the site is large enough. The threshold to allow probabilistic sampling for the Western Mojave Desert is 3290 acres.
- Transects spaced at 10 meter intervals if 100% coverage surveys are utilized
- Surveys for large projects to be conducted during tortoise's active periods, April 1 to May 31 or September 1 to October 31 when the shaded air temperatures are below 40ºC (104ºF) at 5 cm (2 inches) above ground.
- Surveys to cover the "action area" which includes all areas to be affected directly or indirectly by a project action.

Burrowing Owl

Federally, burrowing owls are a Bird of Conservation Concern. On the state level they are a Species of Special Concern (Table 3). A survey for burrowing owl was conducted according to CDFW protocols (CDFG 2012; prior to 2013 CDFW was known as the California Department of Fish and Game [CDFG]).

In brief, these protocols specify the following:

Conduct 4 survey visits: 1) at least one site visit between 15 February and 15 April, 2) a minimum of three survey visits, at least three weeks apart, between 15 April and 15 July, with at least one visit after 15 June. The survey methodology will include the following:

- Transects spaced at 7 to 20 meters apart and adjusted for vegetation height and density.
- Recording all potential burrows used by burrowing owls as determined by the presence of one or more burrowing owls, pellets, prey remains, whitewash, or decoration.
- Survey of a 150-meter wide buffer outside of the Project Area.
- A provision by CDFW to propose alternate survey methods for large projects.

EnviroPlus Consulting, Inc. conducted one breeding season survey in accordance with CDFW burrowing owl methodology that included a 150-meter wide buffer area adjacent to the Project Areas.

Mohave Ground Squirrel

Detection of the California Threatened Mohave ground squirrel (*Xerospermophilus mohavensis;* MGS) requires trapping surveys during specific time periods. MGS trapping was outside the scope of the current survey and not conducted. However, a habitat assessment was conducted for MGS by Dr. Philip Leitner between February 9 and 12, 2019. This habitat assessment was completed to determine the potential for occurrence as well as impacts to this species from proposed project development. The habitat assessment also included a review of the CNDDB and maps for MGS occurrences within the project vicinity

Other Species

In addition to protocol surveys for desert tortoise and burrowing owls, the entire Project Area was surveyed for other wildlife species. All other special status species and their sign were noted if observed. This included, but was not limited to, desert kit fox (*Vulpes macrotis arsipus*), American badger (*Taxidea taxus*), sensitive bird species, and bird nests. The desert kit fox currently does not have federal or California special status, although it is protected from hunting as a fur-bearing mammal under Title 14 of the California Code of Regulations, Section 460.

Field Methods

The entire action area was surveyed at ten meter transect intervals for a total of 783.2 transect miles. In accordance with CDFW burrowing owl protocols (CDFG 2012), 150-meter wide buffer areas adjacent to the Project Areas were surveyed at 20 meter intervals. Burrowing owl buffers were not walked adjacent to the gen-ties. A total of 50.9 miles of burrowing owl buffer transects were walked. The location of burrowing owl buffers are shown in Figure 3. Burrowing owl buffers were established around the entire project perimeter where possible. Exceptions included the southern boundary of Project Areas #1, #2, and #3 and the western boundary of Project Area #3 where the Project Area abutted Edwards Air Force Base (EAFB) property. A portion of the buffer south of Project Area #4 was also narrowed because of EAFB lands. Burrowing owl buffers were also not established where the project abutted the communities of Boron and Desert Lake and along State Route 58.

All transects were walked in a north-south direction except for east-west oriented gen-tie routes and east-west burrowing owl buffer areas. North-south transects were preferred to increase visibility by reducing glare from walking directly into the sun in the early morning.

All desert tortoise surveys of the action area and burrowing owl buffers surveys were conducted between April 7 and May 16, 2019. The survey was conducted by a team of three experienced desert biologists including Gilbert Goodlett, Ellen Schafhauser, and Fabio Fortunat.

All transects and the boundaries of the survey area were downloaded to handheld GPS units for ease of navigation. Each team member was equipped with a GPS unit. For efficiency, team members worked independently. Team members nominally completed 8 miles of transects per day.

Biologists focused their search within an approximate 180º arc and 5 meter radius centered in front of them. The survey team generally remained on their transect centerline except to investigate shrubs, trees, and other landscape features which prevented the biologist from seeing an item of interest. After investigation of a feature, the biologist returned to the transect centerline. This insured accurate coverage of the survey area. Biologists avoided staring at the GPS units to maintain their track. Instead they selected an object on the horizon to use as a target and occasionally checked the GPS for their position with respect to the intended transect. Less than 10% of the biologist's time was spent looking at the GPS. All of the survey team has substantial prior experience in this type of GPS navigation.

Desert tortoise related data collected included the following:

- Observer name
- Date
- Location of observation (UTM, WGS84)
- Burrows and coversites
    - Burrow class
        - Class 1 - Currently active, with tortoise or recent tortoise sign
        - Class 2 - Good condition, definitely tortoise, no evidence of recent use
        - Class 3 - Deteriorated condition; definitely tortoise
        - Class 4 - Deteriorated condition; possibly tortoise
        - Class 5 – Good condition; possibly tortoise
    - Burrow dimensions (length, width, height, soil cover [mm])
    - Burrow aspect – direction mouth of burrow is facing
- Scat
    - Class (this year [TY] or not this year [NTY])
    - Number of individual items of scat
- Live tortoise
    - Maximum carapace length (MCL, mm)
    - Sex – male, female, or unknown. Sex cannot be reliably determined for animals under 180 mm MCL
    - Location – in burrow, under shrub, in open, etc.
    - Activity - resting, basking, walking, feeding, interacting, other
    - Health notes - signs of upper respiratory tract disease, cutaneous dyskeratosis, etc.
- Carcasses
    - MCL (mm)
    - Sex – male, female, or unknown. Sex cannot be reliably determined for animals under 180 mm MCL
    - Sun exposure – percentage of time carcass is exposed to sun – for a carcass in the open the value is 100%

  - Position - upright, inverted, disarticulated
  - Cause of death – often unknown; detectable indications of cause of death could include predator chew marks, predator scat nearby, or gunshot wounds
  - Time-since-death in standard categories (Berry and Woodman, 1984)
    - < 1 year
    - 1 to 2 years
    - 2 to 4 years
    - > 4 years
- Other sign such as tracks, drinking depressions (tortoise created water catchments), courtship rings (circular disturbed areas in the soil created by tortoise courtship activities), etc.
- Additional notes

Data collected for desert kit fox included:

- Observer name
- Date
- Location of observation (UTM, WGS84)
- Status of den
  - Inactive
  - Active
  - Pupping
- Number of entrances to den
- Detailed notes on observation

Data collected for burrowing owl included:

- Observer name
- Date
- Location of observation (UTM, WGS84)
- Status of burrow
  - Inactive
  - Active
- Burrowing owl sign observed at burrow
  - Feathers
  - Pellets
  - Prey items
  - Whitewash
- Observation of a live burrowing owl
  - At a burrow
  - Not associated with a burrow

- Detailed notes on observation

Data collected for other species observations included:

- Observer name
- Date
- Location of observation (UTM, WGS84)
- Species
- Detailed notes on observation

In the field, all data were collected using an Apple iPhone® and the application Avenza Maps for which a custom data collection schema was developed. The cumulative data were uploaded daily to a cloud storage site (Dropbox.com). Photographs were taken of every item of sign trackable to a unique sequential sign identification number assigned in Avenza Maps. Photographs were also taken of typical habitat features. The application Theodolite was used to take all photographs. Theodolite imprints data to a digital photograph. These data include the date and time, location in Universal Transverse Mercator (UTM) coordinates, altitude, datum, direction the camera is pointed, elevation and horizon angles, zoom level, and custom notes.

No desert tortoises were handled during the survey. All burrows and potential coversites were investigated by using a mirror to reflect sunlight into the burrow. Neither probes nor downhole cameras were utilized to investigate burrows to prevent potentially harassing tortoises.

At 0800 and 1200, weather conditions were recorded. Weather conditions included the shaded air temperature at 1.5 meters measured with a 0.1 °C precision thermister, the ocularly estimated percentage of cloud cover and type of clouds, and wind speeds and direction. Winds speeds were measured with a Kestrel® brand electronic wind meter. Measurements were taken until average wind speeds stabilized. The average and maximum wind speeds were recorded. Wind direction was estimated by observing the drift direction of a handful of fine soil that was dropped. These data are listed in Appendix 3.

In addition to recorded temperature data, 5 cm shaded air temperatures were routinely taken on warm days during the active survey time period to ensure that the peak desert tortoise survey temperature of 40 ºC at 5 cm was not exceeded. Cooler temperatures prevailed during the survey and the 5 cm temperature never approached the maximum.

Incidental observations were recorded of all vertebrate species observed to develop a comprehensive species list. Additionally, detailed notes and locations were recorded if sign of any special status species were noted. Focus species included desert kit fox, American badger, Mohave ground squirrel, burrowing owl, and a variety of other special status bird species.

Specific to burrowing owls, sign observations were placed in the following categories – live burrowing owls that did not appear to be associated with a burrow, live burrowing owls at or otherwise associated with a burrow or burrows, active burrowing owl burrows, and inactive burrowing owl burrows. Active burrowing owl burrows were of an appropriate size for use by a burrowing owl and one or more of the following recent items of sign were present – whitewash (uric acid excretions which are the equivalent of urine in mammals), owl feathers, pellets (undigested parts of owl's food that are regurgitated), remains of prey items, and disturbed area in the mouth of a burrow consistent with owls. Inactive burrows were similar to active burrowing owl burrows except that the sign was not recent. Inactive burrows are often difficult to determine because the sign persists for a limited time after a burrow becomes inactive.

Specific to desert kit fox, sign observations included pupping, active, inactive kit fox dens. Pupping or natal dens were identified by observation of pups, hearing pups in the den, or den characteristics. Pupping den characteristics include multiple entrances to a den that show evidence of heavy use. The presence of prey items and scat tended to confirm a den's designation as a pupping den.

An active kit fox den was identified as an appropriately sized den with a typically narrow entrance, often with multiple access points, with one of more of the following recent items of sign were present – disturbance in one or more entrances showing recent use, fox tracks in the vicinity, remains of prey items nearby, live foxes heard or seen in den, or flies in the burrow indicating a likely prey item inside. Inactive kit fox dens possess the same general characteristics less the recent sign and are more difficult to identify that active kit fox dens.

Identification Resources

Identification of plants followed The Jepson Manual: Vascular Plants of California (Baldwin, 2012) and plant communities followed A Manual of California Vegetation: Second Edition (Sawyer and Keeler-Wolf and Evens, 2009).

Bird identification resources included A Field Guide to Western Birds (Peterson, 1993), Field Guide to the Birds of North America (National Geographic Society, 1987), and Stokes Field Guide to Birds: Western Region (Stokes, 1996). Mammal identification resources included California Mammals (Jameson, 1988) and A Field Guide to the Mammals of North America North of Mexico (Burt and Grossenheider, 1980). Reptile identification resources included A Field Guide to Western Reptiles and Amphibians (Stebbins, 1985).

RESULTS

Records Searches

Records searches revealed one sensitive mammal species, one reptile species, seven bird species, and two invertebrate species potentially occurring within the sixteen 7.5 minute quadrangles searched (Table 3; Figure 3).

Table 3. Federal and State Sensitive, Special Status, and Listed Species and DRECP Species Identified for the Proposed Aratina Solar Project, Kern County, CA

SPECIES	ESA[1]	CESA[1]	DRECP[2]
Mohave Ground Squirrel (*Xerospermophilus mohavensis*)		ST	X
Desert Kit Fox (*Vulpes macrotis arsipus*)		CCR, Title 14	
American Badger (*Taxidea taxus*)		SSC	
Agassiz's Desert Tortoise (*Gopherus agassizii*)	FT	ST	X
Golden Eagle (*Aquila chrysaetos*)	BCC BGEPA	FP WL	X
Prairie Falcon (*Falco mexicanus*)	BCC	WL	
Mountain Plover (*Charadrius montanus*)	BCC	SSC	X
Burrowing Owl (*Athene cunicularia*)	BCC	SSC	X
Gray Vireo (*Vireo vicinior*)	BCC	SSC	
San Joaquin LeConte's Thrasher (*Taxostoma lecontei macmillanorum*)	BCC	SSC	
Tricolored Blackbird (*Agelaius tricolor*)	SC BCC	SSC	X
Crotch Bumble Bee (*Bombus crotchii*)		CS	
Western Bumble Bee (*Bombus occidentalis*)		CS	

1 - Listing codes
- ST - State listed as Threatened
- FT - Federally listed as Threatened
- BCC – Federal Birds of Conservation Concern
- BGEPA - Bald and Golden Eagle Protection Act
- SSC – State Species of Special Concern
- CS – State Candidate Species for Listing under CESA

2 – DRECP – Covered species under the Desert Renewable Energy Conservation Plan

Desert Tortoise

No definitive sign of desert tortoise habitation of the Project Area was detected. One carcass was located within Project Area #3 (Table 4; Figure 5; Photograph 7). The disarticulated carcass remains were of an adult female tortoise with a maximum carapace length of 240mm. The animal was estimated to have died over 4 years prior to the observation (Berry and Woodman 1984). The cause of death could not be determined. Approximately 50 meters to the south-southeast, a Class 3 burrow (deteriorated condition, definitely tortoise) was located. It appeared likely that this burrow belonged to the tortoise whose carcass was located.

The only other potential tortoise sign detected included seven Class 4 burrows (deteriorated condition, possibly tortoise) seen in Project Areas #1, #3, and #4. When burrows deteriorate from weathering and disuse, it is often difficult to determine the species that created or last inhabited the burrow and the observation of Class 4 burrows alone is not indicative of desert tortoise habitation.

No live tortoises, scat, high quality burrows, tracks, courtship rings, or eggs or fragments thereof, or drinking depressions were detected. Observation of any of these items would indicate current habitation by the species.

Table 4. Desert Tortoise Sign Detected by Project Area

Project Area #	BURROWS*						CARCASS**		
	Class	Length (mm)	Width (mm)	Height (mm)	Soil Cover (mm)	Burrow Aspect	MCL (mm)	Sex	Time Since Death
3	3	Unknown	260	180	50	NE			
1	4	< 1000	300	250	175	NE			
1	4	1000	200	120	100	E			
3	4	< 1m	200	130	250	E			
3	4	Unknown	280	200	20	N			
3	4	>1m	165	110	30	S			
3	4	< 1m	190	130	70	E			
4	4	700	250	110	50	E			
3							240	Unknown	>4 Years

***Burrow Class**
Class 1 – Currently Active, with tortoise or recent tortoise sign
Class 2 – Good condition, definitely tortoise, no evidence of recent use
Class 3 – Deteriorated condition; definitely tortoise
Class 4 – Deteriorated condition; possibly tortoise
Class 5 – Good condition; possibly tortoise
Soil Cover – Distance between top of burrow and surface at burrow entrance
Burrow Aspect – Direction mouth of burrow is facing

****Carcass**
MCL – maximum carapace length in mm or size class
Sex – male or female
Time Since Death – based on Berry and Woodman, 1984
<1 Year
1-2 Years
2-4 Years
>4 Years

Mohave Ground Squirrel

The Project Area is within the geographic range of MGS and there are multiple records of this species being trapped and identified during surveys within the Project Area. The current CNDDB contains multiple records of MGS within the proposed Aratina project footprint, along the approximate boundary of the proposed project, and within 2 miles of the proposed project boundary.

Given the intact nature of the vegetation communities, limited human disturbances, the appropriate soil types for burrow construction, and the availability of forage and cover from predators and weather events, Dr. Philip Leitner concluded that the proposed Aratina Project Area could support a MGS population (EnviroPlus Consulting 2019). During the botanical survey, a botanist who is also experienced with MGS, heard a MGS (D. LaBerteaux, personal communication, May 17, 2019). Additional MGS-focused work may be conducted by Dr. Leitner to further quantify the presence of MGS on the site.

Burrowing Owl

No live burrowing owls were observed within the Project Area. Two active burrowing owl burrows were located within 10 meters of each other in Project Area #1 (Table 5, Figure 6, Photograph 8). No other active burrowing owl burrows were detected.

Three inactive burrowing owl burrows (Table 5, Figure 6) were observed within Project Area #2. All were within 150 meters of each other. No additional burrowing owl sign was found within the Project Area or the burrowing owl buffer survey area.

Table 5. Burrowing Owl Sign Detected by Project Area

Coordinates (WGS 84, Grid 11)

Project Area #	Date (2019)	Northing	Easting	Observation
1	17-Apr	38 71 517	04 41 023	Active BUOW burrow
1	17-Apr	38 71 524	04 41 029	Active BUOW burrow
2	3-May	38 72 591	04 39 485	Inactive BUOW burrow
2	3-May	38 72 593	04 39 479	Inactive BUOW burrow
2	4-May	38 72 549	04 39 345	Inactive BUOW burrow

Desert Kit Fox

A total of 152 desert kit fox (DKF) dens were located within the Project Area and within burrowing owl buffer survey areas. This included four pupping dens (Photograph 9), 11 active dens, and 137 inactive dens (Figure 6). These data are summarized in Table 6 and detailed in Appendix 1.

Table 6. Summary of Desert Kit Fox Dens by Project Area

Project Area #	Pupping Dens	Active Dens	Inactive Dens	Totals Within Each Project Area
1		6	46	**52**
2	2	2	46	**50**
3		3	22	**25**
4			14	**14**
5			4	**4**
Burrowing Owl Buffer Survey Areas	2		3	**5**
Gen-ties and Collector Line Areas			2	**2**
TOTALS	**4**	**11**	**137**	**152**

Other Special Status Species

One inactive American badger den was observed in Project Area #3 (Figure 6; UTM coordinates 04 36 406E, 38 73 040N [WGS84, Grid 11]). There were no observations of live badgers or any other sign detected. American badger is a CDFW Species of Special Concern.

General Species Observations

A total of 44 vertebrate species were detected within the Project Area and burrowing owl buffer survey area (Appendix 2). These included 28 bird species, eight mammal species, and eight reptile species.

Survey Weather Conditions

Surveys were conducted when weather conditions were conducive to the observation of active desert tortoises. In cooler temperatures, surveys could be conducted during the mid-day while in warmer conditions bimodal surveys in the early morning and late afternoon were utilized. In general though, the survey effort was skewed towards the morning, hence the collection of weather data at 0800 and 1200 (Appendix 3, Figure 7).

The average 0800 temperature was 60.8 °F and the average 1200 temperature was 73.5 °F. The minimum 0800 temperature encountered was 50.4 °F and the maximum 1200 temperature was 86.9 °F.

Temperatures throughout the survey period were relatively cool and below the protocol maximum of 40 °C (104 °F) shaded air temperature at 5 cm on all survey days. Light rain occurred a few times during the survey.

Winds were generally from the southwest to the west with westerly winds being most common. The average wind speed for the 0800 to 1200 time frame was 4.3 mph, with an average survey 0800 wind speed of 3.8 mph and average 1200 wind speed of 4.7 mph. The average maximum wind speed encountered at 0800 was 6.6 mph, while the average maximum wind speed encountered at 1200 was 8.5 mph. Maximum winds encountered were 21.7 mph on April 30, 2019.

DISCUSSION

The lack of detection of recent desert tortoise sign was a surprise to the entire biological team. Overall, the habitat appeared suitable for desert tortoise habitation and a particularly wet winter provided substantial spring forage (Photographs 1 - 5). The lack of live tortoises, recent burrows, scat, tracks, courtship rings, and drinking depressions in 834 miles of transects walked by three experienced biologists lends credence to the idea that the Project Area is not occupied by desert tortoise. Further, a botanical survey team, all of whom are also experienced desert biologists, covered the same area and also did not detect any desert tortoise sign incidental to the botanical survey.

There were no live burrowing owl observations within the Project Area and limited burrow observations suggesting there are very few burrowing owls in the area. There were two active burrowing owl burrows located close to one another in Project Area #1. It is likely that the same owl used both of these burrows. A cluster of three burrowing owl burrows within 150 meters of one another in Project Area #2 did not show signs of recent use. Burrowing owl sign was not observed in Project Areas #3, #4, or #5.

Desert kit fox dens were found throughout the Project Area. However, they appeared to generally transition from higher to lower density as one moved from east to west. Most of the dens, which may persist for years, were inactive (n=137) but 11 active dens and 4 pupping dens were also seen. All of the active dens were in Project Areas #1, #2, and #3 while the two pupping dens were located in Project Area #2 and two were located in burrowing owl buffer survey areas.

One inactive American badger den was observed in Project Area #3. There were no observations of live badgers or any other badger sign detected. Although the American badger den located in Project Area #3 appeared inactive, badgers are wide-ranging species that will excavate their own dens or modify existing burrows of other species such as desert kit fox, making them sometimes difficult to distinguish from a large kit fox den or a coyote den. Due to the mobility of this species and its preferred foraging habitat, the American badger is anticipated to potentially occur on the proposed Project Area as an occasional transient, dispersing young adult, or forager.

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FIGURES

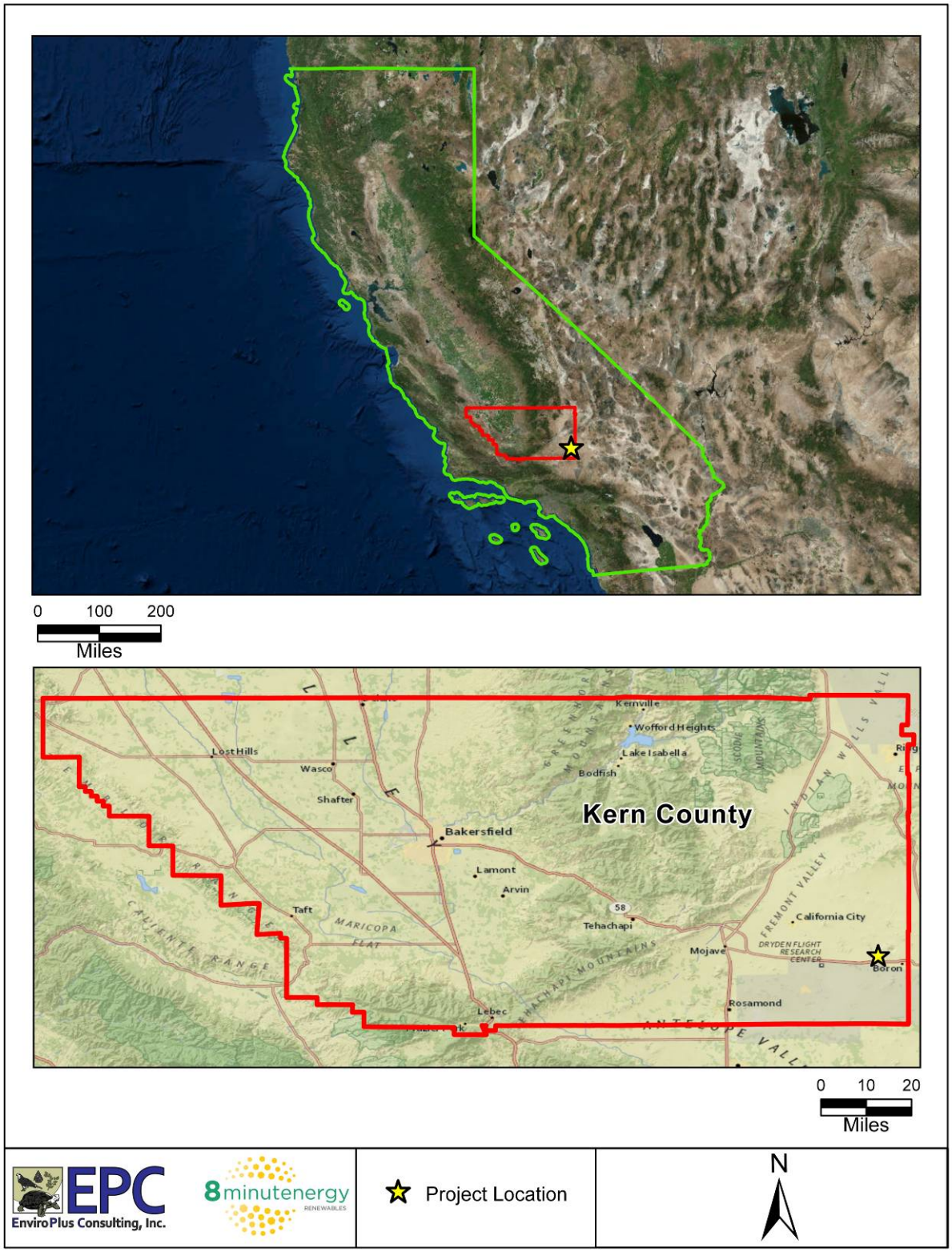


Figure 1. Aratina project vicinity map

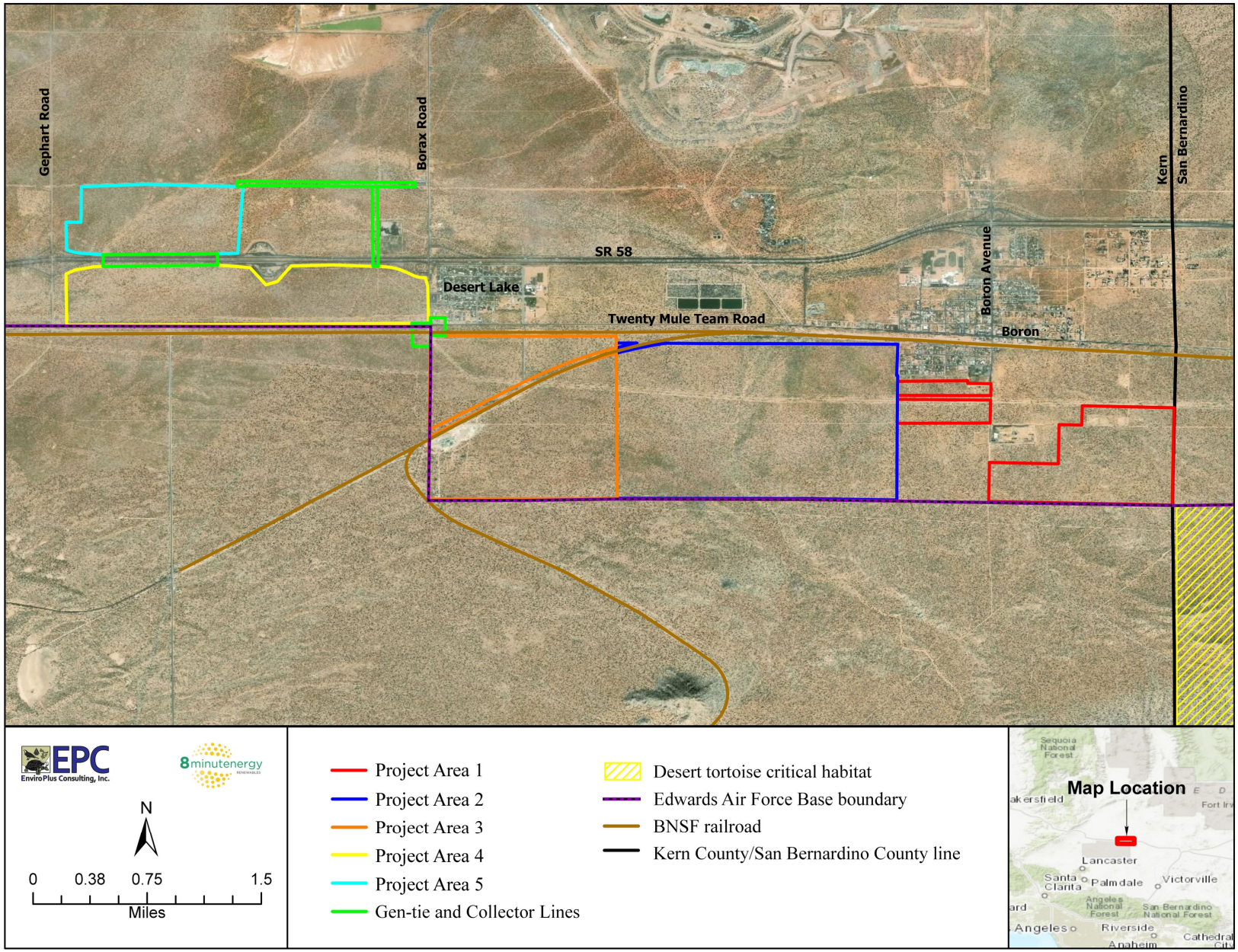


Figure 2. Aratina project area

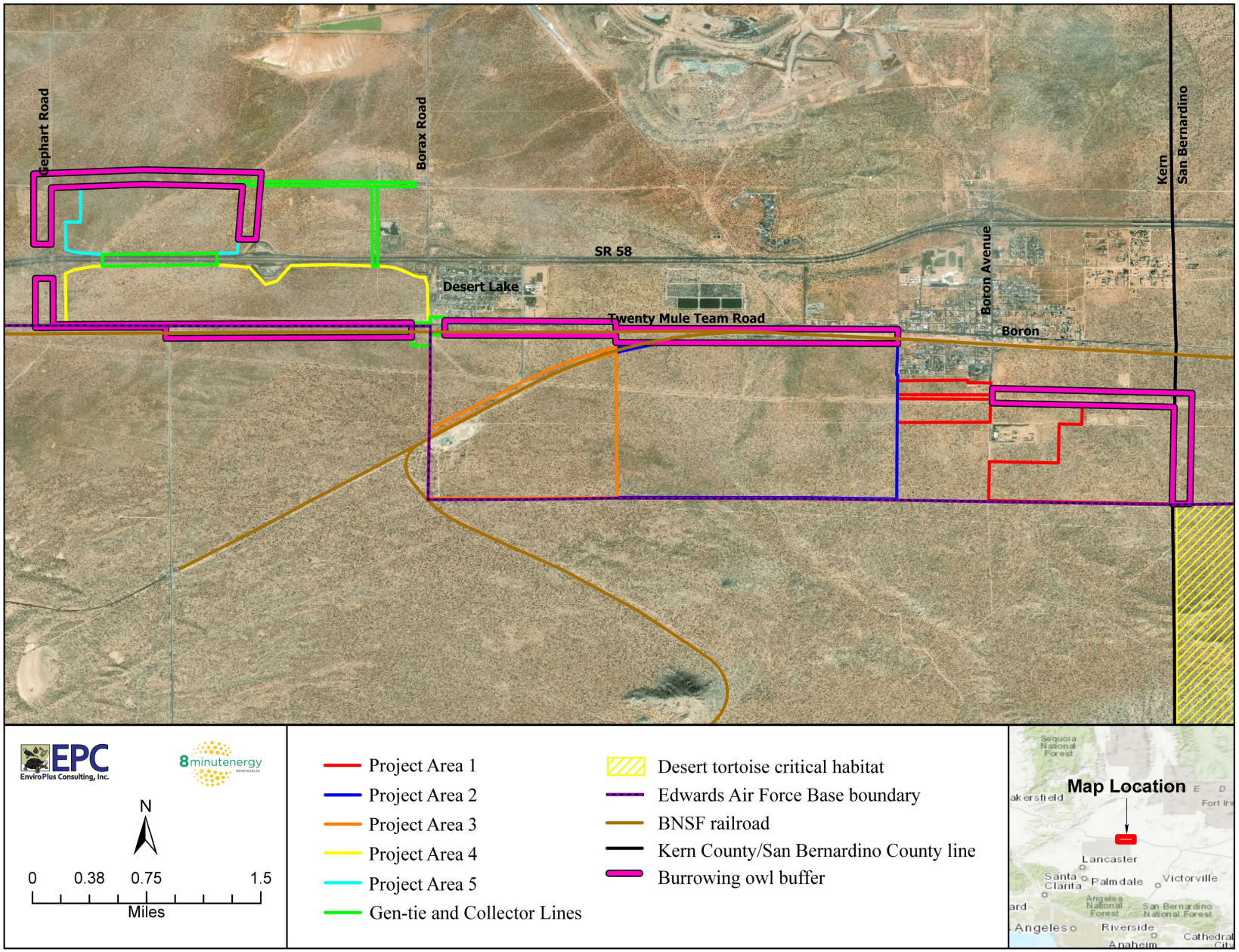


Figure 3. Location of burrowing owl buffer survey areas

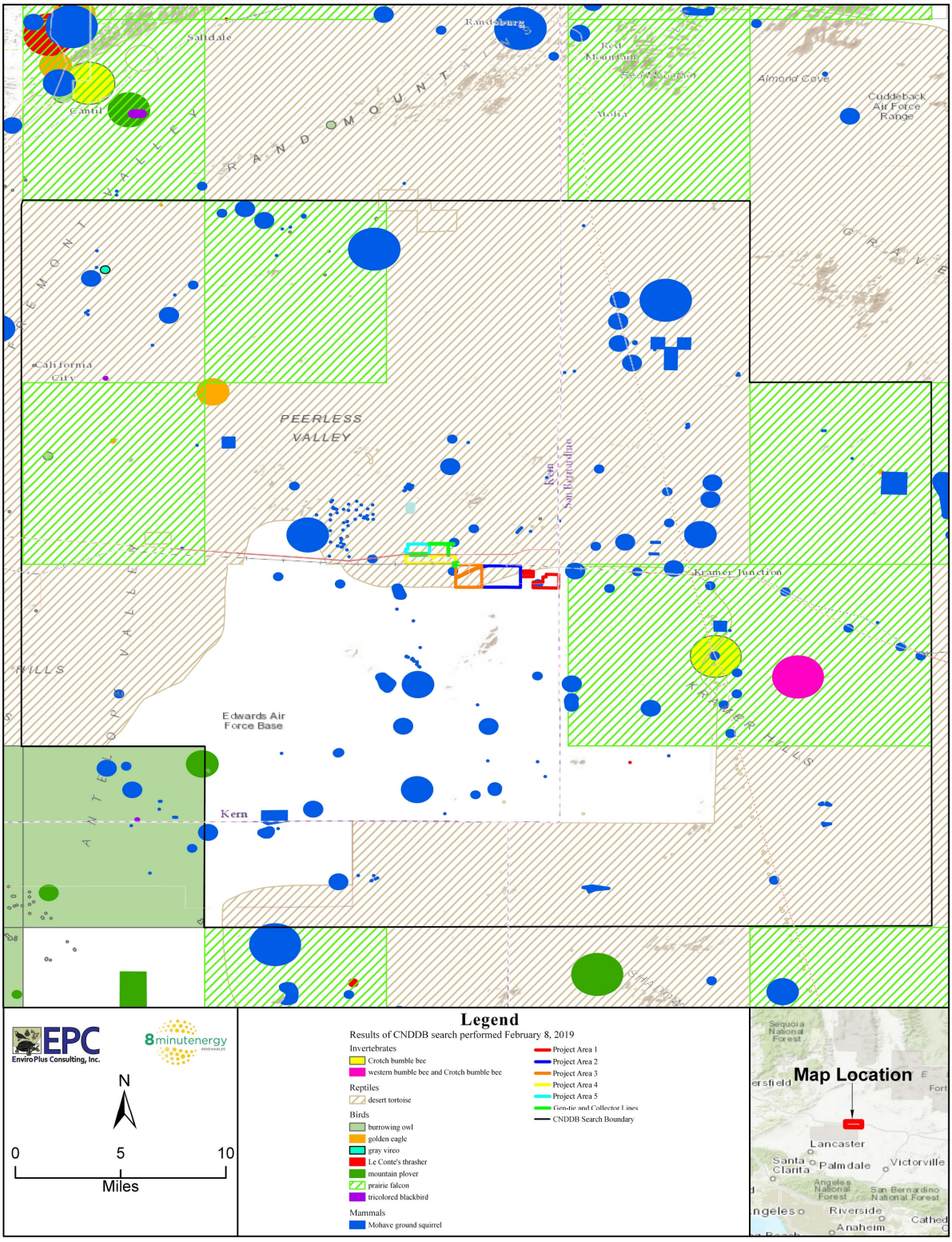


Figure 4. Results of California Natural Diversity Database search for sensitive wildlife species

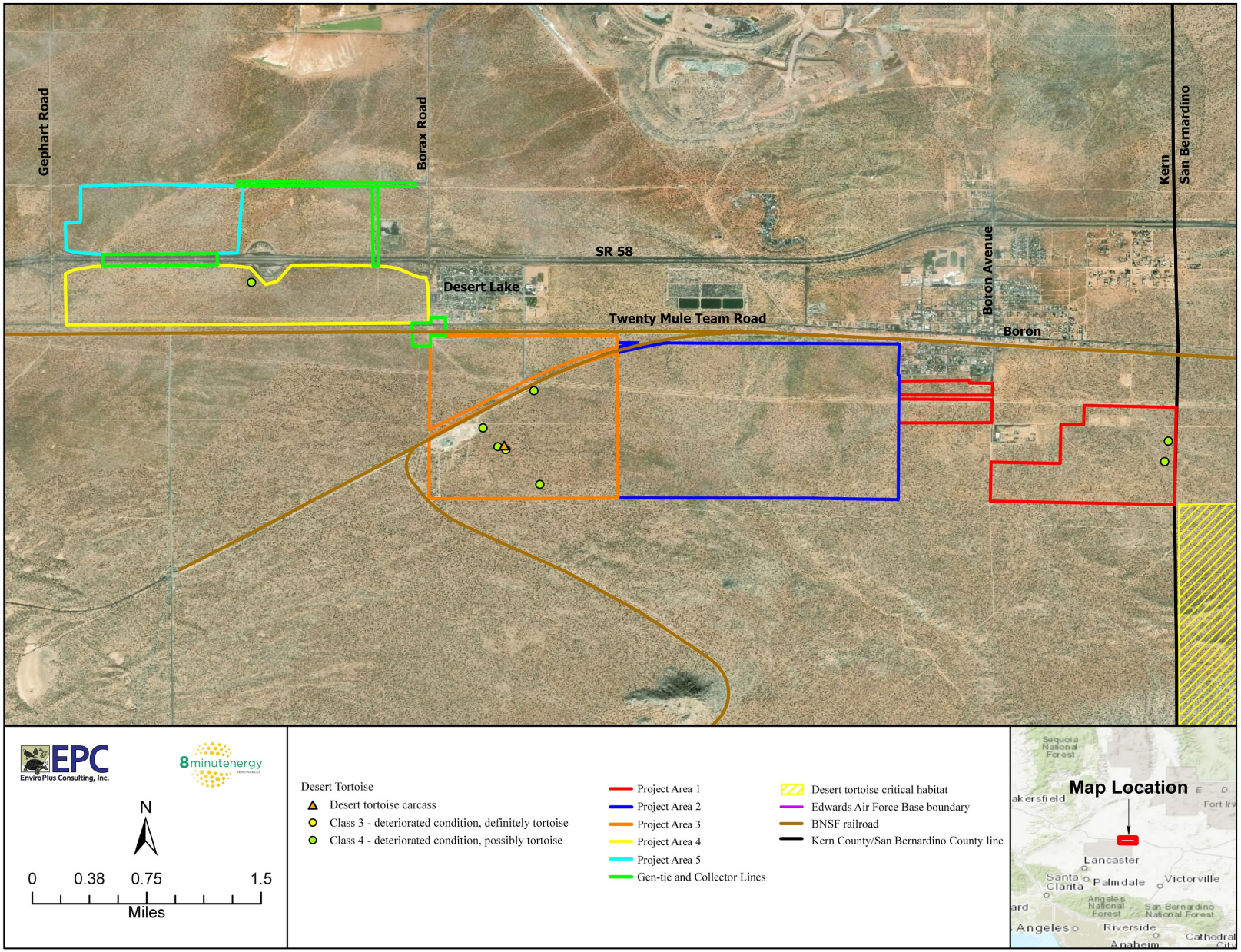


Figure 5. Aratina desert tortoise sign observations

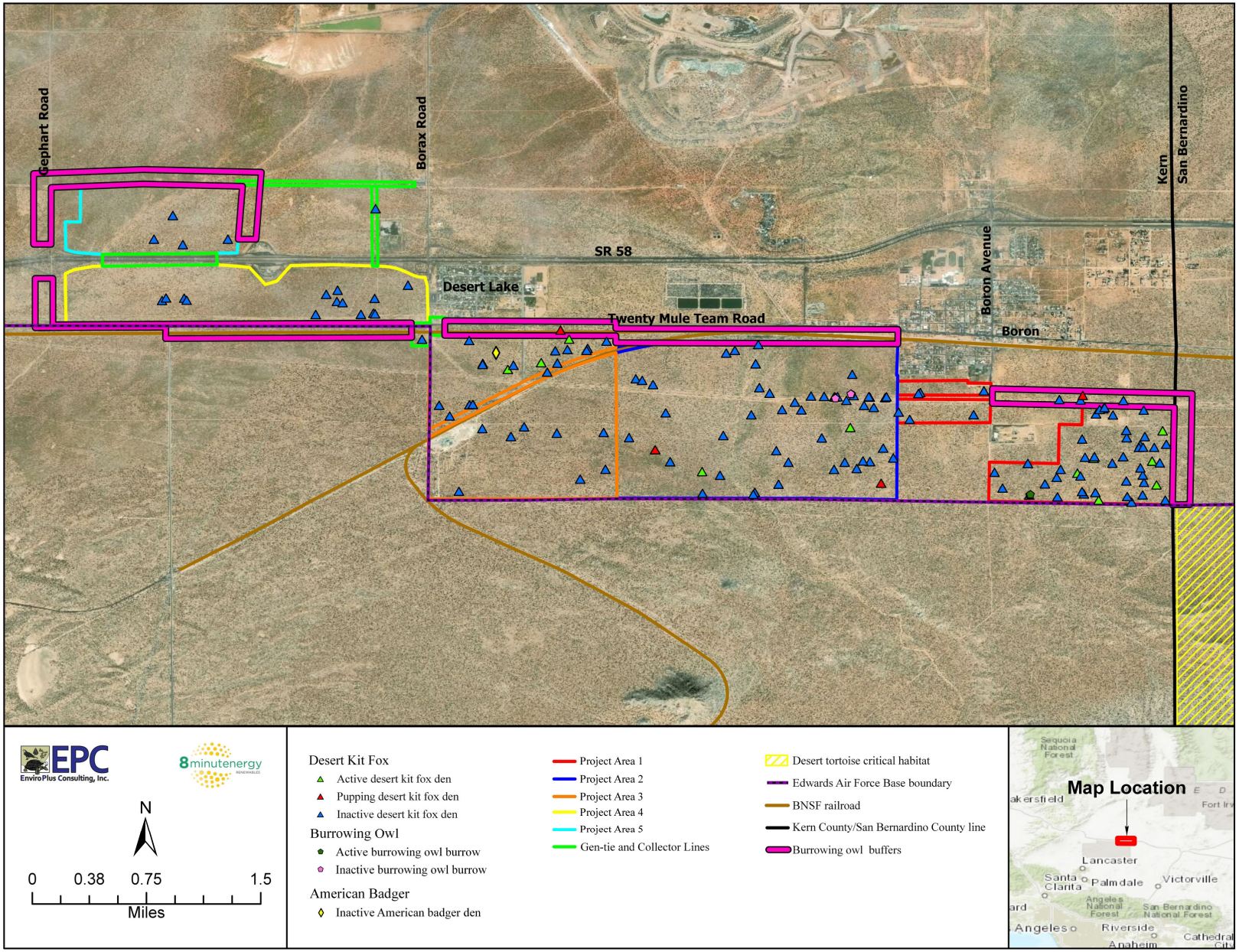


Figure 6. Aratina burrowing owl, desert kit fox, and American badger dens

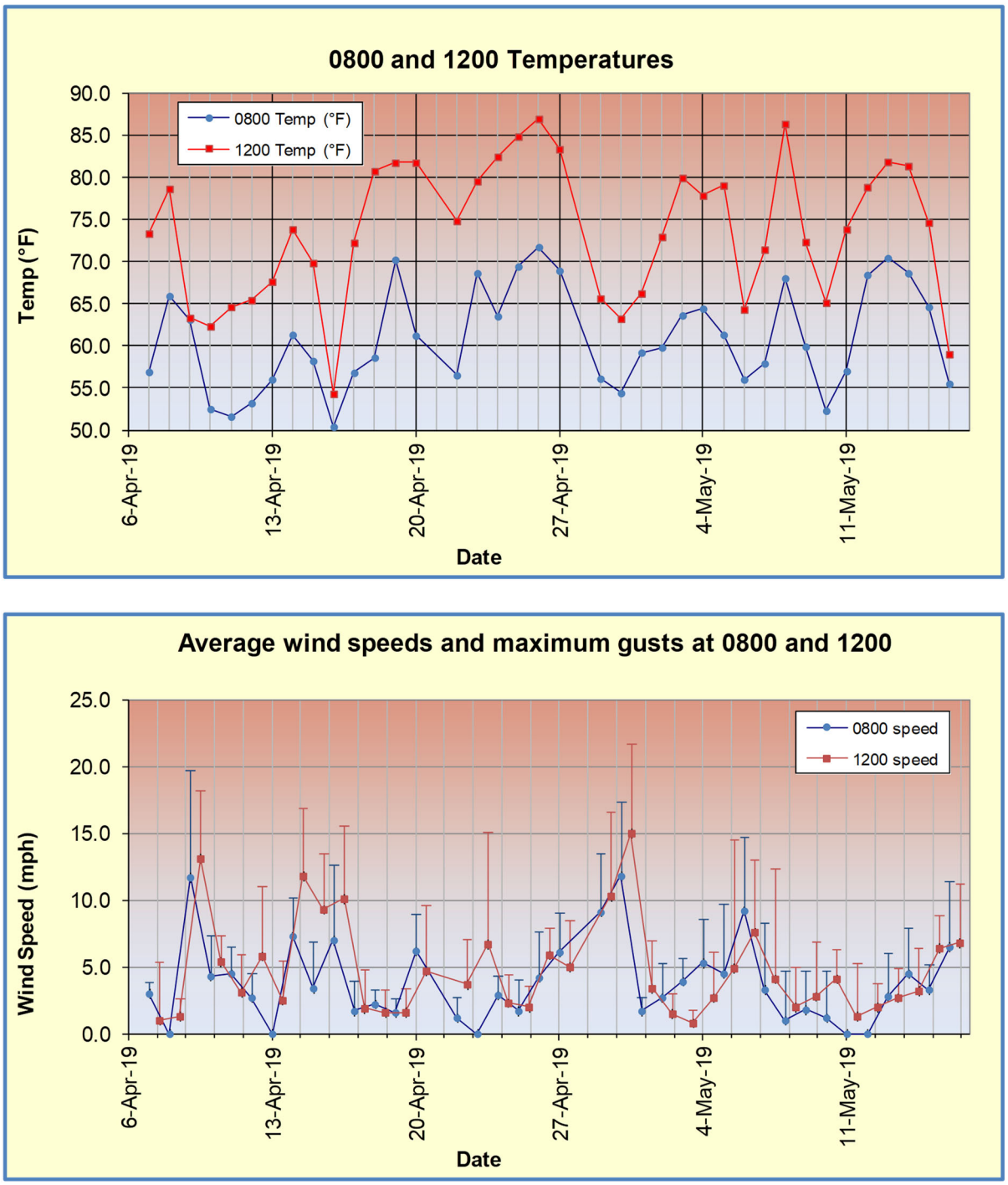


Figure 7. Shaded air temperatures and wind conditions at 0800 and 1200 for Aratina biological survey

PHOTOGRAPHS



Photograph 1. Project Area #1 typical habitat.



Photograph 2. Project Area #2 typical habitat.



Photograph 3. Project Area #3 typical habitat.



Photograph 4. Project Area #4 typical habitat.



Photograph 5. Project Area #5 typical habitat.



Photograph 6. Incised wash in Project Area #4.



Photograph 7. Desert tortoise carcass located in Project Area. Disarticulated remains of a 240 mm MCL female animal that is estimated to have died over 4 years prior to its observation



Photograph 8. Active burrowing owl burrow



Photograph 9. Desert kit fox pupping den.

Appendices

Appendix 1. Desert Kit Fox Dens Found on the Aratina Biological Survey

Coordinates (WGS 84, Grid 11)

Area	Date (2019)	Northing	Easting	Observation
Project Area 1	27-Apr	38 72 400	04 39 893	DKF den - Inactive
Project Area 1	26-Apr	38 72 323	04 39 987	DKF den - Inactive
Project Area 1	24-Apr	38 72 595	04 40 064	DKF den - Inactive
Project Area 1	24-Apr	38 72 606	04 40 081	DKF den - Inactive
Project Area 1	20-Apr	38 72 368	04 40 543	DKF den - Inactive
Project Area 1	19-Apr	38 72 620	04 40 633	DKF den - Inactive
Project Area 1	18-Apr	38 71 763	04 40 719	DKF den - Inactive
Project Area 1	18-Apr	38 71 595	04 40 788	DKF den - Inactive
Project Area 1	17-Apr	38 71 853	04 41 010	DKF den - Inactive
Project Area 1	17-Apr	38 71 517	04 41 019	DKF den - Inactive
Project Area 1	16-Apr	38 71 637	04 41 157	DKF den - Inactive
Project Area 1	15-Apr	38 71 706	04 41 258	DKF den - Inactive
Project Area 1	15-Apr	38 71 499	04 41 263	DKF den - Inactive
Project Area 1	15-Apr	38 71 790	04 41 292	DKF den - Inactive
Project Area 1	14-Apr	38 71 749	04 41 439	DKF den - Active
Project Area 1	13-Apr	38 71 718	04 41 466	DKF den - Inactive
Project Area 1	13-Apr	38 71 553	04 41 478	DKF den - Inactive
Project Area 1	13-Apr	38 72 107	04 41 483	DKF den - Inactive
Project Area 1	13-Apr	38 71 528	04 41 494	DKF den - Inactive
Project Area 1	13-Apr	38 71 915	04 41 507	DKF den - Inactive
Project Area 1	13-Apr	38 71 904	04 41 580	DKF den - Active
Project Area 1	13-Apr	38 71 920	04 41 588	DKF den - Inactive
Project Area 1	12-Apr	38 71 542	04 41 594	DKF den - Inactive
Project Area 1	12-Apr	38 72 370	04 41 605	DKF den - Inactive
Project Area 1	12-Apr	38 71 461	04 41 622	DKF den - Active
Project Area 1	12-Apr	38 72 417	04 41 635	DKF den - Inactive
Project Area 1	12-Apr	38 72 424	04 41 667	DKF den - Inactive
Project Area 1	12-Apr	38 72 437	04 41 678	DKF den - Inactive
Project Area 1	11-Apr	38 71 851	04 41 742	DKF den - Inactive
Project Area 1	11-Apr	38 72 358	04 41 751	DKF den - Inactive
Project Area 1	11-Apr	38 71 918	04 41 837	DKF den - Inactive
Project Area 1	11-Apr	38 71 663	04 41 862	DKF den - Inactive
Project Area 1	11-Apr	38 72 195	04 41 865	DKF den - Inactive
Project Area 1	10-Apr	38 72 118	04 41 869	DKF den - Inactive
Project Area 1	10-Apr	38 71 498	04 41 869	DKF den - Inactive
Project Area 1	10-Apr	38 71 439	04 41 906	DKF den - Inactive
Project Area 1	10-Apr	38 72 015	04 41 973	DKF den - Inactive
Project Area 1	10-Apr	38 72 043	04 41 984	DKF den - Inactive
Project Area 1	10-Apr	38 71 801	04 41 985	DKF den - Inactive

Appendix 1 (cont). Desert Kit Fox Dens Found on the Aratina Biological Survey

Area	Date (2019)	Northing	Easting	Observation
Project Area 1	10-Apr	38 71 514	04 42 002	DKF den - Inactive
Project Area 1	10-Apr	38 71 725	04 42 005	DKF den - Inactive
Project Area 1	10-Apr	38 72 017	04 42 010	DKF den - Inactive
Project Area 1	9-Apr	38 71 647	04 42 015	DKF den - Inactive
Project Area 1	10-Apr	38 72 407	04 42 018	DKF den - Inactive
Project Area 1	9-Apr	38 72 129	04 42 026	DKF den - Inactive
Project Area 1	9-Apr	38 71 870	04 42 088	DKF den - Active
Project Area 1	9-Apr	38 72 015	04 42 107	DKF den - Inactive
Project Area 1	9-Apr	38 71 620	04 42 125	DKF den - Active
Project Area 1	8-Apr	38 71 852	04 42 155	DKF den - Inactive
Project Area 1	8-Apr	38 72 188	04 42 182	DKF den - Active
Project Area 1	8-Apr	38 71 458	04 42 200	DKF den - Inactive
Project Area 1	8-Apr	38 72 047	04 42 213	DKF den - Inactive
Project Area 2	2-May	38 72 148	04 37 552	DKF den - Inactive
Project Area 2	3-May	38 72 766	04 37 615	DKF den - Inactive
Project Area 2	3-May	38 72 749	04 37 671	DKF den - Inactive
Project Area 2	4-May	38 72 704	04 37 765	DKF den - Inactive
Project Area 2	5-May	38 72 018	04 37 779	DKF den - Pupping
Project Area 2	6-May	38 72 406	04 37 872	DKF den - Inactive
Project Area 2	8-May	38 71 892	04 37 907	DKF den - Inactive
Project Area 2	11-May	38 71 787	04 38 183	DKF den - Active
Project Area 2	11-May	38 71 557	04 38 185	DKF den - Inactive
Project Area 2	12-May	38 71 747	04 38 340	DKF den - Inactive
Project Area 2	13-May	38 72 164	04 38 371	DKF den - Inactive
Project Area 2	15-May	38 73 030	04 38 402	DKF den - Inactive
Project Area 2	15-May	38 73 058	04 38 476	DKF den - Inactive
Project Area 2	16-May	38 72 380	04 38 615	DKF den - Inactive
Project Area 2	15-May	38 71 543	04 38 626	DKF den - Inactive
Project Area 2	15-May	38 71 564	04 38 640	DKF den - Inactive
Project Area 2	15-May	38 72 917	04 38 656	DKF den - Inactive
Project Area 2	15-May	38 73 118	04 38 680	DKF den - Inactive
Project Area 2	15-May	38 72 666	04 38 686	DKF den - Inactive
Project Area 2	14-May	38 72 608	04 38 774	DKF den - Inactive
Project Area 2	12-May	38 72 002	04 38 828	DKF den - Inactive
Project Area 2	12-May	38 71 649	04 38 846	DKF den - Inactive
Project Area 2	11-May	38 72 434	04 38 882	DKF den - Inactive
Project Area 2	11-May	38 71 880	04 38 933	DKF den - Inactive
Project Area 2	9-May	38 72 512	04 38 994	DKF den - Inactive
Project Area 2	8-May	38 72 429	04 39 050	DKF den - Inactive

Appendix 1 (cont). Desert Kit Fox Dens Found on the Aratina Biological Survey

Area	Date (2019)	Northing	Easting	Observation
Project Area 2	7-May	38 72 575	04 39 133	DKF den - Inactive
Project Area 2	6-May	38 72 134	04 39 224	DKF den - Inactive
Project Area 2	6-May	38 72 571	04 39 248	DKF den - Inactive
Project Area 2	5-May	38 71 803	04 39 328	DKF den - Inactive
Project Area 2	5-May	38 72 566	04 39 335	DKF den - Inactive
Project Area 2	5-May	38 72 563	04 39 344	DKF den - Inactive
Project Area 2	4-May	38 72 567	04 39 363	DKF den - Inactive
Project Area 2	3-May	38 71 877	04 39 421	DKF den - Inactive
Project Area 2	3-May	38 72 528	04 39 440	DKF den - Inactive
Project Area 2	3-May	38 72 240	04 39 472	DKF den - Active
Project Area 2	3-May	38 72 801	04 39 492	DKF den - Inactive
Project Area 2	2-May	38 72 578	04 39 504	DKF den - Inactive
Project Area 2	2-May	38 71 811	04 39 525	DKF den - Inactive
Project Area 2	2-May	38 71 889	04 39 581	DKF den - Inactive
Project Area 2	1-May	38 72 473	04 39 594	DKF den - Inactive
Project Area 2	1-May	38 72 566	04 39 636	DKF den - Inactive
Project Area 2	1-May	38 71 881	04 39 641	DKF den - Inactive
Project Area 2	1-May	38 72 560	04 39 645	DKF den - Inactive
Project Area 2	29-Apr	38 72 451	04 39 678	DKF den - Inactive
Project Area 2	28-Apr	38 71 653	04 39 736	DKF den - Pupping
Project Area 2	28-Apr	38 72 022	04 39 756	DKF den - Inactive
Project Area 2	28-Apr	38 72 554	04 39 776	DKF den - Inactive
Project Area 2	28-Apr	38 72 564	04 39 788	DKF den - Inactive
Project Area 2	27-Apr	38 71 918	04 39 843	DKF den - Inactive
Project Area 3	8-Apr	38 72 499	04 35 908	DKF den - Inactive
Project Area 3	9-Apr	38 72 386	04 35 999	DKF den - Inactive
Project Area 3	10-Apr	38 71 593	04 36 074	DKF den - Inactive
Project Area 3	12-Apr	38 72 503	04 36 170	DKF den - Inactive
Project Area 3	12-Apr	38 73 179	04 36 172	DKF den - Inactive
Project Area 3	12-Apr	38 72 507	04 36 199	DKF den - Inactive
Project Area 3	13-Apr	38 72 251	04 36 280	DKF den - Inactive
Project Area 3	13-Apr	38 72 927	04 36 288	DKF den - Inactive
Project Area 3	13-Apr	38 72 938	04 36 289	DKF den - Inactive
Project Area 3	16-Apr	38 72 872	04 36 507	DKF den - Active
Project Area 3	16-Apr	38 72 166	04 36 529	DKF den - Inactive
Project Area 3	17-Apr	38 72 917	04 36 555	DKF den - Inactive
Project Area 3	19-Apr	38 72 266	04 36 643	DKF den - Inactive
Project Area 3	21-Apr	38 72 942	04 36 796	DKF den - Active

Appendix 1 (cont). Desert Kit Fox Dens Found on the Aratina Biological Survey

Area	Date (2019)	Northing	Easting	Observation
Project Area 3	22-Apr	38 73 064	04 36 918	DKF den - Inactive
Project Area 3	22-Apr	38 72 198	04 36 926	DKF den - Inactive
Project Area 3	22-Apr	38 72 936	04 36 936	DKF den - Inactive
Project Area 3	23-Apr	38 73 077	04 37 025	DKF den - Inactive
Project Area 3	23-Apr	38 73 187	04 37 041	DKF den - Active
Project Area 3	26-Apr	38 71 714	04 37 127	DKF den - Inactive
Project Area 3	29-Apr	38 73 067	04 37 191	DKF den - Inactive
Project Area 3	28-Apr	38 73 088	04 37 199	DKF den - Inactive
Project Area 3	29-Apr	38 72 203	04 37 333	DKF den - Inactive
Project Area 3	1-May	38 71 817	04 37 346	DKF den - Inactive
Project Area 3	30-Apr	38 73 163	04 37 365	DKF den - Inactive
Project Area 4	2-May	38 73 461	04 35 237	DKF den - Inactive
Project Area 4	30-Apr	38 73 462	04 34 844	DKF den - Inactive
Project Area 4	2-May	38 73 465	04 35 359	DKF den - Inactive
Project Area 4	2-May	38 73 472	04 35 344	DKF den - Inactive
Project Area 4	1-May	38 73 585	04 35 078	DKF den - Inactive
Project Area 4	1-May	38 73 598	04 35 028	DKF den - Inactive
Project Area 4	23-Apr	38 73 619	04 33 513	DKF den - Inactive
Project Area 4	24-Apr	38 73 621	04 33 725	DKF den - Inactive
Project Area 4	2-May	38 73 628	04 35 356	DKF den - Inactive
Project Area 4	24-Apr	38 73 642	04 33 704	DKF den - Inactive
Project Area 4	23-Apr	38 73 646	04 33 548	DKF den - Inactive
Project Area 4	1-May	38 73 673	04 34 936	DKF den - Inactive
Project Area 4	1-May	38 73 717	04 35 036	DKF den - Inactive
Project Area 4	4-May	38 73 764	04 35 646	DKF den - Inactive
Project Area 5	13-Apr	38 74 207	04 33 696	DKF den - Inactive
Project Area 5	16-Apr	38 74 260	04 34 088	DKF den - Inactive
Project Area 5	12-Apr	38 74 265	04 33 447	DKF den - Inactive
Project Area 5	13-Apr	38 74 512	04 33 613	DKF den - Inactive
Gen-tie & Collectors	17-Apr	38 74 571	04 35 371	DKF den - Inactive
Gen-tie & Collectors	4-May	38 73 195	04 35 765	DKF den - Inactive
Burrowing Owl Buffers	11-May	38 72 524	04 41 286	DKF den - Inactive
Burrowing Owl Buffers	11-May	38 72 518	04 41 472	DKF den - Inactive
Burrowing Owl Buffers	11-May	38 72 511	04 41 843	DKF den - Inactive
Burrowing Owl Buffers	11-May	38 72 567	04 41 491	DKF den - Pupping
Burrowing Owl Buffers	12-May	38 73 284	04 36 966	DKF den - Pupping

Appendix 2. List of Birds, Mammals, and Reptiles Detected During Aratina Survey

Scientific Name	Common Name
BIRDS	
ORDER: ACCIPITRIFORMES	**HAWKS, KITES, EAGLES**
Cathartidae	**American Vultures**
Cathartes aura	Turkey Vulture
Accipitiridae	**Hawks, Kites, Eagles**
Accipiter cooperii	Cooper's Hawk
Buteo jamaicensis	Red-tailed Hawk
Circus cyaneus	Northern Harrier
ORDER: COLUMBIFORMES	**DOVES AND PIGEONS**
Columbidae	**Pigeons and Doves**
Zenaida macroura	Mourning Dove
ORDER: CUCULIFORMES	**CUCKOOS, ROADRUNNERS, ANIS**
Cuculidae	**Cuckoos, Roadrunners, Anis**
Geococcyx californianus	Greater Roadrunner
ORDER: APODIFORMES	**HUMMINGBIRDS AND SWIFTS**
Trochidae	**Hummingbirds**
Calypte costae	Costa's Hummingbird
ORDER: PICIFORMES	**WOODPECKERS**
Picidae	**Woodpeckers**
Picoides scalaris	Ladder-backed Woodpecker
ORDER: FALCONIFORMES	**FALCONS**
Falconidae	**Falcons**
Falco sparverius	American Kestrel
ORDER: PASSERIIFORMES	**PASSERINES AND PERCHING BIRDS**
Tyrannidae	**Flycatchers**
Myiarchus cinerascens	Ash Throated Flycatcher
Sayornis saya	Say's Phoebe
Tyrannus verticalis	Western Kingbird
Corvidae	**Jays, Magpies, and Crows**
Corvus corax	Common Raven
Alaudidae	**Larks**
Eremophila alpestris	Horned Lark
Remizidae	**Verdins**
Auriparus flaviceps	Verdin
Troglotytidae	**Wrens**
Campylorhynchus brunneicapillus	Cactus Wren
Polioptilidae	**Gnatcatchers**
Polioptila caerulea	Blue-gray Gnatcatcher
Mimidae	**Mimic Thrashers**
Mimus polyglottos	Northern Mockingbird
Toxostoma lecontei	LeConte's Thrasher
Parulidae	**Warblers**
Setophaga coronata	Yellow-rumped Warbler
Emberizidae	**Emberizids**
Amphispiza bilineata	Black-throated Sparrow
Artemisiospiza belli	Bell's Sparrow
Melozone crissalis	California Towhee
Spizella breweri	Brewer's Sparrow
Zonotrichia leucophrys	White-crowned Sparrow
Cardinalidae	**Cardinals**
Piranga ludoviciana	Western Tanager
Fringillidae	**Finches**
Haemorhous mexicanus	House Finch
Passeridae	**Weaver Finches**
Passer domesticus	House Sparrow

Appendix 2 (cont). List of Birds, Mammals, and Reptiles Detected During Aratina Survey

Scientific Name	Common Name
MAMMALS	
ORDER: CARNIVORA	**FLESH-EATERS**
Canidae	**Dogs, wolves, and foxes**
Canis familaris	Domestic Dog
Vulpes macrotis	Kit Fox
ORDER: RODENTIA	**GNAWING MAMMALS**
Sciuridae	**Squirrels**
Ammosphermophilus leucurus	Whitetail Antelope Squirrel
Spermophilus beecheyi	California Ground Squirrel
Xerospermophilus mohavensis	Mohave Ground Squirrel
Heteromyidae	**Kangaroo Rats**
Dipodomys deserti	Desert Kangaroo Rat
ORDER: LAGOMORPHA	**PIKAS, HARES, AND RABBITS**
Leporidae	**Hares and Rabbits**
Lepus californicus	Black-tailed Jackrabbit
Sylvilagus auduboni	Audubon's Cottontail
REPTILES	
ORDER:SQUAMATA	**LIZARDS AND SNAKES**
Iguanidae	**Iguanids**
Dipsosaurus dorsalis	Desert Iguana
Phrynosomitidae	**Phrynomsomitids**
Phrynosoma platyrhinos	Desert Horned Lizard
Sceloporus magister	Desert Spiny Lizard
Uta stansburiana	Side-blotched Lizard
Crotaphytidae	**Collared and Leopard Lizards**
Gambelia wislizenii	Long-nosed Leopard Lizard
Teiidae	**Whiptails**
Aspidoscelis tigris	Western Whiptail
Colubridae	**Colubrids**
Pituophis melanoleucus	Gopher Snake
Viperidae	**Pit Vipers**
Crotalus scutulatus	Mojave Rattlesnake

Appendix 3. Aratina Survey Weather Data

Date	0800 Temp. (°F)	0800 Cloud Cover (%)	0800 Average Wind Speed (mph)	0800 Maximum Wind Speed (mph)	0800 Wind Direction	1200 Temp. (°F)	1200 Cloud Cover (%)	1200 Average Wind Speed (mph)	1200 Maximum Wind Speed (mph)	1200 Wind Direction
4/7/2019	56.9	50%	3.0	3.9	WNW	73.3	75%	1.0	5.4	W
4/8/2019	65.9	75%	0.0	0.0		78.6	75%	1.3	2.6	W
4/9/2019	63.1	10%	11.7	19.7	W	63.3	10%	13.1	18.2	W
4/10/2019	52.5	2%	4.3	7.4	NW	62.3	1%	5.4	7.4	W
4/11/2019	51.6	10%	4.5	6.5	W	64.6	30%	3.1	5.9	W
4/12/2019	53.2	20%	2.7	4.5	W	65.4	10%	5.8	11.0	N
4/13/2019	56.0	0%	0.0	0.0		67.6	0%	2.5	5.5	N
4/14/2019	61.3	15%	7.3	10.2	SW	73.8	5%	11.8	16.9	SW
4/15/2019	58.2	60%	3.4	6.9	W	69.8	75%	9.3	13.5	SW
4/16/2019	50.4	50%	7.0	12.6	SW	54.3	10%	10.1	15.6	W
4/17/2019	56.8	0%	1.7	4.0	SW	72.2	1%	1.9	4.8	E
4/18/2019	58.6	20%	2.2	3.3	N	80.7	30%	1.6	3.3	N
4/19/2019	70.2	50%	1.6	2.6	S	81.7	60%	1.6	3.4	W
4/20/2019	61.2	15%	6.2	9.0	SW	81.7	30%	4.7	9.6	SW
4/22/2019	56.5	5%	1.2	2.7	S	74.8	30%	3.7	7.1	N
4/23/2019	68.6	15%	0.0	0.0		79.5	10%	6.7	15.1	N
4/24/2019	63.5	2%	2.9	4.3	SW	82.4	5%	2.3	4.4	W
4/25/2019	69.4	5%	1.7	4.1	SW	84.8	10%	2.0	3.6	W
4/26/2019	71.7	0%	4.2	7.6	SW	86.9	2%	5.9	7.9	SW
4/27/2019	68.9	10%	6.1	9.1	SW	83.3	15%	5.0	8.5	SW
4/29/2019	56.1	20%	9.1	13.5	W	65.6	75%	10.3	16.6	W
4/30/2019	54.4	2%	11.8	17.4	W	63.2	10%	15.0	21.7	W
5/1/2019	59.2	0%	1.7	2.7	W	66.2	10%	3.4	7.0	E
5/2/2019	59.8	30%	2.7	5.3	SW	72.9	30%	1.5	3.0	E
5/3/2019	63.6	20%	3.9	5.7	W	79.9	30%	0.8	1.8	W
5/4/2019	64.4	0%	5.3	8.6	W	77.8	0%	2.7	6.1	SW
5/5/2019	61.3	0%	4.5	9.7	SW	79.0	0%	4.9	14.5	SW
5/6/2019	56.0	5%	9.2	14.7	W	64.3	15%	7.6	13.0	W
5/7/2019	57.9	5%	3.3	8.3	SW	71.4	0%	4.1	12.4	SW
5/8/2019	68.0	0%	1.0	4.7	SW	86.3	5%	2.0	5.0	S
5/9/2019	59.9	80%	1.8	4.7	W	72.3	40%	2.8	6.9	W
5/10/2019	52.3	100%	1.2	4.7	NW	65.1	100%	4.1	6.3	N
5/11/2019	57.0	90%	0.0	0.0		73.8	30%	1.3	5.3	SW
5/12/2019	68.4	0%	0.0	0.0		78.8	10%	2.0	3.8	W
5/13/2019	70.4	10%	2.8	6.0	SW	81.8	30%	2.7	4.9	SW
5/14/2019	68.6	10%	4.5	7.9	SW	81.3	30%	3.2	6.4	W
5/15/2019	64.6	90%	3.3	5.2	SW	74.6	40%	6.4	8.9	W
5/16/2019	55.5	95%	6.5	11.4	W	59.0	70%	6.8	11.2	W

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Appendix D-2
Jurisdictional Waters and Wetlands Delineation

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Aratina Solar Farm Project

Jurisdictional Waters and Wetlands Delineation

prepared for

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Executive Summary

On behalf of 64NB 8me LLC, Rincon Consultants, Inc. (Rincon) conducted a jurisdictional delineation for the proposed Aratina Solar Project (project), an up to 600 megawatt-alternating current (MW-AC) utility-scale solar farm with energy storage located at the western edge of the Mojave Desert near the communities of Desert Lake and Boron in Kern County, California. The proposed project site would comprise approximately 2,711 acres within five separate project areas.

Approximately 261 acres are located in the Edwards Air Force Base (Edwards AFB) utility corridor, along its northeastern boundary in both Kern and San Bernardino counties. However, the entire area drains southwesterly towards Rodgers Lake on Edwards AFB and there may be drainages that meet the definition of state regulatory authorities, such as California Department of Fish and Wildlife (CDFW) and Lahontan Regional Water Quality Control Board (RWQCB).

The delineation was conducted to determine the location and extent of resources potentially subject to the jurisdiction of the CDFW and the Lahontan RWQCB. Proposed impacts to potential jurisdictional features may be subject to CDFW notification and permit requirements, pursuant to Sections 1600 *et seq*. of the California Fish and Game Code (CFGC) and RWQCB Section 13263 of the Porter-Cologne Water Quality Act (Porter-Cologne Act). As part of project scoping, planning, and design, this report was prepared to support CDFW and RWQCB consultation, notification, and permitting, as needed. Note that potentially jurisdictional features identified during this delineation are not likely subject to the regulation by the U.S. Army Corps of Engineers (USACE) under the Clean Water Act (CWA) because the site's hydrologic isolation from navigable waters means that, from a general basin-wide perspective, the watershed drains solely to inland areas of California.

Five ephemeral drainages were identified and delineated within the project site. Total potential RWQCB jurisdiction was 13.99 acres and total potential standard CDFW jurisdiction was 48.21 acres. The total horizontal distance of the drainages was 14,661 linear feet. No riparian habitat associated with the streams was present.

1 Introduction

Rincon Consultants, Inc. (Rincon) conducted a jurisdictional delineation for the proposed Aratina Solar Project (project). The delineation was conducted to determine the location and extent of waters and wetlands on the project site that may potentially be subject to the jurisdiction of the California Department of Fish and Game (CDFW) and Regional Water Quality Control Board (RWQCB).

Any proposed development in areas identified as jurisdictional waters and/or wetlands may be subject to the permit requirements of the under Porter-Cologne Water Quality Act and a Streambed Alteration Agreement from the CDFW pursuant to Section 1600 *et seq.* of the California Fish and Game Code. Actual jurisdictional limits are determined by the state agencies at the time that permits are requested.

1.1 Project Location

The approximately 2,711-acre project site is located in the western Mojave Desert near the communities of Desert Lake and Boron in unincorporated Kern County, California. The project site consists of five project sites on 27 parcels, hereafter referred to as Project Sites 1 through 5. Figure 1 and Figure 2 show the regional location and immediate vicinity of the project site, respectively.

The project is located west and south of the communities of Desert Lake and Boron; north and south of State Route (SR) 58, between Gephart Road on the west and the San Bernardino County line on the east; and within the northeastern utility corridor of Edwards Air Force Base (Edwards AFB). The project site is south of the existing U.S. Borax mine in Boron. The project site and associated power connections are located in portions of the *Leuhman Ridge, California* and *Boron, California* U.S. Geological Survey (USGS) 7.5-minute quadrangles. Quadrangle and township, range, and section location information for each project site are provided below:

- Project Site 1: *Leuhman Ridge*. T10N R07W S05,06
- Project Site 2: *Leuhman Ridge*. T10N R07W S06 and T10N R08W S01
- Project Site 3: *Leuhman Ridge*. T10N R08W S02 and T11N R08W S35
- Project Site 4: *Boron*. T11N R08W S33,34
- Project Site 4: *Boron*. T11N R08W S33

Figure 3 shows the project site overlaid on a USGS topographic map.

1.2 Project Description

This project description is abbreviated, focusing on elements of the proposed solar facility that are most relevant to the jurisdictional delineation. The proposed project includes the development of a photovoltaic solar generating facility with energy storage system (up to 600 MW-AC each of solar photovoltaic and energy storage). Power generated by the project energy storage will be delivered via up to 230 kV overhead and/or underground electrical transmission line(s) originating from one or more on-site substation(s)/switchyard(s) and terminating at the Southern California Edison (SCE)

Figure 1 Regional Location



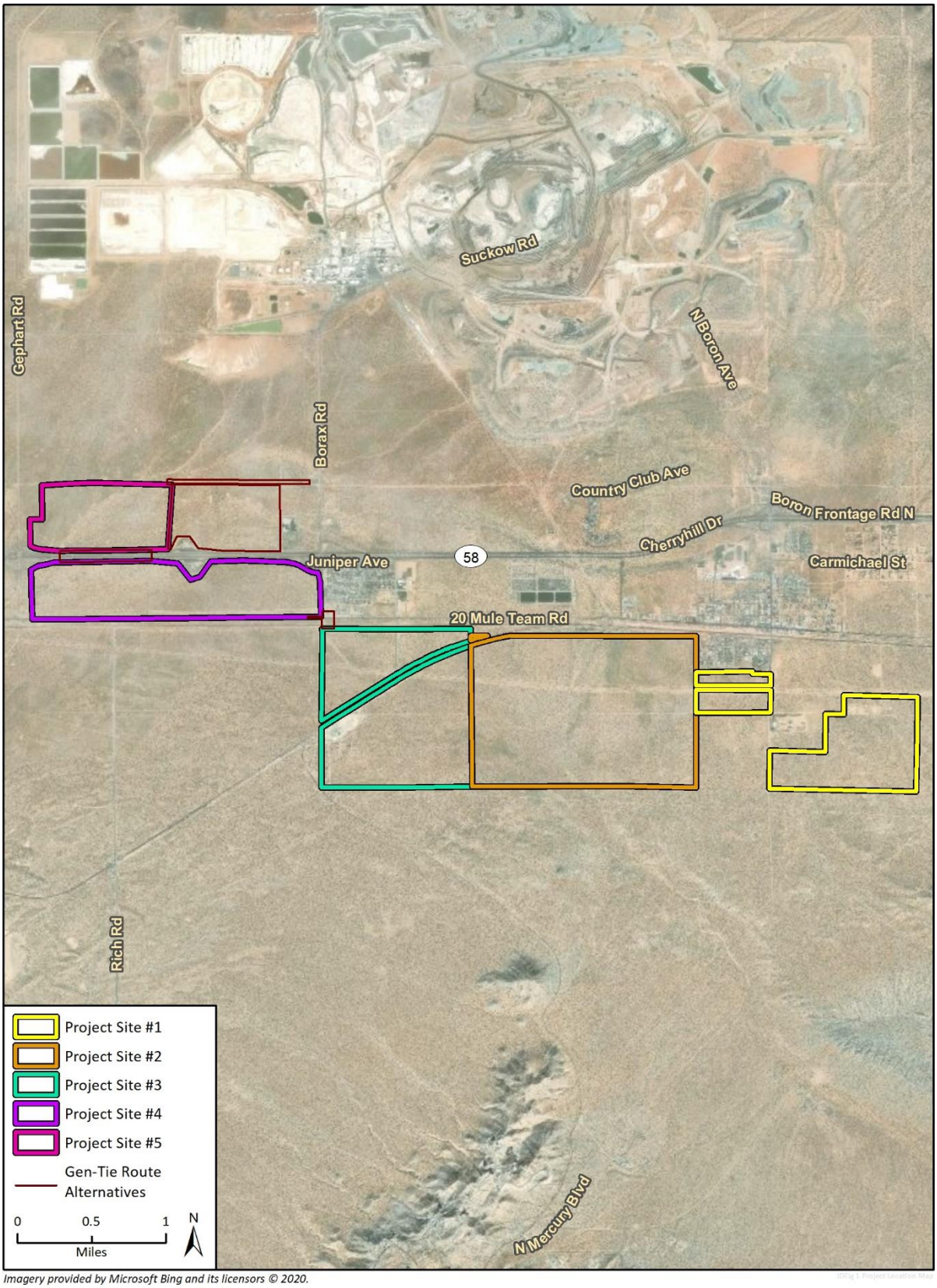
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Project Location

N

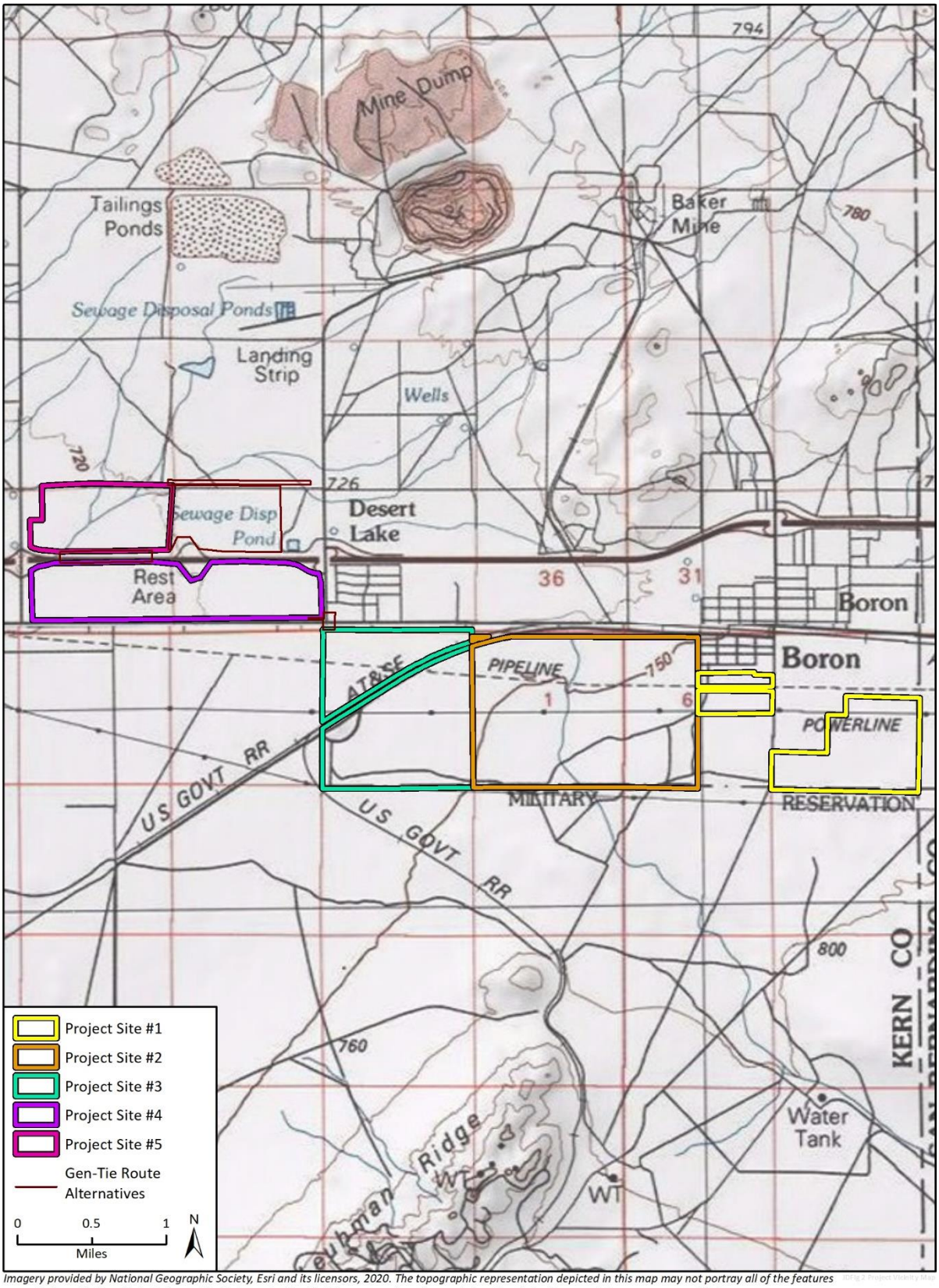


Figure 2 Project Location



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Figure 3 Project Location on USGS Topographic Map



Imagery provided by National Geographic Society, Esri and its licensors, 2020. The topographic representation depicted in this map may not portray all of the features currently found in the vicinity today and/or features depicted in this map may havechanged since the original topographic map was assembled.

Holgate Substation. Alternatively, the project may interconnect at the SCE Kramer Substation in San Bernardino County. The permanent disturbance acreage associated with development of the solar facility and associated infrastructure within the project site would be less than the gross acreage of the project site.

Each project site may include operations & maintenance (O&M) buildings, substations, energy storage systems (ESS), and/or transmission facilities, as necessary. It may share such facilities with other project sites or with any future energy projects in the area, and/or it may be operated remotely.

After the useful life of the project, the panels will be disassembled from the mounting frames and the project site will be restored to its pre-development condition.

1.3 Construction Activities

Construction of all project components would occur over approximately 12 to 18 months beginning as early as the fourth quarter of 2021 (i.e., October 1, 2021). Construction of the project would include the following types of activities:

- Site preparation
- Grading and earthwork
- Concrete foundations
- Structural steel work
- Electrical/instrumentation work
- Collector line installation
- Architecture and landscaping

Each project site may be constructed simultaneously, and phases of construction would overlap. Construction traffic would access the project site locally from Gephart Road, Del Oro Street, Boron Avenue, and 20 Mule Team Road. Materials and supplies would be delivered to the project site by truck. Earthmoving activities are expected to be limited to the construction of access roads, O&M buildings, substations, energy storage systems, and storm water protection or storage (detention) facilities. Final grading may include revegetation with low lying grass or applying earth-binding materials to disturbed areas.

1.4 Operational Activities

Once completed, the project would generally be limited to the following maintenance activities:

- Cleaning PV panels
- Monitoring electricity generation
- Providing site security
- Maintaining the facility: replacing or repairing inverters, wiring, and PV modules

The project would operate continuously, seven days a week, until the anticipated repowering or decommissioning of the project in 30 to 40 years. Each project site could require an operational staff of up to five full-time employees. The project may share an O&M, substation, and/or transmission facilities with one or more nearby solar projects, which could reduce the proposed

project's on-site operational staff. Maintenance activities may occur as-needed seven days a week, 24 hours a day to ensure PV panel output when solar energy is available.

1.5 Federal Clean Water Act Jurisdiction

Surface water flow from the project site drains toward or into Rogers Dry Lake, which is located approximately 2.5 miles southwest of Project Site 4. Section 404 of the CWA establishes a program to regulate the discharge of dredged or fill material into waters of the United States (WOUS), including wetlands. Section 404 requires a permit before dredged or fill material may be discharged into WOUS, unless the activity is exempt from Section 404 regulation. The USACE has jurisdiction over WOUS, under provisions of Section 404 of the CWA and USACE implementing regulations.

USACE previously evaluated numerous waters within a 40-mile radius of the project site to determine if drainages in the Mojave Desert Basin constitute WOUS that would be regulated under Section 404 of the CWA. The closest waters previously evaluated were dryland drainages in western Mojave Desert Basin near Red Mountain. The USACE considered two drainages in an approved jurisdictional determination (AJD) dated June 4, 2013, for the Sydney Peak Stone Mine Expansion Project (USACE File No. SPL-2011-01040-SLP). In this determination the USACE found that surface flows into Rogers Dry Lake percolate into the groundwater table or evaporate. The determination concluded that Rogers Dry Lake is not a navigable water. It does not have use for surface water used for recreation or other purposes by foreign or interstate travelers, it does not support harvesting activities of fish or shellfish that may be sold in interstate or foreign commerce, and it does not support surface water industrial usage by industries in interstate commerce. The USACE concluded that Rogers Dry Lake is an intrastate, isolated water; therefore, drainages flowing into Rogers Dry Lake are not jurisdictional WOUS.

On April 21, 2020, the USACE and U.S. Environmental Protection Agency published the *Navigable Waters Protection Rule to define "Waters of the United States"* (85 FR22250). This rule, effective on June 22, 2020, defines jurisdictional waters, documents certain types of waters that are excluded from jurisdiction, and clarifies some regulatory terms (USACE, USEPA 2020). Under the *Navigable Waters Protection Rule*, streams that are ephemeral features that flow only in direct response to precipitation are excluded from the definition of a WOUS.

Based on this determination, the USACE is not expected to assert jurisdiction over tributaries to Rogers Dry Lake, because they do not meet the current definition of WOUS and the USACE has previously declined to assert jurisdiction over those features and has formally documented this position in an Approved Jurisdictional Determination. They are hydrologically isolated from traditionally navigable waters or interstate waters, and do not have the potential to directly or indirectly affect interstate or foreign commerce. Therefore, federal CWA jurisdiction are not considered further in this report.

2 Methodology

This jurisdictional delineation was conducted in accordance with the most currently accepted regulatory guidelines. The delineation analysis began with a literature review of existing studies, maps, and other publications. After completion of the literature review, a field delineation was completed to identify, describe, and map all potential jurisdictional waters within each project site. Delineated features are depicted in Figure 6a through Figure 6j in Section 4 of this report. Rincon regulatory specialists, led by Senior Biologist Jonathan True, conducted fieldwork for this evaluation on April 2, 3, 4, 8, 9, 10, 25 and 26, 2019.

2.1 Literature Review and Photo Interpretation

Prior to the field survey, Rincon reviewed aerial photographs of the site, regional and site specific topographic maps including *Leuhman Ridge, California*, *Boron, California*, and *Kramer Junction* quads; the *Soil Survey of Kern County, Southeastern Part, California* (U.S. Department of Agriculture Natural Resources Conservation System [USDA NRCS] 1981) (Appendix D); the Desert Renewable Energy Conservation Plan; and other available background information to better characterize the nature and extent of potentially jurisdictional waters and wetlands.

The *National Wetlands Inventory* (NWI) (United States Fish and Wildlife Service 2019) and the *National Hydrography Dataset* (USGS 2019) were reviewed to determine if any wetlands or other waters had been previously documented and mapped in or near the project sites (Appendix D). The *National Hydric Soils List by State: California* (USDA NRCS 2019b) was also reviewed to determine if any soil map units mapped in the project sites were classified as hydric.

Historic and recent high-resolution aerial photographs were examined prior to conducting field surveys to detect signatures that may indicate fluvial activity. Using GIS areas were selected where watercourses and related geomorphic forms or units (e.g., floodplain, terrace, interfluves, islands) appeared to be present. Based on aerial signatures, such as changes in landscape color, vegetation density, and drainage patterns, various areas across the project site were identified where field investigations would be focused. Rincon imported the locations of potential jurisdictional features into an Android tablet equipped with ESRI ArcCollector. The tablet was paired with a Trimble R1 Global Positioning System (GPS) with sub-meter accuracy for use in the field. The data was overlaid on high recent resolution aerial imagery for navigation and data collection.

2.2 Field Surveys

After the completion of the literature review, the jurisdictional delineation field survey was conducted at the project site in April 2019. The surveys were conducted by driving throughout the site to selected areas where representative samples of potential jurisdictional ephemeral streams were identified during the literature review, including the areas identified via aerial photo interpretation and those mapped in the NWI and National Hydrography Dataset (NHD). These areas were surveyed on the ground to verify the presence or absence of jurisdictional features. The surveyors also drove the perimeter of the project sites to observe any potential waters crossing into or out of the project site. Potential jurisdictional areas including streams that exhibit an ordinary high water mark (OHWM) and that might constitute waters of the state were identified. The site was examined for the presence of defined channels with characteristic bed and bank features and

indicators of water flow. The landforms, vegetation, hydrology, and soil conditions were noted where these characteristics were relevant to identification of the feature.

Current federal and state methods and guidelines were used to identify and delineate potential jurisdictional areas, including waters of the state, as follows.

Waters of the State

As noted above, on-site streams that are ephemeral in nature were determined to not meet the definition of a water of the U.S. pursuant to the *Navigable Waters Protection Rule*; therefore, no potentially jurisdictional features identified during this delineation are subject to USACE and RWQCB jurisdiction pursuant to the CWA. However, USACE guidelines for delineating jurisdictional limits can be used to determine the limits of waters subject to RWQCB jurisdiction except that the requireents for connectivity to navigable water and exclusions states in the Navigable Waters Protection Rule (*e.g.,* the exclusion for ephemeral features) do not apply. In the case of isolated features displaying an OHWM, RWQCB still considers such drainages to be jurisdictional waters of the State pursuant to the Porter-Cologne Act. Therefore, these features were mapped using the OHWM methodology utilized by the USACE. OHWM datasheets completed for the primary drainage features that exhibited an OHWM (Attachment B).

The State Water Resources Control Board's procedures for delineating State wetlands (see Appendix C), direct that wetland waters of the State should be delineated using the USACE's 3-parameter routine delineation procedures, except that areas meeting the wetland hydrology and hydric soils parameters but lacking vegetation should be considered wetland. However, because the site is within a desert area and no wetland indicators were observed in the field, collecting formal wetland data was not necessary.

Waters potentially subject to RWQCB jurisdiction were evaluated in accordance with the following:

- USACE Guidelines for Jurisdictional Determinations for Waters of the United States in the Arid Southwest (2001)
- USACE Jurisdictional Determination Form Instructional Guidebook (2007)
- USACE A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States (2008)
- State Water Resources Control Board Implementation Guidance for the State Wetland Definition and Procedures for Discharge of Dredged or Fill Material to Waters of the State (2019)
- Porter-Cologne Water Quality Control Act statutory language

CDFW Streambed Jurisdiction

Streambeds subject to CDFW jurisdiction were mapped to the top of the outermost active banks or extent of riparian vegetation. This evaluation involved a combination of aerial imagery analysis and field inspection. Mapping to the top of the bank is consistent with long-standing agency practice, and comports with the law, adopted agency regulations, and applicable court cases. Key tenets from these sources pertaining to delineation of streambeds are summarized below.

- The plain language of **Section 1602 of the California Fish and Game Code** establishes the following general concepts:
  - References "river," "stream," and "lake"

- References "natural flow"
- References "bed," "bank," and "channel"

- **Applicable court decisions**, in particular *Rutherford v. State of California* (188 Cal App. 3d 1276 (1987), which interpreted Section 1602's use of "stream" to be as defined in common law. The Court indicated that a "stream" is commonly understood to:
  - Have a source and a terminus
  - Have banks and a channel
  - Convey flow at least periodically, but need not flow continuously and may at times appear outwardly dry
  - Represent the depression between the banks worn by the regular and usual flow of the water
  - Include the area between the opposing banks measured from the foot of the banks from the top of the water at its ordinary stage, including intervening sand bars
  - Include the land that is covered by the water in its ordinary low stage
  - Include lands below the OHWM
- **CDFW regulations** defining "stream" for other purposes, including sport fishing (14 CCR 1.72) and streambed alterations associated with cannabis production (14 CCR 722(c)(21)), which indicate that a stream:
  - Flows at least periodically or intermittently
  - Flows through a bed or channel having banks
  - Supports fish or aquatic life
  - Can be dry for a period of time
  - Includes watercourses where surface or subsurface flow supports or has supported riparian vegetation

2.3 Data Collection and Processing

The extents of potential jurisdictional features and photo locations were mapped using the GPS and field tablet, and were also plotted on aerial photographs. The data were subsequently transferred to Rincon's Geographic Information System (GIS) to produce Delineation Figure 6a through Figure 6j, presented in Section 4. Representative photographs of potential jurisdictional waters and surrounding site conditions are presented in Attachment A.

3 Delineation Results

3.1 Environmental Setting

The project site is located in the western portion of the Mojave Desert basin northeast of Rogers Dry Lake. The high desert ecological sub-region is characterized by arid scrub, creosote bush scrub, playas, and desert washes. The project site is surrounded by Rogers Dry Lake to the southwest and Leuhman Ridge to the south, and Castle Butte to the northwest. Elevation at the site ranges between 2,335 and 2,550 feet above mean sea level. The topography of the project site is relatively flat to gently sloped.

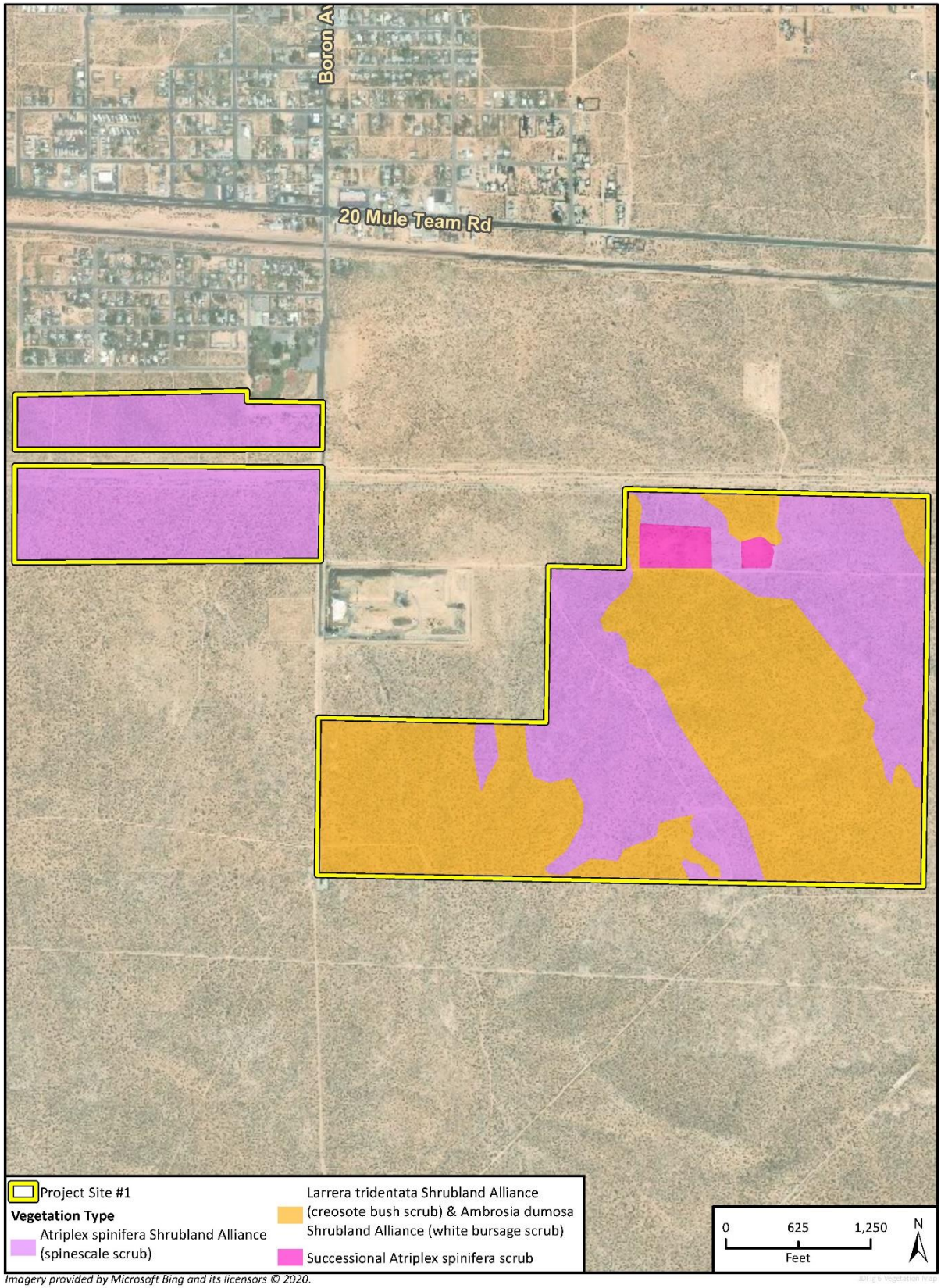
Desert climates are characterized by an arid environment (low humidity/rainfall), strong fluctuations in daily temperatures, hot summers and cold winters, and generally clear skies. Wind is also a strong feature of this climatic regime, with dry winds in excess of 25 miles per hour in the late winter and early spring. Average temperatures range from 47.5 to 80.3 degrees Fahrenheit with a high of 102 degrees Fahrenheit in the summer, and an average annual rainfall of 4.33 inches (Western Regional Climate Center 2019). Rainfall in the Mojave Desert is characterized by a high degree of spatiotemporal variability, with isolated precipitation events, high inter-annual variability and decadal oscillations in rainfall rates, and rainfall gradients from south to north and west to east. The winter preceding this survey was documented with above average in rainfall.

The project site is subject to various ongoing disturbances related to road maintenance, utility activities (electrical transmission lines, underground gas pipeline), recreation, OHV travel, and illegal dumping.

3.2 Vegetation

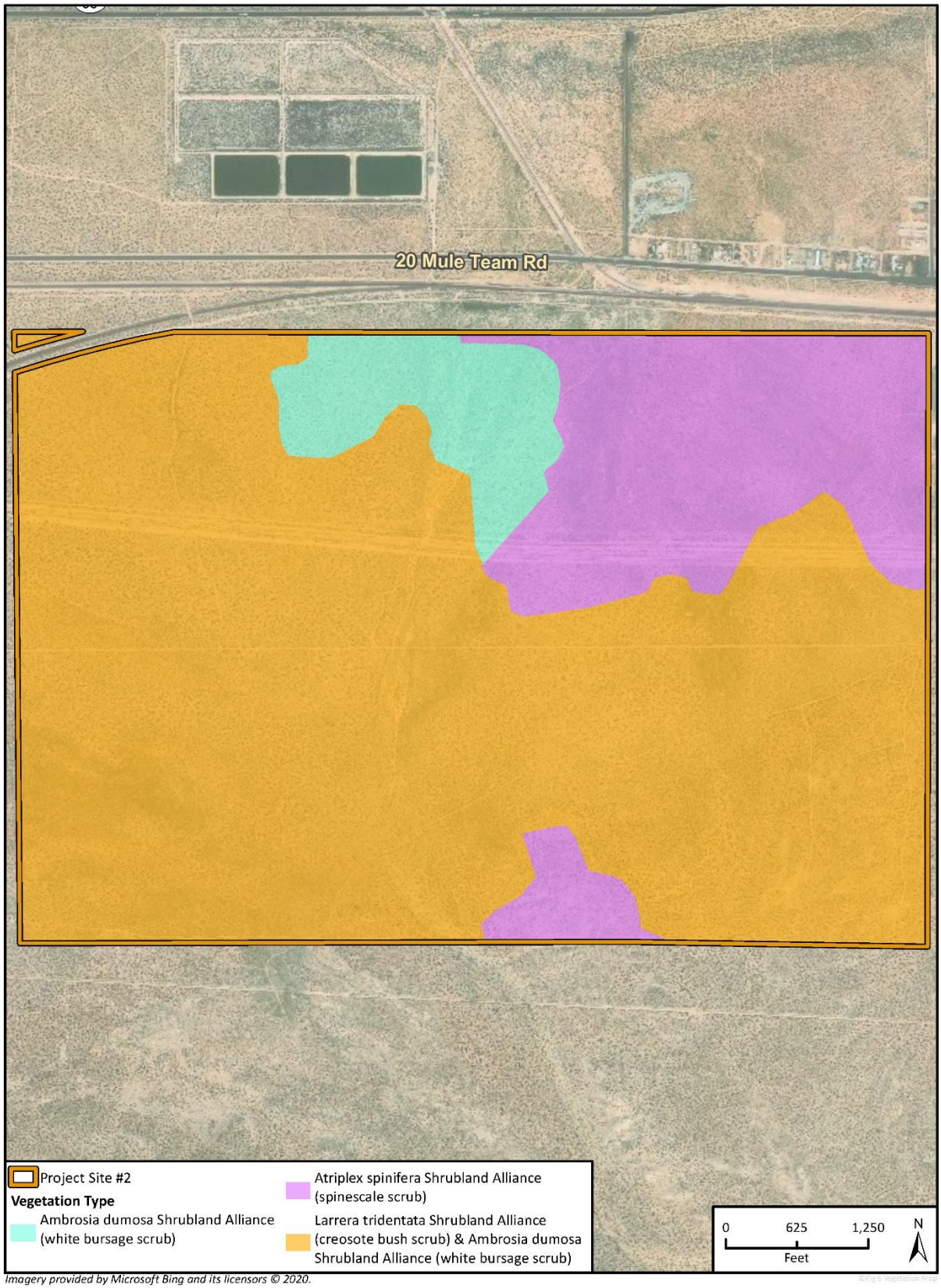
Vegetation types in the Mojave Desert are influenced strongly by arid climatic conditions and desert soils. Vegetation in the region includes a predominance of plant morphological adaptations to extreme aridity and saline alkali soils. Vegetation structure is generally characterized by short-statured and widely spaced shrubs, and arborescent shrubs resulting from a competition for soil water resources (Baldwin, et al. 2012). The project site is located within the Mojave Desert Region of the Desert Floristic Province. Landforms in the region included granite-derived flood plains, alluvial flats and fans, and small clay pans. Nine (9) vegetation communities were identified on site, as shown in Figure 4a through Figure 4e. These vegetation communities include *Larrea tridentata-Ambrosia dumosa* (Creosote Bush-White Bursage) Shrubland Alliance; *Atriplex spinifera* (Spinescale) Shrubland Alliance; White Bursage Shrubland Alliance; Creosote Bush Shrubland Alliance; *Atriplex polycarpa* (Allscale) Scrub Shrubland Alliance; Successional Spinescale - Allscale Scrub; Successional Spinescale Scrub; Successional Allscale Scrub; and *Yucca brevifolia* (Joshua Tree) Woodland Alliance. No riparian or hydrophytic vegetation was observed on the project site.

Figure 4a Vegetation Communities/Land Cover Types – Project Site 1



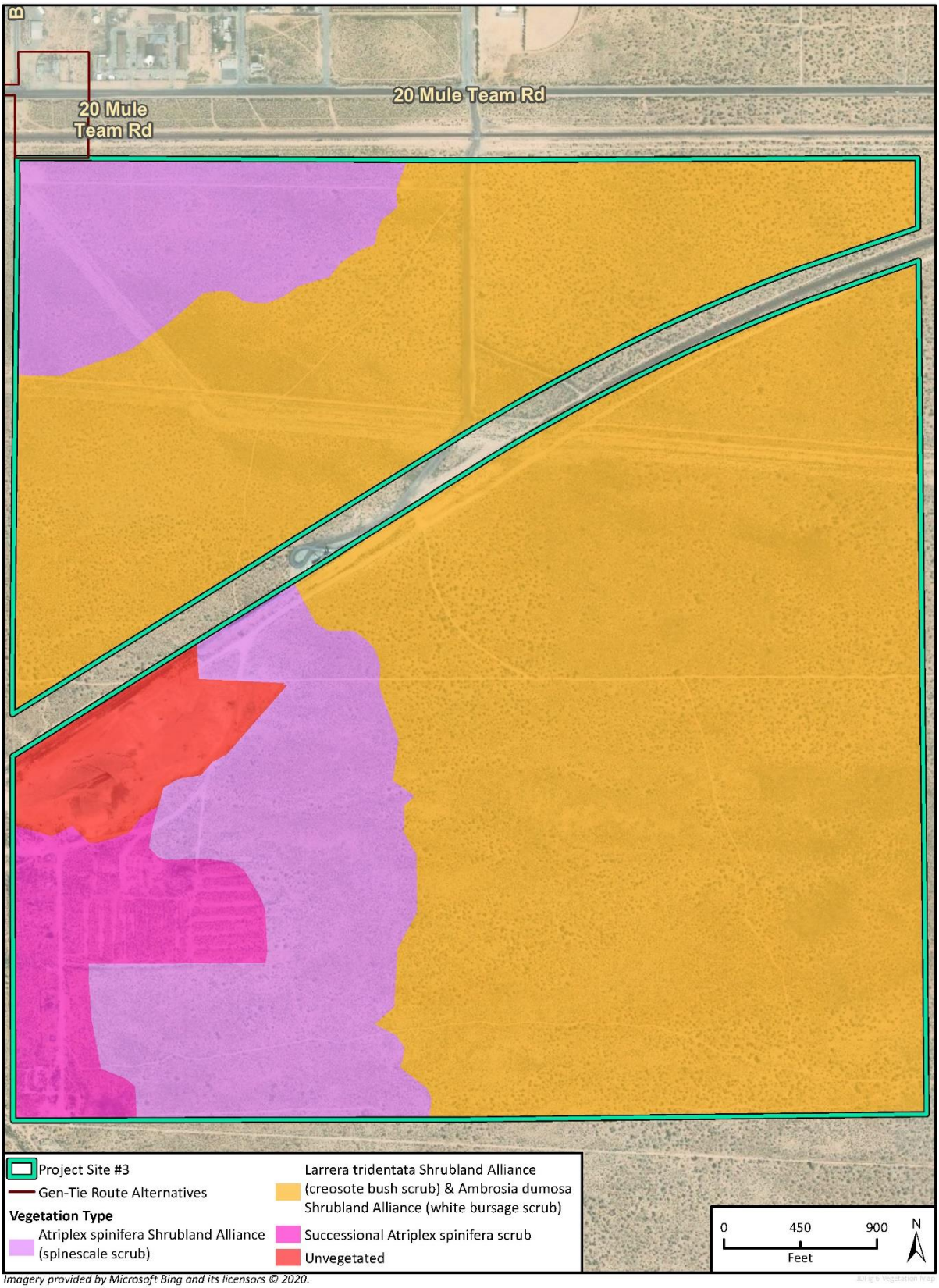
Imagery provided by Microsoft Bing and its licensors © 2020.
Vegetation data provided by EnviroPlus Consulting Inc., March 2019.

Figure 4b Vegetation Communities/Land Cover Types – Project Site 2



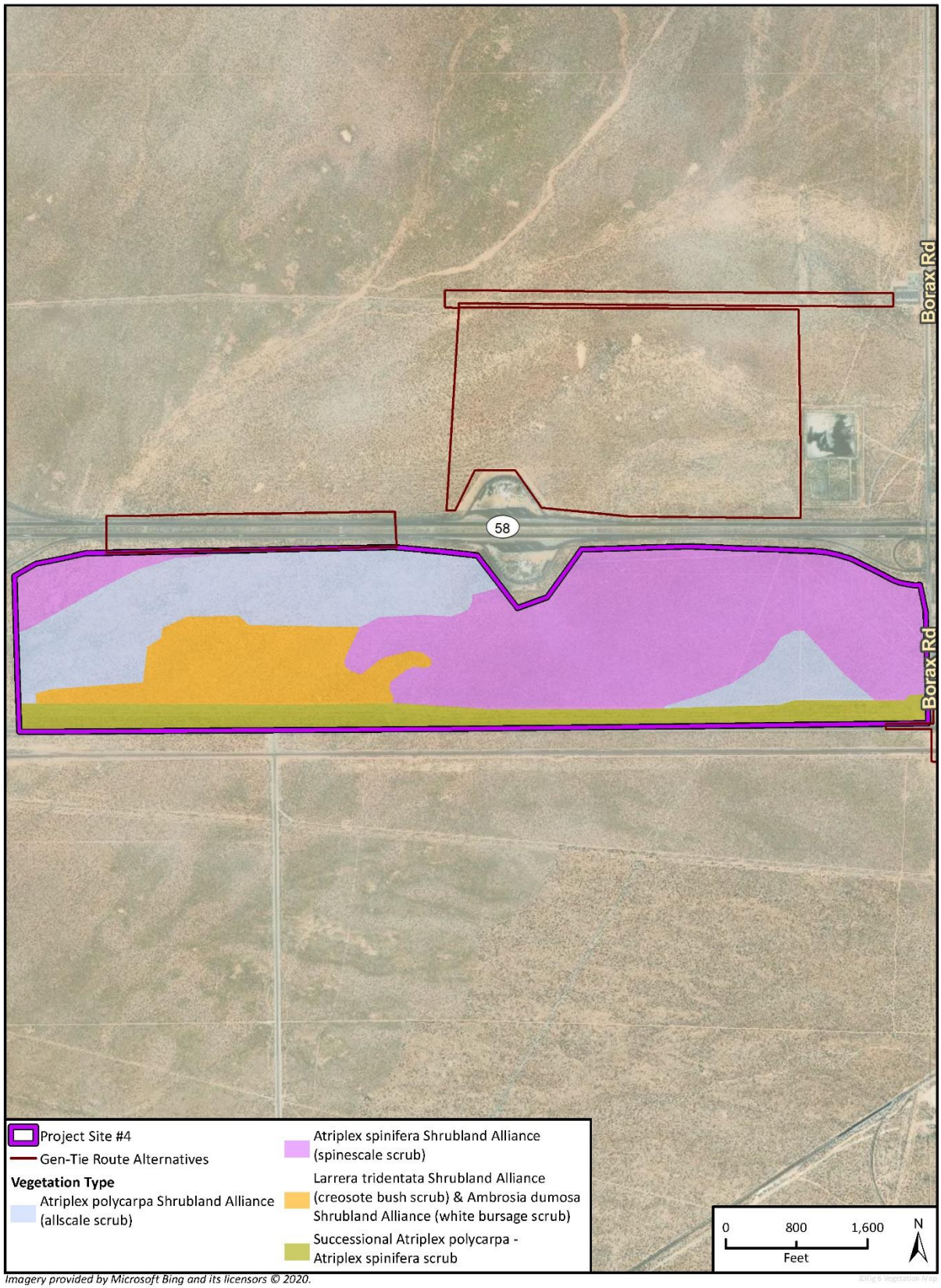
Imagery provided by Microsoft Bing and its licensors © 2020.
Vegetation data provided by EnviroPlus Consulting Inc., March 2019.

Figure 4c Vegetation Communities/Land Cover Types – Project Site 3



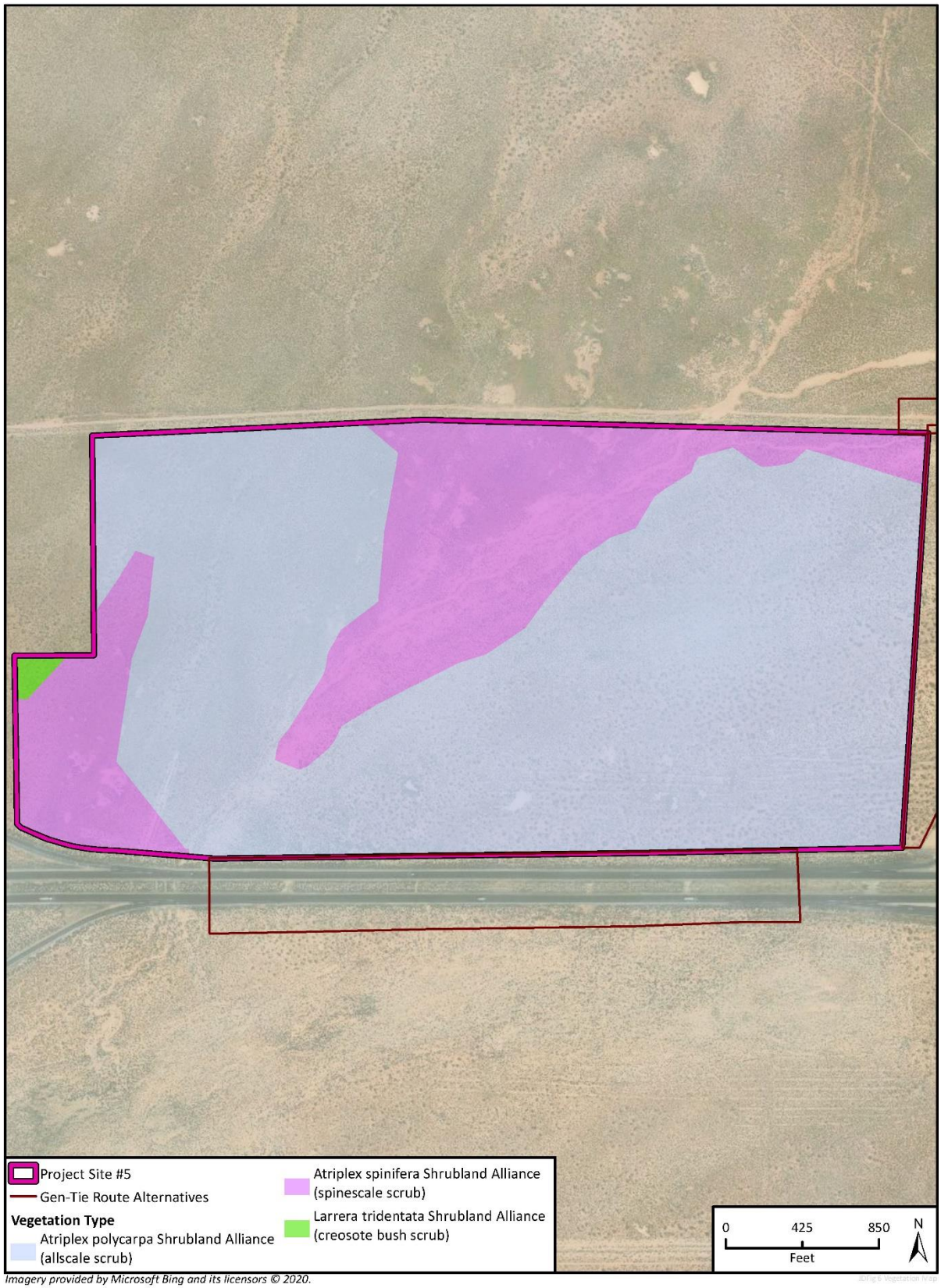
Imagery provided by Microsoft Bing and its licensors © 2020.
Vegetation data provided by EnviroPlus Consulting Inc., March 2019.

Figure 4d Vegetation Communities/Land Cover Types – Project Site 4



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Vegetation data provided by EnviroPlus Consulting Inc., March 2019.

Figure 4e Vegetation Communities/Land Cover Types – Project Site 5



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Vegetation data provided by EnviroPlus Consulting Inc., March 2019.

3.3 Hydrology

The site is primarily located in the Town of Boron watershed, Hydrologic Unit Code (HUC-12 180902062108) and a small portion of the site is also located in the Reclamation Dam Edwards Air Base (HUC-12 180902062102) and Town of North Edwards (HUC-12 180902062109). The majority of the site is mostly level and slope gradients across the site are extremely low. Ephemeral drainages observed west of Borax Road generally flow to the south, and those observed east of Borax Road generally flow to the north. Flowing water on site occurs only during and immediately after high precipitation events. Hydromodification has fragmented drainage flow, primarily on numerous dirt roads and larger roadways such SR 58. Road maintenance activities on access roads through the project site include clearing and blading, which create large soil berms on each side of the roads and block the flow of drainages at the road edge. Additionally, OHV tracks interrupt the flow of small shallow channels.

3.4 Soils

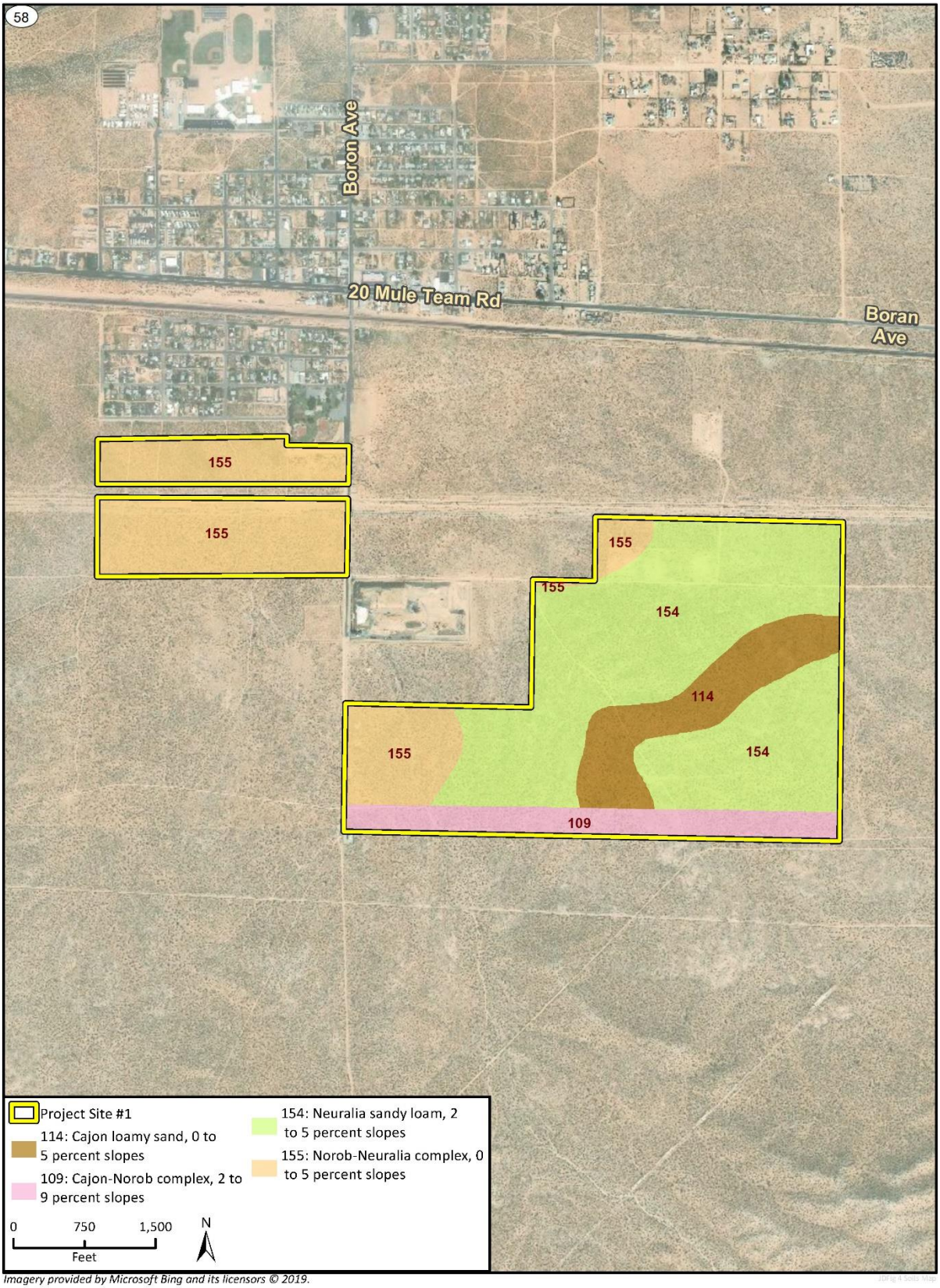
Based on the USDA Soil Conservation Service Soil Survey of Kern County, Southeastern Part (1981), the project site contains five mapped soil units, Cajon loamy sand, 0 to 5 percent slopes; Cajon gravelly loam sand, 0 to 9 percent slopes; Cajon-Norob complex, 2 to 9 percent slopes; Norob-Neuralia complex, 0 to 5 percent slopes, and Neuralia sandy loam, 2 to 5 percent slopes. None of these soils are listed on the NRCS Hydric Soils List. Figure 5a through Figure 5e depict the mapped soil units at the project site.

The Cajon Series of soils consist of very deep, somewhat excessively drained soils that formed in sandy alluvium from dominantly granitic rocks (USDA 2019a). The textures can be coarse sand, loamy coarse sand, sand, loamy sand, fine sand, or loamy fine sand or their gravelly or cobbly equivalents. Cajon soils are on alluvial fans, fan aprons, fan skirts, inset fans, and river terraces at elevations of 200 to 4,300 feet. Slopes are 0 to 15 percent. The profile is slightly alkaline or strongly alkaline and mildly saline-alkali to strongly saline-alkali. Cajon soils are somewhat excessively drained, and have negligible to low runoff with rapid permeability. Cajon soils with sandy loam surface textures have moderately rapid permeability. Vegetation is mostly desert shrubs including creosote bush (*Larrea tridentata*), saltbush (*Atriplex* spp.), Mormon-tea (*Ephedra* sp.), Joshua tree (*Yucca brevifolia*), sand rice grass (*Stipa hymenoides*), and other annual grasses and forbs.

The Norob Series consists of very deep, moderately well drained soils formed from mixed alluvium with eolian deposits, on alluvial plains and alluvial flats at elevations between 2,300 and 3,200 feet. The topsoil consists of sandy clay loam that transition to gravelly sandy loam at a depth of 40 inches. Vegetation occurring in this series includes cattle saltbush, creosote bush, and grasses.

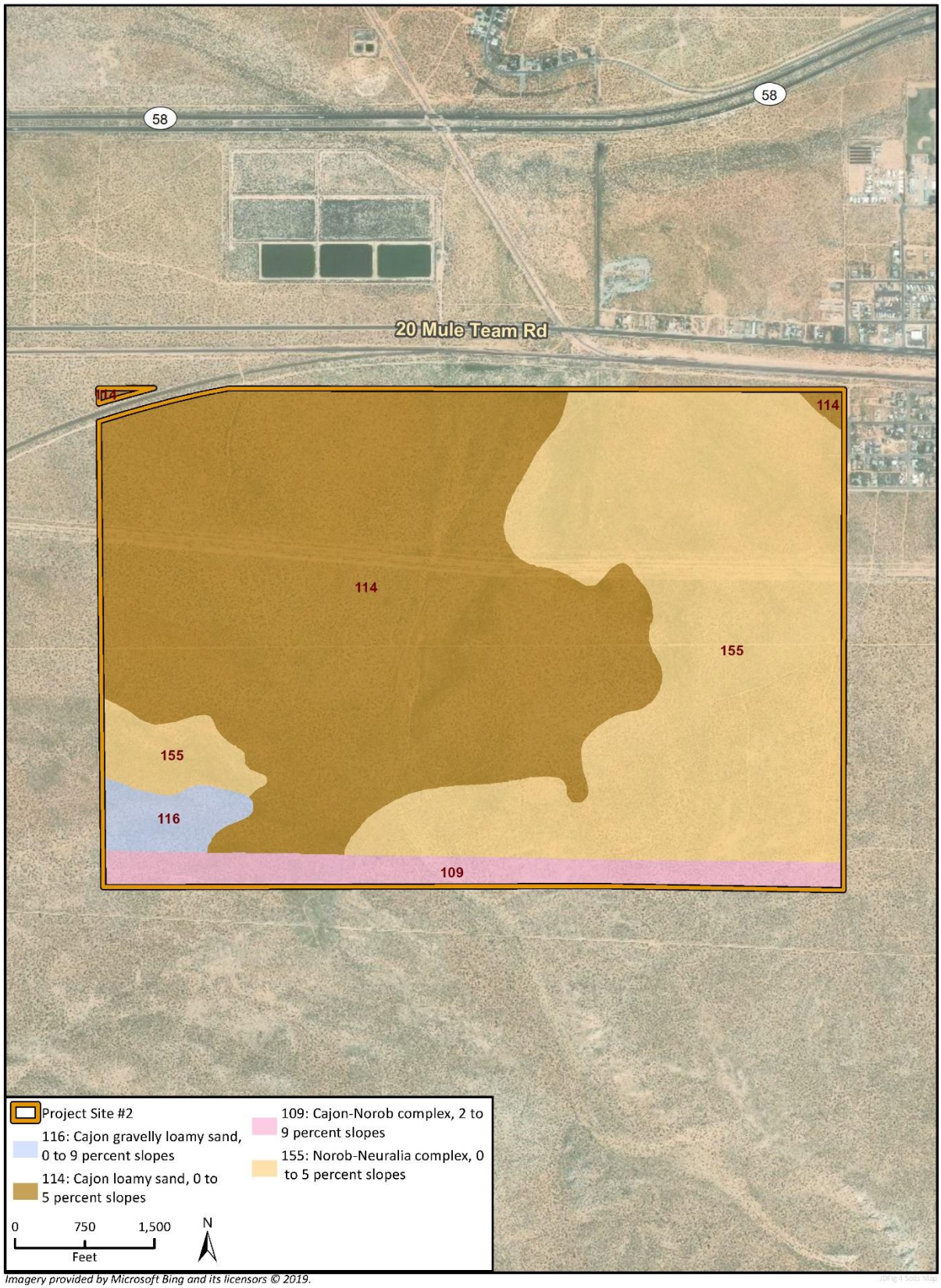
The Neuralia Series consists of very deep, well drained soils formed in alluvium from mixed sources. Neuralia soils are on alluvial fans, fan terraces, and plains and have slopes of 0 to 15 percent. Elevations are 2,300 to 4,200 feet. The mean annual soil temperature is 59 to 65 degrees F. The surface is covered with about 30 to 60 percent fine (2 to 25 mm) gravel. Reaction is neutral to moderately alkaline to a depth of 10 inches and slightly alkaline or moderately alkaline below. Well drained; slow and medium runoff; and moderately slow permeability. Natural vegetation occurring within this series includes white bursage, creosote bush, and scattered annual grasses and forbs.

Figure 5a Soils – Project Site 1



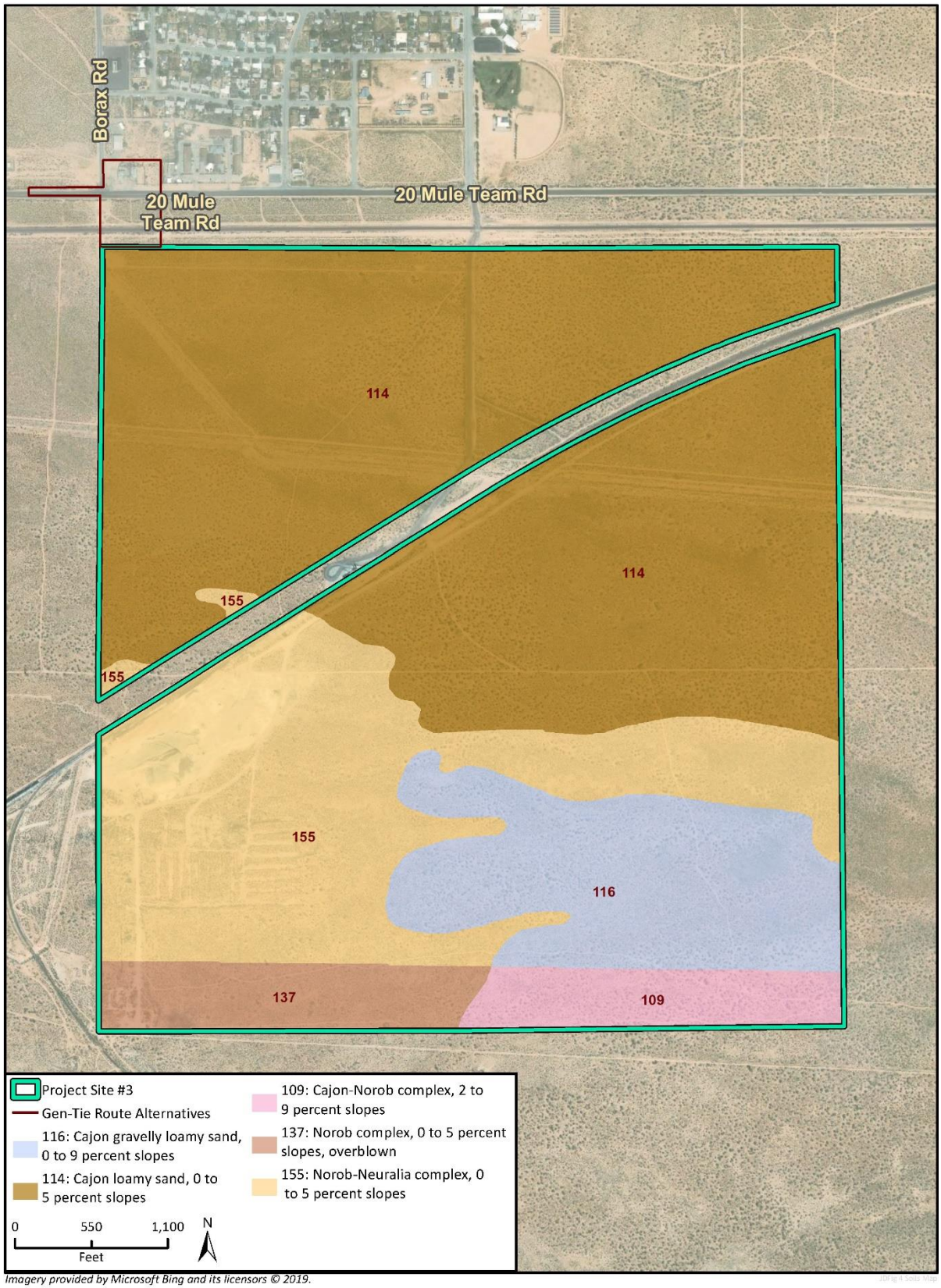
Imagery provided by Microsoft Bing and its licensors © 2019.
Additional data provided by SSURGO, 2018.

Figure 5b Soils – Project Site 2



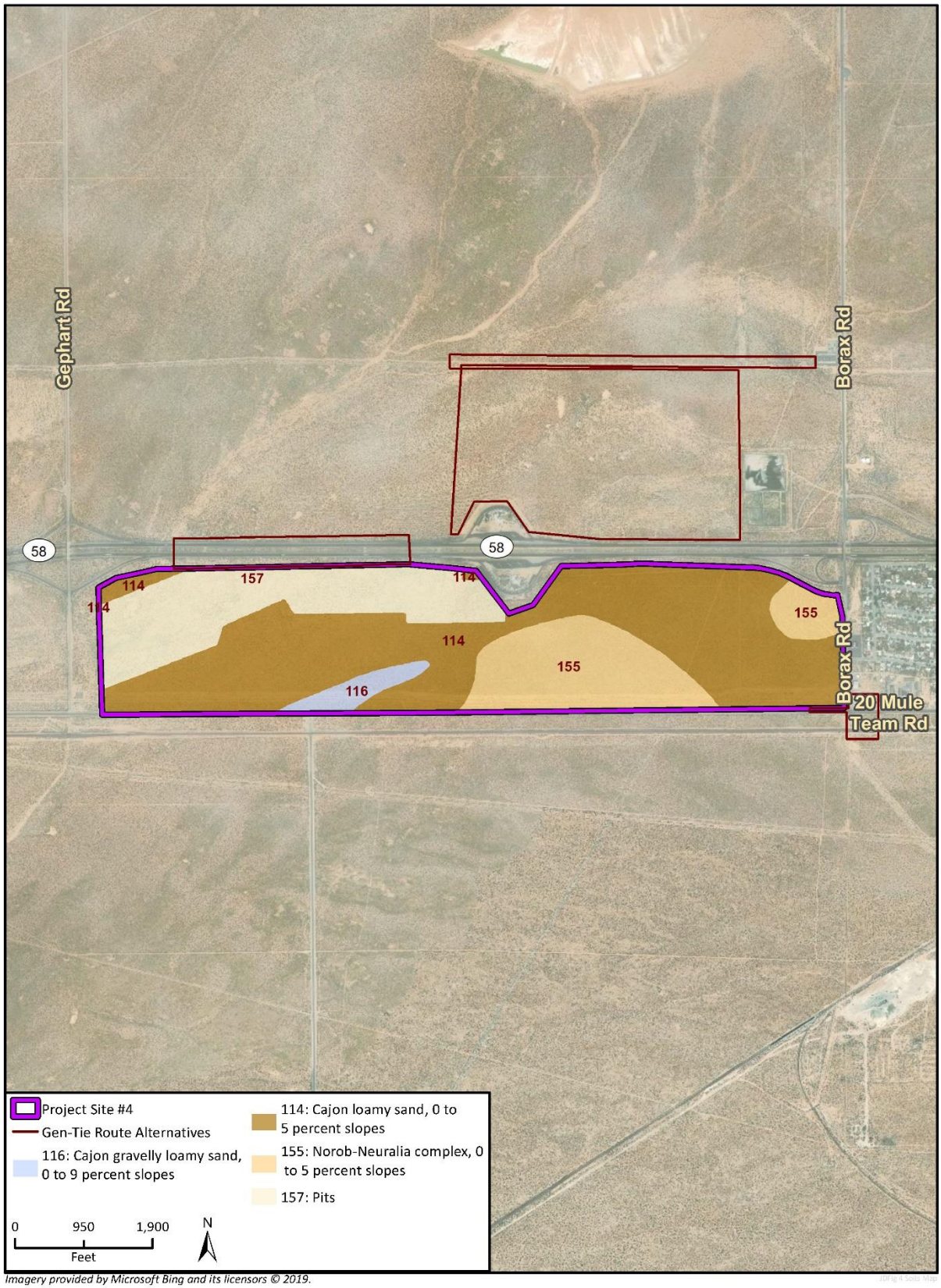
Imagery provided by Microsoft Bing and its licensors © 2019.
Additional data provided by SSURGO, 2018.

Figure 5c Soils – Project Site 3



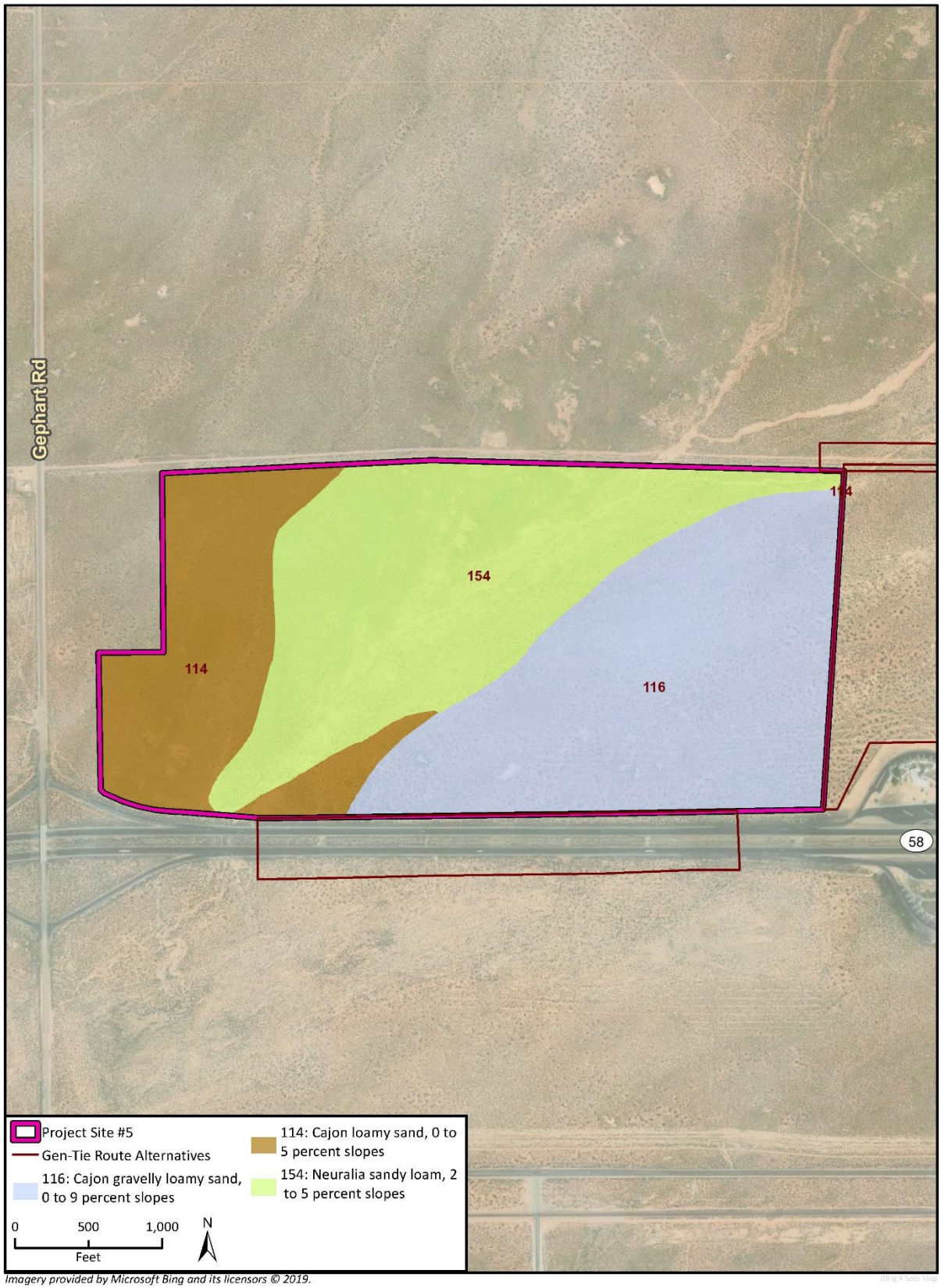
Imagery provided by Microsoft Bing and its licensors © 2019.
Additional data provided by SSURGO, 2018.

Figure 5d Soils – Project Site 4



Imagery provided by Microsoft Bing and its licensors © 2019.
Additional data provided by SSURGO, 2018.

Figure 5e Soils – Project Site 5



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Additional data provided by SSURGO, 2018.

3.5 Ephemeral Drainages

This section presents the results of the delineation of ephemeral drainages potentially under the jurisdiction of the CDFW and RWQCB at the approximately 2,711-acre project site. Five ephemeral drainages were delineated across the five project sites. Table 1 summarizes the delineated drainages. No drainages were identified within Project Sites 1 and 3, based on the absence of flow, channel, bank and bank indicators. The terrain in these sites is mostly level and is dissected by numerous roads and OHV trails.

Project Site 3 contains no aerial photo signatures indicative of drainage features, and no features are mapped in the NWI. It is split by a railway corridor and a borax loading depot. Project Site 1 contains mapped streams in the NWI, but no evidence of drainage flow was observed entering or exiting the site, or at selected locations within the site boundaries (see photos 32-40 in Appendix A that show the lack of features).

Table 1 Summary of Delineated Features within Project Sites

Drainage ID	Project Site(s)	Feature Type	Average CDFW Top of Bank Width (feet)	Average RWQCB OHWM Width (feet)	Delineation Map Figures
ED-1	5	Ephemeral drainage	3	2	6e, 6j
ED-2	4, 5	Ephemeral drainage	35	25	6d, 6e, 6i, 6j
ED-3	5	Ephemeral drainage	20	15	6e, 6j
ED-4	2	Ephemeral drainage	100*	50*	6b, 6g
ED-5	2	Ephemeral drainage	3	2	6b, 6g

* Includes multiple separate channels combined.

A number of ephemeral streams are mapped in the NWI within the project site. They are classified as riverine, intermittently flooded streambeds (Cowardin code R4SBJ). In these areas, most of the streambeds are depicted as connecting to the dry lakebed, but, as discussed above, field observations indicate that the on-site streams lack a clear surface connection via defined channels with bed and bank. The *National Hydrography Dataset* mapping data is similar to the NWI. Streambed features are depicted in approximately the same locations, but fewer features are depicted and playa features are not included.

Five ephemeral drainages were identified and delineated in the project site areas. General drainage characteristics are summarized in Table 2. These drainages convey water flows only during and immediately after high precipitation events. Evidence of fluvial activity in the primary channels of the drainages is distinct, and primarily consists of defined channels with low banks, changes in soil character, and marginally decreased vegetative cover. The delineated drainages, including the primary channels and associated adjacent channels, in general were distinct and separated by local topography and elevations of land that confine them to a definite course when waters rise to their highest level. Vegetation species composition in the drainages and margins generally does not differ from the surrounding areas, although vegetation density is generally slightly lower. Soils consist primarily of unconsolidated particles including sand and gravel. Evidence of sediment sorting was observed. Infiltration rates are high. Overall, the movement of sediment, organic debris, and nutrients is limited.

Based on a review of historical aerial photographs, it is likely that these drainages conveyed higher volume flows and were more clearly defined prior to the construction of roads and increased human use and manipulation of the site and vicinity. It appears that construction and operation of the borax plant upstream of Project Sites 4 and 5 has decreased the historic watershed drainage size, as well the volume and velocity of flows.

Table 2 General Characteristics of Ephemeral Drainages in the Project Sites

ID	Observations
ED-1	ED-1 is located in Project Site 5, entering the site from the north and moving in a southerly direction for approximately 215 feet. A berm on the north side of the road was present and no significant indicators of bed, bank, or channel were present to the north. The drainage appears to originate from runoff from the roadway. Minor scouring and low banks defined the channel. The drainage bed was approximately 2 feet wide and approximately 3 feet to the tops of the banks. No evidence of flow was present after approximately 220 feet, where the feature dissipated and was indiscernible from the surrounding areas. No evidence of flow was present outside of the single narrow shallow channel (no fluvial activity in adjacent areas outside the channel). OHWM Data Sheet 1 was completed (Figure 6j). The acreage and horizontal distance (linear feet) of ED-1 within Project Site 5 are shown in Table 3.
ED-2	ED-2 is located approximately 0.25 mile east of ED-1 in Project Site 5. A primary drainage channel enters Project Site 5 from the north and travels in a southeastern direction to culverts immediately north of westbound SR 58. It continues south of SR 58 into Project Site 4 and exits Project Site 4 at 20 Mule Team Road through a culvert. The OWHM width averaged approximately 25 feet and CDFW top of banks averaged 35 feet across Project Sites 4 and 5. Vegetation was mostly absent in the active channels. The primary channel was incised and approximately 1-2 feet in height with heavily eroded banks. Indicators primarily included a wider floodplain and small shallow side channels associated with the primary channel. South of SR 58, the channel enters Project Site 4 via three culverts and contains low gradient terraces and more incised banks approximately 2-3 feet high, with numerous drift piles. Flow indicators here (as with areas north of SR 58) included gravel bars, mud cracks, sand sediment ramps, wrack, and erosion (exposed roots, scour and water-cut benches). OHWM Data Sheets 2 and 3 were completed (Figures 6i, 6j). The acreage and horizontal distance (linear feet) of ED-2 within Project Sites 4 and 5 are shown in Table 3.
ED-3	ED-3 is located east of ED-2 in Project Site 5. The primary drainage channel enters the site from the north and travels in a southwestern direction to its confluence with ED-2 approximately 0.3 mile downstream. This drainage is similar to ED-2, with an OWHM approximately 15 feet wide, with a change in vegetation cover and a break in bank slope. A 1-foot wide low-flow channel was also observed in the OWHM that was lined with drift and debris, and was devoid of vegetation. Flow indicators were well-defined including mud cracks, sediment sorting, organic drift and wrack, and erosion indicators including exposed roots, cut banks, scour, and water-cut benches. OHWM Data Sheet 4 was completed (Figure 6j). The acreage and horizontal distance (linear feet) of ED-3 within Project Site 5 are shown in Table 3.
ED-4	ED-4 is located in the center of Project Site 2, entering the site from the south as a braided feature. The drainage contained 2 larger single-thread channels in the eastern and western portions with clearly defined steep banks 2-3 foot high. A number of smaller, narrow, shallow braided channels were present between the larger outer channels. The channels contained drift and debris, and were generally devoid of vegetation. Flow indicators were included mud cracks, sediment sorting, organic drift and wrack, and erosion indicators including exposed roots, cut banks, scour, and water-cut benches. The extent of the OHWM and CDFW top of bank was delineated by adding the average widths of the various channels. OHWM Data Sheet 5 were completed (Figure 6g). The acreage and horizontal distance (linear feet) of ED-4 within Project Site 5 are shown in Table 3.

ID	Observations
ED-5	ED-5 is located approximately 0.3 mile west of ED-4 in Project Site 2. The single thread drainage enters the site from the south through an Edwards Air Force Base boundary fence and flows in a northwestern direction. No evidence of flow was present after approximately 700 feet, where the feature dissipated and was indiscernible from the surrounding areas. The OHWM averaged 2 feet wide and was primarily defined by an absence of vegetation and low banks. Drift lines were observed along the banks of the channel, which spanned approximately 3 feet. OHWM Datasheet 6 was completed (Figure 6g). The acreage and horizontal distance (linear feet) of ED-5 within Project Site 2 are shown in Table 3.

Figure 6a Delineation Map – Project Site 1 – CDFW Jurisdictional Streambed

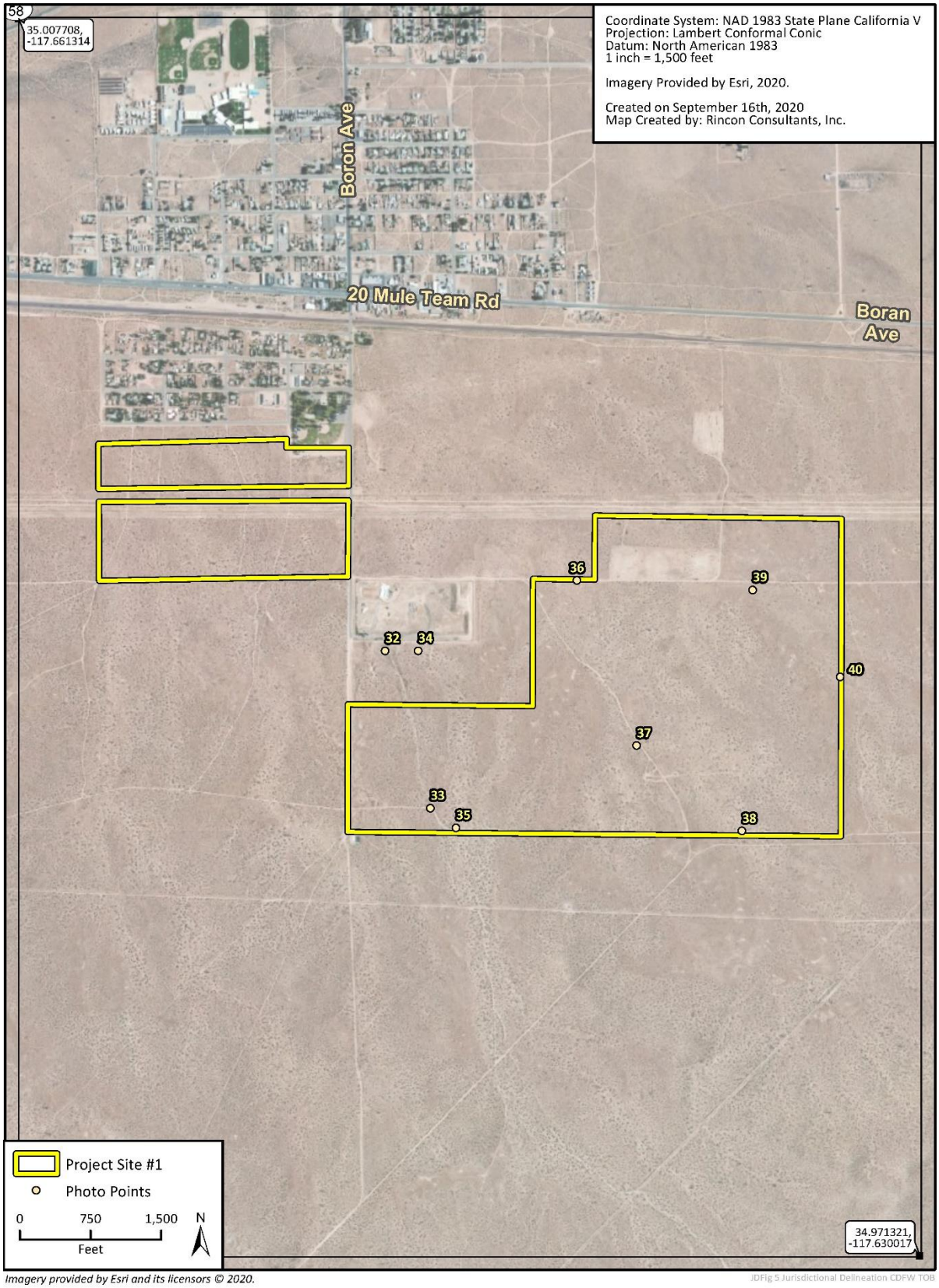


Figure 6b Delineation Map – Project Site 2 – CDFW Jurisdictional Streambed



Figure 6c Delineation Map – Project Site 3 – CDFW Jurisdictional Streambed

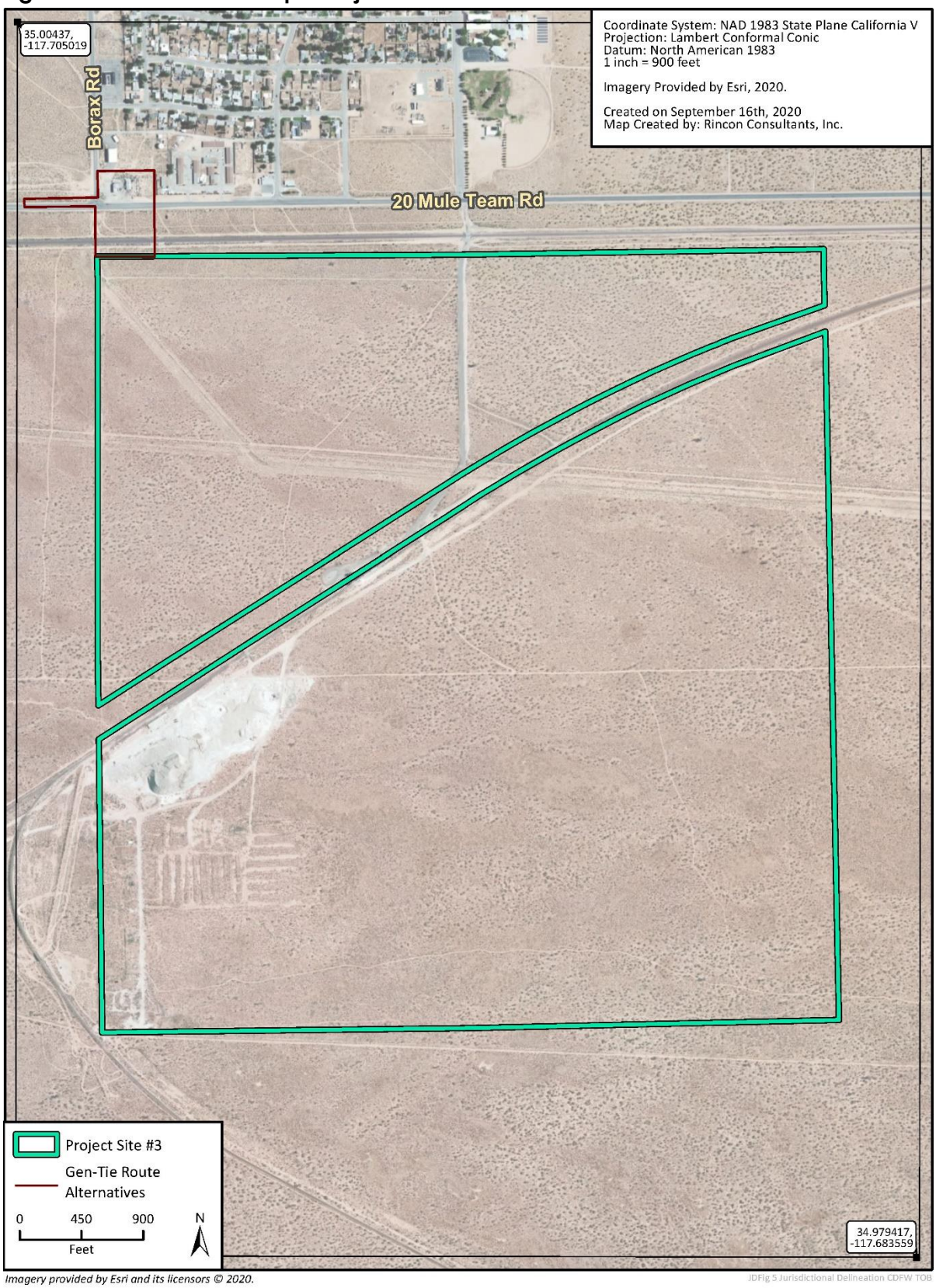


Figure 6d Delineation Map – Project Site 4 – CDFW Jurisdictional Streambed

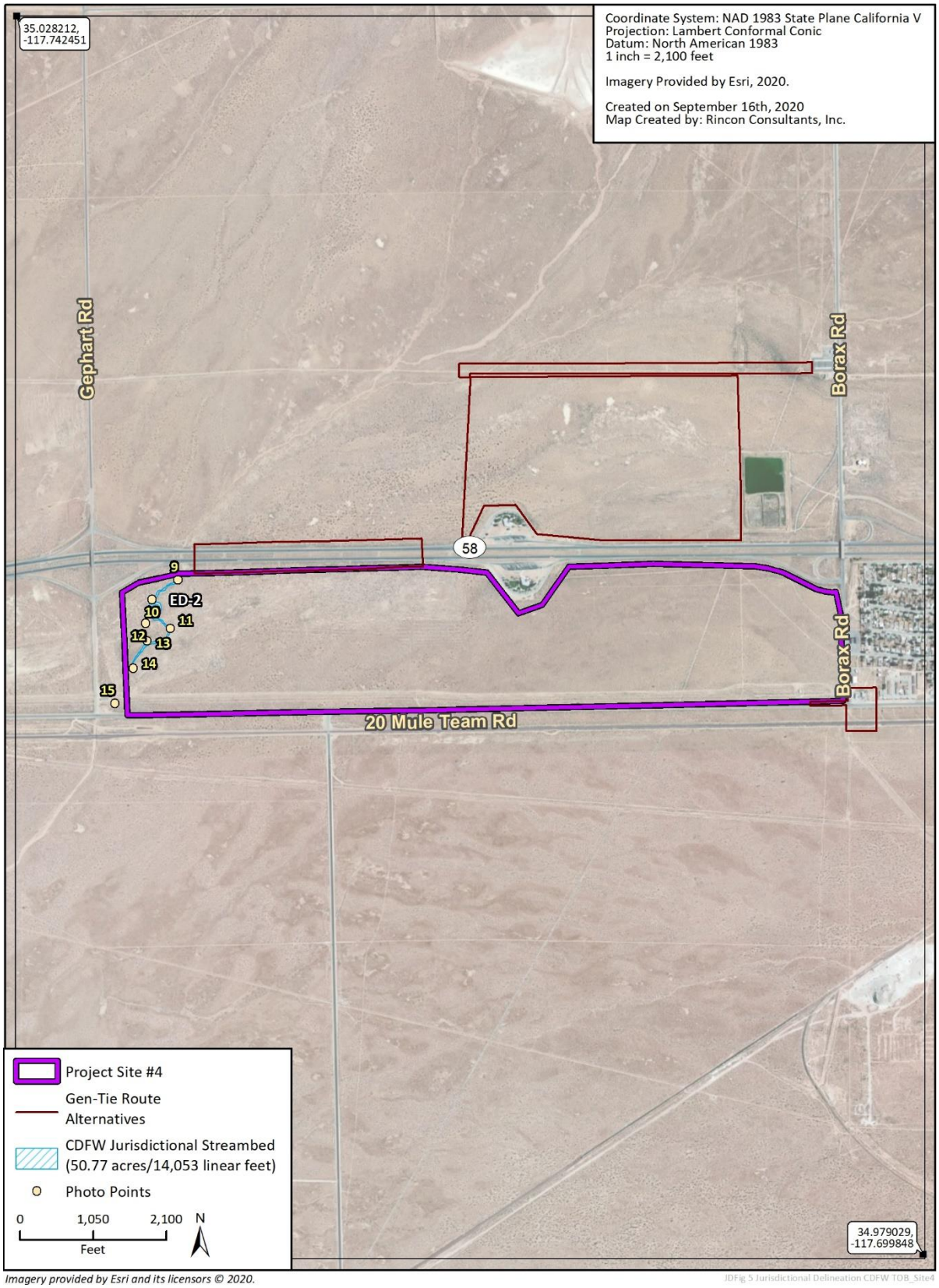


Figure 6e Delineation Map – Project Site 5 – CDFW Jurisdictional Streambed

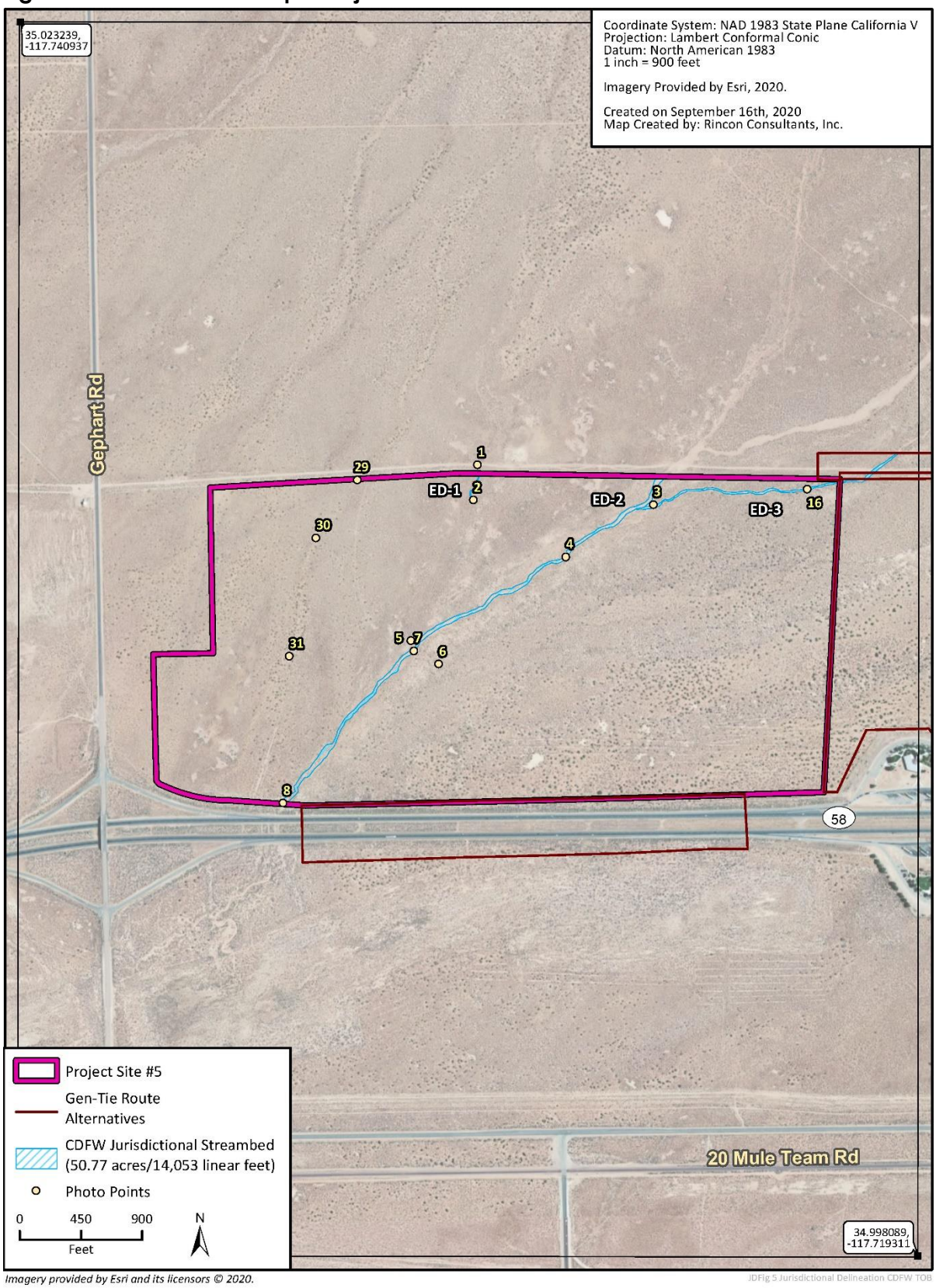


Figure 6f Delineation Map – Project Site 1 – RWQCB Non-Wetland Water of the State

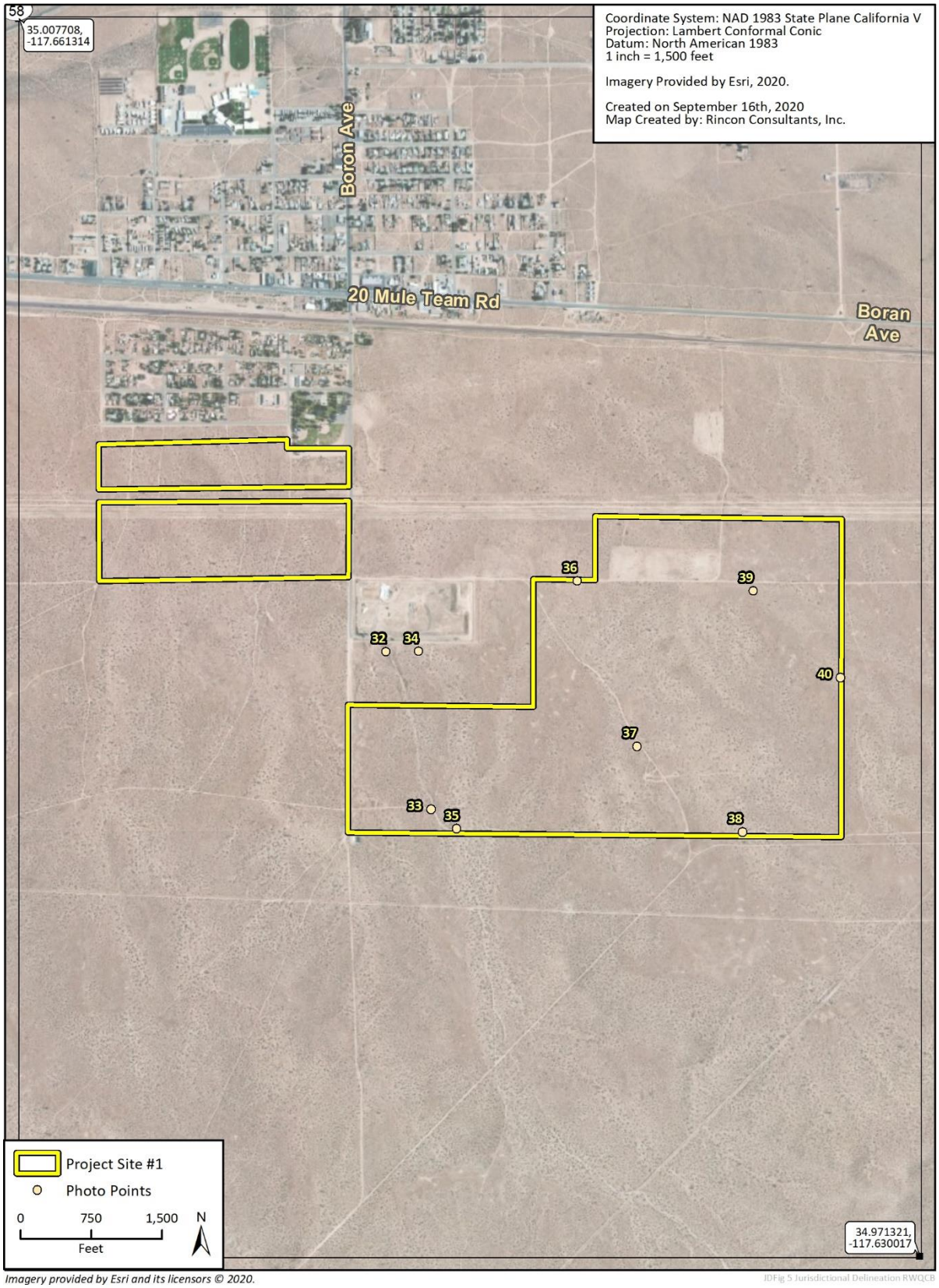


Figure 6g Delineation Map – Project Site 2 – RWQCB Non-Wetland Water of the State

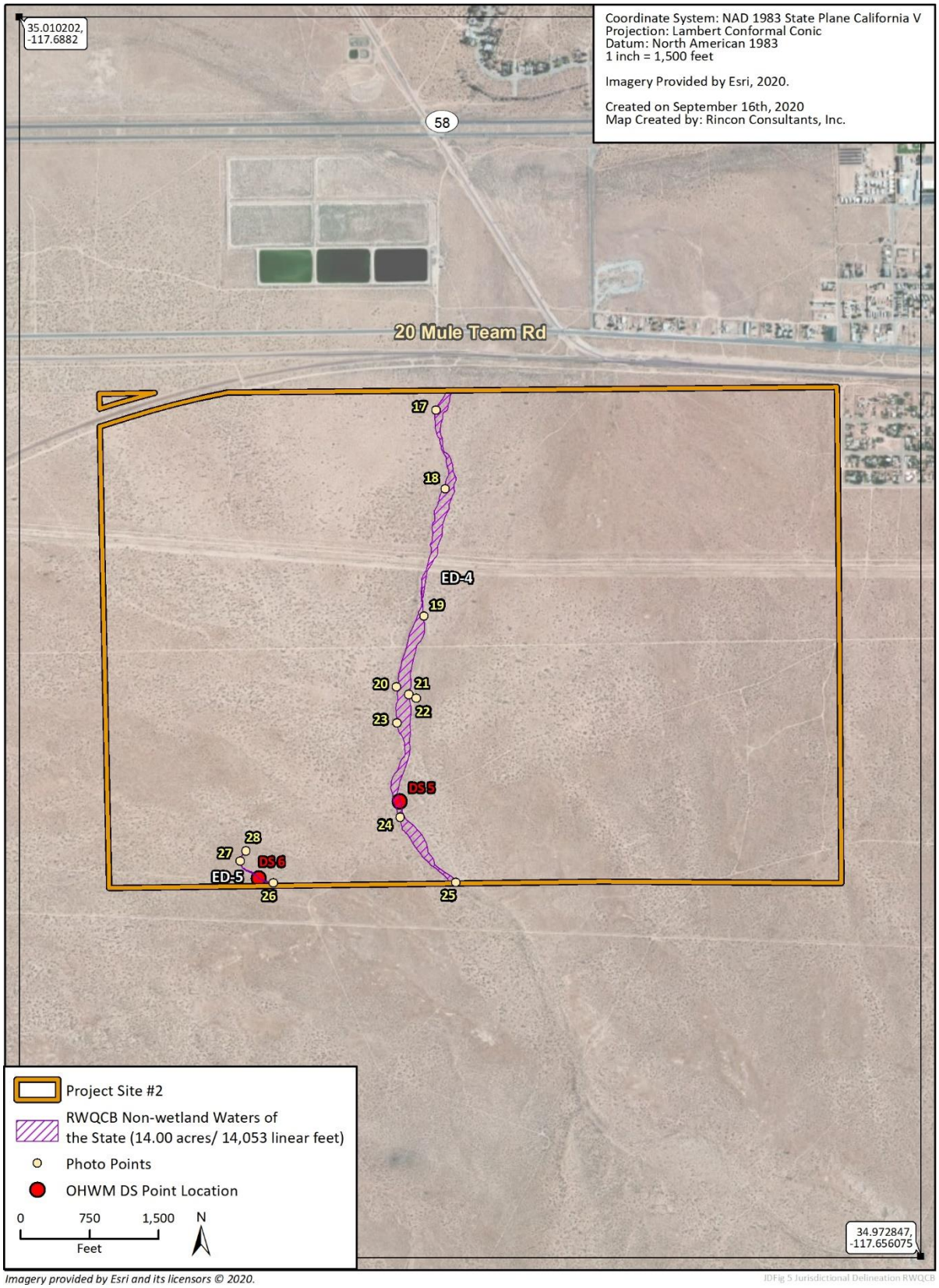


Figure 6h Delineation Map – Project Site 3 – RWQCB Non-Wetland Water of the State

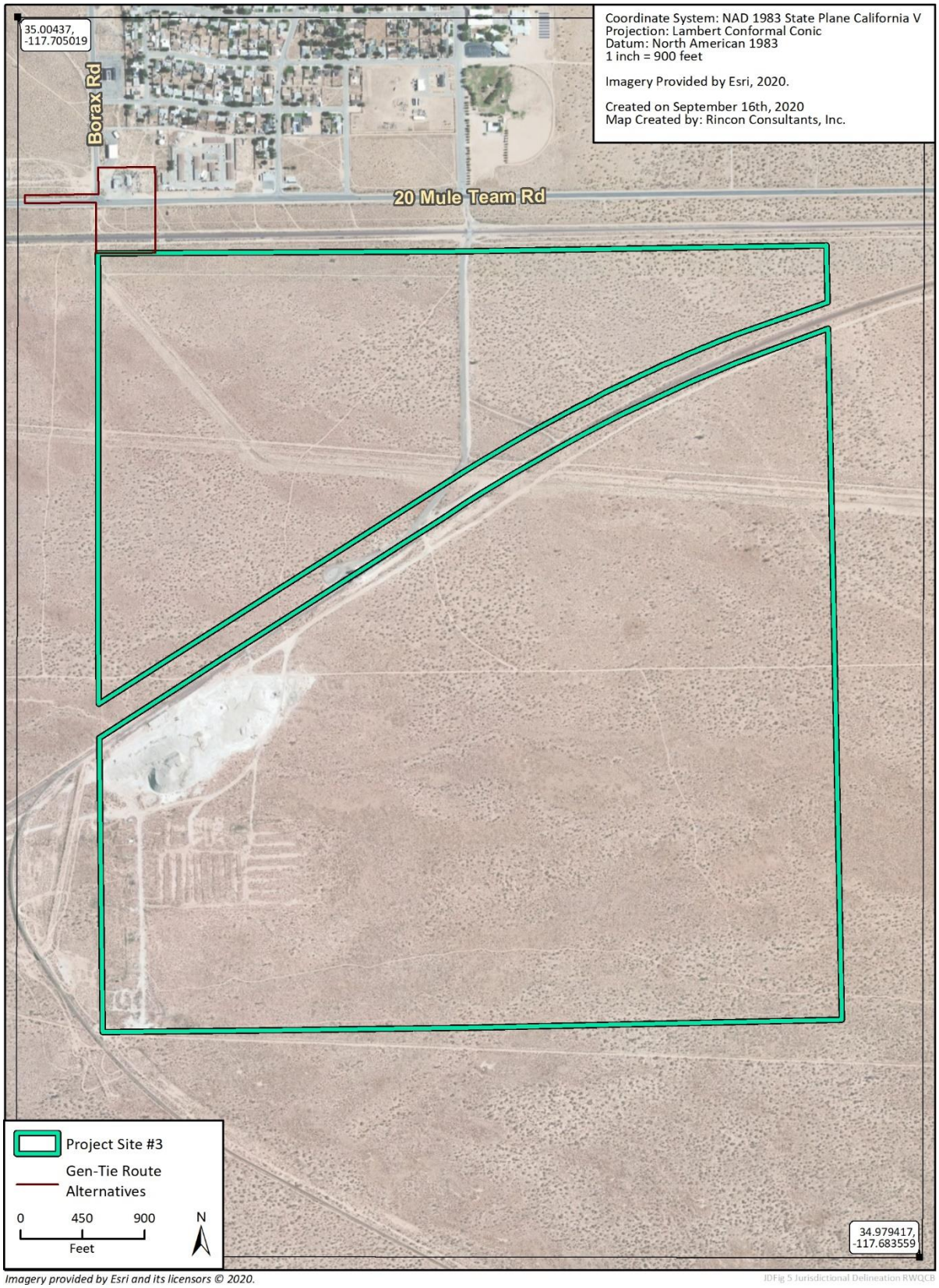


Figure 6i Delineation Map – Project Site 4 – RWQCB Non-Wetland Water of the State

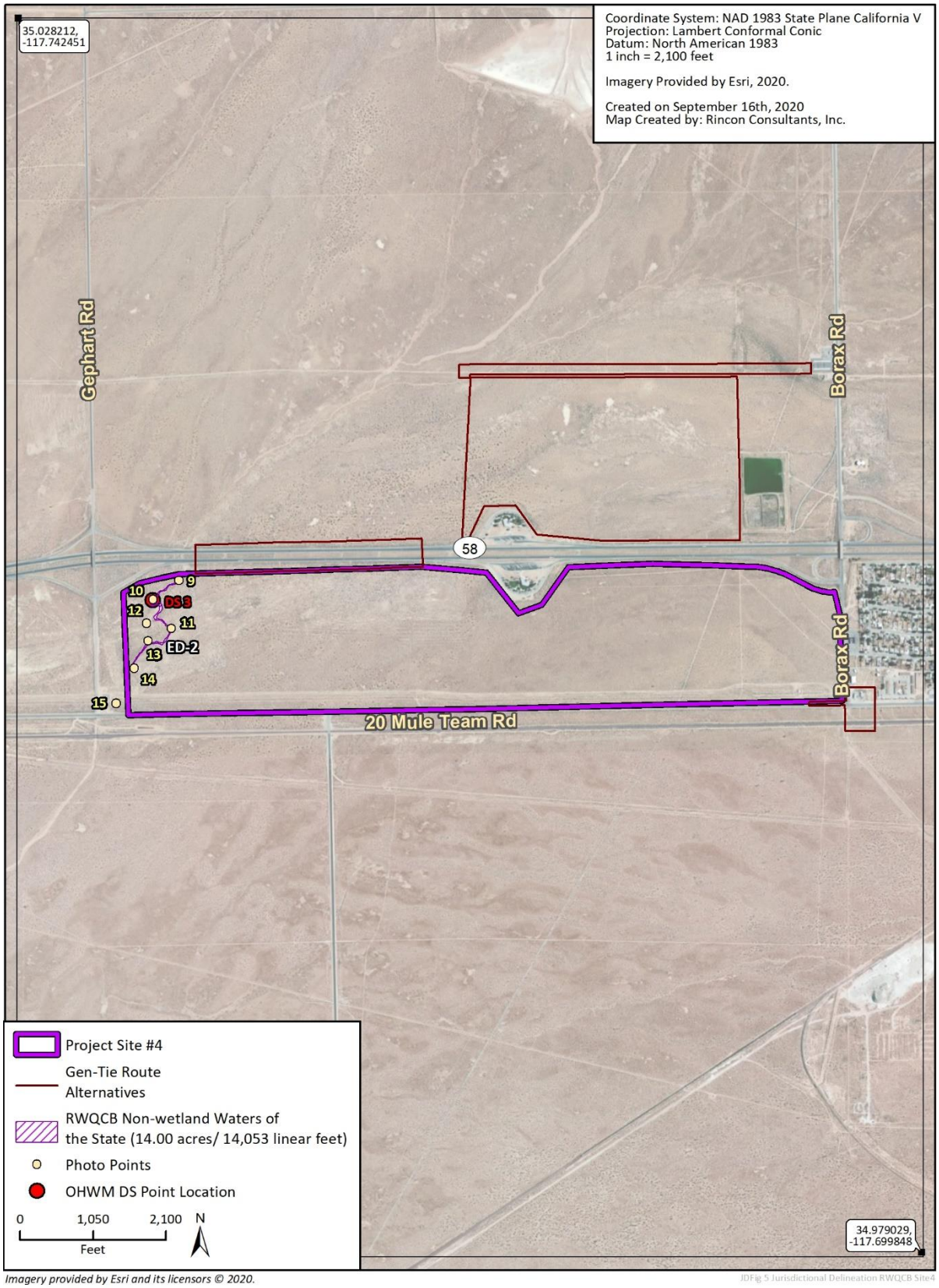
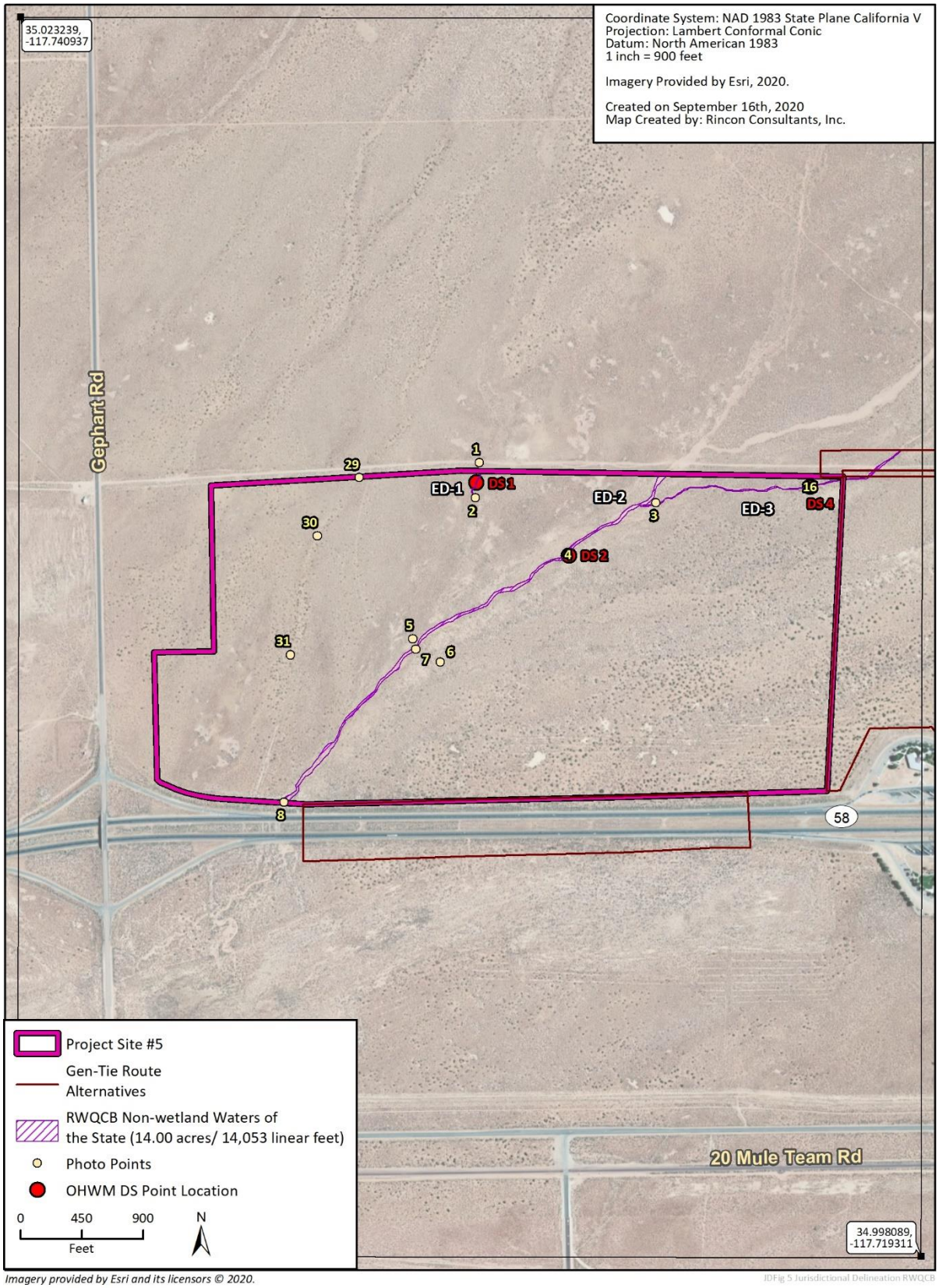


Figure 6j Delineation Map – Project Site 5 – RWQCB Non-Wetland Water of the State



4 Assessment of Jurisdictional Waters

Table 3 summarizes the acreage and linear feet of potential jurisdictional waters delineated at the project site.

Table 3 Potential CDFW and RWQCB Jurisdiction at the Project Site

Project Site	Drainage ID	RWQCB Jurisdiction (acres/linear feet)	CDFW Streambed and Banks (acres/linear feet)
1	N/A	0	0
2	ED-4	10.87/5,580	46.46/5,580
2	ED-5	0.09/679	0.12/679
Subtotal Site 2		10.96/6,259	44.02/6,259
3	N/A	0	0
4	ED-2	0.93/1,711	1.25/1,711
5	ED-3	0.34/2,031	0.63/2,031
5	ED-2	1.74/3,836	2.28/3,836
5	ED-1	0.02/216	0.03/216
Subtotal Site 5		2.10/6,081	2.94/6,086
Totals across Project Site	**ED-1, ED-2, ED-3, ED-4, ED-5**	**14.00 ac/14,053 LF**	**50.77 ac/14,053 LF**

4.1 Potential USACE Jurisdiction

Based on the isolated and ephemeral nature of the drainages delineated on site, the project site did not contain WOUS subject to USACE jurisdiction, pursuant to the CWA, defined under the *Navigable Waters Protection Rule*. Although ephemeral drainages were identified and delineated in the project site, all surface water drains to Rogers Dry Lake and no surface connection exists to downstream navigable or interstate waters. Therefore, the USACE is not expected to assert jurisdiction over the features identified in this report.

4.2 Potential RWQCB Jurisdiction

Based on the results of the investigation, the project site did not contain wetland or non-wetland waters of the State subject to the jurisdiction of the RWQCB pursuant to the CWA. However, ephemeral features displaying an OHWM are expected to be jurisdictional waters of the State, pursuant to Porter-Cologne. Potential RWQCB waters are located in Project Sites 2, 4 and 5 totaling approximately 14.00 acres (14,053 linear feet) across the project site.

4.3 Potential CDFW Jurisdiction

Based on results of the investigation, drainages were delineated within Project Sites 2, 4, and 5 that show evidence of recent sediment deposition or OHWM and bed, bank, and channel characteristics and therefore are likely subject to CDFW jurisdiction. Approximately 50.77 acres were delineated using standard CDFW practices. The horizontal extent of CDFW jurisdiction is 14,053 linear feet.

5 Conclusions and Recommendations

Project Sites 2, 4, and 5 contain ephemeral drainages that do not connect to navigable waters and may be regulated by the CDFW, as well as RWQCB under the Porter Cologne Act.

Where feasible, jurisdictional waters should be considered and avoided during project design, including the potential deposition of fill material. With the understanding of the current project designs, authorizations from the USACE and RWQCB under the CWA are not anticipated, as the project design does not call for the discharge of dredge or fill material into WOUS.

Should the project design change and impacts to ephemeral drainages are required, a Notification of Lake or Streambed Alteration to the CDFW, and subsequent execution of a Lake or Streambed Alteration Agreement pursuant to Sections 1600 *et seq.* of the CFGC will likely be required. Additionally, the on site drainages may be regulated by the Lahontan RWQCB, pursuant to the Porter-Cologne Water Quality Control Act. Coordination with the agencies to confirm permitting requirements is recommended. Final jurisdictional limits are determined by the respective agencies at the time that permits are requested.

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Appendix A

Site Photographs



Photograph 1. ED-1, facing south (downstream), from the access road north of Project Site 5, where flow in a small channel appears to move from the road into the project site .



Photograph 2. ED-1, facing north (upstream), from where the feature lost bed and bank features and dissipated into level terrain, with no clear evidence of flow to the south.



Photograph 3. View of the confluence of ED-2 and ED-3, facing southwest (downstream).



Photograph 4. ED-2, facing southwest (downstream), in the northern portion of its reach. ED-2 is mapped as a stream is NWI. OHWM Datasheet 1 was competed in this location.



Photograph 5. ED-2, facing northeast (upstream), near where it exited Project Site 5 and flow was conveyed to the south via culverts under SR 58.



Photograph 6. ED-2, facing south (downstream), near the northern boundary of Project Site 4, as it entered the site with steeply incised banks.



Photograph 7. ED-2, facing south (downstream), in the northern portion of its reach in Project Site 4.



Photograph 8. ED-2 south of the southern boundary of Project Site 4, facing north (upstream). Channel bed and bank are well-defined in this area just north of 20 Mule Team Road.



Photograph 9. ED-3 in the northern portion of its reach within Project Site 5, facing west, containing well-defined bed and banks. ED-3 is mapped as a stream is NWI. It conveys flow westward approximately 1,500 feet to where it joins ED-2.



Photograph 10. ED-4 near the northern boundary of Project Site 2, facing south (upstream). Several narrow, shallow channels are present. ED-4 is mapped as a stream in NWI.



Photograph 11. ED-4 facing north (downstream), along the western edge of jurisdictional area.



Photograph 12. ED-4 facing north (downstream), with multiple small channels.



Photograph 13. ED-4 facing north (downstream) as it crosses a dirt road near the southern boundary of Project Site 4.



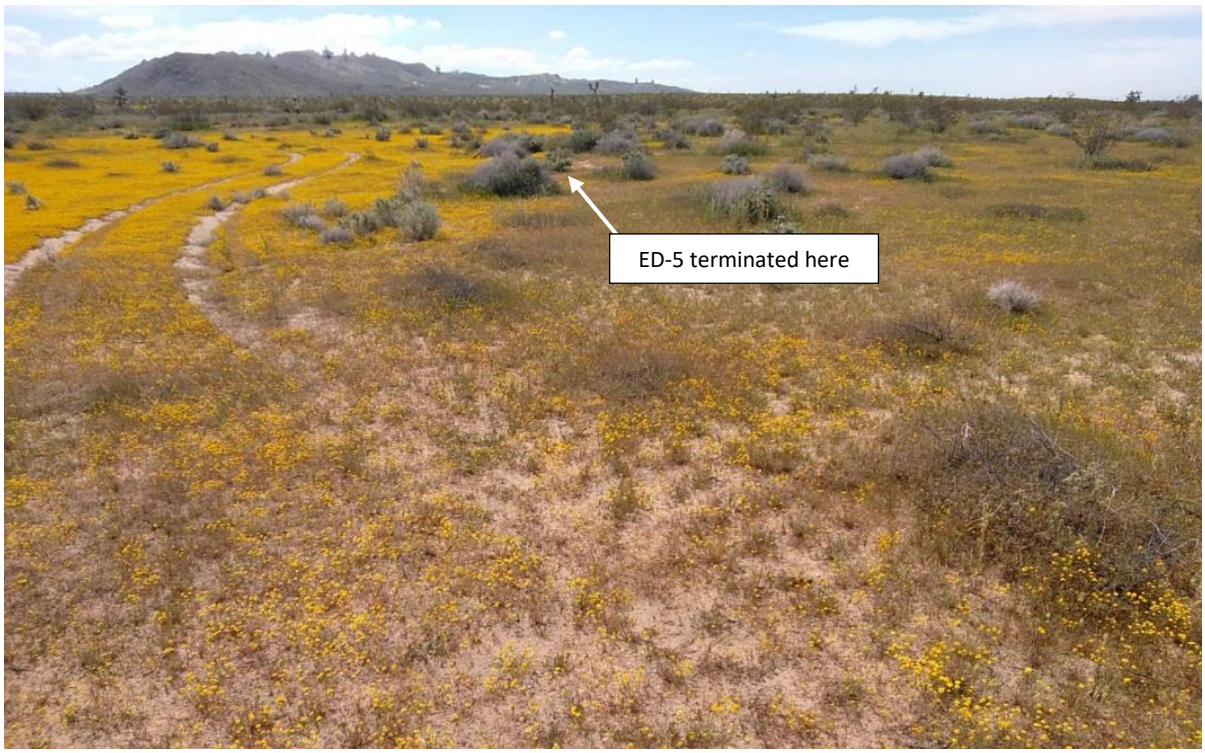
Photograph 14. ED-4 facing northwest (downstream) as it enters the southern portion of Project Site 4.



Photograph 15. ED-5 facing west (downstream) as it enters the southern portion of Project Site 4.



Photograph 16. ED-5 facing north (downstream). It consisted of a narrow, shallow single channel with minimal indicators of recent flow.



Photograph 17. Photo from a point south of ED-5, facing southwest. No channel bed and bank were evident and the drainage terminated in level ground (ruts at left are unauthorized vehicle tracks).



Photograph 18. Photo facing southwest in Project Site 5 where a stream is mapped in NWI and aerial seems to indicate potential flow. However, no evidence of flow was present across the road, and no indicators were present south of the road in Project Site 5 (see Photos 24 and 25).



Photograph 19. Photo facing northeast in Project Site 5 where a stream is mapped in NWI and aerial seems to indicate potential flow. No evidence of flow, level terrain, no channels.



Photograph 20. Photo facing south in Project Site 5 where a stream is mapped in NWI and aerial seems to indicate potential flow. However, no evidence of flow or channels present. Level terrain.



Photograph 21. Photo facing south in area south of Project Site 1 where a stream is mapped in NWI and aerial seems to indicate potential flow. However, no evidence of flow, no channels exiting Project Site 1. The density and composition of vegetation was similar in adjacent areas.



Photograph 22. Photo facing north in Project Site 1 where a stream is mapped in NWI. However, no evidence of flow or channels were present. Trash/debris piles and berm would block any flow if present. **Aerial** signature appears to be an ORV road.



Photograph 23. Photo facing northeast south of Project Site 1 where a stream is mapped in NWI and aerial seems to indicate potential flow. However, no evidence of flow or channels were present leaving Project Site 1. Level terrain.



Photograph 24. Photo facing north in Project Site 1 where a stream is mapped in NWI and aerial seems to indicate potential flow. However, no evidence of flow or channels were present. Level terrain. Density and composition of vegetation was similar in adjacent areas.



Photograph 25. Photo facing southeast in Project Site 1 where a stream is mapped in NWI. However, no evidence of flow or channels were present. Level terrain. Density and composition of vegetation was similar in adjacent areas.



Photograph 26. Photo facing northwest in Project Site 1 where a stream is mapped in NWI. However, no channels or evidence of flow was present. Level terrain. Density and composition of vegetation was similar in adjacent areas.



Photograph 27. Photo facing northwest in Project Site 1 where a stream is mapped in NWI. However, no evidence of flow or channels were present. Level terrain. Density and composition of vegetation was similar in adjacent areas.



Photograph 28. Photo facing southeast in Project Site 1 where a stream is mapped in NWI. No evidence of flow, no channels present. Level terrain. Density and composition of vegetation was similar in adjacent areas.



Photograph 29. Photo facing northwest in Project Site 1 where stream is mapped in NWI. No evidence of flow, no channels present. Level terrain.

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Appendix B

Ordinary High Water Mark Data Forms and Episodic Stream Indicator Data Sheets

OHWM DS 1

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Aratina
Project Number: 18-06956
Stream: ED-1
Investigator(s): True, Daman

Date: 4/2/19 **Time:** 1110
Town: Boron area **State:** CA
Photo begin file#: 7 **Photo end file#:** 8

Y ☒ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ☒ Is the site significantly disturbed?

Location Details: CUP Site 5

Projection: Lambert cc **Datum:** NAD83 SPCV
Coordinates: 35.01377 ; -117.72994

Potential anthropogenic influences on the channel system:
Heavily used dirt access road near site boundary. Flow appears to originate from road and low volume flow moves into site. Borax plant and other roads/development upstream (north).

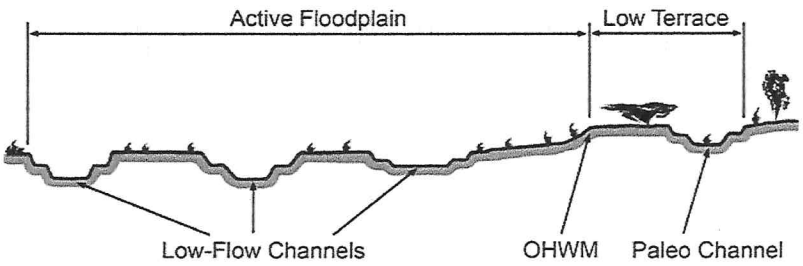
Brief site description:
CUP Site 5. Mostly level site with very slight grade downhill to South. Vacant property but OHV use is evident, trash, dumping.

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☒ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

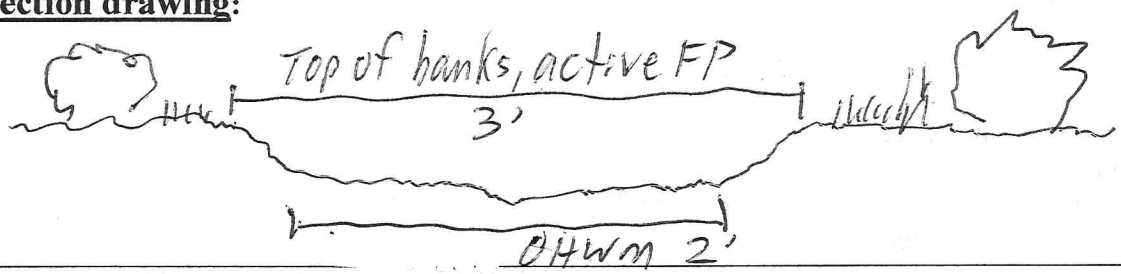


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☒ Digitized on computer
   - ☒ GPS
   - ☐ Other:

Project ID: Arafina **Cross section ID:** ED-1 **Date:** 4/2/19 **Time:** 1115

Cross section drawing:



OHWM

GPS point: 35.01377; -117.72994

Indicators:

- ☐ Change in average sediment texture
- ☐ Change in vegetation species
- ☒ Change in vegetation cover
- ☐ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments: OHWM is mostly planar and veg. mostly absent with a few annuals, goldfields. Sand, gravel. ↳ and a few shrubs, primarily at edges.

Floodplain unit: ☒ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 35.01377; -117.72994

Characteristics of the floodplain unit:

Average sediment texture: Coarse sand, gravel

Total veg cover: 6 % Tree: ____ % Shrub: 1 % Herb: 5 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☒ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Faint drift lines observed and light organic wrack. Active bed + bank.

Project ID: Arafina **Cross section ID:** ED-1 **Date:** 4/2/19 **Time:** 1120

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 35.01376; -117.72996

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: 10 % Tree: ____% Shrub: 2 % Herb: 8 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Active FP confined with low banks of channel (0.5-1 ft high
Active FP includes low-flow channel, low banks sparsely veg'd, annuals herbs and young shrubs.

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: ____% Tree: ____% Shrub: ____% Herb: ____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

OHWM DS 2

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Aratina
Project Number: 18-06956
Stream: ED-2
Investigator(s): True, Daman

Date: 4/3/19 **Time:** 1100
Town: Boron area **State:** CA
Photo begin file#: 10-13, 27-29, 33-36 **Photo end file#:**

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details: CUP site 5

Projection: Lambert CC **Datum:** NAD 83 SPC V
Coordinates: 35.01227; -117.72771

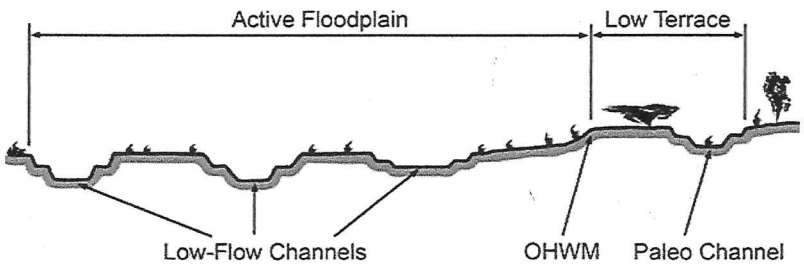
Potential anthropogenic influences on the channel system:
Heavily used dirt access road to north. Borax plant and numerous roads/developed areas upstream (north). drastically reduce watershed size

Brief site description:
CUP site 5. Mostly level site w/ very slight grade to south. Vacant property but OHV use, trash dumping is evident.

Checklist of resources (if available):

- [X] Aerial photography
  - Dates:
- [X] Topographic maps
- [ ] Geologic maps
- [X] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  - Gage number:
  - Period of record:
- [ ] History of recent effective discharges
- [ ] Results of flood frequency analysis
- [ ] Most recent shift-adjusted rating
- [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [ ] Mapping on aerial photograph
   - [X] Digitized on computer
   - [X] GPS
   - [ ] Other:

Project ID: **Cross section ID:** ED-2 **Date:** 4/3/19 **Time:** 1105

Floodplain unit: ☒ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 35.01227; -117.72771

Characteristics of the floodplain unit:

Average sediment texture: ~~Coarse~~ sand, silt, pebbles

Total veg cover: Ø % Tree: ____% Shrub: ____% Herb: ____%

Community successional stage:

- ☒ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☒ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

No vegetation observed w/in low-flow channel. Drift debris observed along ~~edge of~~ banks fine sand w/in low-flow in areas concentrated.

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 35.01226; -117.72770

Characteristics of the floodplain unit:

Average sediment texture: coarse sand, pebbles, silt

Total veg cover: ____% Tree: ____% Shrub: ____% Herb: 1 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☒ ~~Benches~~
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

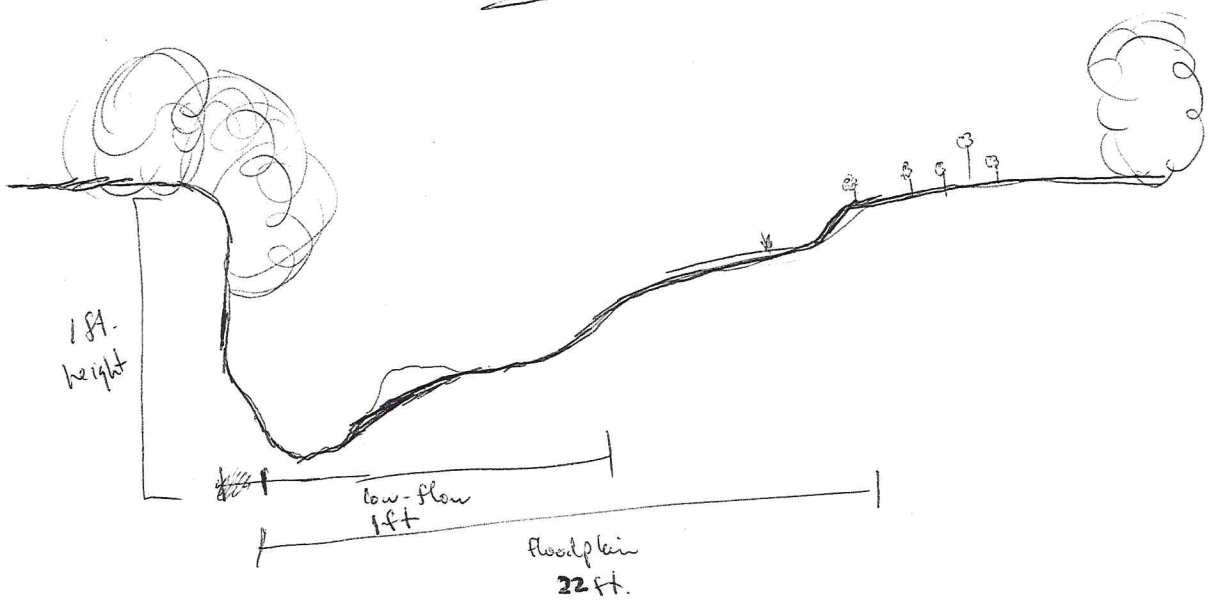
Comments:

Active floodplain extends 12ft. including the low flow-channel. Gravel deposits along edge.

Cross Section ID CD-2 (CUP 5) Date 4/3/19 Time 1102

Cross Section Drawing

Southwest



OHWM Indicators

- Change in veg sp.
- ✓ Change in veg cover
- ✓ Break in bank slope
- Change in average sediment texture

Comments

channel OHWM meanders through channel, ~~as low flow~~ change in vegetation cover beyond OHWM limits. No vegetation observed w/in channel OHWM.

OHWM DS 3

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Aratina
Project Number: 18-06956
Stream: ED-2 (downstream, CUP 4)
Investigator(s): True, Daman

Date: 4/3/19 **Time:** 1330
Town: Boron area **State:** CA
Photo begin file#: 37-40, 43-45, 116-120, 125-126 **Photo end file#:**

Y ☒ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ☒ Is the site significantly disturbed?

Location Details: CUP Site 4

Projection: Lambert CC **Datum:** NAD83 SPC V
Coordinates: 35.00517; -117.73638

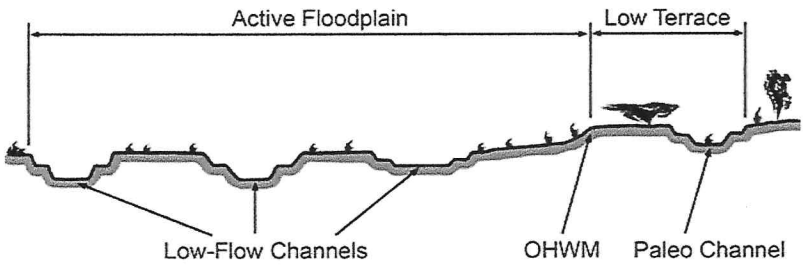
Potential anthropogenic influences on the channel system:
Drainage enters site via culverts under SR58. Borax plant and numerous roads/developed areas upstream, drastically reduce watershed size.

Brief site description:
CUP 4. Mostly level w/ slight grade to south. Vacant property but OHV use, trash dumping evident.

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☒ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☐ Global positioning system (GPS)
- ☐ Other studies
- ☐ Stream gage data
  Gage number:
  Period of record:
- ☐ History of recent effective discharges
- ☐ Results of flood frequency analysis
- ☐ Most recent shift-adjusted rating
- ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☒ Digitized on computer
   - ☒ GPS
   - ☐ Other:

Project ID: Arating **Cross section ID:** ED-2 (in CUP 4) downstream **Date:** 4/3/19 **Time:** 1330

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 35.00517; -117.73638

Characteristics of the floodplain unit:

Average sediment texture: coarse sand

Total veg cover: ~~20~~ % Tree: ____ % Shrub: ~~10~~ % Herb: ~~10~~ %

Community successional stage:

- ☒ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☒ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

~~Dominate species~~

mudcracks observed on edges of active floodplain at a clear defined bed and steep banks observed.

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☒ Low Terrace

GPS point: 35.00518; -117.73644

Characteristics of the floodplain unit:

Average sediment texture: coarse sand, gravel

Total veg cover: 20 % Tree: ____ % Shrub: 10 % Herb: 10 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

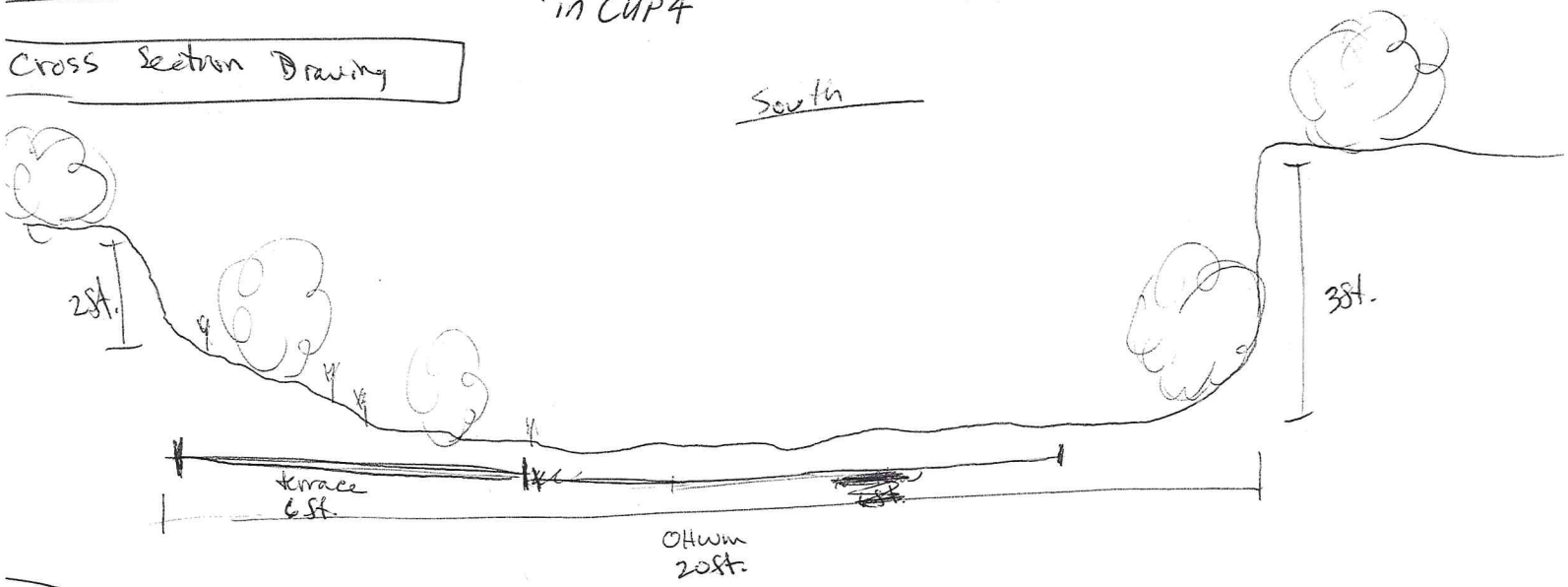
- ☒ Mudcracks
- ☐ Ripples
- ☒ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Mudcracks observed @ edge of terrace prior to bank slope. Drift/debris piles observed on terrace closest to active floodplain.

Cross Section ID ED-2 (downstream in CUP4 | Date 4/3/19 | Time 1330

Cross Section Drawing



OHWM Indicators

- ✓ change in veg. sp.
- ✓ change in veg cover
- ✓ break in bank slope
- change in average sediment texture

Comments

Channel incised w/ 2-3ft. tall banks that are vertical and eroded. Low-flow is most of the bed that is level. Gradual slope elevation to the east where shrub w/in banks occur.

OHWM DS 4

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Aratina
Project Number: 18-06956
Stream: EP-3
Investigator(s): True, Daman

Date: 4/3/19 **Time:** 0925
Town: Boron area **State:** CA
Photo begin file#: 9-10, 33-36 **Photo end file#:**

Y ☒ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ☒ Is the site significantly disturbed?

Location Details: CUP 5

Projection: Lambert CC **Datum:** NAD83 SPC V
Coordinates: 35.01358; -117.72178

Potential anthropogenic influences on the channel system:
Heavily used dirt road near site boundary. Borax plant with numerous roads/developed areas upstream (north), drastically reduce watershed size

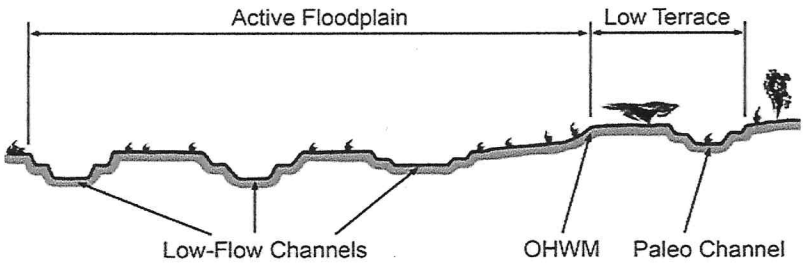
Brief site description:
CUP 5. Mostly level with slight grade to south. Vacant property but OHV use + trash dumping prevalent.

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☒ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☐ Other studies

- ☐ Stream gage data
  Gage number:
  Period of record:
- ☐ History of recent effective discharges
- ☐ Results of flood frequency analysis
- ☐ Most recent shift-adjusted rating
- ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units



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5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☒ Digitized on computer
   - ☒ GPS
   - ☐ Other:

Project ID: **Cross section ID:** ED-3 **Date:** 4/3/19 **Time:** 0928

Floodplain unit: ☒ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 35.01358; -117.72178

Characteristics of the floodplain unit:

Average sediment texture: coarse sand

Total veg cover: Ø % Tree: ____% Shrub: ____% Herb: ____%

Community successional stage:

- ☒ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☒ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Low-flow channel contains drift & debris of dead shrub branches, undercut to create bed & bank.

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 35.01361; -117.72179

Characteristics of the floodplain unit:

Average sediment texture: coarse sand w/ pebbles

Total veg cover: 5 % Tree: ____% Shrub: ____% Herb: 5 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

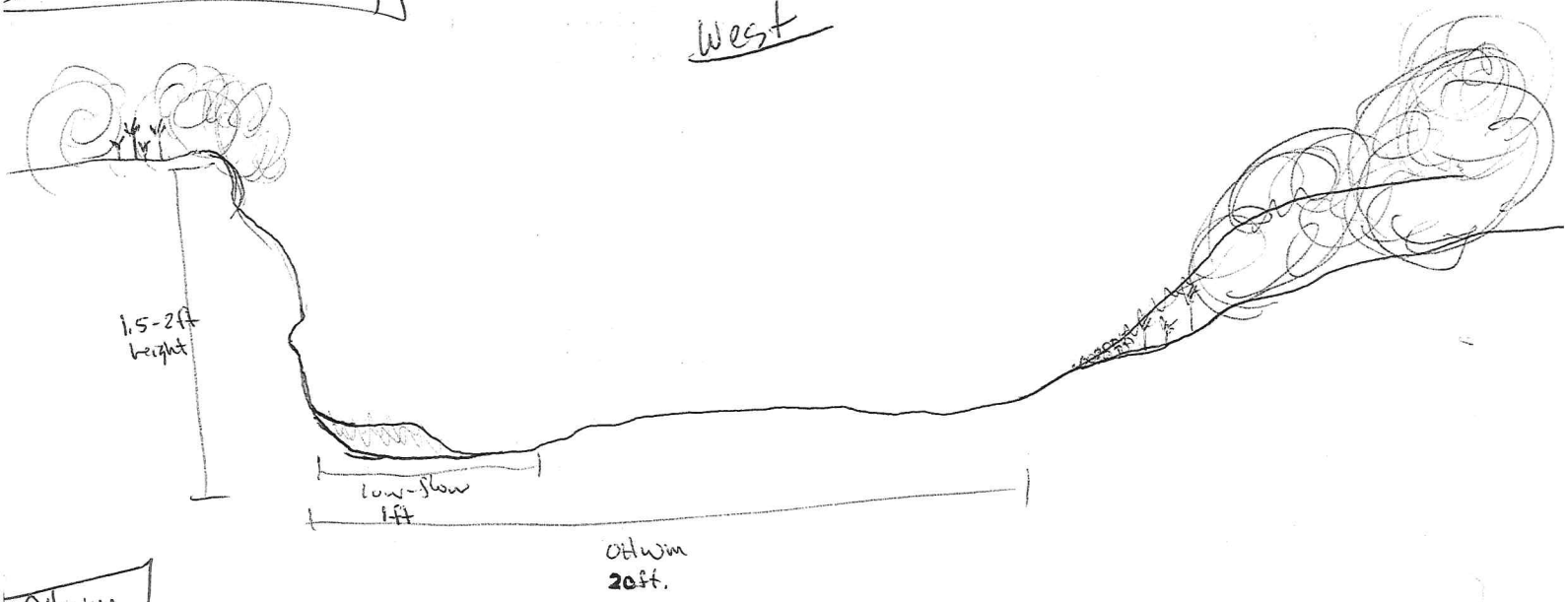
- ☐ Mudcracks
- ☐ Ripples
- ☒ Drift and/or debris
- ☒ Presence of bed and bank
- ☒ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Active floodplain extends to edge of denuded vegetation with benches (slight grade change). Contains drift & ~~bed~~ debris in channel along edges.

Cross Section ID ED-3 Date 4/3/19 Time 0928

Cross section Drawing



OHWM Indicators

change in veg. sp.

✓ Change in veg cover

✓ Break in bank slope

change in average sediment texture.

Comment:

Low-flow channel observed adjacent to south bank @ observation location. OHWM devoid of vegetation and distinct break in bank slope observed. Slight upslope on northside, gradual. with more concentration of larger pebble size sand. Eroded south side bank w/ 2 benches observed @ location anylized.

OHWM DS 5

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Aratina
Project Number: 18-06956
Stream: ED-4
Investigator(s): Carolyn Damon & Jon True

Date: 4/4/19 **Time:** 1145
Town: Boron area **State:** CA
Photo begin file#: 74-77, 129-163 **Photo end file#:**

Y ☒ / N ☐ Do normal circumstances exist on the site?

Y ☐ / N ☒ Is the site significantly disturbed?

Location Details: CUP Site 2

Projection: Lambert cc **Datum:** NAD 83 SPC V
Coordinates: 34.98665; -117.67478

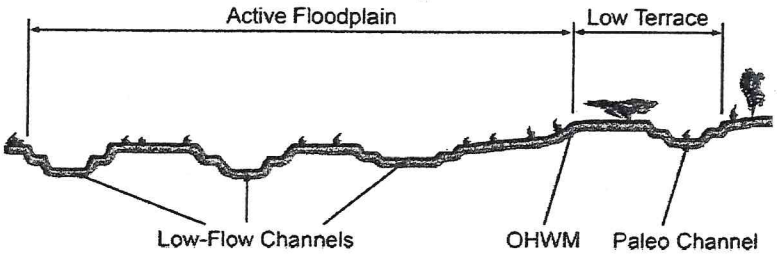
Potential anthropogenic influences on the channel system:
Access roadway crosses channel upstream of analysis point where feature became more defined channel.

Brief site description: Single thread channel w/ 2.5ft. banks and a bed ~12ft. wide active floodplain vegetation dispersed along edges @ base of slope. Area predominately flat with dispersed creosote & atriplex vegetation shrubs and annuals blooming the time of Survey.

Checklist of resources (if available):

- ☒ Aerial photography
  Dates:
- ☒ Topographic maps
- ☐ Geologic maps
- ☒ Vegetation maps
- ☒ Soils maps
- ☐ Rainfall/precipitation maps
- ☐ Existing delineation(s) for site
- ☒ Global positioning system (GPS)
- ☐ Other studies
- ☐ Stream gage data
  Gage number:
  Period of record:
  - ☐ History of recent effective discharges
  - ☐ Results of flood frequency analysis
  - ☐ Most recent shift-adjusted rating
  - ☐ Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

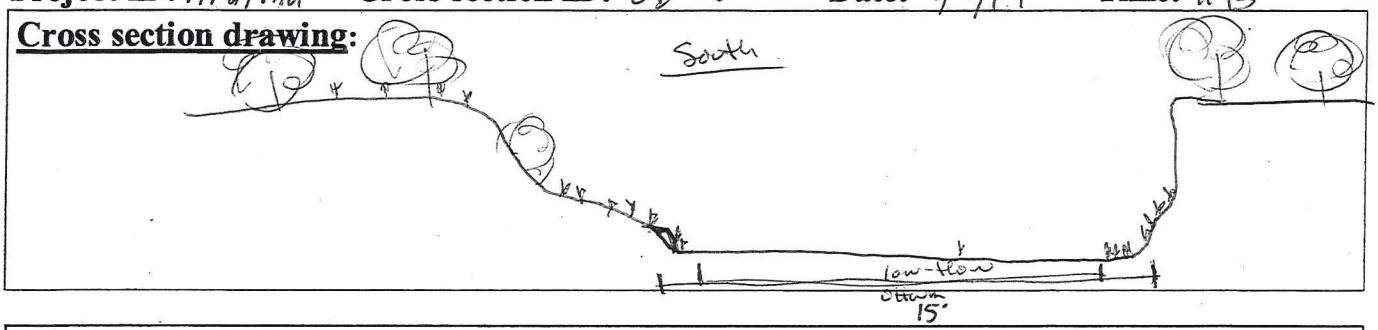


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - ☐ Mapping on aerial photograph
   - ☒ GPS
   - ☒ Digitized on computer
   - ☐ Other:

Project ID: Arafina **Cross section ID:** ED-4 **Date:** 4/4/19 **Time:** 1145

Cross section drawing:



OHWM

GPS point: 34.98665; -117.67478

Indicators:

- ☐ Change in average sediment texture
- ☐ Change in vegetation species
- ☒ Change in vegetation cover
- ☒ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments:
The OHWM is relatively flat and devoid of vegetation with sparse annuals on low-flow channel.

Floodplain unit: ☒ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 34.98665; -117.67478

Characteristics of the floodplain unit:

Average sediment texture: Coarse sand

Total veg cover: 0 % Tree: ____% Shrub: ____% Herb: ____%

Community successional stage:

- ☒ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☒ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:
Drift line observed @ bare of slope and a well defined bed and bank observed.

Project ID: Arafina **Cross section ID:** ED-4 **Date:** 4/4/19 **Time:** 1145

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 35.98663; -117.67481

Characteristics of the floodplain unit:

Average sediment texture: coarse sand

Total veg cover: 15 % Tree: ____ % Shrub: ____ % Herb: 15 %

Community successional stage:

- ☐ NA
- ☒ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☒ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: ____
- ☐ Other: ____
- ☐ Other: ____

Comments:

The active floodplain is confined w/in the banks of the channel. The active floodplain includes the low-flow channel and the small benches that are sparsely vegetated.

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: ____

Characteristics of the floodplain unit:

Average sediment texture: ____

Total veg cover: ____ % Tree: ____ % Shrub: ____ % Herb: ____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: ____
- ☐ Other: ____
- ☐ Other: ____

Comments:

OHWM DS 6

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Aratina
Project Number: Rincon 18-06956
Stream: ED-5
Investigator(s): True

Date: 4/9/19 **Time:** 2:25 PM
Town: Boron area **State:** CA
Photo begin file#: 78 **Photo end file#:** 81

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details: CUP Site 2

Projection: Lambert cc **Datum:** NAD SPC V
Coordinates: 34.98440; -117.67992

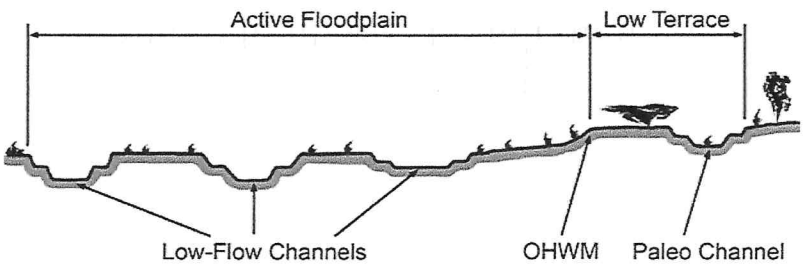
Potential anthropogenic influences on the channel system:
Access road crosses eph. drainage at EAFB boundary fence.

Brief site description: Single thread channel with 2 ft wide OHWM, tops of banks 3 ft. wide. Small, shallow single channel. Sand, gravel.

Checklist of resources (if available):

- [X] Aerial photography
  Dates:
- [X] Topographic maps
- [ ] Geologic maps
- [X] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [X] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  Gage number:
  Period of record:
  - [ ] History of recent effective discharges
  - [ ] Results of flood frequency analysis
  - [ ] Most recent shift-adjusted rating
  - [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

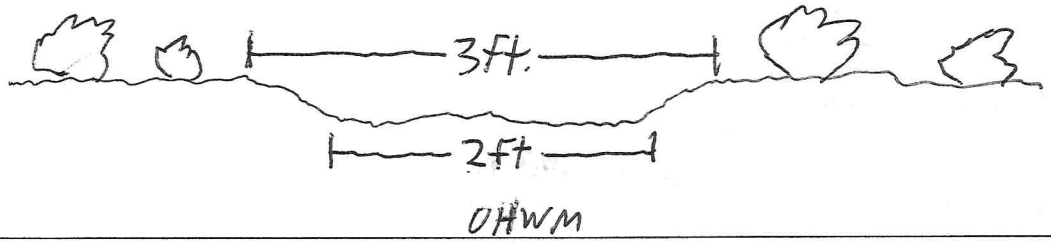


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [ ] Mapping on aerial photograph
   - [X] Digitized on computer
   - [X] GPS
   - [ ] Other:

Project ID: Arafina **Cross section ID:** ED-5 **Date:** 4/9/19 **Time:** 1430

Cross section drawing:



OHWM

GPS point: 34.98439; -117.67993

Indicators:

- ☐ Change in average sediment texture
- ☐ Change in vegetation species
- ☒ Change in vegetation cover
- ☐ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments: OHWM is mostly level/planar and devoid of vegetation with sparse annuals and a few young scattered shrubs.

Floodplain unit: ☒ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: 34.98440; -117.67992

Characteristics of the floodplain unit:

Average sediment texture: Coarse sand, gravel

Total veg cover: 2 % Tree: ____ % Shrub: 1 % Herb: 1 %

Community successional stage:

- ☒ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☒ Drift and/or debris
- ☒ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Drift lines observed and light organic wrack.
Bed and bank observed.

Project ID: Arating **Cross section ID:** ED-5 **Date:** 4/9/19 **Time:** 1430

Floodplain unit: ☐ Low-Flow Channel ☒ Active Floodplain ☐ Low Terrace

GPS point: 34.98439 ; -117.67993

Characteristics of the floodplain unit:

Average sediment texture: Coarse Sand

Total veg cover: 12 % Tree: ____ % Shrub: ~~10~~ 2 % Herb: 10 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☒ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☒ Presence of bed and bank
- ☒ Benches - NO
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments: Active ~~FP~~ confined w/in banks of channel. Active FP includes the low-flow channel, low banks are sparsely vegetated, most annual goldfields with a few scattered low shrubs.

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: ____ % Tree: ____ % Shrub: ____ % Herb: ____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

MESA DS 1

Episodic Stream Indicator Data Sheet			page 1 of 4
Site ID: Aratina-CUP5	Stream ID: ED-2 (in CUP 5)		Date: 4/3/19
Nearest Town: Boron		County: Kern	
Investigators: True, Daman			

Base Map

Aerial Photo #: 1	Date: 3/28/19	Topographic Map Name: Leuhman Ridge	Date: 1973

GPS Data

GPS Name: R1-02	Datum: NAD 83	Transect Elevation: 2355 ft	Zone 10 / (11)	GPS Error: ± 3 (ft) / m
GPS co-ords start of transect: 35.01063, -117.73156		GPS co-ords end of transect: 35.01015, -117.73089		

Geomorphic Province (✓one)	[X] Mojave	[ ] Sonoran/Colorado	[ ] Great Basin	Other:

Landform (✓ all that apply)

[ ] Headwater	[ ] Upper fan	[ ] Middle fan	[ ] Lower fan	[X] Alluvial plain	[ ] Axial valley	[ ] Playa

Channel Form (✓ one)

[ ] Single thread	[X] Braided	[ ] Compound	[ ] Distributary	[ ] Discontinuous	Other:

Transect was selected to:

[X]	Document fluvial activity & boundaries	[ ]	Document channel elevations & boundaries
[ ]	Document habitat associations	[ ]	Document a change in watercourse morphology
[ ]	Other:		

Date of most recent runoff event (if known): Approx. 2 weeks prior to survey.

Physical Setting: Briefly describe geomorphic processes and surficial materials and conditions, including the degree of disturbance relative to an intact dryland stream ecosystem, and any anthropogenic influences on the channel form and function: System consists of a primary channel with braiding within, and included adjacent areas east + west to small narrow shallow channels associated w/ primary. Borax plant w/ numerous roads and developed areas appears to greatly reduce watershed drainage area and flow volumes/velocities. Disturbances upstream are high and dist's on site are moderate.

Summary Site Description and Cross-section Sketch: View across the channel from watercourse-edge to watercourse-edge. Identify channel(s), banks, islands, interfluves, floodplains, terraces, and uplands where present. Note approximate width and elevation differences between features indicated.

(facing SW)
Left — Primary channel below. Transect extended ~265' across, out to small channels associated w/ primary. Aerial imagery indicates potential flow to these edges. Beyond these points, topography is level, no indicators of fluvial activity. — Right



Site ID: Aratina CUP 5	Stream ID: ED-2 (CUP5)	page 2 of 4

Note presence or absence of each indicator within a minimum distance of 50 feet upstream and 50 feet downstream of the representative channel cross section. Mark each box with a plus (+) for those indicators observed, and a minus (–) for indicators not observed. For examples see the Photo Atlas in MESA ~ Mapping Episodic Stream Indicators.

UPLAND

Terrestrial Indicators

–	Av soil horizon	+	Relict bars & swales
–	Biotic soil crusts	–	Rock fractured in place
+	Bioturbation	–	Rock varnish
–	Caliche: coatings / layers / rubble	–	Rock weathering
–	Carbonate etching	–	Rubified rock undersides
+	Coppice dunes: active / (relict)	–	Soil development
–	Deflated surface	+	Surface rounding of landform
–	Pavement	+	Woody debris in place
–	Other:		

Substrate Particle Size

Estimated percentages		
	% Bedrock / Cemented substrate	
	% Boulder	≥ 256 mm
5	% Cobble	≥ 64 – 256mm
10	% Pebble	≥ 4 – 64 mm
40	% Granule	≥ 2 – 4 mm
45	% Sand	≤ 2 mm
	% Silt/Clay	Fines

mammal burrows + mounds observed. Surface rounding around shrubs.

Fluvial Indicators

–	Bars: sand / gravel	+	Mud: (cracks) / curls / drapes	–	Sediment tails: sand / gravel
–	Cut banks	–	Organic drift	–	Vegetation-channel alignment
–	Drainage swales	–	Overturned rocks	–	Water-cut benches
–	Exposed roots	–	Scour	–	Wrack
–	First-order streams	–	Sediment ramps: sand / gravel	–	Wrinkle marks
–	Flow lineations	–	Sediment sorting		
	Other:				

soil cracking observed in uplands devoid of vegetation. Appears to be very short-duration puddling, no other indicators observed.

Vegetation

Estimated % total vegetative cover (perennial & shrub species combined):	Dominant and co-dominant species (if known) and % of total vegetative cover of each:	Representative height and width of dominant and co-dominant species:
25	Atriplex polycarpa dominant in uplands	2-4 ft height 2-4 ft width

Differences in total shrub/perennial density (total #shrubs/perennial plants) between upland & fluvially active units or watercourse complex? (describe and qualify the differences): Only significant difference is primary channel and side channels mostly devoid of veg.

Are there plant species that are present in (or absent from) the uplands when compared to fluvially active units or the watercourse complex? (describe differences): Atriplex polycarpa is dominant in the uplands vs. fluvially active areas which is dom'd w/ A. spinifera.

Are there plant species that are more abundant (or less abundant) in the uplands when compared to the fluvially active units or the watercourse complex? (describe and qualify differences) See above. A. spinifera abundance lower in uplands.

Site ID: Arafina CMP 5	Stream ID: EO-2 (CMP 5)	page 3 of 4

Note presence or absence of each indicator within a minimum distance of 50 feet upstream and 50 feet downstream of a representative channel cross section. Mark each box with a plus (+) for those indicators observed, and a minus (–) for those not observed. For examples see the Photo Atlas in MESA ~ Mapping Episodic Stream Indicators.

WATERCOURSE or WATERCOURSE COMPLEX

Transportation, Deposition & Flow Transition Indicators

+	Bar forms: sand / gravel	–	Secondary channels
+	Bifurcated flow	–	Sediment plastering
–	Drainage swales	+	Sediment ramps: sand / gravel
+	Flow lineations	–	Sediment sheets: sand / gravel
–	Imbricated gravel	+	Sediment sorting
–	Levee ridges: sand / gravel	–	Sediment tails: sand / gravel
+	Mud: cracks / curls / drapes	+	Vegetation-channel alignments
+	Organic drift	+	Wrack
–	Overturned rocks	–	Wrinkle marks
–	Out-of-channel flow: Lateral floodplain / Terminal floodplain		
–	Ripples		
	Other:		

Substrate Particle Size

Estimated percentages

	% Bedrock / Cemented substrate	
	% Boulder	≥ 256 mm
	% Cobble	≥ 64 – 256 mm
5	% Pebble	≥ 4 – 64 mm
20	% Granule	≥ 2 – 4 mm
70	% Sand	≤ 2 mm
5	% Silt/Clay	Fines

Numerous and well-defined indicators in primary channel. Fewer and less distinct indicators within greater MESA-mapped area, mostly veg-channel alignment.

Erosion Indicators

+	Cut banks	–	Rills	+	Water-cut benches
+	Exposed roots	+	Scour	–	Water level mark
–	Headcuts	+	Secondary channels		
	Other:				

well-defined erosion indicators in primary channel.

Vegetation

Estimated % total vegetative cover (perennial & shrub species combined):	Dominant and co-dominant species (if known) and % of total vegetative cover of each:	Representative height and width of dominant and co-dominant species:
2% in channels	Atriplex spinifera	2-4 ft height 2-4 ft width

Differences in total shrub/perennial density (total #shrubs/perennial plants) between the low-flow channel(s) and the adjacent floodplain? (describe and qualify the differences): Channels mostly devoid of veg. Density of shrub/perenn. between channels is similar, ~25%.

Are there plant species that are present in (or absent from) the low-flow channel(s) when compared to the adjacent floodplain? (describe differences): Species diversity is the same, density is lower.

Are there plant species that are more abundant (or less abundant) on the low-flow channel(s) and the adjacent floodplain? (describe and qualify differences) All species are less abundant in low flow channels vs. floodplain.

Site ID	Aratina	Stream ID	ED-2 (CUP5)	page 4 of 4

INDICATORS of PONDING & EVAPORATION and EOLIAN TRANSPORT & DEPOSITION

–	Algal crusts	–	Sand-filled channels		
–	Beach ridges	–	Springs		
–	Coppice dunes: active / relict	–	Substrate staining		
–	Crusts: carbonate / salt / soda	+	Vegetation-landscape alignments		
+	Mud: (cracks) / curls / polygons				
	Other:				

Additional Diagrams and Notes

Vegetation cross-section diagram: Draw a cross-section that identifies the approximate locations along the transect or diagram of geomorphic units (see page 1 of data sheet) where there are changes in vegetation characteristics, as summarized in the vegetation subsections under "Upland" and "Watercourse Complex".

No significant changes in veg. other than lower density in channels and A. polycarpa dom. in uplands + A. spinifera dom in fluvially active areas

Photographs

Photographs should document the representative landscape units, vegetation, and the presence or absence of representative stream indicators.

JD Report

Photo ID #	Description	GPS location	
5	western extent	35.01063	-117.73156
6	Eastern extent	35.01015	-117.73089
7	Primary channel	35.01043	-117.73149

MESA DS 2

Episodic Stream Indicator Data Sheet			page 1 of 4
Site ID: Arating CUP 4	Stream ID: ED-2 (downstream in CUP 4)		Date: 4/3/19
Nearest Town: Boron		County: Kern	
Investigators: True, Daman			

Base Map

Aerial Photo #: 2	Date: 3/28/19	Topographic Map Name: Lewhman Ridge	Date: 1973

GPS Data

GPS Name: P1-02	Datum: NAD 83	Transect Elevation: 2345 ft	Zone 10 / (11)	GPS Error: ± 3 (ft) / m
GPS co-ords start of transect: 35.00428, -117.73668		GPS co-ords end of transect: 35.00411, -117.73537		

Geomorphic Province (✓one)	[X] Mojave	[ ] Sonoran/Colorado	[ ] Great Basin	Other:

Landform (✓ all that apply)

[ ] Headwater	[ ] Upper fan	[ ] Middle fan	[ ] Lower fan	[X] Alluvial plain	[ ] Axial valley	[ ] Playa

Channel Form (✓ one)

[ ] Single thread	[X] Braided	[ ] Compound	[ ] Distributary	[ ] Discontinuous	Other:

Transect was selected to:

[X] Document fluvial activity & boundaries	[ ] Document channel elevations & boundaries
[ ] Document habitat associations	[ ] Document a change in watercourse morphology
[ ] Other:	

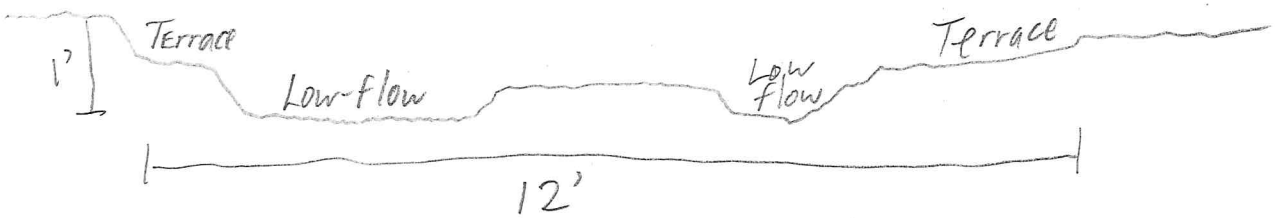
Date of most recent runoff event (if known): Approx. 2 weeks prior to survey.

Physical Setting: Briefly describe geomorphic processes and surficial materials and conditions, including the degree of disturbance relative to an intact dryland stream ecosystem, and any anthropogenic influences on the channel form and function: System consists of primary channel with braiding and secondary channels, and adjacent areas east and west with small shallow channels associated with primary channel. Borax plant with numerous roads + developed areas reduces watershed drainage area and flow volume and velocity. This reach is immediately downstream of SR 58, conveyed through culverts. Disturbance upstream is moderate to high.

Summary Site Description and Cross-section Sketch: View across the channel from watercourse-edge to watercourse-edge. Identify channel(s), banks, islands, interfluves, floodplains, terraces, and uplands where present. Note approximate width and elevation differences between features indicated. on site moderate

(Facing SE)

Left — Primary channel shown below. Transect ~400 ft wide, out to areas where fluvial indicators associated w/ primary were observed. Aerial imagery indicates potential fluvial ind's to these extents. — Right



Site ID: Arafina CUP 4	Stream ID: ED-2 (in CUP 4)	page 2 of 4

Note presence or absence of each indicator within a minimum distance of 50 feet upstream and 50 feet downstream of the representative channel cross section. Mark each box with a plus (+) for those indicators observed, and a minus (–) for indicators not observed. For examples see the Photo Atlas in MESA ~ Mapping Episodic Stream Indicators.

UPLAND

Terrestrial Indicators

–	Av soil horizon	+	Relict bars & swales
–	Biotic soil crusts	–	Rock fractured in place
+	Bioturbation	–	Rock varnish
–	Caliche: coatings / layers / rubble	–	Rock weathering
–	Carbonate etching	–	Rubified rock undersides
–	Coppice dunes: active / relict	–	Soil development
–	Deflated surface	+	Surface rounding of landform
–	Pavement	+	Woody debris in place
	Other:		

Substrate Particle Size

Estimated percentages

	% Bedrock / Cemented substrate	
	% Boulder	≥ 256 mm
5	% Cobble	≥ 64 – 256mm
5	% Pebble	≥ 4 – 64 mm
25	% Granule	≥ 2 – 4 mm
50	% Sand	≤ 2 mm
15	% Silt/Clay	Fines

Fluvial Indicators

–	Bars: sand / gravel	+	Mud: cracks / curls / drapes	–	Sediment tails: sand / gravel
–	Cut banks	–	Organic drift	–	Vegetation-channel alignment
–	Drainage swales	–	Overturned rocks	–	Water-cut benches
–	Exposed roots	–	Scour	–	Wrack
–	First-order streams	–	Sediment ramps: sand / gravel	–	Wrinkle marks
–	Flow lineations	–	Sediment sorting		
	Other:				

Soil cracking in uplands appears to be very short-duration puddling, no other fluvial ind's observed.

Vegetation

Estimated % total vegetative cover (perennial & shrub species combined):	Dominant and co-dominant species (if known) and % of total vegetative cover of each:	Representative height and width of dominant and co-dominant species:
20	Atriplex spinifera, A. polycarpa	2-4 ft H 2-4 ft W

Differences in total shrub/perennial density (total #shrubs/perennial plants) between upland & fluvially active units or watercourse complex? (describe and qualify the differences): Only signif. difference is density is that channels are mostly un-vegetated.

Are there plant species that are present in (or absent from) the uplands when compared to fluvially active units or the watercourse complex? (describe differences): No.

Are there plant species that are more abundant (or less abundant) in the uplands when compared to the fluvially active units or the watercourse complex? (describe and qualify differences) No.

Site ID: Aratina CNP 4	Stream ID: ED-2 (in CNP 4)	page 3 of 4

Note presence or absence of each indicator within a minimum distance of 50 feet upstream and 50 feet downstream of a representative channel cross section. Mark each box with a plus (+) for those indicators observed, and a minus (–) for those not observed. For examples see the Photo Atlas in MESA ~ Mapping Episodic Stream Indicators.

WATERCOURSE or WATERCOURSE COMPLEX

Transportation, Deposition & Flow Transition Indicators

+	Bar forms: sand / gravel	–	Secondary channels
+	Bifurcated flow	–	Sediment plastering
–	Drainage swales	–	Sediment ramps: sand / gravel
+	Flow lineations	–	Sediment sheets: sand / gravel
–	Imbricated gravel	+	Sediment sorting
–	Levee ridges: sand / gravel	–	Sediment tails: sand / gravel
+	Mud: cracks / curls / drapes	+	Vegetation-channel alignments
+	Organic drift	+	Wrack
–	Overturned rocks	–	Wrinkle marks
+	Out-of-channel flow: Lateral floodplain / Terminal floodplain		
–	Ripples		
	Other:		

Substrate Particle Size

	Estimated percentages	
	% Bedrock / Cemented substrate	
	% Boulder	≥ 256 mm
	% Cobble	≥ 64 – 256 mm
5	% Pebble	≥ 4 – 64 mm
10	% Granule	≥ 2 – 4 mm
75	% Sand	≤ 2 mm
10	% Silt/Clay	Fines

Various distinct indicators in primary channel, fewer and less distinct with MESA-mapped cross section east + west.

Erosion Indicators

+	Cut banks	–	Rills	+	Water-cut benches
+	Exposed roots	+	Scour	–	Water level mark
–	Headcuts	+	Secondary channels		
	Other:				

Vegetation

Estimated % total vegetative cover (perennial & shrub species combined):	Dominant and co-dominant species (if known) and % of total vegetative cover of each:	Representative height and width of dominant and co-dominant species:
5% in channels	A. spinifera A. polycarpa	2-4 ft. H 2-4 ft. W

Differences in total shrub/perennial density (total #shrubs/perennial plants) between the low-flow channel(s) and the adjacent floodplain? (describe and qualify the differences): Channels mostly un-vegetated. Density between channels is similar, ~ 20%.

Are there plant species that are present in (or absent from) the low-flow channel(s) when compared to the adjacent floodplain? (describe differences): Species diversity is the same, density is lower.

Are there plant species that are more abundant (or less abundant) on the low-flow channel(s) and the adjacent floodplain? (describe and qualify differences) All species less abundant in low-flow channels in relation to FP.

Site ID	Arafona CUP 2	Stream ID	ED-4	page 4 of 4

INDICATORS of PONDING & EVAPORATION and EOLIAN TRANSPORT & DEPOSITION

—	Algal crusts	—	Sand-filled channels		
—	Beach ridges	—	Springs		
—	Coppice dunes: active / relict	—	Substrate staining		
—	Crusts: carbonate / salt / soda	—	Vegetation-landscape alignments		
—	Mud: cracks / curls / polygons				
—	Other:				

Additional Diagrams and Notes

Vegetation cross-section diagram: Draw a cross-section that identifies the approximate locations along the transect or diagram of geomorphic units (see page 1 of data sheet) where there are changes in vegetation characteristics, as summarized in the vegetation subsections under "Upland" and "Watercourse Complex".

Channels mostly un-veg'd. Veg density slightly higher in uplands. J. Trees in uplands (scattered).

Photographs

Photographs should document the representative landscape units, vegetation, and the presence or absence of representative stream indicators.

Photo ID #	Description	GPS location	
20	western extent	35.99005	-117.67484
21	central transect	35.98983	-117.67439
22	eastern extent	35.98971	-117.67413

Appendix C

Regulatory Overview and Definitions

CDFW Jurisdiction

Section 1602 of CFGC requires an entity to notify the CDFW before conducting any activity that would divert obstruct, or substantially alter a streambed. Once notified, the CDFW may require that a Streambed Alteration Agreement be executed before the activity may proceed. The CDFW has not defined the term "stream" for the purposes of implementing its regulatory program under Section 1602, and the agency has not promulgated regulations directing how jurisdictional streambeds may be identified, or how their limits should be delineated. Considering this, four sources of information were reviewed and considered in determining the appropriate limits of CDFW jurisdiction within the site, as discussed below. The principles presented in these materials were used to guide the delineation of on-site streams, with consideration given to the relevance (i.e., jurisdiction, applicability) of each source to the project and resources at hand.

- **The plain language of Section 1602 of CFGC** establishes the following general concepts:
  - References "river," "stream," and "lake"
  - References "natural flow"
  - References "bed," "bank," and "channel"
- **Applicable court decisions**, in particular *Rutherford v. State of California* (188 Cal App. 3d 1276 (1987), which interpreted Section 1602's use of "stream" to be as defined in common law. The Court indicated that a "stream" is commonly understood to:
  - Have a source and a terminus
  - Have banks and a channel
  - Convey flow at least periodically, but need not flow continuously and may at times appear outwardly dry
  - Represent the depression between the banks worn by the regular and usual flow of the water
  - Include the area between the opposing banks measured from the foot of the banks from the top of the water at its ordinary stage, including intervening sand bars
  - Include the land that is covered by the water in its ordinary low stage
  - Include lands below the OHWM
- **CDFW regulations** defining "stream" for other purposes, including sport fishing (14 CCR 1.72) and streambed alterations associated with cannabis production (14 CCR 722(c)(21)), which indicate that a stream:
  - Flows at least periodically or intermittently
  - Flows through a bed or channel having banks
  - Supports fish or aquatic life
  - Can be dry for a period of time
  - Includes watercourses where surface or subsurface flow supports or has supported riparian vegetation
- **Guidance documents**, including *A Field Guide to Lake and Streambed Alteration Agreements* (CDFG 1994) which suggest the following:

- A stream may flow perennially or episodically
- A stream is defined by the course in which water currently flows, or has flowed during the historic hydrologic course regime (approximately the last 200 years)
- Width of a stream course can reasonably be identified by physical or biological indicators
- A stream may have one or more channels (single-thread vs. compound form)
- Features such as braided channels, low-flow channels, active channels, banks associated with secondary channels, floodplains, islands, and stream-associated vegetation, are interconnected parts of the watercourse
- Canals, aqueducts, irrigation ditches, and other means of water conveyance can be considered streams if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife
- Biologic components of a stream may include aquatic and riparian vegetation, all aquatic animals including fish, amphibians, reptiles, invertebrates, and terrestrial species which derive benefits from the stream system
- The lateral extent of a stream can be measured in different ways depending on the particular situation and the type of fish or wildlife resource at risk

The tenets listed above, among others, were applied within the project site in an attempt to determine the limits of on-site streams. The project site is in a desert, and the on-site resources are episodic streams on arid landscapes.

RWQCB Jurisdiction

The State Water Resources Control Board (SWRCB) and local Regional Water Quality Control Board (RWQCB) have jurisdiction over "waters of the State," which are defined as any surface water or groundwater, including saline waters, within the boundaries of the state.

The SWRCB has not established regulations for field determinations of waters of the state except for wetlands currently. For non-wetland waters, each local RWQCB may delineate boundaries differently based on their interpretations of jurisdiction. The Lahontan RWQCB, which is the local RWQCB for the project area, generally uses United State Army Corps of Engineers (USACE) delineation methods and delineates waters of the State to the ordinary high water mark (OHWM).

Wetland waters of the State are defined under the SWRCB's *State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State,* which went into effect May 28, 2020.The SWRCB defines an area as wetland if, under normal circumstances:

(i) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both;

(ii) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and

(iii) the area's vegetation is dominated by hydrophytes or the area lacks vegetation.

The SWRCB's *Implementation Guidance for the Wetland Definition and Procedures for Discharges of Dredge and Fill Material to Waters of the State* (2020), states that waters of the U.S. and waters of the State should be delineated using the standard USACE delineation procedures, taking into consideration that the methods shall be modified only to allow for the fact that a lack of vegetation does not preclude an area from meeting the definition of a wetland.

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Appendix D

Background Databases

The National Map Advanced Viewer



9/15/2020, 3:55:40 PM

1:72,224

0 0.5 1 2 mi

0 0.75 1.5 3 km

Waterbody - Large Scale
Estuary
Ice Mass
LakePond
Playa
Reservoir
SwampMarsh
Area - Large Scale
Area of Complex Channels
Area to be Submerged
BayInlet
Bridge
CanalDitch
DamWeir
Flume

USGS The National Map: Orthoimagery and US Topo. Data refreshed

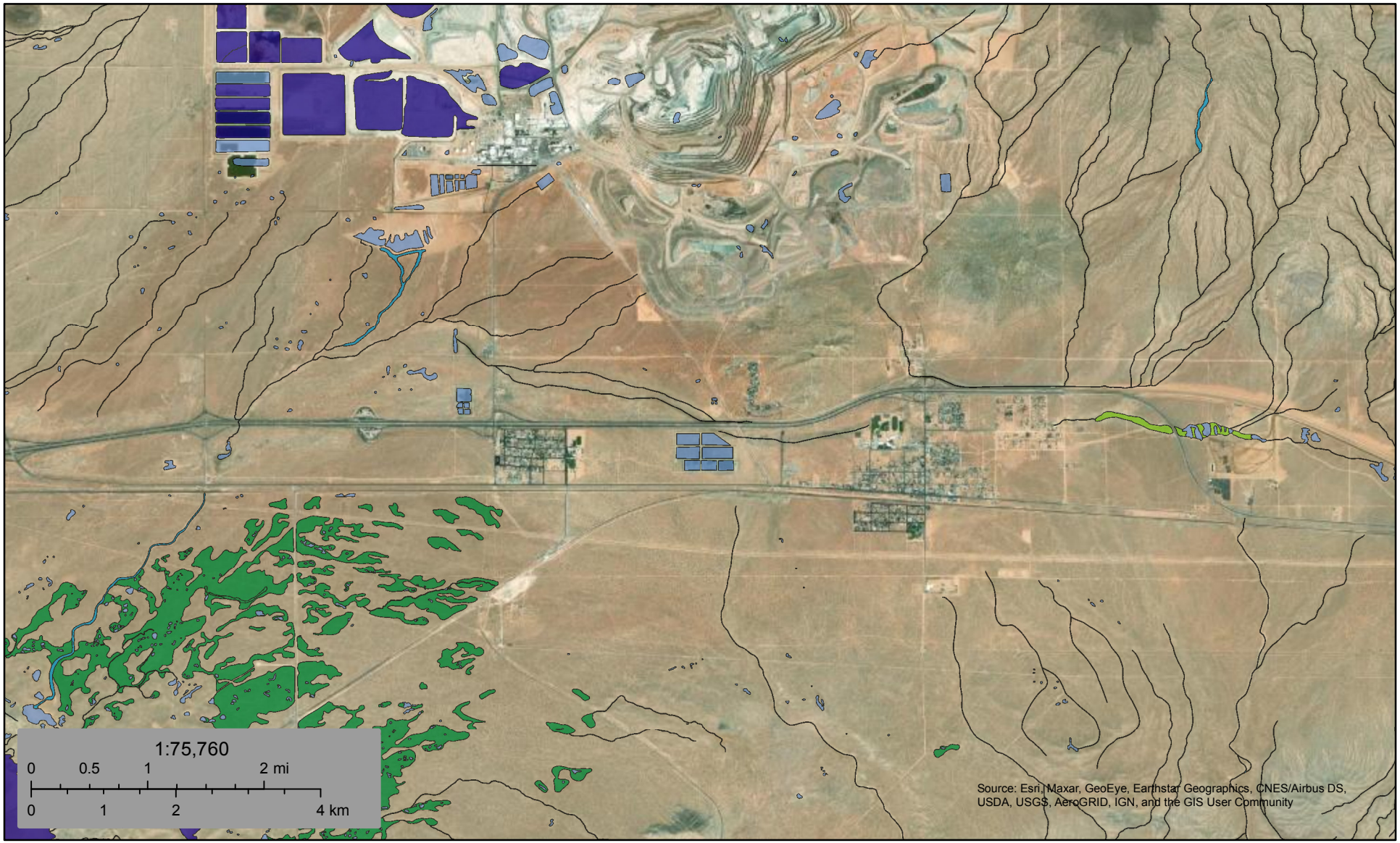
USGS

USGS The National Map: Orthoimagery | Garrity, C.P., Soller, D.R. | USGS National Map 3D Elevation Program (3DEP) | USGS TNM - 3D Elevation Program (3DEP). Data Refreshed Weekly. | USGS The National Map: 3D Elevation Program. Data Refreshed July,

U.S. Fish and Wildlife Service

National Wetlands Inventory

Aratina Solar



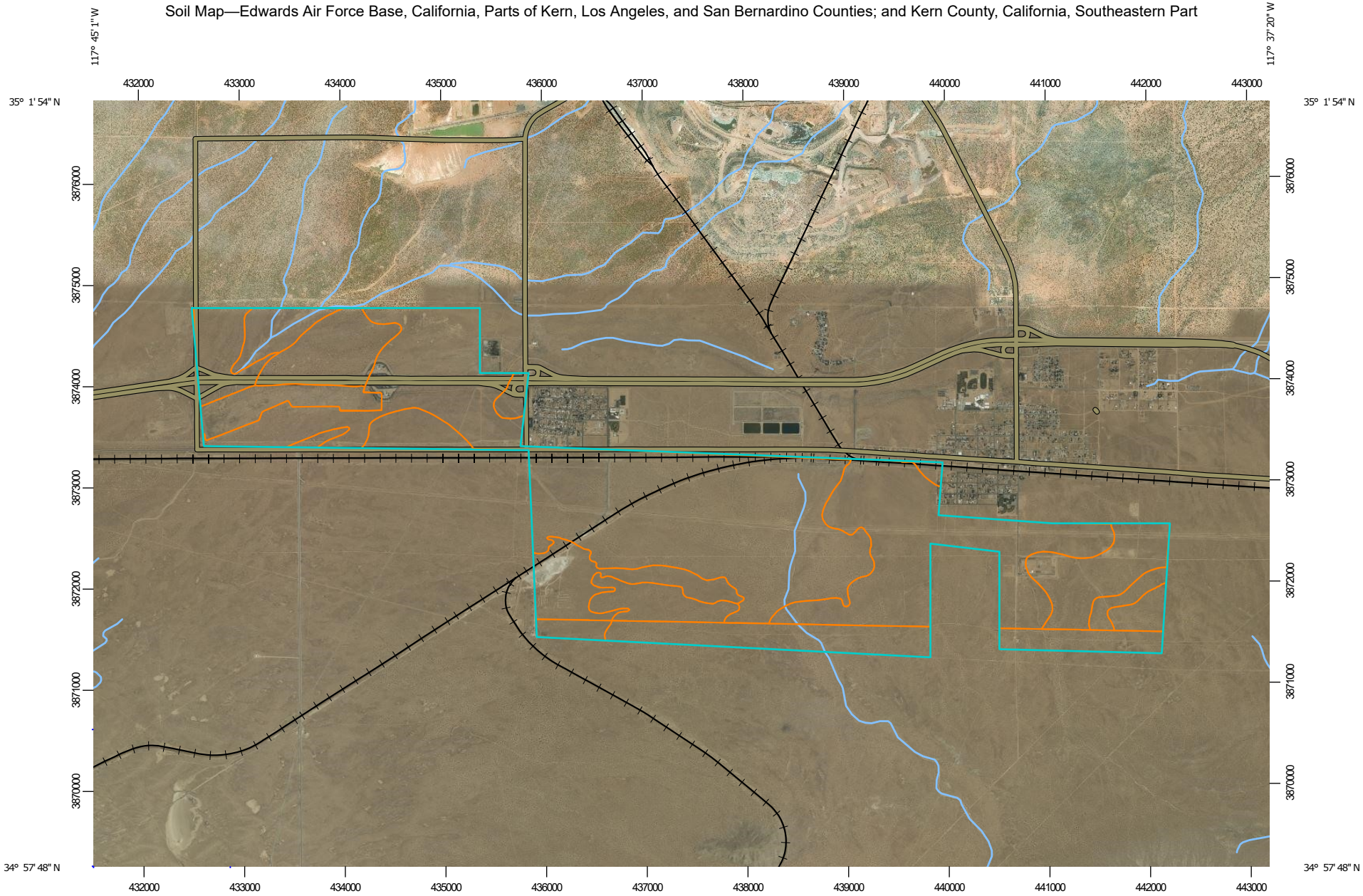
September 15, 2020

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Soil Map—Edwards Air Force Base, California, Parts of Kern, Los Angeles, and San Bernardino Counties; and Kern County, California, Southeastern Part



Map Scale: 1:53,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 500 1000 2000 3000

Feet
0 2500 5000 10000 15000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Edwards Air Force Base, California, Parts of Kern, Los Angeles, and San Bernardino Counties
Survey Area Data: Version 11, May 27, 2020

Soil Survey Area: Kern County, California, Southeastern Part
Survey Area Data: Version 11, May 27, 2020

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 18, 2016—Jul 8, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
109	Cajon-Norob complex, 2 to 9 percent slopes	285.0	8.1%
137	Norob complex, 0 to 5 percent slopes, overblown	32.9	0.9%
Subtotals for Soil Survey Area		**317.8**	**9.1%**
Totals for Area of Interest		**3,498.5**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
114	Cajon loamy sand, 0 to 5 percent slopes	1,602.6	45.8%
116	Cajon gravelly loamy sand, 0 to 9 percent slopes	284.4	8.1%
154	Neuralia sandy loam, 2 to 5 percent slopes	313.6	9.0%
155	Norob-Neuralia complex, 0 to 5 percent slopes	863.7	24.7%
157	Pits	116.4	3.3%
Subtotals for Soil Survey Area		**3,180.7**	**90.9%**
Totals for Area of Interest		**3,498.5**	**100.0%**

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Appendix D-3
Western Joshua Tree Census Report

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Aratina Solar Farm

Western Joshua Tree Census Report

Prepared For:

64NB 8me LLC
5455 Wilshire Boulevard, Suite 2010
Los Angeles, CA 90036
323-525-0900

Prepared By:

EREMICO Biological Services, LLC
and
EnviroPlus Consulting, Inc.

March 6, 2021

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Appendices

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Appendix B Data Spreadsheet
Appendix C Representative Photos

1.0 Introduction

On October 15, 2019, the California Fish and Game Commission (CFGC) received a petition to list the western Joshua tree (WJT) (*Yucca brevifolia*) as threatened under the California Endangered Species Act (CESA) (CBD 2019). In February 2020, the California Department of Fish and Wildlife (CDFW) completed a review of the petition, as well as other scientific information available to CDFW. In its review, CDFW determined that "the petition provides sufficient scientific information to indicate that the petitioned action may be warranted" (CDFW 2020). On September 22, 2020, the California Fish and Game Commission (CFGC) accepted for consideration the petition to list the WJT as threatened or endangered under the CESA and made the WJT a candidate species (CFGC 2020a). Subsequently, CFGC adopted a regulation authorizing incidental take of WJT during the candidacy period pursuant to Section 2084 of the Fish and Game Code for certain energy projects in Kern and San Bernardino Counties listed in the regulation (the "2084 Rule"). Aratina Solar Farm is one of the projects listed in the 2084 Rule. This conditional incidental take authorization is codified in Section 749.10 of Title 14, California Code of Regulations (CFGC 2020b).

This Report is submitted pursuant to and in fulfillment of the terms and conditions of the 2084 Rule for WJT incidental take authorization.

1.1 Project Description

68NB 8me LLC (Applicant) proposes to develop up to a 530 megawatt-alternating current (MW-AC) utility-scale solar farm with 600 MW-AC energy storage known as the Aratina Solar Farm (Project) located near the communities of Desert Lake and Boron in Kern County, California (Figure 1). The proposed project would encompass 2,374.85 acres comprised of 22 assessor's parcels. Power generated by Aratina would be delivered from the site with up to a 230 kilovolt (kV) overhead and/or underground electrical transmission line(s) originating from one or more on-site substation(s) and terminating at the Southern California Edison (SCE) Holgate Substation. Alternatively, Aratina may interconnect at the SCE Kramer Substation in San Bernardino County with up to a 230 kV transmission line located in an Edwards Air Force Base (Edwards AFB) utility corridor (EnviroPlus Consulting, Inc. [EPC] 2020).

1.2 Project Location

The Project lies within an unincorporated area in the southeastern corner of Kern County, California, to the south and west of the unincorporated community of Boron (Figure 2). The Project is located on private land located on the Boron and Leuhman Ridge USGS 1:24000 quadrangles. The cadastral description of the Project is as follows:

- Township 11N, Range 8W – portions of Sections 33, 34;
- Township 10N, Range 8W – Sections 1 and 2; and
- Township 10N, Range 7W – portions of Sections 5 and 6.

The Project is bounded as follows:

- North – an Antelope Valley East Kern Water Agency pipeline right-of-way;
- West – Gephart Road;

- South – Edwards AFB; and
- East – the Kern-San Bernardino County line.

This report documents the methods and results of a census of WJT on the Aratina Solar Farm project site. The purpose of the census was to gather information on the occurrence of WJT on the project site, use that information to identify the impacts of the project on WJT, and calculate the amount of compensatory mitigation required for the project, as specified by the 2084 Rule.

2.0 Methods

The methods used for the census were designed to provide the information required by the terms and conditions of the 2084 Rule (CFGC 2020b). Two operative terms of the 2084 Rule regarding the scope of the census (and used in this report) are:

- The census area, which encompasses 2,464.42 acres, includes the Project, collector lines, and the Holgate gen-tie (Project Area) and the Kramer gen-tie (Figure 2).
- The Project Impact Area includes all areas in which there will be permanent or temporary impacts to an individual WJT and the area around each individual WJT, defined by a radius, as measured from a single point at its trunk, of:
    - 40 feet for WJT five meters or greater in height (encompassing approximately 0.115 acres)
    - 12 feet for WJT one meter or greater but less than five meters in height (encompassing approximately 0.010 acres)
    - 6 feet for WJT less than one meter in height (encompassing approximately 0.003 acres).

A census (complete count) of all WJT on the project site was conducted November 5-17, 2020 and February 25-26, 2021. The census was completed by the following qualified biologists, who were approved in advance in writing by CDFW:

Approved Qualified Biologists for the Aratina Solar Farm Joshua Tree Census.

Biologist	Title	Affiliation
Gilbert Goodlett	Biologist	EnviroPlus Consulting, Inc.
Denise LaBerteaux	Biologist	EREMICO Biological Services, LLC
Bruce Garlinger	Biologist	EREMICO Biological Services, LLC
Cecile Shohet	Botanist	Calypso Botanical Consulting, LLC
Mark Bagley	Botanist	Mark Bagley Consulting Biologist
Youssef Atallah	Botanist	Redwood Biological Consulting, LLC
Michael Honer	Botanist	Michael Honer
Cathy Halley	Biologist	Roadrunner Biological Consulting, LLC

2.1 Field Investigations

The eight qualified biologists used Global Positioning System (GPS) units to navigate along pre-determined north-south or east-west transects across the entire census area at 15-meter intervals. The 15-meter distance between transects was sufficient to allow the experienced biologists to observe all individual WJT present, even small ones under shrubs, given the sparse nature of desert vegetation. The biologists deviated from the transects as needed to ensure 100 percent visual coverage of the census area.

Each tree encountered was positionally recorded using the data recording application "Avenza Maps" running on an Apple iPhone or Android Phone. A Bluetooth connected mapping grade GPS (Bad Elf GNSS) with 1-m horizontal accuracy provided the locational data to the smart phone.

The height of each tree was determined to the nearest 0.5 m. Trees less than approximately 2 m in height were measured directly. Taller trees were measured using the tree measuring application "Arboreal", which utilizes augmented reality capabilities as a measurement tool. Field tests of "Arboreal" demonstrated that it was an easy, efficient, accurate, and repeatable tool.

Tree heights were entered into the data recording schema using a drop-down menu for height categories. The height categories were at 0.5-m intervals from 0.5 m to 15 m. Categories included < 0.5 m, 0.5 to < 1.0 m, 1.0 m to < 1.5 m, etc. Characterization of tree heights at 0.5-m intervals provided much finer resolution than the three categories prescribed in the 2084 specifications. This allowed flexibility in data utilization. Field data was backed up daily. Spreadsheet format of the data downloaded from Avenza Maps is shown in Appendix B.

2.2 Data Analysis

To determine the Project Impact Area and acreage, the raw tree data from the field effort, including tree identifier, location (latitude/longitude), height, 2084 size class, and the corresponding 2084 impact radius, were first added to Esri's ArcMap and sorted by the 2084 size class, i.e., < 1 m, 1 to < 5 m, and ≥ 5 m. The buffer tool was then used to add the buffers around individual trees according to the 2084 impact radii, i.e., 1.83 m (6 feet) for trees < 1 m; 3.66 (12 feet) for trees 1 to < 5 m; and 12.20 m (40 feet) for trees ≥ 5 m. Once the individual buffer layers were created, they were merged together to form one layer. The merged layer was then dissolved to remove any overlaps in the impact radii, so as to not count the overlap area twice. Finally, the dissolved polygon was used to calculate the overall Project Impact Area acreage.

2.3 Photographs

After determining the Project Impact Area, the Fishnet tool in ArcMap was used to overlay a grid, consisting of one-acre grid cells, over the entire Project Area. Photographs were taken in the grid cells containing the most Project Impact Area. The number of grid cells targeted for photographs equaled the Project Impact Area acreage. For example, if the Project Impact Area totaled 100 acres, then 100, one-acre grid cells were photographed. To identify these grid cells, the intersect tool in ArcMap was used to separate the Project Impact Area that intersected with the grid cells. The acreage of the Project Impact Area was then calculated within each one-acre cell. These data were

then sorted by acreage from greatest to least. The grids cells with the greatest amount of Project Impact Area acreage were targeted during the photographic effort.

Two photographs were taken from locations that best represented western Joshua trees within the grid cell. Each photograph featured a standard height reference that was placed near a tree. The height reference was 2 m tall, made from PVC pipe, and alternately banded white and high visibility orange. Each band measured 0.5 m for a total of 4 bands. The bottom band was white while the top band was orange.

The aspect bearing of each photograph within a grid cell varied but was no less than 45° from one another. Photographs were taken using a 12 megapixel Apple iPhone using the application Theodolite at 1X zoom. Theodolite imprinted the following information on each photograph:

- date and time;
- position (UTM coordinates);
- altitude;
- datum (WGS-84);
- aspect expressed as azimuth/bearing;
- elevation angle;
- horizon angle;
- zoom (set to 1X); and
- notes - all photographs were labeled with the grid cell number ("Cell #") and "Aratina Solar-Ht. Reference=2.0 m".

The file names for the digital photographs included the project (Aratina) plus the grid cell identification number plus a "1" or a "2" to identify if it was the first or second photograph in that cell. A typical example was "Aratina Cell 15-2".

The compensatory mitigation requirement (in acres) was calculated by multiplying the Project Impact Area (in acres) by the compensatory mitigation ratio of 1.5:1. The compensatory mitigation fee was calculated by multiplying the compensatory mitigation requirement (in acres) by the variable mitigation fee of $10,521.95 per acre, and then adding the per-project base mitigation fee of $10,000.00.

3.0 Results

The Aratina Solar Farm is located in the Mojave Desert Region of the Desert Floristic Province. Landforms in the region included granite-derived flood plains, alluvial flats and fans, and small clay pans. The entire area drained southwesterly towards Rodgers Lake. Soil textures throughout most of the Project are loamy sands, gravelly loamy sands, and sandy clay loams. Native vegetation on-site is typical of that found throughout the Mojave Desert. Six vegetation communities occur and are listed below, listed from most to least prevalent:

- *Larrea tridentata – Ambrosia dumosa* Shrubland Alliance;
- *Atriplex spinifera* Shrubland Alliance (including early successional stages);
- *Larrea tridentata* Shrubland Alliance;
- *Atriplex polycarpa* Shrubland Alliance;
- *Atriplex polycarpa* - *Atriplex spinifera* Shrubland Alliance (early successional stage); and
- *Ambrosia dumosa* Shrubland Alliance.

A total of 4,722 WJT were recorded at Aratina Solar Farm during the WJT census. Their locations are plotted in Appendix A, Figure 3. The distribution in each size class, as defined in Section 2084 of the Fish and Game Code, is shown in Table 1.

Table 1 Census Results

	WJT by Height Class (count)			
	Less than 1 m	1 m to less than 5 m	5 m or greater	Total (count)
Project Area	976	3,192	527	4,695
Kramer Gen-tie	6	12	9	27
Census Area Total	982	3,204	536	4,722

The Project Impact Area for western Joshua trees on the Aratina Solar Farm project site is depicted in Appendix A, Figure 4. The total Project Impact Area was calculated to be 88.00 acres (Table 2).

Table 2 Project Impact Area

Area	Impact
Project Area:	86.99 acres
Kramer Gen-tie:	1.01 acres
Project Impact Area Total:	88.00 acres

On December 19 and 22, 2020, two photographs were taken at a minimum of 88, 1-acre grid cells containing the densest WJT. Appendix C has example photographs. All photographs can be found at the following link on Dropbox:

https://www.dropbox.com/sh/r0rjbrubb5qxavc/AAD3bi2D2o2yzMQca31pa-pHa?dl=0

Upon request, photographs can be provided by alternative means.

Per the terms of the 2084 exemption for WJT, the compensatory mitigation ratio is 1.5:1 with a base mitigation fee of $10,000.00 per project and $10,521.95 for each acre yielding a total mitigation fee of $1,398,897.40 (Table 3).

Table 3 Compensatory Mitigation Calculations	
Variable	**Value**
Project Impact Area Total:	88.00 acres
Compensatory Mitigation Ratio:	1.5:1
Compensatory Mitigation Requirement:	132.00 acres
Base Mitigation Fee:	$10,000.00 per project
Variable Mitigation Fee:	$10,521.95 per acre
Compensatory Mitigation Fee:	$1,398,897.40

4.0 References

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Appendix A Figures

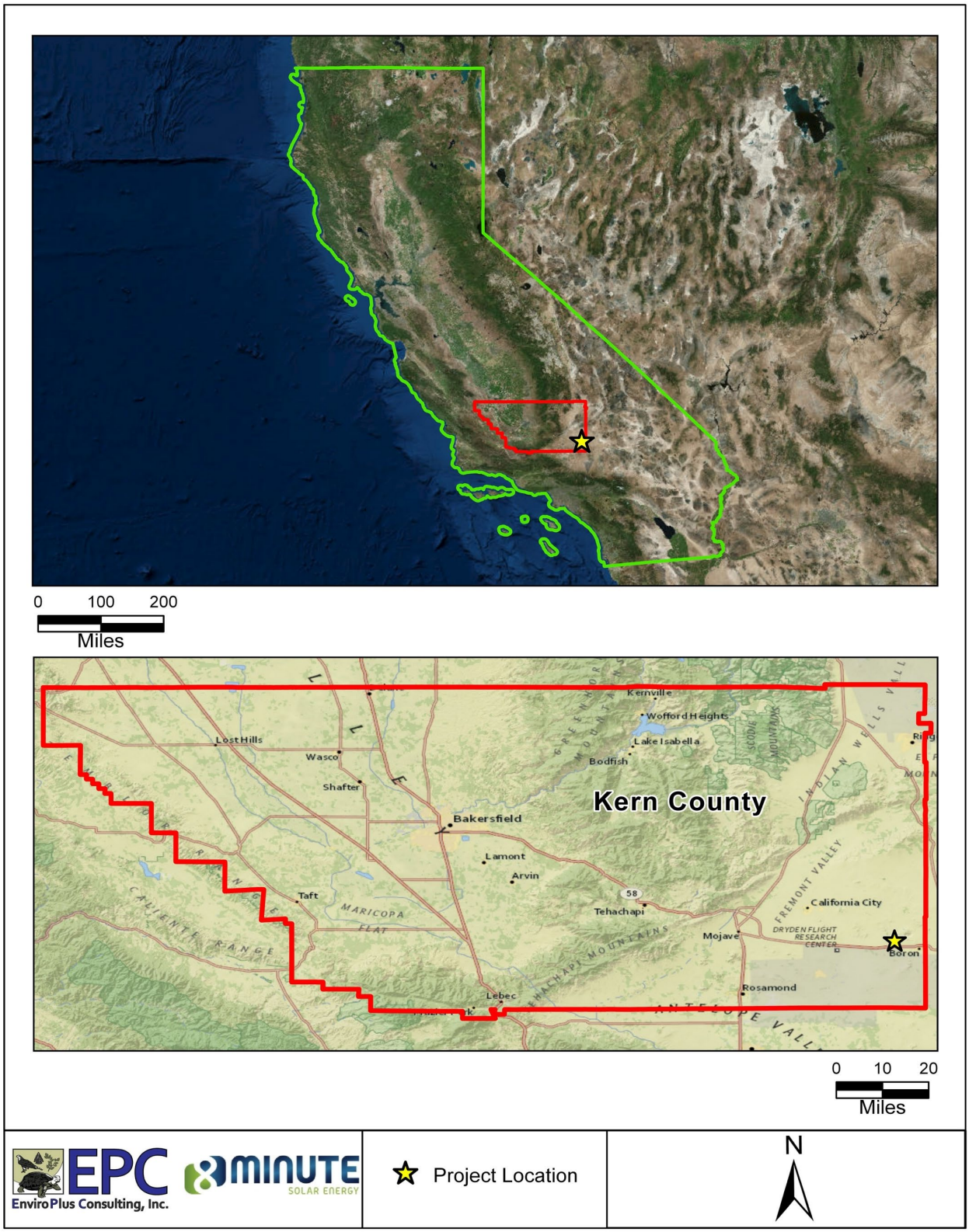


Figure 1 Proposed Aratina Solar Project Area Vicinity Map

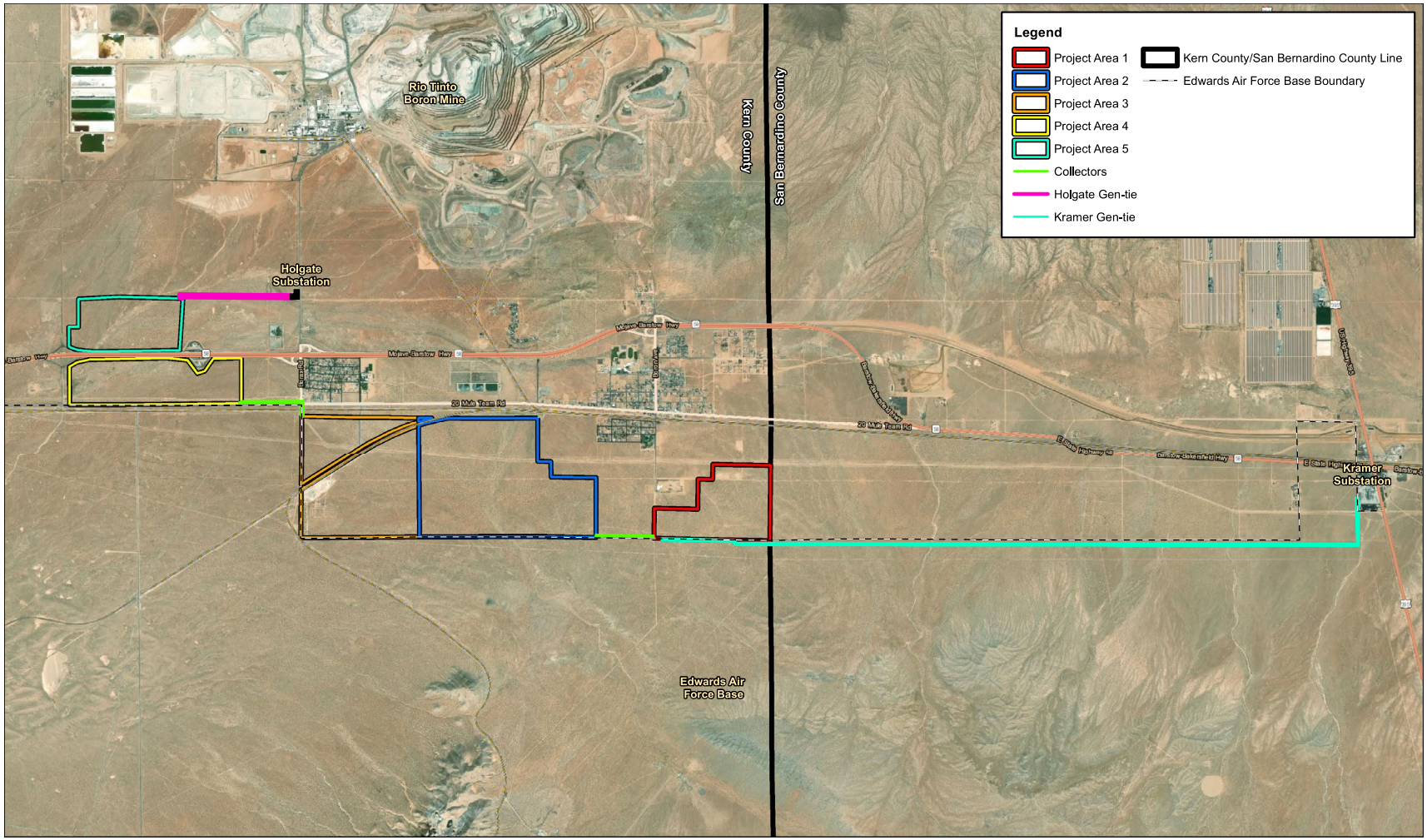


Figure 2 Aratina Solar Project Overview

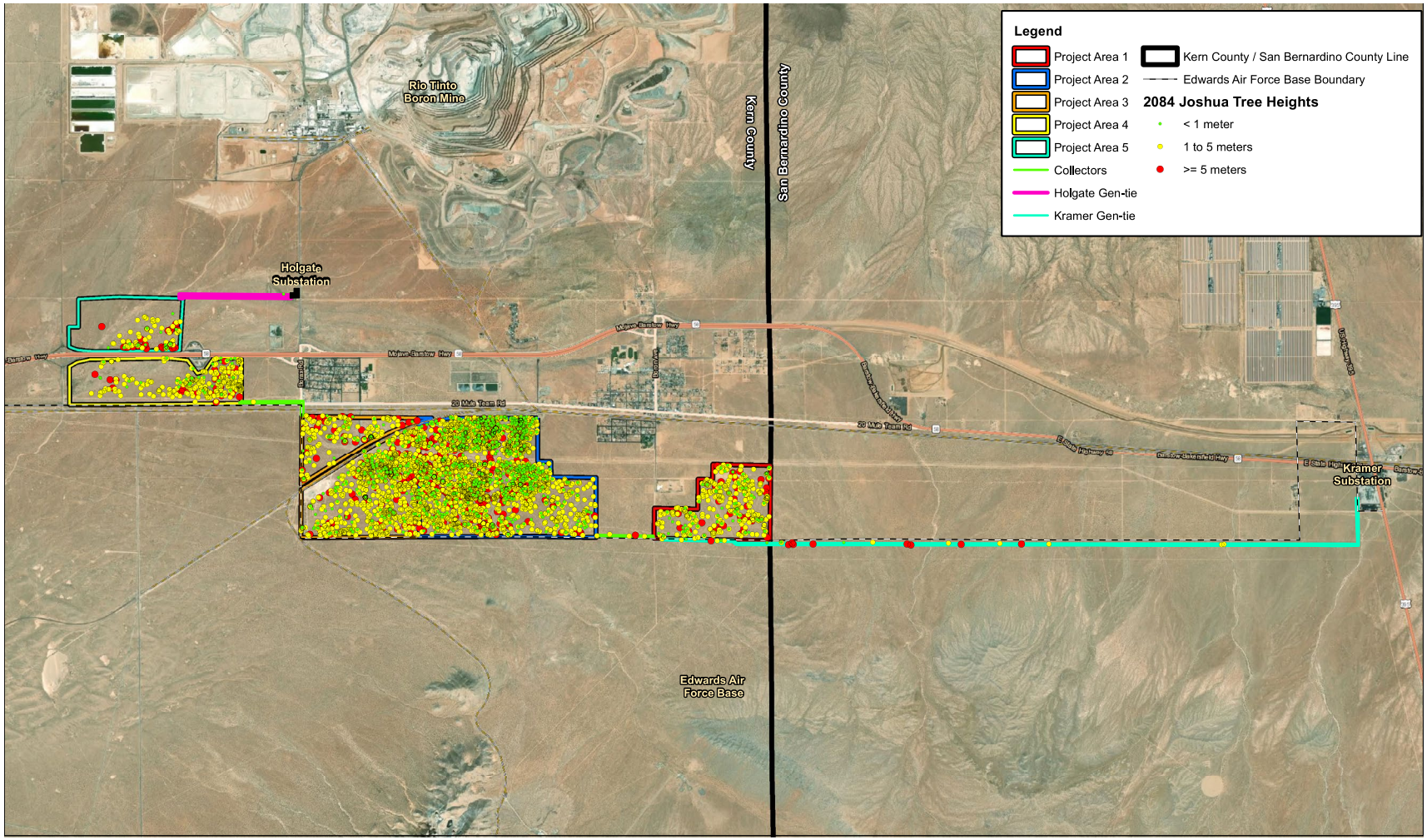


Figure 3 Western Joshua Trees on the Aratina Solar Farm Project Area

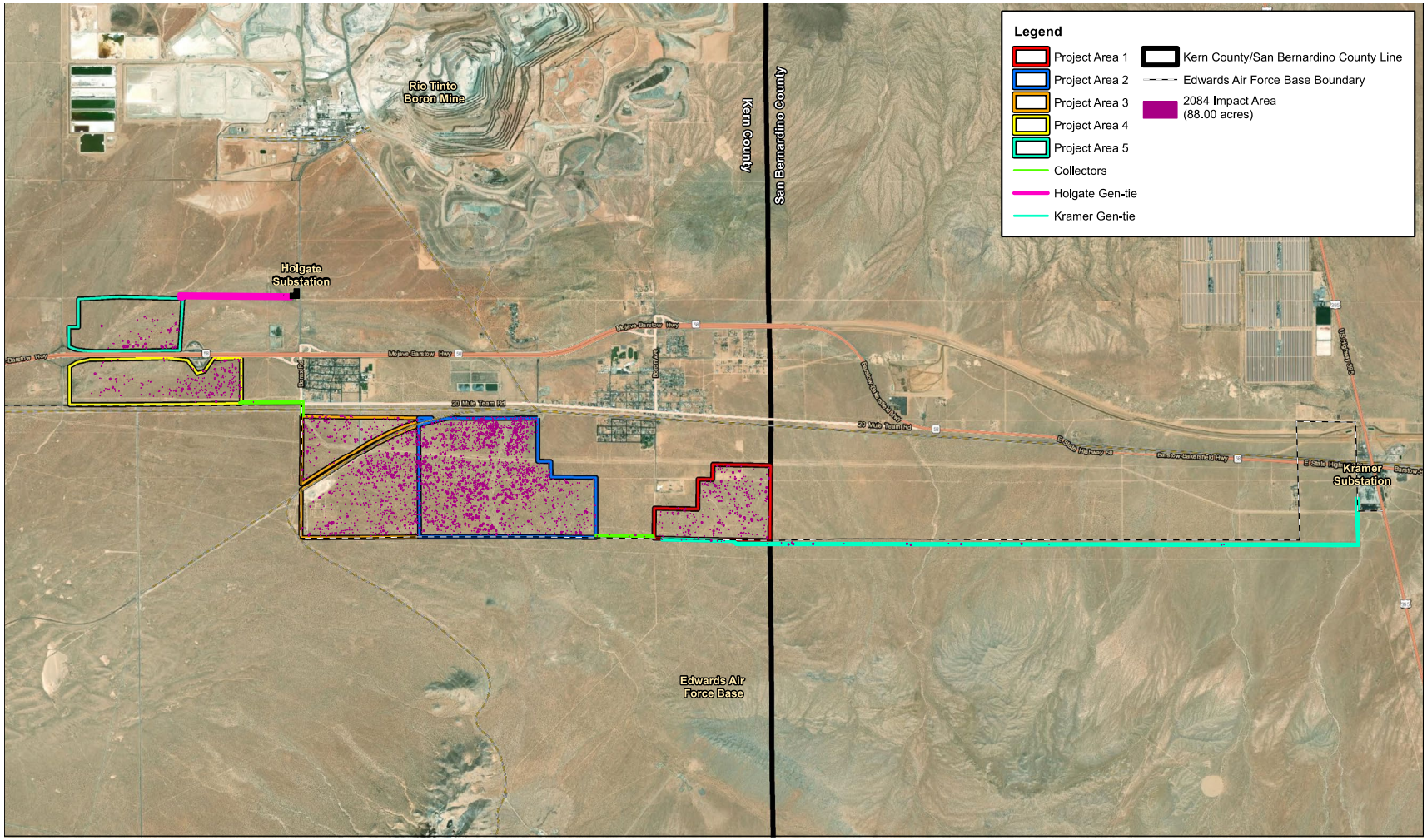


Figure 4 Project Impact Area for Western Joshua Trees on the Aratina Solar Farm Project Area

Appendix B Data Spreadsheet

Western Joshua Tree Census –Data Spreadsheet Layout

WJT ID[1]	Date/Time	Latitude	Longitude	Northing	Easting	Tree Height
DL22	2020-11-05 T09:57:44-08:00	34.9858085	-117.68953	3871686.41	437067.967	1.5 to <2.0 meters
DL23	2020-11-05 T09:59:56-08:00	34.985874	-117.6895	3871693.66	437071.105	3.0 to <3.5 meters
DL24	2020-11-05 T10:05:36-08:00	34.9870307	-117.68948	3871821.92	437073.268	5.0 to <5.5 meters
DL25	2020-11-05 T10:09:10-08:00	34.9878028	-117.68958	3871907.61	437065.036	4.0 to <4.5 meters
DL26	2020-11-05 T10:14:14-08:00	34.9890582	-117.68959	3872046.84	437064.795	1.0 to <1.5 meters
DL27	2020-11-05 T10:17:53-08:00	34.990225	-117.68948	3872176.16	437076.214	Less than 0.5 meters

[1] Includes qualified biologist's initials and sequential WJT number.

Appendix C Representative Photos

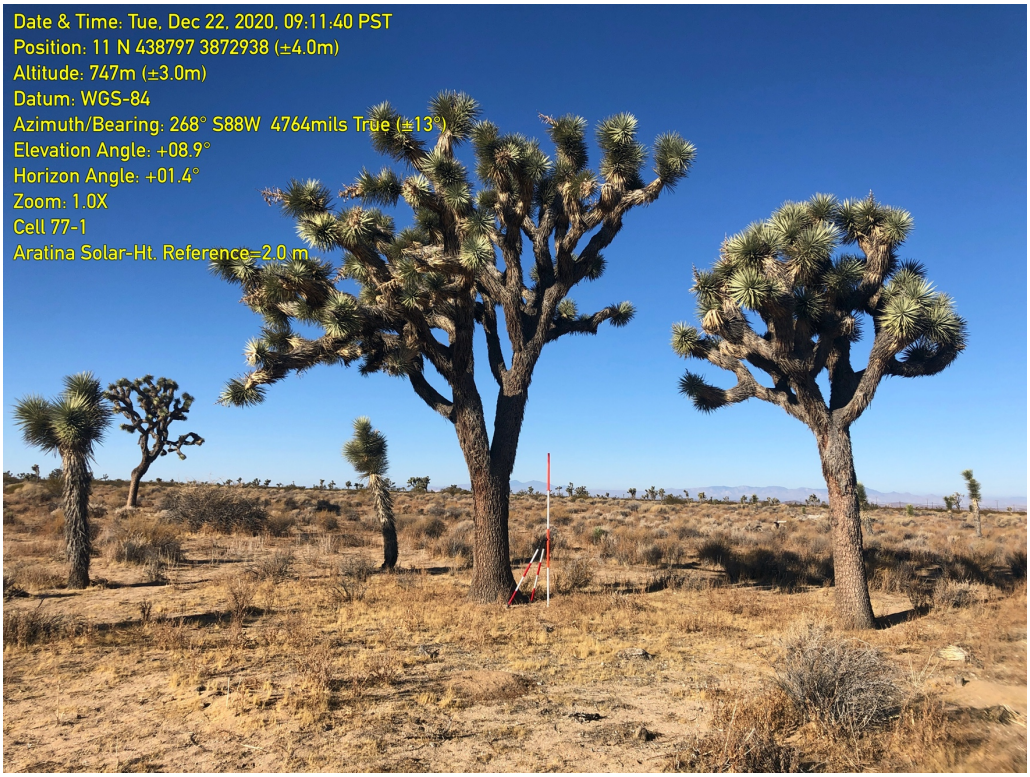


Photo 1 Typical Photograph at the Aratina Solar Farm



Photo 2 Typical Photograph at the Aratina Solar Farm

Appendix D-4
Western Joshua Tree Census CDFW Email

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Alexander Sundquist

Subject: 8minute Solar Energy - Aratina 2084 Western Joshua Tree Census

---

From: Ferranti, Annee@Wildlife <Annee.Ferranti@wildlife.ca.gov>
Sent: Wednesday, April 21, 2021 10:21 AM
To: Erec DeVost <edevost@8minute.com>
Subject: 8minute Solar Energy - Aratina 2084 Western Joshua Tree Census

Good morning Erec:

The California Department of Fish and Wildlife (CDFW) is in receipt of the Aratina Solar Project's Western Joshua Tree Census Report (Census Report) prepared in compliance with the recently adopted 2084 Emergency Regulations authorizing the take of western Joshua tree (*Yucca brevifolia*) (WJT) during its candidacy for listing under the California Endangered Species Act for fifteen (15) specific renewable energy projects. The Aratina Project (Project) is one of the 15 projects identified for take authorization in the 2084 Regulation. The Project is located in southern Kern County. The Kern County Planning and Natural Resources Department has circulated Notices of Preparation for the Project and a Draft Environmental Impact Report (DEIR) will be prepared. However, to date, the DEIR for the Project has not been circulated for public review.

CDFW has completed its review and is approving the Census Reports for the Aratina Project. Based on information provided in the report:

- Aratina is impacting 88 acres of WJT occupied habitat and at a mitigation ratio of 1.5:1, the mitigation obligation for the Project is 132 acres. Based on a mitigation fee of $10,521.95 per acre of mitigation and a $10,000.00 base mitigation fee, the Project mitigation fee is **$1,398,897.40**

Prior to initiating ground- or -vegetation disturbing activities that will result in take of WJT on the Project, **$1,398,897.40** is to be deposited into the CDFW approved WJT mitigation fund held by the National Fish and Wildlife Foundation. Once the Project is completed, as-built development plans must be submitted to CDFW within 90 days of completion of all construction and ground-disturbing activities.

If you have any questions, or need any further information, please don't hesitate to reach out. Annee

Annee Ferranti
Environmental Program Manager
Habitat Conservation Planning
California Department of Fish and Wildlife Central Region (R4)
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Appendix D-5
A Review of Avian Monitoring and Mitigation Information at Existing Utility-Scale Solar Facilities

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A **Review** of **Avian Monitoring** and **Mitigation** Information at Existing Utility-Scale Solar Facilities







Environmental Science Division

ANL/EVS-15/2

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ANL/EVS-15/2

A Review of Avian Monitoring and Mitigation Information at Existing Utility-Scale Solar Facilities

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April 2015

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NOTATION

The following is a list of the acronyms, initialisms, and abbreviations (including units of measure) used in this document.

ACRONYMS, INITIALISMS, AND ABBREVIATIONS

ACRP	Airport Cooperative Research Program
ABPP	Avian and Bat Protection Plan
APLIC	Avian Power Line Interaction Committee
APP	Avian Protection Plan
BACI	Before-After Control-Impact
BBCS	Bird and Bat Conservation Strategy
BLM	Bureau of Land Management
BMP	Best Management Practice
CEC	California Energy Commission
CFR	*Code of Federal Regulations*
CSP	concentrating solar power
CVSR	California Valley Solar Ranch
ECPG	Eagle Conservation Plan Guidance
ESA	Endangered Species Act
FAA	Federal Aviation Administration
HTF	heat transfer fluid
ISEGS	Ivanpah Solar Electric Generating System
IR	Iberdrola Renewables, LLC
NEPA	National Environmental Policy Act
NREL	National Renewable Energy Laboratory
PSEGS	Palen Solar Electric Generating System
PV	photovoltaic
R&D	research and development
RPM	revolution per minute
SAM	System Advisor Model
USC	*United States Code*
USFWS	U.S. Fish and Wildlife Service
UV	ultraviolet
WEG	Wind Energy Guidelines

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SUMMARY

There are two basic types of solar energy technology: photovoltaic and concentrating solar power. As the number of utility-scale solar energy facilities using these technologies is expected to increase in the United States, so are the potential impacts on wildlife and their habitats. Recent attention is on the risk of fatality to birds. Understanding the current rates of avian mortality and existing monitoring requirements is an important first step in developing science-based mitigation and minimization protocols. The resulting information also allows a comparison of the avian mortality rates of utility-scale solar energy facilities with those from other technologies and sources, as well as the identification of data gaps and research needs.

This report will present and discuss the current state of knowledge regarding avian issues at utility-scale solar energy facilities by:

1. Summarizing available avian fatality data and issues;

2. Summarizing current monitoring activities and reporting requirements;

3. Summarizing avian mortality data for non-solar development activities;

4. Summarizing mitigation measures being used or considered by solar developers;

5. Evaluating mitigation measures that have been successfully employed for non-solar activities for those that may be effective for solar development;

6. Examining solar-technology-specific aspects of avian fatality, including solar flux associated with power towers; and

7. Recommending future steps.

Several federal and state regulations apply to the protection of birds at solar energy developments. Most birds are protected by the Migratory Bird Treaty Act, which prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when authorized by the U.S. Fish and Wildlife Service. Projects are also required to comply with state and federal regulations to protect threatened, endangered, and certain other species (e.g., Endangered Species Act, Bald and Golden Eagle Protection Act, Bureau of Land Management policy, and state wildlife codes). Because the potential for impact to birds and their populations depends largely on project size and location, specific requirements for threatened, endangered, and sensitive bird species are often considered on a project-specific basis.

Like many industrial activities, utility-scale solar energy development has the potential to impact, directly and indirectly, birds and bird communities in a number of ways, such as by habitat degradation, habitat loss, habitat fragmentation, and direct fatality. This report summarizes existing information about direct impacts, of which there are two general types: collision-related and solar-flux-related. Collision-related impacts may occur from all types of solar energy technologies. The effects of solar flux on birds have so far been observed only at facilities employing concentrated-solar-power towers.

Information and data summarized in this report were collected directly from solar energy companies, industry organizations, and state and federal regulatory agencies, as well as through Internet searches. Compared with other industries, there are relatively few reports that describe or quantify the interaction of birds with utility-scale solar power facilities. Most of the available information on solar-

avian interactions is from projects in the southwest United States. In total, avian monitoring plans and/or fatality data are known to exist for 15 solar energy facilities (14 of them in the U.S.). Not all utility-scale solar energy developments in the United States are required to prepare project-specific avian monitoring protocols. A Bird and Bat Conservation Strategy (BBCS) may be part of a solar energy application when an environmental review indicates the need for one. The BBCS outlines an approach for assessing the risks for impacts to birds and bats, designing the facility to avoid and minimize risks, and monitoring avian activity and fatalities in the vicinity.

Evaluating avian mortality rates and patterns is important for comparing avian mortality risk for utility-scale solar facilities with that for other energy developments. However, as discussed in this report, data collected to date from utility-scale solar facilities are not adequate to support such evaluations and comparisons. Avian fatality data were available for seven solar energy facilities in the United States. Of these, systematic avian fatality data were available for only four.

Available project-specific data, discussed in this report, are presented in Appendix B. Existing monitoring requirements and mitigation measures employed by the solar industry and other industries are also presented in this report. Specific solar energy technological factors that have been identified and possibly associated with avian fatality, including solar flux, are discussed.

Standardization of data collection and methodology is essential for comparing avian mortality between projects and across industries. However, the paucity of information for solar energy facilities and its lack of standardization make it impossible to develop an industrywide avian mortality estimate or comparison with any scientific certainty. Standardized methods would increase certainty in mortality estimates by accounting for the following factors that may bias mortality calculation: searcher efficiency, search effort, predation and scavenging, and the role of background mortality.

On the basis of the findings presented in this report, several recommendations can be made to improve understanding of avian fatality issues at utility-scale solar energy facilities. There is a basic need to understand the cause of fatalities (e.g., collision, flux, and predation) within solar arrays and associated infrastructure for a variety of avian species. The findings presented in this report point to several recommendations for improving understanding of avian fatality issues at utility-scale solar energy facilities:

1. Not all utility-scale solar energy developments in the United States have been required to prepare and comply with project-specific avian monitoring protocols, particularly projects located on private lands. Available BBCSs revealed opportunities to improve consistency and standardization in avian monitoring and reporting protocols. Building upon lessons learned from the wind energy industry, adopting programmatic guidelines similar to those for wind energy would likely (a) promote standardized monitoring, data collection, and reporting throughout the solar energy industry; (b) promote compliance with relevant wildlife laws and regulations; (c) encourage scientifically rigorous survey, monitoring, assessment, and research designs proportionate to the risk to species of concern; (d) produce potentially comparable data from different geographical regions; and (e) mitigate potential adverse effects on species of concern and their habitats using avoidance, minimization, and habitat compensation strategies.

2. More systematic data from solar energy facilities across geographic regions will clarify avian risks of the solar industry and allow comparison with risks of other energy sources. Standardized monitoring methodologies and assessment approaches will vastly improve the scientific certainty of conclusions about avian risk and mortality; the types of birds impacted; the contribution of background mortality to fatality data sets; the influence of facility attraction to birds; and other factors, such as predation.

3. As efforts get under way to increase the amount and compatibility of avian mortality data collected from utility-scale solar facilities, researchers should seize the opportunity create science plans to tailor data collection to their research needs to inform future decisions about solar energy project siting and design. Such science plans should focus on (1) uncertainties related to avian risks and causative factors; (2) population-level impacts to migratory birds; (3) development of more effective inventory and monitoring techniques; and (4) guiding the development of pilot studies to assess causative factors, the potential to mitigate effects, and the implications of mitigation measures and best management practices to energy production.

Moving forward, the industry, federal and state agencies, and other stakeholders might all benefit from working collaboratively towards (1) developing and implementing useful and scientifically rigorous data collection program, (2) evaluating avian mortality related to utility-scale solar development and the causal effects, and (3) identifying appropriate mitigation measures to address identified issues.

1 INTRODUCTION

Renewable energy development has been increasing as an alternative to fossil-fuel-based technologies, in large part to reduce toxic air emissions and carbon-dioxide-induced effects on climate (Shafiee and Topal 2009; Allison et al. 2014). According to the U.S. Energy Information Association (2014), electric generation from renewables in the United States has increased by more than 50% since 2004, and renewable energy sources currently provide approximately 14% of the nation's electricity. Solar energy-based technologies represent a rapidly developing renewable energy sector that has seen exponential growth in recent years (Lewis 2007; Bolinger and Weaver 2013). Electrical generation from solar energy is expected to more than double between 2013 and 2015, with about two-thirds of new solar capacity built in California (EIA 2014).

Utility-scale solar energy projects generate electricity for delivery via the electric transmission grid and sale in the utility market. This differs from distributed solar energy systems which are designed at smaller scales (<1 MW). According to the Solar Energy Industries Association (SEIA 2014a), there currently are approximately 800 utility-scale solar energy projects (>1 MW) that are either planned, under construction, or in operations in the United States, representing more than 43 GW of electric capacity. Models developed by the National Renewable Energy Laboratory (NREL 2012) indicate the greatest solar resource potential in the United States is in the Southwest (Figure 1). Indeed, the SEIA (2014b) map in Figure 2 shows that most domestic utility-scale solar development is in Arizona, California, Colorado, Nevada, New Mexico, and Utah.

There are two basic types of solar energy technology: photovoltaic (PV) and concentrating solar power (CSP). Photovoltaic systems use cells to convert sunlight to electric current, whereas CSP systems use reflective surfaces to concentrate sunlight to heat a receiver. The heat is converted to electricity using a thermoelectric power cycle. CSP systems typically include power tower systems with heliostats (angled mirrors) and parabolic trough systems (parabolic mirrors). In the United States, most of the electricity produced by utility-scale solar energy projects through 2014 was generated using PV technologies (SEIA 2014b). An overview of utility-scale solar power systems is provided in Section 1.1.

Despite its benefits of reduced toxic and carbon emissions and renewable generation, utility-scale solar development can impact ecological systems and other environmental resources, including species and their habitats (Lovich and Ennen 2011; Hernandez et al. 2014). Recent studies have demonstrated that utility-scale solar developments represent a source of fatality for wildlife such as birds (e.g., Kagan et al. 2014); however, there are relatively few systematic and empirically based studies that address avian fatality issues at solar facilities (but see McCrary et al. 1986; WEST 2014).

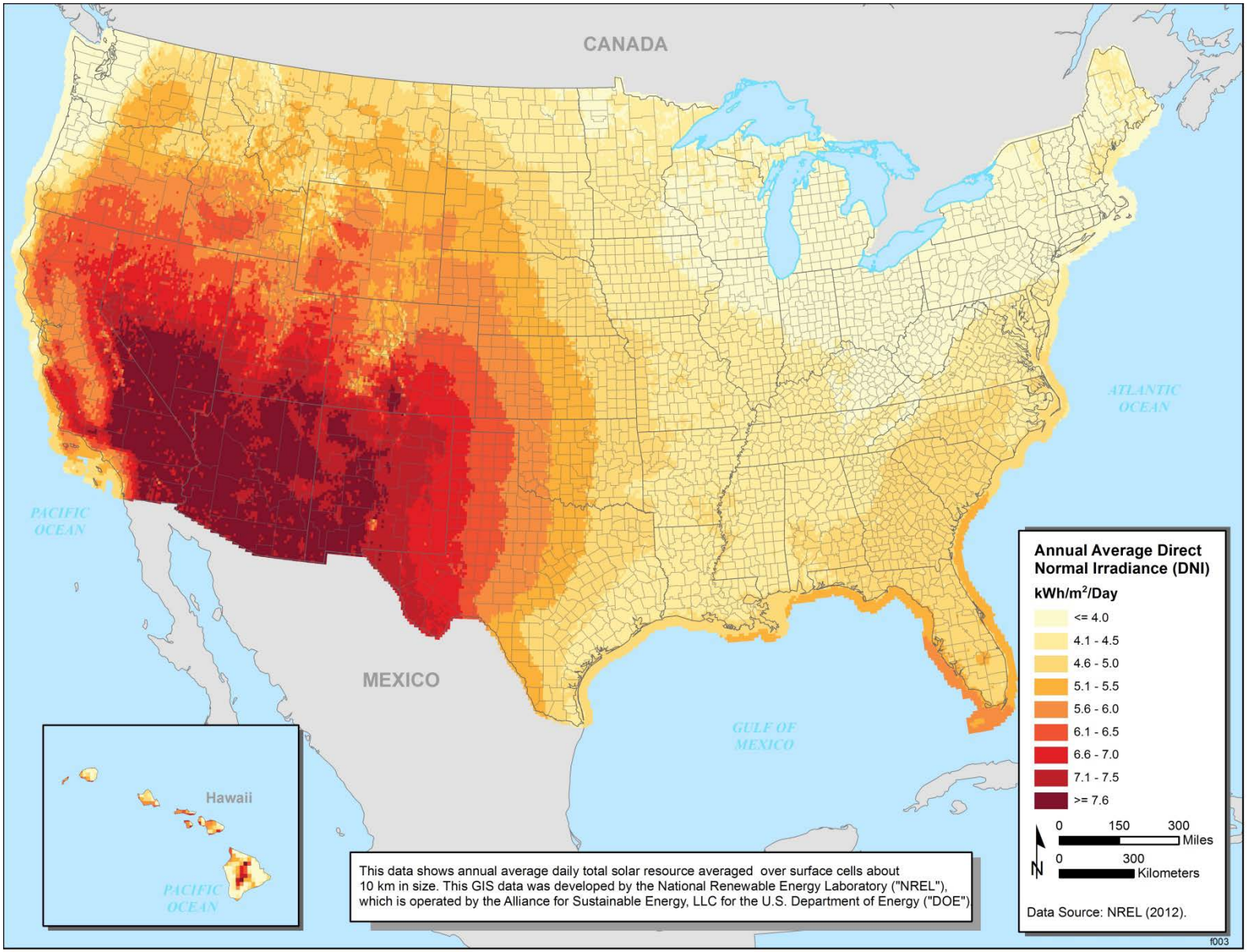


FIGURE 1 Solar Energy Potential in the United States (Source: NREL 2012)

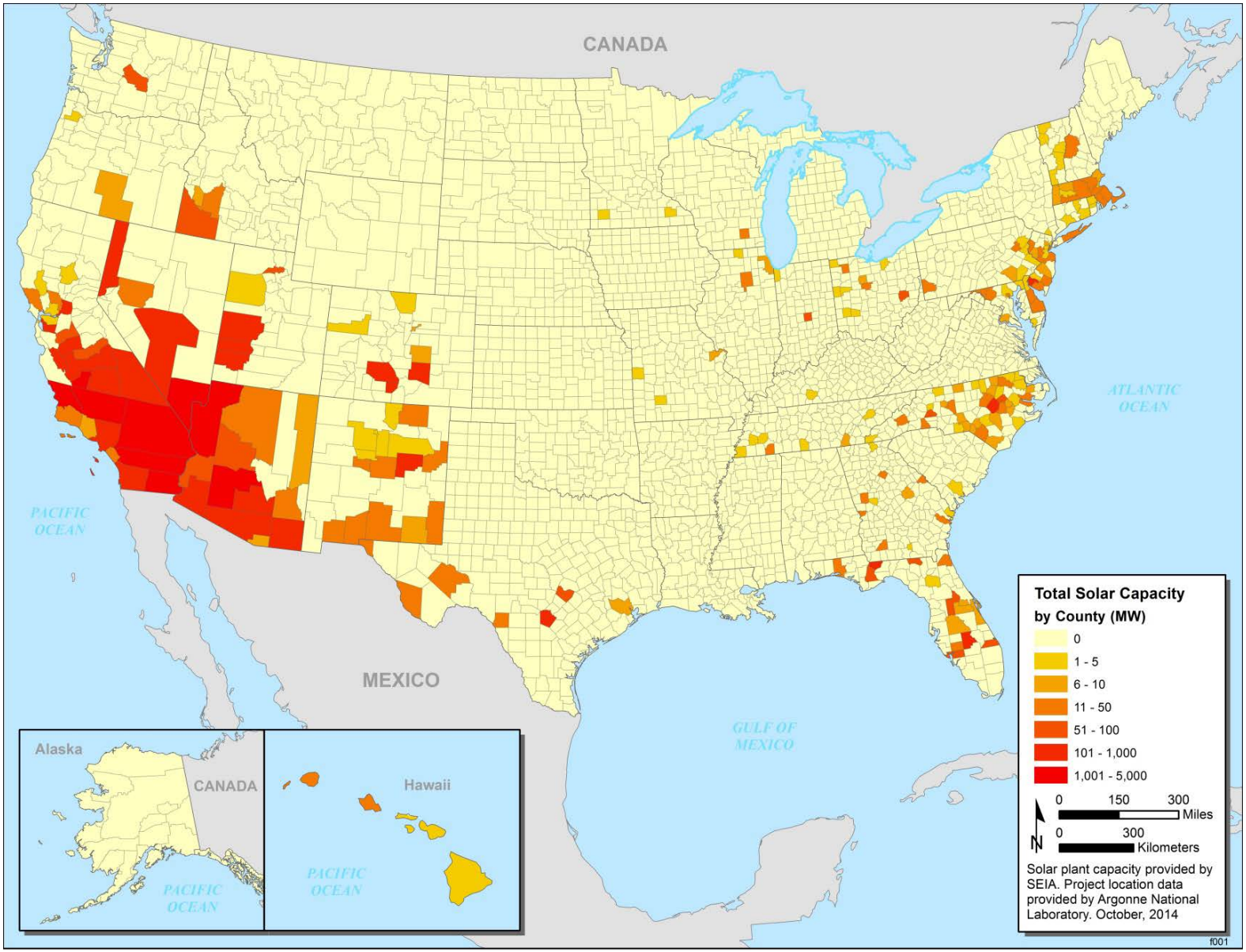


FIGURE 2 Total Solar Utility-Scale Energy Production Capacity (MW) by County (Source: SEIA 2014b)

Understanding current rates of avian mortality at utility-scale solar facilities and existing monitoring requirements is an important first step toward the development of science-based monitoring, avoidance, minimization, and mitigation protocols. Such an effort would aid in understanding the relative mortality rates compared with those from other technologies and sources, as well as the identification of data gaps and potential research needs. The purpose of this report is to summarize the current state of knowledge regarding avian issues at utility-scale solar energy facilities by:

1. Summarizing available avian fatality data and issues;

2. Summarizing current monitoring activities and reporting requirements;

3. Summarizing avian mortality data for non-solar development activities;

4. Summarizing mitigation measures being used or considered by solar developers;

5. Evaluating mitigation measures that have been successfully employed for non-solar activities for those that may be effective for solar development;

6. Examining solar-technology-specific aspects of avian fatality, including solar flux associated with power towers; and

7. Recommending future steps.

1.1 OVERVIEW OF UTILITY-SCALE POWER SYSTEMS

Utility-scale solar power systems are loosely defined as ground-mounted facilities larger than 1 MW_e that are tied directly to the transmission grid. Many facilities are larger than 1 MW_e, and the plants can range up to several hundred megawatts in size and cover hundreds of acres. The growing number of utility-scale solar facilities is a direct result of falling costs of the technologies and the desire to deploy more low-carbon, renewable power into the U.S. electric grid.

Solar power systems are divided into technologies that convert sunlight directly into electricity (PV technologies) and technologies that collect the sun's light and convert it into thermal energy. PV systems generate power without any appreciable noise, pollution, or fuel consumption; involve few moving parts; and require little routine maintenance, especially when compared with other power-generation technologies. All PV systems consist of three basic subsystems: (1) PV modules; (2) inverters and power electronics; and (3) structural and wiring hardware, commonly referred to as the balance of system. PV modules are fundamentally the same, whether the system is mounted on a residential rooftop or in a large, utility-scale plant.

Solar thermal electric systems, also known as concentrating solar power (CSP) systems, first capture sunlight as heat and then convert the thermal energy into electricity via a thermoelectric power cycle. A CSP plant uses mirrors to focus sunlight onto a "receiver" that contains a flowing liquid, or heat transfer fluid (HTF). The reflectors may be made of glass mirrors or highly reflective polymer films. The hot HTF may be pumped to a storage tank or pumped directly to heat exchangers in the power block to produce steam. Electric power is made by spinning a steam turbine/generator. A major benefit of CSP technologies is the ability to efficiently store the hot HTF and retrieve it later to produce power in periods of poor or no sunlight. The various technologies are summarized in Table 1.

The cost of solar power technologies has fallen dramatically in the past few years due to new technology developments, lower manufacturing costs, and increased deployment volume. Utility-scale

plants continue to represent the lowest installed cost and levelized cost of electricity for solar power. PV systems are the most prevalent and lowest-cost solar power technology. CSP systems with thermal energy storage provide more consistent power, with fewer challenges related to grid integration, but they currently have a higher levelized cost per kilowatt-hour.

The most obvious impact of a solar power plant is the occupied land area. Land area per megawatt of capacity depends on several factors, including the solar resource quality, technology, collector/module efficiency, and inclusion of thermal energy storage (for CSP). In general, solar plants occupy between 5 and 10 acres per megawatt of alternating current (MW_{ac}) capacity and between 3 and 4 acres per annual gigawatt-hour of generation (Ong et al. 2013). Including thermal energy storage in CSP plants increases land usage per capacity (acre/MW_{ac}), but decreases land usage per energy generation (acre/GWh). These effects of thermal storage occur because the collector field area increases (to allow charging of storage), and the annual power block operating time increases (when storage is discharged), but the power block size is unchanged. A comparison of land use per gigawatt-hour of generation indicates that utility-scale solar technology has a lower impact than other renewable-generation technologies (such as wind and hydropower) and is comparable to fossil extraction (such as coal extraction) (Fthenakis and Kim 2009).

1.2 REGULATORY CONTEXT

Federal and state regulations provide the legal framework for addressing avian fatality issues at solar energy facilities. Solar projects sited and designed with a federal nexus (i.e., constructed on public land) are required to use the National Environmental Policy Act (NEPA) process and any applicable state environmental planning regulations. Projects without a federal nexus are not subject to NEPA but may be subject to state-level environmental planning regulations. Other federal regulations include the Federal Land Policy and Management Act, Endangered Species Act (ESA), Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and policies of federal land managers such as the Bureau of Land Management special status species policy (BLM 2008). State regulations vary by state, but examples include state-level environmental planning requirements (e.g., the California Environmental Quality Act) and policies to protect state-listed special status wildlife (e.g., *California Fish and Game Code*, California Endangered Species Act, and *Nevada State Codes*).

TABLE 1 Common Utility-Scale Solar Technologies

Technology	Key Features	
PV fixed-tilt	• Simplest design, with no moving parts • Thin-film or silicon cells • No cooling water requirement	
PV tracking	• More sun-capturing efficiency because the PV panels rotate to follow the sun • Typically used with crystalline silicon cells • No cooling water requirement	
CSP parabolic trough	• Linear receivers with single-axis tracking • Can include thermal energy storage • Usually wet cooled • Most common and most mature CSP technology	
CSP power tower	• Two-axis tracking heliostats surround a central tower-mounted receiver • Can include thermal energy storage • More cost effective than parabolic troughs • Can be wet or dry cooled	

2 SUMMARY OF AVIAN FATALITY ISSUES AND STUDY METHODOLOGY

2.1 SUMMARY OF ISSUES

One commonality among utility-scale solar facilities of all technology types is that they occupy relatively large spatial footprints to capture the sun's energy. The development of utility-scale solar facilities, therefore, represents a large human land use in the environment, which has the potential to affect birds and bird communities in a number of ways and during all project phases (construction, operations, and decommissioning). The range of potential impacts from utility-scale solar projects on birds and other wildlife has been evaluated in the literature (e.g., Lovich and Ennen 2011; Hernandez et al. 2014) and in the *Final Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States* (BLM and DOE 2012). Like all industrial activities, utility-scale solar energy development has the potential to directly and indirectly impact birds and bird communities in a number of ways (Table 2). In general, direct impacts result from ground-disturbing activities at the project and are observable within the solar project footprint, whereas indirect impacts may extend beyond the solar project footprint as the result of factors such as runoff, water depletion, dust deposition, noise, or visual impacts.

A comprehensive literature review on avian issues at solar energy facilities and other industrial developments was conducted and has been documented in a separate bibliography (Walston et al. 2015). The literature review included peer-reviewed journal articles on avian fatalities from other sources (e.g., wind energy, building collisions), project-specific technical reports on avian monitoring and fatality at solar facilities, information on mitigation measures and best management practices (BMPs), and literature pertaining to avian behavioral patterns and habitat use. In addition to the bibliography, data and information were solicited from U.S. and international solar industry developers and industry organizations.

TABLE 2 Potential Impacts of Utility-Scale Solar Energy Development on Birds and Bird Communities

Direct Impacts	Indirect Impacts
Direct fatality of individual birds	Effects of noise (e.g., behavioral changes)
Direct onsite habitat destruction and/or modification	Road effects
Habitat fragmentation	Effects of altered fire regimes
	Effects of altered surface water and groundwater on habitat condition
	Effects of light pollution
	Effects of spills and pollution
	Effects of electromagnetic fields

Sources: Lovich and Ennen (2011); BLM and DOE (2012).

Although there are several types of direct and indirect impacts (Table 2), this report summarizes existing information of direct avian fatality at utility-scale solar facilities, which represents one of several impact factors. There are currently two known types of direct solar-related bird fatalities (McCrary et al. 1986; Hernandez et al. 2014; Kagan et al. 2014):

1. Collision-related fatality—fatality resulting from the direct contact of the bird with a project structure(s). This type of fatality has been documented at solar projects of all technology types.

2. Solar-flux-related fatality—fatality resulting from the burning/singeing effects of exposure to concentrated sunlight. Passing through the area of solar flux may result in: (a) direct fatality; (b) singeing of flight feathers that cause loss of flight ability, leading to impact with other objects; or (c) impairment of flight capability to reduce the ability to forage or avoid predators, resulting in starvation or predation of the individual (Kagan et al. 2014). Solar-flux-related fatality has been observed only at facilities employing power tower technologies.

The nature and magnitude of impacts on bird populations and communities are generally related to three primary project-specific factors: location, size, and technology (PV vs. CSP) (Lovich and Ennen 2011; BLM and DOE 2012). Bird abundance and activity vary by habitat availability and distribution of other physical features in the environment (e.g., terrain) (Flather and Sauer 1996). Therefore, the location of a solar energy project relative to bird habitats, such as migration flyways, wetlands, and riparian vegetation as well as the preservation or removal of habitat within arrays, could influence the impacts of solar energy development on birds; avoidance or minimization of siting in these sensitive areas can greatly reduce impacts on birds. The size of the solar project (acres) is a direct measure of the amount of surface disturbance and human activity. Thus projects with larger footprints are expected to have greater impacts on birds than projects with smaller footprints. Different solar technologies may vary in the types and magnitude of impacts on birds. For example, it has been hypothesized that projects employing wet cooling technologies would require greater amounts of water than dry cooling technologies, which may increase water demand and alter the availability of surface and groundwater sources to sustain bird habitats such as riparian vegetation (BLM and DOE 2012).

It has been hypothesized that solar-energy-related fatalities for some avian guilds result from bird attraction to the project site (e.g., Kagan et al. 2014). Projects that include evaporative cooling ponds may provide artificial habitat to birds and their prey (e.g., insects). Such projects may attract more birds to the site and result in a greater risk of collision with project structures (Lovich and Ennen 2011; BLM and DOE 2012). Glare and polarized light emitted by solar projects may also attract insects, which, in turn, could attract foraging birds. For example, insects may perceive polarized light as water bodies and may be attracted to such sources (Horváth et al. 2009). Lastly, it has also been hypothesized that utility-scale PV facilities may attract migrating waterfowl and shorebirds through what has been called the “lake effect” (Kagan et al. 2014), whereby migrating birds perceive the reflective surfaces of PV panels as bodies of water and collide with project structures as they attempt to land on the panels. To date, however, no empirical research has been conducted to evaluate the attraction of PV facilities to migrating birds.

The potential impacts of solar energy development on birds can be characterized by evaluating risks to populations and guilds and by understanding mortality risk from solar energy development in the context of mortality risk from other industrial developments. Despite the potential for avian fatality from solar energy development, there is currently little empirical data on avian fatality at solar facilities. Only one systematic study of avian fatality at a utility-scale solar energy facility occurs in the current peer-reviewed scientific literature (McCrary et al. 1986). However, more data have been recently collected at several current solar energy projects and have been synthesized (e.g., H.T. Harvey and Associates 2014a-d; WEST 2014).

Avian fatality at other industrial developments (e.g., energy developments, buildings, and transportation.) has been previously published in the peer-reviewed literature (e.g., Erickson et al. 2005, 2014; Loss et al. 2013; Smallwood 2013; Sovacool 2013). A summary of estimated avian fatalities from

anthropogenic sources in the United States is provided in Table 3. To better understand the risk of avian fatality from solar energy development in the context of risks from other sources of fatality, it is important that empirical data be standardized to enable direct comparison among fatality sources. Thus, science-based monitoring designs should be developed to provide systematic collection of fatality data that can be used to calculate overall (e.g., site-wide) mortality estimates that can be compared with other sources of fatality. Systematic monitoring protocols have been identified for a number of solar energy projects through the development of project-specific BBCSs.

Most recent methods to calculate overall mortality estimates (Huso 2011) include factors related to the length of the monitoring period, survey effort, and monitoring frequency, size of the project, searcher efficiency, and the carcass persistence rate. Searcher efficiency is a metric to quantify the ability of searchers to detect carcasses. It typically refers to the percentage of carcasses observed by searchers relative to a known number of carcasses. Based on studies from other industries, factors like bird size and the presence of obstructions, such as vegetation and structures, may influence searcher efficiency (Ponce et al. 2010; Huso 2011). The carcass persistence rate is a metric to quantify the amount of time (usually days) that a carcass is available to be observed before it is scavenged by predators. On the basis of studies from other industries, factors like bird size and densities of predators, such as ravens, may influence carcass persistence estimates (Ponce et al. 2010; Smallwood et al. 2010; Huso 2011).

2.2 TYPES OF INFORMATION AND DATA AND DATA COLLECTED

Currently, there are several sources of information on the potential risks of solar energy development to birds. Project-specific environmental planning documents (e.g., those developed under NEPA or CEQA) describe bird abundance and activity at the project location and evaluate impacts of project development to those bird species and communities. If determined necessary by regulatory agencies, as part of the solar energy applicant's required measures to reduce impacts, a Bird and Bat Conservation Strategy (BBCS) is prepared that describes in detail the measures to minimize avian fatality at the project. BBCSs are not required for some projects (e.g., those projects located on private lands) and therefore are not known to exist for all utility-scale solar energy projects. BBCSs document the methods to systematically monitor for avian abundance, activity, and fatality at the project location. Implementation of the systematic avian fatality monitoring described within a BBCS for a particular project typically commences following the completion of construction activities. A synthesis of currently available BBCSs for utility-scale solar energy projects is provided in Section 3.3.

There are two types of fatality data collected at a project depending on the nature of the observation—incidental and systematic. Incidental data include fatalities observed incidentally during other activities that were not part of focused systematic searches for carcasses. Systematic data include fatalities observed during the course of dedicated search efforts. The collection and reporting of both types of data may be required for a particular solar project through permits issued by state or federal

TABLE 3 Summary of Annual Avian Fatality Estimates in the United States

Form of Fatality	Erickson et al. 2005	Erickson et al. 2014	WEST 2014	Loss et al. 2013	Sovacool 2013	Smallwood 2013	Loss et al. 2014
Buildings and windows	550 million	—	98 million–980 million	—	97 million	—	365 million–988 million
Power lines	130 million	—	—	—	—	—	—
Cat predation	100 million	—	1.4 billion–3.7 billion	—	110 million	—	—
Vehicles/roads	80 million	—	89 million–340 million	—	—	—	—
Pesticides	67 million	—	—	—	72 million	—	—
Fossil fuel power plants	14 million	—	—	—	14.1 million	—	—
Communication towers	4.5 million	—	6.8 million[a]	—	4 million	—	—
Oil field wastewater disposal facilities	—	—	500,000–1 million	—	—	—	—
Nuclear power plants	—	—	—	—	332,323	—	—
Wind energy Facilities	28,500	368,000	209,059–330,010[a]	140,000–328,000	19,875	573,000	—
Aircraft	25,000	—	4,722	—	—	—	—

[a] Estimates include Canada.
— Not estimated

agencies, as a condition of the environmental review process, or as established in the BBCS. For example, documentation and reporting of incidental fatality observations at some projects may be required under the federal Migratory Bird Special Purpose Utility permit issued by the U.S. Fish and Wildlife Services (USFWS) (50 CFR Parts 10, 13, and 21.27). There may also be state requirements that govern the reporting of incidental avian fatality data. If available, the project-specific BBCS outlines the methods for collecting and reporting of systematic avian fatality data. In addition, at solar projects that do not have state or federal requirements to monitor and report avian fatalities, these activities may still be conducted on a voluntary basis. Depending on the project and regulatory agencies involved, fatality data may not be made publicly available.

For this report, information on avian monitoring and fatality at solar facilities was obtained using several methods.

1. The major solar energy projects database maintained by the Solar Energy Industries Association (2014b) was used to identify all solar projects in the United States and their attributes (land management, technology, status, etc.).

2. For projects with a federal nexus (e.g., developed on public land), information was requested from federal agencies and obtained from publicly available documents.

3. For projects without a federal nexus (e.g., developed on private land), information was requested from individual developers and/or operators and industry associations such as the Large-Scale Solar Association. Requests for information from industry representatives involved email correspondence and phone conversations.

4. A request for data and information at international solar energy facilities was made by emailing several international solar developers and industry representatives.

5. A comprehensive literature search was performed.

3 SUMMARY AND EVALUATION OF EXISTING AVIAN FATALITY DATA AND ASSOCIATED LIMITATIONS

The literature review reveals a scarcity of published, scientifically vetted information regarding large-scale solar plants and birds. A summary of data and information available at solar facilities, collected as of December 2014 using the methodology described in Section 2, is provided in Table 4. In total, avian monitoring plans and/or fatality data were known to exist for 15 solar energy facilities (14 U.S., 1 international). A summary of those U.S. solar facilities with available fatality data is provided in Table 5. Section 3.1 discusses the limitations of the fatality data, Section 3.2 presents a synthesis of these data, and Section 3.3 summarizes existing monitoring requirements and mitigation measures being employed at solar facilities.

3.1 LIMITATIONS OF AVAILABLE FATALITY DATA

Because avian activity and abundance are known to vary regionally (Somveille et al. 2013; Hurlbert and Haskell 2003; Kuvlesky et al. 2007), standardization of data collection methods and reporting units is essential for making avian mortality comparisons across studies and industries. Many fatality studies are confined to single locations or short time-frames, meaning that variation in weather, bird abundance, and quality of research can result in particularly high or low estimates of fatality leading to inaccurate extrapolations to different temporal periods or geographic scales (Sovacool 2009). In order to understand avian mortality risk at solar facilities in the context of other anthropogenic sources of avian fatality (e.g., Table 3), systematically-based solar-avian mortality estimates need to be calculated to account for potential biases that may occur as a result of survey design and project location. Factors that influence the calculation of avian mortality from survey efforts are summarized in Table 6 and are based upon the work by Huso (2011). These potential bias factors include variation in searcher efficiency, search effort, predation and scavenging, and the role of background mortality in the project's vicinity. An incomplete understanding of these factors can lead to uncertainty in determining project-specific avian mortality risk. The factors presented in Table 6 represent the common forms of bias in avian mortality estimation and are not intended to reflect a comprehensive list of all factors that influence avian mortality. Mortality risk may also be influenced by the project's geographic setting in relation to bird migration patterns, seasonal differences in avian activity and abundance, daytime versus nighttime effects, and other factors such as moon phase and weather.

Standardization of data across projects is necessary to systematically calculate an overall solar-avian mortality rate that could be used to understand the overall risk of avian mortality at solar facilities compared with other human installations. However, the available solar-avian fatality data evaluated in this report were too limited and inconsistent to provide an overall avian mortality estimate for the utility-scale solar industry. Of the known solar projects with available avian fatality data presented in Table 5, three projects have publicly available systematic survey results that can be used to estimate annual mortality (Ivanpah Solar Electric Generating System [ISEGS], California Valley Solar Ranch [CVSR], and California Solar One). The three solar facilities with systematic avian fatality data were inconsistent in survey design and methodology, which precluded data compilation to calculate overall avian mortality. Inconsistencies were largely related to (1) certainty in detecting fatalities and relating fatalities to the solar facility, (2) the role of predation and/or scavenging, and (3) the role of background mortality.

Incidental data, while useful in identifying general patterns of fatality, are not appropriate for estimating annual mortality rates due to the potential for biases to be present within incidental observations (e.g., searcher efficiency, scavenger removal; see Table 6). Based upon review of existing information, therefore, it was determined that the available solar-avian fatality data were too sparse and

inconsistent to provide a meaningful assessment of overall avian mortality at solar facilities. More systematic study and efforts to standardize data through the development of systematic monitoring protocols are needed to make any conclusions about the avian risks of utility-scale solar development.

3.2 SUMMARY OF AVAILABLE AVIAN FATALITY DATA, MONITORING REQUIREMENTS, AND MITIGATION MEASURES AT EXISTING SOLAR FACILITIES

This section presents a summary of avian fatalities at U.S. solar energy facilities for which incidental or systematic avian fatality data were available. A summary of U.S. solar facilities with available incidental or systematic avian fatality data is provided in Table 5. See Appendix B (Table B.1) for a summary of avian mortality by species among the solar energy facilities reviewed in this report. Over 1,300 incidental and systematic avian fatality observations from seven utility-scale solar projects that were publicly available as of December 2014 were used in this section to evaluate general patterns of avian fatality. All six utility-scale solar facilities are located in the state of California. The data were collected and reported over various monitoring and observation periods from 2011 to 2014. The data used in these evaluations include both incidental and systematic avian mortality data. While only systematic data may be useful in calculating facility-wide avian mortality estimates, evaluations of both incidental and systematic data may reveal general patterns of avian fatality.

General patterns of fatality related to cause of death, taxonomic groups, residency, and status are presented below. Without more complete and systematic data on local avian abundance and activity near solar facilities, background mortality rates, and the role of predation (including scavenging), a more comprehensive scientific examination of these factors cannot be completed.

3.2.1 Cause of Death

The causes of death documented at solar facilities include solar flux, impact trauma, predation trauma, electrocution, and emaciation; however, the cause of death is often unknown (Kagan et al. 2014). With the exception of California Solar One, the cause of death could not be determined for the majority of bird deaths at all solar facilities. Solar flux was the second-ranked cause of death at the two power tower solar facilities (ISEGS and Solar One). Collision ranked second at Desert Sunlight, CVSR, and Genesis. At Topaz, predation ranked second. It is important to note that fatality observations made within these large solar facilities may not be caused by the project facilities. Cause of death could not be determined for over 50% of the fatality observations and many carcasses included in these analyses consisted only of feather spots (feathers concentrated together in a small area) or partial carcasses, thus making determination of cause of death difficult. It is anticipated that some unknown fatalities were caused by predation or some other factor unrelated to the solar project (e.g., H.T. Harvey and Associates 2014a-d; WEST 2014).

TABLE 4 Summary of Available Information on Avian Fatality and Monitoring at Utility-Scale Solar Facilities (January 2015)

Project Name	Location	Technology Type and MW (in Parentheses)	Current Status	Land Type	Available Avian Monitoring Plan	Known Collection of Avian Fatality Data
Mohave Solar	Harper Dry Lake, CA	CSP – Trough (250)	Operational – January 2015	Private	NA[a]	Yes – Incidental[b]
California Solar One	Daggett, CA	CSP – Power Tower (10)	Decommissioned in 1987	Private	NA	Yes – Systematic[c]
California Valley Solar Ranch	San Luis Obispo County, CA	PV (250)	Operational – Oct 2013	Private	Yes[d]	Yes – Systematic[e,f]
Campo Verde	Imperial County, CA	PV (139)	Operational – Oct 2013	Private	NA	Yes – Incidental[b]
Centinela Solar Energy	Imperial County, CA	PV (170)	Operational – August 2013	Private	Yes[g]	NA
Crescent Dunes	Nye County, NV	CSP – Power Tower (110)	Construction completed	Public	Yes[h]	Yes – Systematic[i]
Desert Sunlight	Desert Center, CA	PV (550)	Operating and under construction	Public	Yes[j]	Yes – Incidental[b]
Genesis	Blythe, CA	CSP – Trough (250)	1st Unit Operational – Nov. 2013 2nd Unit Operational – March 2014	Public	Yes[k]	Yes – Incidental[b,l]
Ivanpah Solar Electric Generating System (ISEGS)	San Bernardino County, CA	CSP – Power Tower (377)	Operational – Oct. 2013	Public	Yes[m]	Yes – Incidental[b,l] and systematic[n]
Palen Solar Electric Generating System (PSEGS)	Riverside County, CA	CSP – Power Tower (N/A)	Application submitted	Public	Yes[o]	NA

Project Name	Location	Technology Type and MW (in Parentheses)	Current Status	Land Type	Available Avian Monitoring Plan	Known Collection of Avian Fatality Data
Rice Solar	Riverside County, CA	CSP – Power Tower (150)	Under development	Private	Yes[p]	NA
Silver State North	Primm, NV	PV (50)	Operational – May 2012	Public	Yes[q]	NA
Silver State South	Primm, NV	PV (250)	Under construction	Public	Yes[r]	NA
Topaz Solar Farm	Carrizo Plains, CA	PV (550)	Under construction	Private	Yes[s]	Yes – Systematic[e]
Solar Demonstration Plant	Dimona, Israel	CSP – Power Tower	Operational – 2008	Unknown	NA	Yes[t]

[a] NA = not applicable.
[b] Source: USFWS (2014) – U.S. solar facilities with USFWS-issued SPUT permits.
[c] Source: McCrary et al. (1986).
[d] Source: H.T. Harvey & Associates (2011).
[e] Source: WEST (2014a).
[f] Source: H.T. Harvey & Associates (2014a).
[g]Source: JBR Environmental Consultants, Inc. (2011).
[h] Source: JBR Environmental Consultants, Inc. (2011).
[i] Sources: Personal communication between L. Walston (Argonne National Laboratory) and Rob Howe (SolaReserve). Preliminary avian fatality data have been collected but were not available for this report.
[j] Source: Ironwood Consulting (2010).
[k] Source: Tetra Tech (2011).
[l] Source: Monthly compliance reports submitted to the CEC (2014). See References (Section 7) for complete list of project-specific compliance reports.
[m] Source: Avian & Bat Monitoring and Management Plan - Ivanpah Solar Electric Generating System.
[n] Sources: H.T. Harvey & Associates (2014b-d).
[o] Source: Levenstein et al. (2014a).
[p] Source: CH2MHILL (2011).
[q] Source: Silver State Solar Power North, LLC (2011).
[r] Source: Ironwood Consulting (2013).
[s] Source: Althouse and Meade, Inc. (2011).
[t] Source: Labinger (2012).

TABLE 5 Summary of Available Avian Fatality Data at Utility-Scale Solar Facilities (as of December 2014)[a]

Project Name	Known Collection of Avian Fatality Data	Land Type	Survey Period	Incidental Fatalities	Systematic Fatalities (Unadjusted)
Mohave Solar	Yes – Incidental[b]	Private	Aug. 2013–March 2014	14	None collected
California Solar One	Yes – Systematic[c]	Private	May 1982–May 1983	NA	70
California Valley Solar Ranch	Yes – Systematic[d]	Private	Aug. 16, 2012–Aug. 15, 2013	NA	368[h]
Desert Sunlight	Yes – Incidental[e]	Public	Sept. 12, 2011–March 4, 2014	154	None collected
Genesis	Yes – Incidental[b]	Public	Jan. 2012–May 2014	183	None collected
Ivanpah	Yes – Systematic[f]	Public	Oct. 29, 2013–March 21, 2014	159	376 (includes 7 injured birds)
Topaz Solar Farm	Yes – Incidental and Systematic[g]	Private	Jan. 1, 2013 –Jan. 16, 2014	19	41

[a] Refer to Appendix B for a summary of avian fatality and monitoring at utility-scale solar facilities.
[b] Source: Monthly compliance reports submitted to the CEC (2014). See References (Section 7) for complete list of project-specific compliance reports.
[c] Source: McCrary et al. (1986).
[d] Source: H.T. Harvey & Associates (2014a).
[e] Source: First Solar (2014).
[f] Sources: H.T. Harvey & Associates (2014 b,c).
[g] Source: Althouse and Meade, Inc. (2014).
[h] This value includes fatalities from known and unknown causes at all project elements including background control plots, fence lines, generation tie-line, medium voltage lines, and arrays

TABLE 6 Factors Influencing Mortality Rate Calculation (Sources: Huso 2011; H.T. Harvey & Associates 2015; Avian & Bat Monitoring and Management Plan for the Ivanpah Solar Electric Generating System)

Factor	Description
Searcher efficiency	The percentage of fatalities found by individual searchers or teams of searchers. Mortality rate estimations are influenced by how well a searcher can detect the actual number of birds within the project. Searcher efficiency percentage is typically determined by conducting field trials, where a predetermined number of bird carcasses of various sizes are placed in the different areas throughout the project footprint and searchers record the number of birds detected. The adjustment for searcher efficiency is a common bias-correction tool employed in mortality estimation for many studies.
Search effort	The percentage of the project footprint surveyed over space and time. Overall mortality estimates are typically calculated for 100% of the project footprint's area. Therefore, surveys of less than 100% of the project often require an adjustment to estimate mortality across the entire footprint. Similarly, overall mortality estimates are calculated for a standard unit of time (e.g., annually). Therefore, surveys of different temporal periods often require adjustment to standardize mortality estimates on an annual basis.
Predation and scavenging	Predators and scavengers may transport carcasses on and off the project footprint, and may therefore contribute to uncertainty in mortality estimation. Carcass removal trials are commonly used to quantify the amount of time (days) that a carcass usually persists in the field before it is removed by predators and scavengers. The adjustment for carcass removal is a common bias-correction tool employed in mortality estimation for many studies. Recent studies have highlighted the potential for predators to transport carcasses to the project footprint from offsite locations, where the bird may have died from causes unrelated to the project. Understanding the role of this form of background mortality in the estimation of solar-avian mortality has been identified as a need for future research.
Background mortality	An estimate of natural avian mortality occurring independently from human-caused fatality. Some avian fatality observations within project footprints may be attributable to background mortality. To better understand background mortality and adjust project-related mortality estimates, background mortality is examined by surveying for avian fatality in offsite reference areas (i.e., control plots). Background mortality studies at utility-scale solar facilities have shown that a large portion of fatalities may be attributable to background and unrelated to the project. Mortality estimates at some solar facilities have been calculated with adjustments to account for background mortality.

3.2.2 Species Composition

The species composition of reported avian fatalities at the seven utility-scale solar facilities is summarized in Appendix B (Table B.1). Passerines were the taxonomic group most frequently found killed or injured at all six California solar energy facilities, ranging from 39.6% to 62.5% of the avian mortalities. Doves and pigeons had the next highest overall percentage; however, the order of rankings varied among facilities.

Water-dependent species (loons, grebes, rails, coots, shorebirds, waterbirds, and waterfowl) have been considered vulnerable to fatality at PV facilities because of the potential for them to confuse arrays for bodies of water (the lake effect hypothesis) (Kagan et al. 2014; WEST 2014). Based on the limited number of solar projects reviewed, observations of fatality by taxonomic groups were too inconsistent to test the lake-effect hypothesis. Overall, water-dependent species represented 11.2% of all fatalities, but there was high variability among solar facilities, ranging from 0.27% at CVSR to 45.5% at Desert Sunlight. At all three PV facilities (Topaz, Desert Sunlight, and CVSR), water-dependent species accounted for an average of 12.9% of fatalities, while at all three CSP facilities (ISEGS, Solar One, and Genesis) water-dependent species accounted for an average of 11.2% of mortalities. Water-dependent birds represented the greatest proportion of mortalities at only one facility (Desert Sunlight).

Although these preliminary fatality observations do not show a clear association between waterbird fatalities and the lake-effect hypothesis, the sample size (e.g., number of solar facilities) was too limited to allow for statistical analysis of this hypothesis. It is therefore too speculative using the existing data to make any conclusions about the influence of the lake effect or other factors that contribute to fatality of water-dependent birds. The activity and abundance of water-dependent species near solar facilities may depend on other site-specific or regional factors (such as the surrounding landscape) that have not yet been investigated (WEST 2014). It is important to note that not all fatality observations of water-dependent birds within the project footprint may have been caused by the project facility. Cause of death could not be determined for the majority of the fatality observations (Section 3.2.1).

A total of 20 birds (about 1.5%) found dead or injured at all six California solar energy facilities belonged to sensitive species (federally listed, state-listed, or BLM-sensitive). Two, Yuma clapper rail and yellow-billed cuckoo[1], were federally listed or candidates for listing under the ESA (and state-listed in California). Three fatalities of the California state-listed bank swallow, also considered a sensitive species by the U.S. Bureau of Land Management (BLM), also were detected. The remaining 15 avian fatalities were of BLM-sensitive species (brown pelican and burrowing owl). It is important to note that not all fatality observations of sensitive species were necessarily caused by the project facility. Cause of death could not be determined for the majority of the fatality observations (Section 3.2.1).

3.2.3 Residency

Avian mortalities were divided into two residency groups: resident (breeding, winter, or year-round resident) and migrant (passage migrant) (Appendix B, Table B.1). Residency was determined for each identified species based on NatureServe (2014) and the California Department of Fish and Wildlife (2014). The majority of avian fatalities at all facilities were of resident species. The percentage of fatalities that were residents ranged from 63.4% at Genesis to 93.5% at CVSR. The presence of migrants in the vicinity of solar facilities varies seasonally and may lead to seasonal variation of avian mortalities.

[1] At the time the fatality observation was made, the yellow-billed cuckoo was a candidate species for listing under the ESA. It is now federally listed as a threatened species under the ESA.

This trend was observed at ISEGS, where transient species accounted for a larger proportion of avian mortalities during the spring than at other times of the year.

3.3 EXISTING AVIAN MONITORING REQUIREMENTS, MITIGATION MEASURES, AND BEST PRACTICES AT SOLAR FACILITIES

This section presents an overview of existing avian fatality monitoring and reporting requirements, mitigation measures, and related BMPs, as identified in available solar project-specific BBCSs, Avian and Bat Protection Plan (ABPPs), or similar avian monitoring plans (hereafter, all such plans are referred to as "BBCSs"). The purpose of this section is to present the current measures used to minimize avian impacts at utility-scale solar energy facilities. As shown in Table 4, BBCSs were available for 10 solar energy facilities; these plans are summarized in Appendix B (Table B.2).

Most BBCSs required operators to conduct preconstruction surveys to assess baseline avian abundance and activities. Some plans established specific preconstruction monitoring requirements, such as the number of years and seasons of baseline data collection, collection of offsite baseline data, and minimum surveyor requirements. Nearly all plans included discussion of species-specific surveys for rare species and most acknowledged that the project would comply with ESA and state wildlife requirements, which could impose additional monitoring requirements.

BBCSs reported various approaches for evaluating avian risks from solar energy development. One important approach to evaluating project-specific impacts was through Before-After Control-Impact (BACI) studies (Smith 2002). Although few BBCSs reported specific plans for BACI evaluations, the majority of the BBCSs reported the collection of baseline information and complementary post-construction data collection at project and offsite locations that would permit a BACI analysis. In addition, while all BBCSs documented the collection and summation of avian fatality detections, several BBCSs reported on the use of specific statistical models to evaluate risk.

Requirements for specifying measures for avoidance, minimization, and mitigation, and BMPs to reduce avian mortality risks, varied among the BBCSs. These measures were identified based on project technology and location relative to the known presence of sensitive species and known avian abundance and activity patterns in the project area. Most projects generally described avoidance of sensitive bird habitats and nest locations. Several BBCSs included measures to minimize the effects of lighting on birds. Several BBCSs also discussed measures to minimize the risk of collision with transmission lines associated with project development. Solar projects with designs for cooling ponds included measures to reduce attraction of birds to the ponds. For projects where sensitive species may be present (e.g., burrowing owls, golden eagles), species-specific avoidance and minimization measures were identified.

4 EXAMPLES OF BEST MANAGEMENT AND OTHER PRACTICES FROM NON-SOLAR INDUSTRIES

This section presents examples of guidance, BMPs, and mitigation measures used for wind energy, power lines, and airports. The focus of this section is on actions used in non-solar industries to reduce avian fatalities, and how these actions might be applicable at solar facilities.

4.1 GUIDANCE, BEST MANAGEMENT PRACTICES, AND MITIGATION MEASURES FROM A SAMPLE OF NON-SOLAR APPLICATIONS

4.1.1 Wind Energy

Wind energy has been deployed in the United States for nearly four decades. Many lessons have been learned since the first wind farm came on line in 1978 in the Altamont Pass Wind Resource Area in California. The specific reasons birds collide with wind turbines remain unclear, but reducing avian collisions with wind turbines is of great importance to nearly all stakeholder groups involved in wind energy development. Proper siting is thought to be a valuable tool for decreasing avian collisions.

Operational minimization (curtailment) and acoustic deterrents have shown promise for reducing bat fatalities at wind facilities. It is unclear whether either of these strategies will be effective in reducing bird fatalities at wind facilities, as rigorous testing has not been conducted. Acoustic deterrents, in general, have not been successful in deterring birds in other applications, primarily due to the short-term nature of their effectiveness, and eventual rehabituation of the species. However, recent research to develop an acoustic deterrent to keep European starlings from foraging has shown promise. Both curtailment and acoustic deterrents may be viable options to reduce avian fatalities at solar facilities; however, research and field testing is needed to determine their efficacies.

To assist the wind energy industry, the USFWS (2012) released *Land-based Wind Energy Guidelines* (WEG), a guidance document for assessing potential adverse effects wind energy might have on species of concern and their habitats. These guidelines are intended to do many things, including promote compliance with relevant wildlife laws and regulations and encourage scientifically rigorous survey, monitoring, assessment, and research designs proportionate to the risk to species of concern. The WEG are intended to produce potentially comparable data across the nation and mitigate potential adverse effects on species of concern and their habitats, using avoidance, minimization, and habitat-compensation strategies. The guidelines are voluntary yet provide BMPs for site development, construction, retrofitting, repowering, and decommissioning.

The tiered approach described in the WEG is an iterative decision-making process for collecting information in increasing detail. The WEG assist wind developers in identifying species of concern that might be affected by their proposed project, including migratory birds, bats, bald and golden eagles and other birds of prey; prairie and sage grouse; and listed, proposed, or candidate endangered and threatened species. Wind energy development in some areas might be disallowed by federal law. Also, other areas may be inappropriate for development because they have been recognized as having high wildlife value based on their ecological rarity and intactness. Details on the five WEG tiers, listed below, can be found within the document. Although WEG guidelines are voluntary, project developers who follow the guidelines and ultimately have unexpected avian impact issues may be better positioned if enforcement actions are proposed by the USFWS.

The five WEG tiers are:

- Tier 1—Preliminary site evaluation (landscape-scale screening of possible project sites)
- Tier 2—Site characterization (broad characterization of one or more potential project sites)
- Tier 3—Field studies to document site wildlife and habitat , and to predict project impacts
- Tier 4—Post-construction studies to estimate impacts
- Tier 5—Other post-construction studies and research

In addition to its Land-based Wind Energy Guidelines, in 2013 the USFWS released the Eagle Conservation Plan Guidance (ECPG) (USFWS 2013). The ECPG provides specific, in-depth direction for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities. Eagles are federally protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (BGEPA).

The ECPG also calls for wind project developers to take a tiered (staged) approach to siting new projects, but is intended for use when applying for an incidental take permit under the BGEPA. The ECPG calls for preliminary landscape-level assessments to consider potential wildlife interactions, then to conduct site-specific surveys and risk assessments prior to construction. It also calls for monitoring all project operations and reporting eagle fatalities to the USFWS, state, and tribal wildlife agencies. Details on each of the stages can be found in the ECPG.

Both the WEG and ECPG took years to develop and adopt. Guidance documents comparable to these may be useful tools for solar project development, although at this time it is not clear that eagles are at risk from such facilities.

BMPs for renewable energy projects in the intermountain west by Jones (2012) were developed primarily for use by conservation organizations. These BMPs are intended to provide guidance to minimize impacts on species and habitats from wind and solar project development in the western United States and are fundamentally based on the best available science. The peer-reviewed Jones report gives special attention to western species and habitats, and its guidance focuses on siting, pre- and post-construction, and operational activities. The document points out that BMPs are not intended to be universally applied, but rather, site-specific assessments need to be conducted.

A number of states have adopted guidelines for wind energy development. While the process for developing state-level guidelines vary, they have many similarities: They are voluntary; they primarily focus on addressing adverse impacts on birds and bats; their objective is to provide a standardized framework for conducting assessments before, during, and after construction; and their results are intended to assess impacts on a broader spatial scale (since virtually all assessments are conducted at a project-specific level). Table 7 summarizes nine state guidelines.

TABLE 7 Summary Wind Energy Guidelines for Nine States

State	Preliminary Site Screening	Pre-Construction Survey Protocols	Impact Assessment and Mitigation	Post-Construction Monitoring and Reporting	Research	Principles for Habitat Mitigation	Reference
Arizona	Yes	Yes	Yes	Yes			AGFD 2009
California	Yes	Yes	Yes	Yes		Yes	CEC and CDFG 2007; Renewable Energy Action Team 2010
Minnesota		Yes		Yes			Mixon et al. 2014
Nebraska		Yes	Yes	Yes	Yes	Yes	NWWWG 2013
New York	Yes	Yes		Yes			NYSDEC 2009
Ohio	Yes	Yes	Yes	Yes			ODNR 2009; Norris 2012
Oregon	Yes	Yes	Yes	Yes		Yes	ODOE 2008
Pennsylvania		Yes		Yes		Yes	PGC 2013
Washington	Yes	Yes	Yes	Yes	Yes	Yes	WDFW 2009

Of the top 10 states expected to significantly contribute to DOE's 20% wind energy by 2030 scenario (DOE 2008), only California and Minnesota have guidelines in place. Other top states, including Illinois, Iowa, Michigan, New Jersey, North Carolina, Oklahoma, Texas, and Wyoming, do not currently have such guidance. As the United States moves toward the 2030 scenario, it is a reasonable expectation that other states will adopt their own guidelines to address issues for both federal- and state-listed species.

4.1.2 Power Lines

The Avian Power Line Interaction Committee (APLIC) is an organization in the United States that serves as a focal point for avian interaction issues as they pertain to utilities. Formed in 1989 to address whooping crane collisions with power lines, the APLIC originally consisted of 10 utilities, Edison Electric Institute, the USFWS, and the National Audubon Society. Today, APLIC membership includes more than 50 utilities, Edison Electric Institute, the USFWS, Electric Power Research Institute, National Rural Electrical Cooperative Association, and Rural Utilities Service. Further, APLIC's mission was expanded to address electrocution and collision fatality for many other avian species, especially raptors (APLIC 2014).

The APLIC released *Avian Protection Plan (APP) Guidelines* (2005) and *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (2006). Both of these documents are considered BMPs for reducing avian collisions and electrocutions with power lines. Like the USFWS's Land-based Wind Energy Guidelines and Eagle Conservation Plan Guidance, the APLIC's documents are voluntary and are intended to be used together. The Suggested Practices for Avian Protection on Power Lines is a multifaceted tool with aspects of problem definition; regulation and compliance; biological aspects of avian electrocution; power line design and avian safety; perching, roosting, and nesting issues; and development of an APP. The APLIC's guidelines can serve as a valuable knowledge base to avoid, minimize, and mitigate adverse avian impacts at utility-scale solar projects.

Details of the various facets within the Practices can be found by reviewing the documents. However, components of an APP are worth mentioning here. An APP outlines a suite of principles designed to reduce avian interactions with electric utility facilities. Although each utility's APP is different, the overall goal of any APP should be to reduce avian fatality. An APP may contain the

following components: corporate policy; training; permit compliance; construction design standards; nest management; avian reporting system; risk assessment methodology; fatality reduction measures; avian enhancement options; quality control; public awareness; and key resources.

4.1.3 Airports

For the period 1990 to 2011, more than 115,000 wildlife strikes were reported to the Federal Aviation Administration (FAA). About 97% of all wildlife strikes reported to the FAA involved birds, about 2% involved terrestrial mammals, and less than 1% involved flying mammals (bats) and reptiles. Waterfowl (ducks and geese), gulls, and raptors (mainly hawks and vultures) are the bird species that cause the most damage to civil aircraft in the United States, while European starlings are responsible for the greatest loss of human life. Vultures and waterfowl cause the most losses to U.S. military aircraft (FAA 2014). Each year in the United States, wildlife strikes to civil aircraft cause about $718 million in damage to aircraft and about 567,000 hours of civil aircraft down time (FAA 2014). Globally, it is estimated that bird strikes cause annual economic impacts of $1.2 billion to commercial aircraft (Allan and Alex 2001; Ning and Chen 2014).

The FAA sponsored the development of a document that "reviews techniques for reducing bird collisions with aircraft and their relative effectiveness" (ACRP 2011). In addition, the FAA has web-based information on its R&D programs and a co-agency publication with the U.S. Department of Agriculture, *Wildlife Hazard Management at Airports: A Manual for Airport Personnel* (Cleary and Dolbeer 2005). The manual is a nearly 400-page document addressing everything from information in the FAA's bird strike database to how to implement and evaluate wildlife hazard mitigation programs.

The International Bird Strike Committee (IBSC 2007) is a voluntary association of "representatives from organizations whose mission is to improve commercial, military, and private aviation flight safety, by sharing knowledge and understanding concerning the reduction of the frequency and risk of collisions between aircraft, birds and other wildlife management practices." The IBSC's BMPs guide airports in wildlife hazard management, active wildlife control, organization and equipment for wildlife management activities, logging of wildlife management activities, wildlife strike reporting, and risk assessment.

The goal of the FAA's R&D program is to mitigate wildlife strikes with aircraft by providing practical resolutions in addition to timely, critical information for pilots and airport managers. FAA research efforts are focused on four areas: (1) habitat management, (2) wildlife detection methods, (3) wildlife control techniques, and (4) systems integration. Some of these strategies may be applicable to addressing adverse bird impacts at utility-scale solar facilities.

4.2 AVIAN AND BAT PROTECTION PLANS IMPLEMENTED AT WIND FACILITIES

In addition to voluntary federal and state guidelines for reducing bird fatalities at wind facilities, the wind industry is beginning to implement ABPPs (now referred to as BBCSs) at both the company and project levels.

The origination of ABPPs within the wind industry is fairly recent, with the first company-wide ABPP being released by Iberdrola Renewables, Inc. (IR) in October 2008 (IR 2008). This ABPP pre-dates the WEG and is modeled after the APLIC APP, but is expanded to include bats and tailored to meet the needs of wind facilities. IR developed its voluntary ABPP in consultation with the USFWS and includes a corporate policy stating that the wind industry, as it deploys more turbines and project

infrastructure across the U.S. landscape, must consider how best to develop projects in a manner to avoid, minimize, and mitigate for adverse impacts on birds and bats in order to ensure a sustainable industry. IR's ABPP commits at the corporate level to:

- Implement and comply with its own comprehensive ABPP;
- Ensure its actions comply with all applicable state and federal laws, regulations, permits, and ABPP procedures;
- Follow procedures described in the ABPP during the development of all new wind projects in order to understand avian and bat risk at each site and to incorporate features to avoid or minimize impacts on these species;
- For development or operational projects acquired from third parties in merger or acquisition transactions, ensure through the due diligence and acquisition process that preproject or operational practices employed by third parties prior to IR ownership are consistent with the ABPP, or, if not consistent, document inconsistencies, develop a strategy for implementing ABPP practices, and implement ABPP practices as soon as practical;
- Document bird and bat mortalities and injuries at projects and/or structures in order to implement adaptive management actions as necessary;
- Provide information, training, and resources to improve staff knowledge and awareness of the requirements of the ABPP in order to support the ABPP's successful implementation at both the company level and as applied at specific projects;
- Participate with public and private organizations in programs and scientific research to identify causes and effective controls of detrimental effects of bird and bat interactions with wind projects; and
- Continue to enhance the ABPP by applying lessons learned, research results, new technologies, and latest regulations and guidelines (IR 2008).

While IR is a model for company-level ABPP, incorporation of ABPP at the project level is becoming a more common practice for wind project developers. Project-specific ABPPs follow a common approach but are individualized for the species under consideration and the project location. Many ABPPs are aligned with the USFWS's WEG, state-specific wind project guidelines, or other similar documents. ABPPs are also being implemented by the solar industry at the project level (see Appendix B for examples).

4.3 TECHNOLOGY SOLUTIONS THAT SHOW PROMISE AS DETERRENTS

Most technology solutions being investigated to reduce wildlife conflicts with wind energy facilities are classified as deterrents. Wildlife deterrents are broadly defined as management techniques that use aversive stimuli to prevent animals from utilizing human resources (Ramp et al. 2011; Schakner and Blumstein 2013). A deterrent stimulus is an aversive, harmful, fearful, or noxious stimulus that elicits a defensive response in a particular animal. This stimulus must create enough real or perceived risk such that the costs of using a resource outweigh foraging or use benefits (Götz and Janik 2011). There are four general classes of deterrents—acoustic, tactile, visual, and chemosensory (Schakner and Blumstein 2013). The following discussion describes each of these modalities and includes information on successes and failures.

4.3.1 Acoustic Deterrents

Acoustic deterrents work by producing a sound painful or distracting enough that it creates aversion and either makes an animal flee or prevents it from visiting an area all together. Acoustic deterrent devices are one of the most widespread nonlethal deterrent methods used, particularly in mammal/fishery conflicts (Fjalling et al. 2006; Schakner and Blumstein 2013). However, their effectiveness in reducing wildlife conflicts at wind energy facilities remains uncertain. In terms of avian collisions with wind turbines, there have been two main issues with using acoustic deterrents: (1) many bird species habituate to sound, so long-term effectiveness is unlikely, and (2) birds and humans hear within the same range, which means that whatever sound is used to deter birds, humans living nearby would also hear the sound (Dooling 2002). It is possible that acoustic deterrents could reduce collisions of migrating passerines because a flock of birds moving through a particular area would likely not habituate to a single noise event. Ultrasonic deterrents have been tried on a few avian species, including gulls and feral pigeons, but were unsuccessful (Soldatini et al. 2007; Eiermann and Heynen 2014).

Other research suggests some options may exist to deter specific bird species. Research on the use of an on-demand cannon system showed promise of deterring waterfowl from landing on oil sands tailing ponds (Ronconi and St. Clair, 2005). Playbacks of calls of various species have shown these methods may also be effective in a continuous playback mode (Ribot et al., 2011; Tupper et al. 2011). The efficacy of a sonic net to deter European starlings from foraging has shown promise (Diekman et al. 2013). Additionally, the use of randomized sounds is being tested, although results are not yet available.

4.3.2 Tactile Deterrents

Tactile deterrents involve physically creating pain or discomfort to induce aversion (Schakner and Blumstein 2013). There is a large body of information on the successes of tactile deterrents for nonflying animals, both marine and land based. However, there is very little information in the peer-reviewed literature on the successes of tactile deterrents with regard to flying animals. Tactile (perch) deterrents on power lines have been tried on raptors with some degree of promise (Slater and Smith 2010). However, some studies were complete failures for various reasons and included photo documentation of raptors actually perched on the perch deterrent (Prather and Messmer 2010). Studies have illustrated that avian perch deterrents are largely ineffective (Duarte et al. 2011), while other types of deterrents, such as electric shock devices, were only somewhat effective at deterring nuisance avian species (Seamans and Blackwell 2014).

4.3.3 Visual Deterrents

Among visual deterrents are novel or intense light, colors, and decoys. In the context of wind energy, a few visual deterrents have been tried or suggested to minimize avian collisions, including

ultraviolet-reflective paint (Young et al. 2003), changes in FAA lighting (Gehring et al. 2009), and painting turbine blades different colors (Hodos 2003). Investigations by Hodos (2003) suggested that painting turbine blades combinations of black and white would reduce motion smear of the blades for turbines with high RPMs. Although large commercial-scale turbines have much lower RPMs and motion smear is not an issue, some wind developers in the European Union are in the midst of testing whether painting turbine blades will be effective at reducing avian collisions. To date, there are no published reports of success or failure. A steady-burn lighting regime was shown to reduce bird collisions with structures like meteorological and communication towers (Gehring et al. 2009). At this point, there is little evidence that UV paint and painting turbine blades are effective means for reducing avian collisions. Passerines constitute the largest group of birds at risk of colliding with wind turbines. Most of these collisions occur during their nocturnal migration, so UV paint on turbines would be irrelevant.

4.3.4 Chemosensory Deterrents

Chemosensory deterrents involve aversive scents or things that taste badly. Therefore, animals must have some sort of olfactory capacity for this type of deterrent to work. Although there is a wealth of literature on the use of chemosensory repellents (Kare 1961; Avery et al. 1995; Marples and Roper 1997; Mason et al. 1989; Stevens et al 1998; Engeman et al. 2002), conditioned taste or smell aversion methods to reduce human-wildlife conflicts have produced mixed results in terrestrial ecosystems (Shivik et al. 2003). Additional research is needed to identify chemosensory deterrents that could be effective in reducing avian impacts at solar facilities.

5 TECHNOLOGY-SPECIFIC FACTORS POTENTIALLY ASSOCIATED WITH AVIAN FATALITY

Some facility elements are common to all solar technologies (e.g., structural and wiring hardware, transmission lines, buildings, and roads), but many elements vary by technology. As discussed in Section 2.1, there are two primary types of solar-related avian fatality: collision-related and solar-flux-related fatality. This section discusses specific factors that have been identified as possibly being associated with these two types of fatality. In addition, the results of power tower flux modeling conducted, to provide context for possible ways to mitigate flux-related fatality as part of this study are discussed.

5.1 COLLISION-RELATED FATALITY FACTORS

Collision-related fatality has been observed at solar energy facilities of all technology types. Collisions may occur at any facility (solar or otherwise) with aboveground structures. In the case of solar plants these may include transmission lines, cooling towers, PV panels and poles, trough systems, heliostats, fencing, and buildings. Collisions may also occur at roadways with project vehicles.

At PV and CSP facilities, collision hazards to birds are greatest among the solar field arrays. It has been suggested that PV facilities may attract some species of birds through what has been called the "lake effect" (Kagan et al. 2014), whereby migrating birds perceive the reflective surfaces of PV panels as bodies of water and collide with project structures as they attempt to land on the panels. However, no empirical research has been conducted to confirm or refute this hypothesis.

The primary hazard to birds presented by power-cycle cooling systems is collision with the structures themselves. Cooling structures may also present attractive perching or nesting sites. Wet-cooled systems generally incorporate an evaporation pond to handle water blowdown from the cooling system. Such ponds may be attractive to wildlife, especially in a desert environment.

5.2 SOLAR-FLUX-RELATED FATALITY FACTORS

Based on the study of McCrary et al. (1986) at Solar One, and reported findings of dead birds at the ISEGS power tower facility in California, there appears to be a link between avian fatality and solar flux. Solar flux is a measure of the amount of solar energy passing through, or impinging on, an area. Direct ambient sunlight or "one sun" of flux is equal to about 1 kW per square meter (kW/m^2). Power towers generate regions of high solar flux near the tower/receiver as the reflected rays from multiple heliostats converge on the receiver. The receiver has a special surface coating that promotes efficient absorbance of sunlight. This coating makes the receiver appear black. However, when exposed to high solar flux, the receiver will glow due to the small fraction of sunlight that is not absorbed. In addition, one can often see scattered light from the reflected beams of the solar field due to a small amount of scattering from dust or other tiny particles in the air. This gives rise to the glow or cloud of light seen around power towers during certain phases of operation (Figure 3).



FIGURE 3 Glow of Scattering Sunlight from Heliostat Beams Converging on a Point Near the Tower During Operation of the Solar Two Demonstration Plant in 1996 (Photo credit: NREL)

At the solar receiver, flux levels can reach near 1,000 kW/m^2, or about 1,000 suns, and the flux drops off as one moves away from the receiver. Any object (e.g., receiver pipe, dust particle, bird) exposed to solar flux will absorb energy and be affected by that energy based on the object's size and optical properties (dark objects absorb sunlight better than light objects), its mass and thermal heat capacity (how much absorbed energy is required to generate a temperature increase), and its duration in the flux zone. The air temperature itself is virtually unaffected except in the immediate vicinity of the receiver. This is because air absorbs very little of the solar energy, and only air directly contacting the receiver is heated to any significant degree.

The amount of solar energy absorbed by an object in the region of solar flux can be calculated based on the area of the object exposed, intensity of the light, absorptivity of the object, length of exposure time, and mass of the object. However, predicting the amount of energy absorbed by a bird flying through the solar flux region is difficult given the variability of these many factors.

BrightSource Energy and the USFWS have performed preliminary tests on the effect of sunlight or heat, respectively, on bird feathers. As presented at the California Energy Commission (CEC) Joint Workshop held August 28, 2012 (BrightSource 2012), the BrightSource study indicated no observable effects on feathers exposed to 50 kW/m^2 of solar flux for 30 seconds. Higher flux levels caused visible effects within 20 to 30 seconds. The USFWS work, reported in Kagan et al. (2014), exposed feathers to hot air for 30-second durations. Visible effects were noted starting at temperatures of 400°C. Recall that air temperature in a zone of high flux is virtually unchanged from ambient conditions. Rather, these combined results suggest that the feathers themselves absorb sufficient energy during the 30-second test to reach a temperature sufficient to cause damage. Although these results are preliminary, they suggest that zones with flux greater than 50 kW/m^2 represent the region of concern for flux effects on birds. The actual effect on a given bird depends on a number of variables, including flight path, species, ambient conditions, and light intensity; further study is necessary to understand and refine this hazard threshold.

The following analysis of the flux profile in the vicinity of an operating power tower uses 50 kW/m^2 as a representative value.

5.3 POWER TOWER FLUX MODELING

Intense solar flux produced by reflected and concentrated sunlight has been documented to harm flying birds. For this report, NREL modeled a representative power tower based on the default molten-salt power tower provided in NREL's free System Advisor Model (SAM) (https://sam.nrel.gov/). The task required developing a methodology for generating solar flux maps not only at the receiver itself, but also in the airspace surrounding the receiver. These results and subsequent analysis using this methodology will be used to understand issues related to avian fatality connected with CSP power tower technology and potentially identify operating methodologies that may reduce the threat.

5.3.1 Description of Methodology

Two NREL-developed modeling tools, SolTrace (Wendelin 2003) and SolarPILOT, were used to generate flux contour maps for the default 100-MW_e molten salt power tower found in SAM (version release date 2014-01-14). The default SAM power tower case is intended to be representative of commercial technology, but is not designed to mimic a specific CSP project. Similar analyses could be performed for other sizes of towers, but are beyond the scope for the purposes of this report. The default case assumes a cylindrical receiver and a surround field (heliostats surrounding the tower). An NREL developed power tower design tool, SolarPILOT, was used to construct an optimized solar field layout based on the SAM default conditions. The field layout is shown in Figure 4. The default power tower field is symmetric about the north-south direction. This is different from many existing and planned power towers, which often have nonsymmetric field layouts due to the effects of the surrounding terrain or proximity to neighboring power tower fields. The height and diameter of the receiver for this case are 20.41 m and 17.67 m, respectively. The optical height of the tower (defined by the distance from the ground to the center of the receiver cylinder) is 203 m. The default location for the power tower is Daggett, Calif., at an elevation of 588 m, latitude of 34.9 degrees, and longitude of −116.8 degrees. The following analysis was generated using weather file data for March 20 at noon (spring equinox) and assumed the DELSOL3 insolation model (Kistler 1986). The default heliostat size is 12.2 m by 12.2 m, divided into eight panels, each canted and focused at the heliostat slant range (heliostat to receiver straight-line distance). The example shown here is representative; the methodology could be employed for any solar field configuration.

The SAM-default heliostat-aim-point algorithm was used. Heliostats are always aimed at the center axis of the receiver. Heliostats distant from the tower deliver the largest images and are aimed, for the most part, at the vertical center of the receiver. (Because the heliostat mirrors are not perfect reflectors, the reflected image spreads with distance from the heliostat.) As the distance from the heliostat to tower decreases, heliostat images get smaller, and individual heliostats can be aimed to achieve the most uniform flux from top to bottom of the receiver. This algorithm, known as "Image Priority," vertically distributes individual heliostat images along the receiver height as a function of the image size. The exact aiming strategy used for operating power towers is proprietary but is assumed to be some variation of this algorithm.

Three different cases were analyzed: a full-load condition and two full-standby conditions. Full load implies that all heliostats, up to the rated power of the receiver, are targeted at the receiver. The full load condition used Image Priority aiming. The full-standby condition (all heliostat images removed from the receiver) was analyzed for Image Priority and Centerline aiming. Centerline aiming will be discussed in more detail in following sections. The full-load and full-standby cases bound the problem for purposes

of this study. During daily startup, full standby may be used while other parts of the plant are start-up before initiating receiver warm-up. To heat the receiver tubes during transitions like preheating prior to establishing salt flow and during cooldown, a small subset of the heliostat population is used to preclude thermal shock from the sudden injection of salt flow, or to prevent freezing before draining is complete.

5.3.2 Results: Full-Load Case

Using the described SAM default power tower and aiming conditions for full load, SolarPILOT was used to generate flux maps for a series of expanding cylindrical surfaces surrounding the receiver and tower. The diametric range of these cylindrical surfaces extended from 20 m (just slightly larger than the receiver diameter) to 820 m. SolarPILOT generated flux map data for each of these cylindrical surfaces. Visual Basic Excel code was then written to post-process these data for purposes of developing maps of the solar flux (kW/m^2) on vertical planes in both the north-south and east-west directions. A map of the maximum flux as a function of position relative to tower, as viewed from above the field, was also produced. Contour levels of 2.5, 5, 10, 25, 50, and 150 kW/m^2 were used in all cases. Other analyses discussed in this report suggests that 50 kW/m^2 may be a threshold flux level of concern for birds; thus, special attention was given to that contour line.

It should be pointed out that the spillage (i.e., flux that misses the receiver and extends beyond it) was not quantified in this analysis. However, because of the divergent nature of this flux and the fact that spillage is designed to be minimal (< 2%) under operating conditions, flux levels are expected to be very small (as noted in a prior analysis [BrightSource 2012]). In future work, especially looking at standby aiming scenarios, it is recommended that spillage issue be addressed.

A map of the flux contours on the north-south plane, as seen from the east, is shown in Figure 5. Because there are more heliostats to the north (see Figure 4), constant flux levels extend farther from the receiver on the north side than on the south side. To the north, the 50-kW/m^2 level ends approximately 130 m from the receiver and 178 m from the ground. To the south, the 50-kW/m^2 zone extends only about 50 m from the receiver centerline.

Figure 6 is a map of the maximum flux in the vertical direction as a function of compass position. The “wavy” contour lines in Figure 6 occur because certain directions experience higher heliostat density with distance from the receiver.

5.3.3 Results: Full-Standby Cases

Two aiming scenarios were analyzed as full-standby cases. A common aiming algorithm used in standby conditions is to aim heliostats tangentially to a virtual cylindrical surface with the same height but somewhat larger diameter than the receiver (e.g., Ho et al. 2014). There could be numerous variations to this simple strategy, such as in the diameter of the virtual cylinder, the vertical aiming strategy on this surface, and whether all heliostats are rotated such that the aim-points are in the same direction (clockwise or counterclockwise). For purposes of this analysis, a 50-m-diameter cylindrical surface was assumed. The SAM-default receiver diameter is 17.67 m, so this cylinder is considerably larger than the receiver. Visual Basic Excel code was written to transform the heliostat aim-points so that all heliostats are aimed tangentially to this virtual cylindrical surface. A counterclockwise aiming strategy for all heliostat aim-points was assumed. SolTrace was used to verify this new aiming strategy (Wendelin 2003). Figure 7 is a ray-trace graphic showing rays incident on the virtual cylindrical surface as seen from above. The receiver is noted by the red circle. Note the counterclockwise direction of incident rays on the cylinder.

In the vertical direction, two different aiming components were considered. The first placed all the aim-points at the midpoint waist of the cylindrical surface (i.e., centerline). The second maintained the vertical components of the heliostats using Image Priority aiming (vertical smoothing of the flux). If one wishes to reduce the region of high flux, the second aiming strategy should result in a slightly lower peak flux than would the centerline aiming method.

Table 8 lists the peak flux values for the three cases. Full-load aiming generates the highest flux levels in the immediate vicinity of the receiver. Changing the full load aiming would impact power production from the plant. The two different full-standby modes have lower peak fluxes than full-load mode has, and Image Priority aiming shows lower peak flux than Centerline aiming. In addition, the airspace volume of flux less than 50 kW/m^2 is somewhat reduced with Image Priority aiming. While overall this is not a huge reduction, it does suggest that in partial- or full-standby operation, a variety of approaches could be used to reduce the size of this critical flux zone. These include further broadening of the flux in the vertical direction and/or varying the size of the virtual cylinder used in tangential aiming. A randomization of heliostat aim-points could also be employed, which could significantly reduce peak flux zones. Initial indications from one such trial used an aim point strategy that limited flux to less than 5 kW/m^2. In the weeks following this practice zero avian fatalities due to high flux were reported. In summary, any alternative standby aiming methodology should be designed to reduce the peak flux as well as the volume of airspace with flux exceeding the desired minimum threshold level, while at the same time minimizing negative impacts on plant operations. This analysis identifies a range of options that might accomplish these objectives. Further investigation is needed to identify the most attractive options.

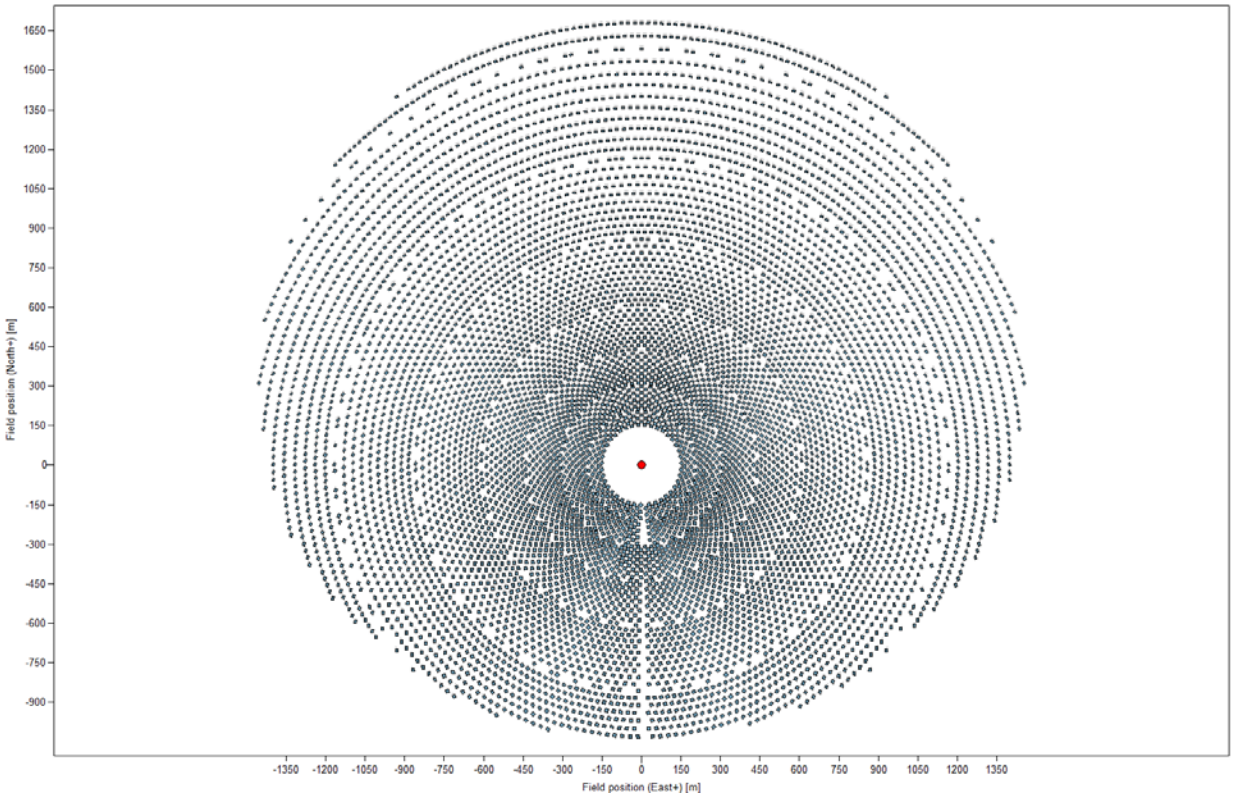


FIGURE 4 SAM Default 100-MW Molten Salt Power Tower Field Layout

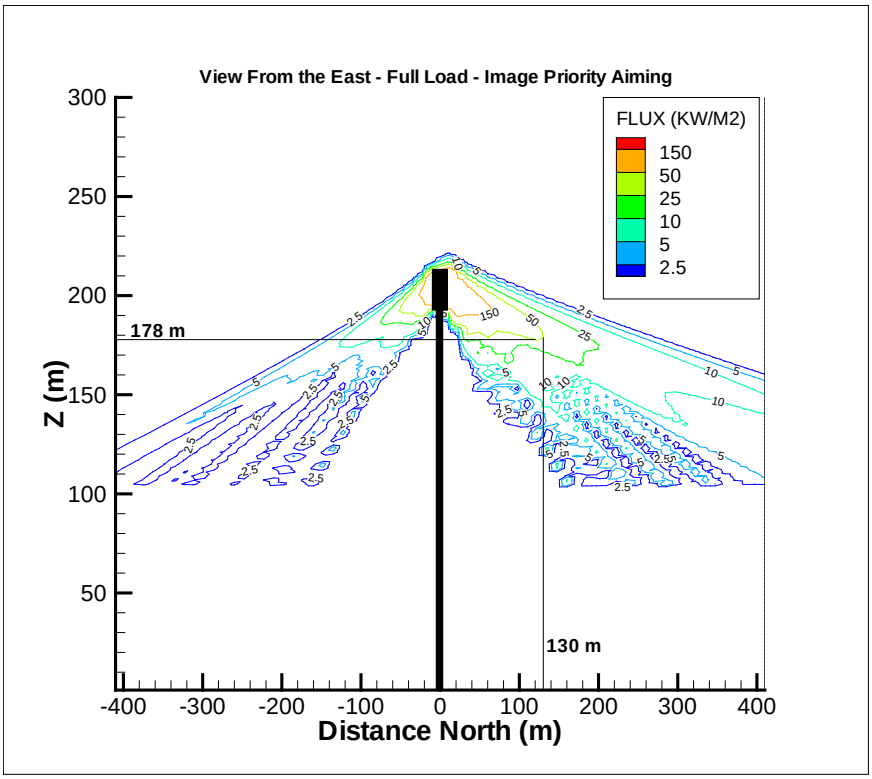


FIGURE 5 Full Load Flux on the North-South Plane as Seen from the East

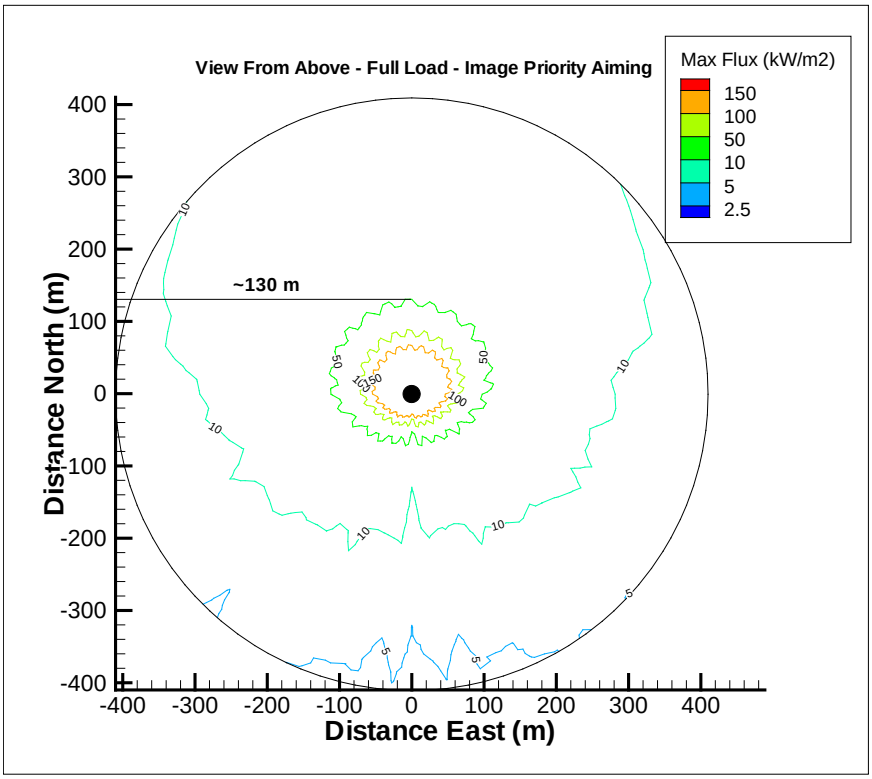


FIGURE 6 Maximum Full Load Flux as Seen from Above the Field

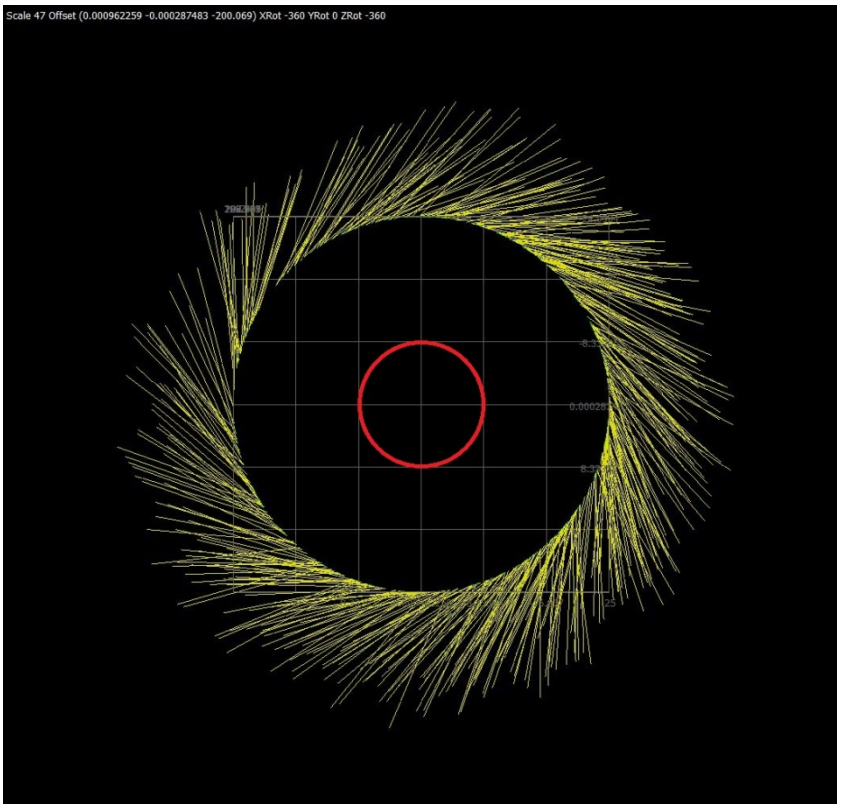


FIGURE 7 SolTrace Ray Trace of SAM Default Field Layout Showing Counterclockwise Tangential Aiming on 50-m-Diameter Virtual Cylindrical Surface. (The diameter of the actual receiver [red circle] is about 18 m.)

TABLE 8 Peak Flux Values for One Full Load and Two Full-Standby Cases[a]

Case	Peak Flux (kW/m^2)
Full Load – Image Priority Aiming	1,013
Full Standby – Centerline Aiming	665
Full Standby – Image Priority Aiming	430

[a] During full load, the peak flux is incident on the solar receiver. A switch to Image Priority aiming during full standby leads to a 35% decrease in peak flux that is generated near the receiver. The results suggest that alternative aiming strategies can be used to decrease the hazard presented by solar flux during standby.

6 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

6.1 SUMMARY AND CONCLUSIONS

6.1.1 Avian Fatality Issues and Study Methodology

Avian fatalities have been documented at solar energy facilities employing both PV and CSP technology types. Several federal and state regulations apply to the protection of birds at solar energy facilities. Most birds are protected by the Migratory Bird Treaty Act, which prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when authorized by the USFWS. Projects are also required to comply with state and federal regulations to protect threatened, endangered, and sensitive species (e.g., ESA, Bald and Golden Eagle Protection Act, BLM policy, and state wildlife codes). Mortality risks to threatened, endangered, and sensitive bird species are related to solar energy project size, location, and technology. Because the potential for impact to birds and their populations depends largely on project size and location, specific requirements for threatened, endangered, and sensitive bird species are often considered on a project-specific basis.

Like many industrial developments, utility-scale solar has the potential to impact birds and bird communities in a number of ways. There are two general types of direct solar-related bird fatality—collision-related and solar-flux-related. Collision-related impacts may occur for all types of solar energy technologies. The effects of solar flux on birds have been observed only at facilities employing power tower technologies.

Not all utility-scale solar energy developments in the United States are required to prepare and comply with project-specific avian monitoring protocols. If determined necessary through the project-specific environmental review process, as part of the solar energy applicant's required measures to reduce impacts, a BBCS may be prepared to better understand bird activity and abundance in the vicinity of a proposed solar energy project and minimize bird mortality risks. The BBCSs provide guidelines on the collection and reporting of avian fatality data, which may be incidental or systematic in nature. Despite efforts to obtain data and information from U.S. and international solar energy companies and organizations, little solar energy project-specific information on bird monitoring or fatality is publicly available.

6.1.2 Existing Avian Fatality Data and Associated Limitations

Evaluating patterns of avian fatality and mortality rates is important in order to understand bird mortality risk at solar energy facilities and in the context of risk from other energy developments. Based on results of data acquisition efforts, avian fatality data were available for seven solar energy facilities in the United States. Of these solar energy projects, systematic avian fatality data were available for four projects (only incidental data were available for the other three facilities). It is important to note that the synthesis of avian mortality in this report was based on publicly available data or information obtained through requests from solar energy companies and regulatory agencies. The information evaluated in this report does not constitute all the data that have been collected at U.S. and international solar energy facilities.

Standardization of data collection and methodology is essential to make avian mortality comparisons between projects and across industries. However, based on the paucity of existing information at solar energy facilities, it is not possible at this time to develop a solar industry-wide avian mortality estimate with any scientific certainty to make any conclusions about the risk of avian mortality at solar facilities compared with other industries and human developments. Additional systematic fatality data at solar energy facilities would be needed to better understand avian mortality risk at solar facilities.

In addition, certainty in mortality estimates will be improved through the development of standardized methods to account for the following factors that may bias mortality calculation: searcher efficiency, search effort, predation and scavenging, and the role of background mortality.

The majority of birds found killed or injured at solar facilities in southern California were passerines. The cause of death could not be determined for the majority of bird deaths, and many detections consisted only of feather spots. It has been hypothesized that feather spots found near perching/roosting structures may be incorrectly classified as fatalities when in fact they are the result of preening (WEST 2014). Feather spots may also represent predation events and not reflect direct solar-related fatality. At sites where a large proportion of the fatalities detected are identified on the basis of feather spots, assigning fatalities to a known cause of death such as predation is difficult. Further work is needed to develop standardized protocols for evaluating feather spot detections and assigning carcasses to causes of death at solar energy facilities.

On average across the six projects evaluated, approximately 54.4% of the known fatality detections were collision-related. The second-ranked cause of fatality among the six solar energy projects was predation. Approximately 26.9% of the known fatality detections were attributed to predation trauma, which may or may not be attributable to the facility. At power tower facilities (ISEGS and California Solar One), the percentage of solar-flux-related fatalities ranked higher than the percentage of predation-related fatalities, likely because birds affected by solar-flux are more easily identified by evidence of singeing.

Water-dependent species (loons, grebes, rails, coots, shorebirds, waterbirds, and waterfowl) have been postulated to be vulnerable to fatality at PV facilities because of the potential for them to confuse arrays for bodies of water (the lake effect hypothesis) (Kagan et al. 2014; WEST 2014). However, there was no consistent pattern of fatality by taxonomic groups among the solar energy facilities evaluated in this report to support or refute the lake effect hypothesis within the southern California region. Water-dependent species represented 11.3% of all recorded fatalities (as of December 2014), but there was high variability among PV facilities, with mortality ranging from 0.27% to 46.3%. Due to the limited and inconsistent dataset (i.e., six studies of incidental and systematic observations), it is too speculative to make any conclusions about the influence of the lake effect fatality of water-dependent birds. The activity and abundance of water-dependent species near solar facilities may depend on other site-specific and regional factors (such as the surrounding landscape) that have not yet been investigated (WEST 2014). Additional studies are needed to determine whether water-dependent species are especially vulnerable to fatality at PV facilities.

BBCSs from 10 solar energy projects were reviewed to present the current state of measures to minimize avian impacts at utility-scale solar energy facilities. There was variability among BBCSs in terms of ESA requirements for federally listed species, plans to conduct preconstruction baseline surveys, analytical methods, and documented mitigation measures and BMPs. In general, BBCS details were project-specific, managing the potential risks to birds and bird communities specific to the project's size (footprint), location, and technology.

6.1.3 Mitigation Measures and Best Management Practices Used in Other Industries

The availability and implementation of mitigation measures and BMPs to reduce impacts on wildlife, with a particular focus on bird and bat species, vary widely across human activities. Voluntary federal and state guidelines, ABPPs, and BBCS plans have been developed and implemented for many wind energy projects, in an industry that has experienced significant capacity additions since 2007. The emerging utility-scale solar industry could benefit, as well, from greater certainty about what assessments to conduct before, during, and after the construction of a solar project. Voluntary guidelines could prove to be quite useful as the industry expands. Several of the companies that are involved in utility-scale solar energy projects also develop wind energy projects, and some participated in the WEG development process. The WEG process was complex and took approximately seven years to complete. If federal guidelines are anticipated, a plan for a more streamlined process would benefit all parties.

In an effort to reduce electrocutions and collision fatalities at electric utility power lines, the APLIC, formed in 1989, developed voluntary BMPs that serve as a valuable knowledge base. Many of these BMPs will apply to utility-scale solar projects.

Collisions between birds and planes at airports can have significant safety and cost implications. The FAA has an active R&D program, but does not appear to have specific BMPs developed for addressing collisions with planes. Developed together with the U.S. Department of Agriculture, the *Manual for Airport Personnel* addresses a wide range of issues that may be encountered at an airport. The International Bird Strike Committee has also published BMPs, in large part based on FAA/USDA manual. Some of the strategies contained in the FAA R&D program may be applicable to addressing adverse bird and bat impacts occurring at utility-scale solar facilities.

The USFWS's WEG serve as the basis for the development of many ABPPs that are currently in use for wind energy projects. Following the tiered approach of the WEG, project-specific ABPPs are adapted to meet species- and habitat-specific considerations. In some cases, mitigation strategies have been implemented and research on the efficacy of these strategies (Tier 5) is ongoing. It is important to distinguish between post-construction monitoring utilizing scientifically rigorous and tested approaches (Tier 4), and R&D that is typically conducted within Tier 5. Ideally, the results from these Tier 5 activities should be made publicly available, preferably published in peer-reviewed journals.

A rush to require project developers to implement untested or unfounded mitigation strategies distracts from the opportunity to conduct scientifically rigorous research and contribute to the knowledge base to provide meaningful solutions. For the solar industry, participating in research to address wildlife impact challenges in the early stages of the growth of this energy sector may help avoid situations that the wind industry experienced, in which informative research was delayed or conducted under study designs that did not adequately address the issues.

6.1.4 Technology-Specific Factors Potentially Associated with Avian Fatality

Power towers are the only technology that has noted solar-flux-related avian fatalities. This report developed a flux-mapping methodology using SAM, SolarPILOT, and SolTrace to predict solar flux in the vicinity of a power tower receiver under full-load and full-standby modes. The method allows exploration of the effects of alternative aiming strategies on peak flux, as well as the airspace region exceeding specified threshold flux levels. These preliminary results compare well with previous analyses and suggest that various approaches to standby aiming could significantly reduce flux levels and their impact on avian fatality. Future work is recommended to determine the impact alternative aiming strategies have on plant operations, and to seek solutions that simultaneously minimize negative impacts on plant operations and zones of high flux that may be harmful to flying birds.

6.2 RECOMMENDATIONS

On the basis of the findings presented in this report, several recommendations can be made to improve understanding of avian fatality issues at utility-scale solar energy facilities. There is a basic need to understand the cause of fatalities (e.g., predation, collision, flux) associated with solar arrays and other infrastructure. Observations of available BBCSs at utility-scale solar facilities revealed opportunities to improve consistency and standardization in avian monitoring protocols. Not all utility-scale solar energy developments in the United States have been required to prepare and comply with project-specific avian monitoring protocols, particularly those projects located on private lands. Building upon lessons learned from the wind energy industry, a programmatic guideline similar to the WEG may help promote standardized monitoring and data collection throughout the solar energy industry. Adopting applicable guidelines from the WEG would help promote compliance with relevant wildlife laws and regulations and encourage scientifically rigorous survey, monitoring, assessment, and research designs proportionate to the risk to species of concern. Further, they should produce potentially comparable data across the nation and mitigate (including avoid, minimize, and compensate) for potential adverse effects on species of concern and their habitats.

The following should be considered when developing standardized inventory and monitoring protocols at utility-scale solar energy facilities:

- Distribution of habitat, species, and resources on the site and in adjacent areas
- Importance of project area relative to local, landscape, and region
- Resident and migrant use of site and surroundings
- Seasonal patterns of use
- Daytime versus nighttime effects
- Effects of project on resident and migratory species
- Direct, indirect, and cumulative effects
- Role of predators in carcass persistence and transport (on and off the facility)
- Distance effect (zone of influence)
- Background mortality rate
- Mortality rates attributable to project features
- Contributors to risk (technology and project feature-specific)
- Role of confounding factors (e.g., moon phase, weather)
- Use of indicator species to represent different categories of species
- Focus on statistically robust data collection rather than incidental or ad hoc reporting

Additional systematically collected fatality data at other solar energy projects in multiple regions would be needed to better understand avian mortality risk at solar facilities compared with other energy developments. More systematic study of utility-scale solar facilities is needed in order to make conclusions about avian risk and mortality, types of birds impacted, contribution of background mortality to mortality estimates, influence of facility attraction to birds (e.g., lake effect), and other factors such as predation could be improved through the development of standardized monitoring methodologies and assessment approaches.

The opportunity exists for the development of a science plan to focus future research on systematic data collection to better understand impacts, causal factors, and feasible mitigation measures and BMPs to inform future decisions about solar energy project siting and design. Such science plans should focus on uncertainties related to avian risks and causative factors, population-level impacts to migratory birds, development of more effective inventory and monitoring techniques, and guide the development of pilot studies to assess the implications of mitigation measures and BMPs to energy production.

Moving forward, the industry, federal and state agencies, and other stakeholders might all benefit from working collaboratively towards (1) developing and implementing useful and scientifically rigorous data collection program, (2) evaluating avian mortality related to utility-scale solar development and the causal effects, and (3) identifying appropriate mitigation measures to address identified issues.

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APPENDIX A:

Glossary

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Glossary

Adaptive Management – A structured, iterative process of robust decision making in the face of uncertainty, with an aim to reduce uncertainty over time via system monitoring. The goal is to decrease avian mortality — Deterrence and BMPs are tested in this framework and monitored to determine whether they are efficacious.

Best Management Practices (BMPs) – Practices the facility can undertake (such as panel or mirror positioning) to decrease risk/impacts to species.

Carcass Removal/Scavenging Rates – The probability that a carcass will be removed before a searcher has the opportunity to observe it. Often described as the mean number of days that a carcass will remain before being scavenged.

Compensatory Mitigation – The provision of compensatory land/monetary or other actions that are intended to offset the impacts of the action.

Concentrating Solar Power (CSP) – A system which captures solar energy as heat before converting it into electricity by a thermo-electric power cycle.

Deterrent – A measure used to repel avian species from a site, such as bird spikes or auditory/chemosensory repellents.

Direct Impact – An impact observable within the solar project footprint resulting from ground-disturbing activities or operation of the project.

Fatality – Death or the occurrence of death.

Feather Spot – Feathers concentrated together in a small area and considered an avian fatality. Feather spots have been defined as two or more primary flight feathers, five or more tail feathers, or 10 or more feathers of any type concentrated together in an area of 1 square meter or smaller. The definition can vary among studies.

Incidental Data – Fatalities observed incidentally during other activities that were not part of focused systematic searches for carcasses.

Indirect Impact – An impact that may extend beyond the solar project footprint.

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.

Mitigation – A broad category of measures/techniques used to decrease or avoid impacts (includes BMPs).

Monitoring – Studies designed to determine mortality at sites.

Mortality – The relative frequency of deaths in a specific population (death rate).

Photovoltaic (PV) – A system that converts sunlight directly into electricity.

Searcher Efficiency – The probability that a searcher will find a carcass during a systematic survey.

Solar Flux – A measure of the amount of solar energy passing through, or impinging on, a specific area.

Systematic Data – Fatalities observed during the course of dedicated search efforts.

Utility-scale – Loosely defined as ground-mounted facilities larger than 1 megawatt that are tied directly to the transmission grid.

Water-Dependent Species – Bird species dependent on aquatic habitats to complete portions of their life cycles (shorebirds, marshbirds, wading birds, seabirds, and waterfowl).

APPENDIX B:

Summary of Avian Fatality Data and Monitoring Plans Developed for Utility-Scale Solar Facilities

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Summary of Avian Fatality Data and Monitoring Plans Developed for Utility-Scale Solar Facilities

B.1 Summary of Avian Fatality Data

Table B.1 presents a summary of avian fatality data collected at utility-scale solar facilities in the U.S. All facilities reported in this table are located in southern California. This table serves as a summary of all reported avian fatality observations at seven utility-scale solar facilities between 2011 and 2014. The data presented in Table B.1 were collected over various time periods and monitoring intervals. Fatality observations at the solar facilities were not based on consistent survey approaches and include incidental and systematic observations.

TABLE B.1 Summary of Avian Fatality by Species for Seven Solar Energy Facilities in the United States for the period 2011-2014. Observations were recorded at solar facilities from various monitoring periods and includes results of incidental and systematic surveys.[a]

Species	Species Group	Residency Status	Total Number of Detections	Percent Composition by Solar Facility (%)							Overall Composition (%)
				California Solar One	CVSR	Desert Sunlight	Genesis	Mojave Solar	Ivanpah	Topaz	
American avocet	Water-Dependent Bird	Migrant	7	0	0	4.54	0	0	0	0	0.51
American coot	Water-Dependent Bird	Resident	26	2.86	0.27	3.25	2.72	14.3	1.67	3.33	1.88
American kestrel	Raptor	Resident	20	1.43	0.54	0.65	3.27	0	1.87	0	1.45
American pipit	Passerine	Resident	4	0	0.27	0	0	0	0.56	0	0.29
Anna's hummingbird	Other	Resident	14	0	0	0	0	0	2.62	0	1.01
Ash-throated flycatcher	Passerine	Resident	5	0	0	1.95	0	0	0.37	0	0.36
Bank swallow	Passerine	Migrant	4	0	0	0	0	0	0.75	0	0.29
Barn owl	Raptor	Resident	9	0	0.27	0.65	2.72	0	0	3.33	0.65
Barn swallow	Passerine	Migrant	8	2.86	0	0	0	0	1.12	0	0.58
Bewick's wren	Passerine	Resident	1	0	0	0	0	0	0.18	0	0.07
Black phoebe	Passerine	Resident	1	0	0	0	0.55	0	0	0	0.07
Black-throated grey warbler	Passerine	Migrant and Resident[b]	2	0	0	0	0.55	0	0.18	0	0.14
Black-and-white warbler	Passerine	Migrant	1	0	0	0	0	0	0.18	0	0.07
Black-crowned night-heron	Water-Dependent Bird	Resident	1	0	0	0.65	0	0	0	0	0.07

Species	Species Group	Residency Status	Total Number of Detections	Percent Composition by Solar Facility (%)							Overall Composition (%)
				California Solar One	CVSR	Desert Sunlight	Genesis	Mojave Solar	Ivanpah	Topaz	
Black-headed grosbeak	Passerine	Migrant	3	0	0	0.65	0.55	0	0.18	0	0.22
Black-necked stilt	Water-Dependent Bird	Resident	2	2.86	0	0	0	0	0	0	0.14
Black-tailed gnatcatcher	Passerine	Resident	1	0	0	0.65	0	0	0	0	0.07
Black-throated sparrow	Passerine	Resident	18	0	0	0	0	0	3.36	0	1.30
Blue-gray gnatcatcher	Passerine	Resident	3	0	0	0	0	0	0.56	0	0.22
Blue-winged teal	Water-Dependent Bird	Resident	6	1.43	0	0.65	1.09	0	0.37	0	0.43
Bonaparte's gull	Water-Dependent Bird	Migrant	2	1.43	0	0	0	7.14	0	0	0.14
Brewer's blackbird	Passerine	Resident	19	7.14	0.27	1.3	1.09	0	1.67	0	1.37
Brewer's sparrow	Passerine	Resident	4	0	0	0	0	0	0.75	0	0.29
Broad-tailed hummingbird	Other	Resident	1	0	0	0	0	0	0.18	0	0.07
Brown pelican	Water-Dependent Bird	Resident	6	0	0	2.59	1.09	0	0	0	0.43
Brown-headed cowbird	Passerine	Resident	17	0	0	1.3	7.1	0	0.37	0	1.23
Bufflehead	Water-Dependent Bird	Resident	2	0	0	0	0.55	7.14	0	0	0.14
Bullock's	Passerine	Resident	8	0	0	0	4.37	0	0	0	0.58

Species	Species Group	Residency Status	Total Number of Detections	Percent Composition by Solar Facility (%)							Overall Composition (%)
				California Solar One	CVSR	Desert Sunlight	Genesis	Mojave Solar	Ivanpah	Topaz	
oriole											
Burrowing owl	Raptor	Resident	7	0	0.82	1.3	0	0	0	3.33	0.51
Cactus wren	Passerine	Resident	2	0	0	0	0	0	0.37	0	0.14
California gull	Water-Dependent Bird	Migrant	1	0	0	0	0	7.14	0	0	0.07
California quail	Other	Resident	2	0	0.54	0	0	0	0	0	0.14
Calliope hummingbird	Other	Resident	4	0	0	0	0	0	0.75	0	0.29
Cassin's vireo	Passerine	Migrant	1	0	0	0	0	0	0.18	0	0.07
Chipping sparrow	Passerine	Resident	3	0	0	0	0	0	0.56	0	0.22
Clark's grebe	Water-Dependent Bird	Resident	1	0	0	0	0.55	0	0	0	0.07
Cliff swallow	Passerine	Migrant and Resident[c]	20	2.86	0	0	4.37	0	1.87	0	1.45
Common gallinule	Water-Dependent Bird	Resident	1	0	0	0	0	0	0.18	0	0.07
Common loon	Water-Dependent Bird	Migrant	8	0	0	2.59	1.64	0	0.18	0	0.58
Common merganser	Water-Dependent Bird	Resident	1	0	0	0.65	0	0	0	0	0.07
Common poorwill	Other	Resident	4	0	0	1.95	0	0	0.18	0	0.29
Common raven	Passerine	Resident	44	0	6.25	3.25	0	7.14	0.37	21.67	3.18
Common yellowthroat	Passerine	Migrant	7	0	0.54	1.3	0	0	0.56	0	0.51
Cooper's hawk	Raptor	Resident	4	0	0	0	0.55	7.14	0.37	0	0.29
Costa's	Other	Resident	18	0	0	1.3	0	0	2.99	0	1.30

Species	Species Group	Residency Status	Total Number of Detections	Percent Composition by Solar Facility (%)							Overall Composition (%)
				California Solar One	CVSR	Desert Sunlight	Genesis	Mojave Solar	Ivanpah	Topaz	
hummingbird											
Dark-eyed junco	Passerine	Resident	1	1.43	0	0	0	0	0	0	0.07
Domestic pigeon	Doves/Pigeons	Resident	2	0	0	0	1.64	0	0	0	0.14
Double-crested cormorant	Water-Dependent Bird	Migrant	3	0	0	1.95	0	0	0	0	0.22
Eared grebe	Water-Dependent Bird	Resident	30	15.71	0	7.14	2.18	7.14	0.37	1.67	2.17
Eurasian collared dove	Doves/Pigeons	Resident	3	0	0	0	0.55	0	0.37	0	0.22
European starling	Passerine	Resident	9	5.71	1.1	0	0	0	0	1.67	0.65
Fox sparrow	Passerine	Migrant	1	0	0.27	0	0	0	0	0	0.07
Gadwall	Water-Dependent Bird	Resident	1	0	0	0	0.55	0	0	0	0.07
Great blue heron	Water-Dependent Bird	Migrant	4	0	0	0	2.18	0	0	0	0.29
Great egret	Water-Dependent Bird	Resident	1	0	0	0.65	0	0	0	0	0.07
Great horned owl	Raptor	Resident	2	0	0.54	0	0	0	0	0	0.14
Greater roadrunner	Other	Resident	20	0	0	0	1.09	0	3.18	1.67	1.45
Great-tailed grackle	Passerine	Resident	9	0	0	2.59	0.55	0	0.75	0	0.65
Green-tailed towhee	Passerine	Resident	1	0	0	0	0	0	0.18	0	0.07
Green-winged teal	Water-Dependent	Resident	3	0	0	0	1.64	0	0	0	0.22

Species	Species Group	Residency Status	Total Number of Detections	Percent Composition by Solar Facility (%)							Overall Composition (%)
				California Solar One	CVSR	Desert Sunlight	Genesis	Mojave Solar	Ivanpah	Topaz	
	Bird										
Hermit thrush	Passerine	Resident	1	0	0	0	0.55	0	0	0	0.07
Hermit warbler	Passerine	Migrant	5	0	0	0	0.55	0	0.75	0	0.36
Herring gull	Water-Dependent Bird	Resident	2	0	0	0	1.09	0	0	0	0.14
Horned grebe	Water-Dependent Bird	Resident	1	0	0	0	0.55	0	0	0	0.07
Horned lark	Passerine	Resident	132	4.28	26.36	1.95	0	0	3.18	20	9.54
House finch	Passerine	Resident	83	5.71	13.59	1.3	0.55	0	3.92	8.33	6.00
House sparrow	Passerine	Resident	1	0	0.27	0	0	0	0	0	0.07
House wren	Passerine	Resident	1	0	0	0	0.55	0	0	0	0.07
Lapland longspur	Passerine	Resident	1	0	0	0	0	0	0.18	0	0.07
Lazuli bunting	Passerine	Migrant	4	0	0	0	0	0	0.75	0	0.29
lesser goldfinch	Passerine	Resident	5	0	0	0	1.64	0	0.18	1.67	0.36
Lesser nighthawk	Other	Resident	16	0	0	0.65	1.64	0	2.24	0	1.16
Lesser scaup	Water-Dependent Bird	Resident	1	0	0	0.65	0	0	0	0	0.07
Lincoln’s sparrow	Passerine	Resident	5	0	0.27	0	0.55	0	0.56	0	0.36
Loggerhead shrike	Passerine	Resident	17	0	0.54	3.89	0	0	1.67	0	1.23
Long-eared owl	Raptor	Resident	2	0	0.27	0.65	0	0	0	0	0.14
MacGillivray's warbler	Passerine	Migrant	4	1.43	0.27	0	0.55	0	0.18	0	0.29
Marsh wren	Passerine	Resident	1	0	0	0	0.55	0	0	0	0.07
Mourning dove	Doves/Pigeo	Resident	208	8.57	29.89	3.25	5.46	0	13.08	11.66	15.03

Species	Species Group	Residency Status	Total Number of Detections	Percent Composition by Solar Facility (%)							Overall Composition (%)
				California Solar One	CVSR	Desert Sunlight	Genesis	Mojave Solar	Ivanpah	Topaz	
	ns										
Nashville warbler	Passerine	Migrant	4	0	0.27	0	0	0	0.56	0	0.29
Northern flicker	Other	Resident	4	0	0.27	0	0	7.14	0.37	0	0.29
Northern mockingbird	Passerine	Resident	1	0	0	0	0	0	0.18	0	0.07
Northern rough-winged swallow	Passerine	Resident	7	0	0	0	0.55	0	1.12	0	0.51
Olive-sided flycatcher	Passerine	Resident	2	0	0	0	0	0	0.37	0	0.14
Orange-crowned warbler	Passerine	Resident	2	0	0	0	1.09	0	0	0	0.14
Peregrine falcon	Raptor	Resident	1	0	0	0	0	0	0.18	0	0.07
Phainopepla	Passerine	Resident	1	0	0	0	0	0	0.18	0	0.07
Pied-billed grebe	Water-Dependent Bird	Resident	5	0	0	1.3	1.64	0	0	0	0.36
Pine siskin	Passerine	Resident	2	0	0	0	0	0	0.37	0	0.14
Prairie falcon	Raptor	Resident	1	0	0	0.65	0	0	0	0	0.07
Red-tailed hawk	Raptor	Resident	3	0	0.54	0	0.55	0	0	0	0.22
Red-breasted merganser	Water-Dependent Bird	Migrant	1	0	0	0.65	0	0	0	0	0.07
Red-necked phalarope	Water-Dependent Bird	Migrant	2	1.43	0	0.65	0	0	0	0	0.14
Red-winged Blackbird	Passerine	Resident	4	4.28	0	0.65	0	0	0	0	0.29
Ring-billed gull	Water-Dependent	Resident	2	0	0	0	1.09	0	0	0	0.14

Species	Species Group	Residency Status	Total Number of Detections	Percent Composition by Solar Facility (%)							Overall Composition (%)
				California Solar One	CVSR	Desert Sunlight	Genesis	Mojave Solar	Ivanpah	Topaz	
	Bird										
Rock dove	Doves/Pigeons	Resident	1	0	0	0	0	0	0.18	0	0.07
Rock pigeon	Doves/Pigeons	Resident	8	0	0	0	0	0	0.56	8.33	0.58
Rock wren	Passerine	Resident	1	0	0	0	0.55	0	0	0	0.07
Ruby-crowned kinglet	Passerine	Resident	1	0	0	0	0	7.14	0	0	0.07
Ruddy duck	Water-Dependent Bird	Resident	4	0	0	0.65	1.09	7.14	0	0	0.29
Rufous hummingbird	Other	Migrant	8	0	0	0	0	0	1.49	0	0.58
Sagebrush sparrow	Passerine	Resident	3	0	0	1.95	0	0	0	0	0.22
Savannah sparrow	Passerine	Resident	11	4.28	1.1	0.65	0	0	0.37	1.67	0.79
Say's phoebe	Passerine	Resident	5	0	0	0.65	1.64	0	0.18	0	0.36
Scott's oriole	Passerine	Resident	1	0	0	0	0	0	0.18	0	0.07
Short-eared owl	Raptor	Resident	3	0	0.82	0	0	0	0	0	0.22
Sora	Water-Dependent Bird	Resident	7	0	0	2.59	1.09	0	0	1.67	0.51
Spotted sandpiper	Water-Dependent Bird	Resident	1	0	0	0	0	0	0.18	0	0.07
Surf scoter	Water-Dependent Bird	Resident	1	0	0	0.65	0	0	0	0	0.07
Swainson's thrush	Passerine	Migrant	1	0	0.27	0	0	0	0	0	0.07
Townsend's warbler	Passerine	Migrant	16	0	0	1.95	0.55	0	2.24	0	1.16

Species	Species Group	Residency Status	Total Number of Detections	Percent Composition by Solar Facility (%)							Overall Composition (%)
				California Solar One	CVSR	Desert Sunlight	Genesis	Mojave Solar	Ivanpah	Topaz	
Tree swallow	Passerine	Migrant	20	0	0.27	0.65	6.01	0	1.61	0	1.45
Unknown	Unknown	Unknown	150	8.57	4.9	5.84	17.48	0	14.57	10	10.84
Vaux's swift	Other	Migrant	2	1.43	0	0	0	0	0.18	0	0.14
Verdin	Passerine	Resident	6	0	0	0.65	0	0	0.93	0	0.43
Violet-green swallow	Passerine	Resident	6	0	0	0	0	0	1.12	0	0.43
Warbling vireo	Passerine	Migrant	1	0	0.27	0	0	0	0	0	0.07
Western grebe	Water-Dependent Bird	Resident	20	0	0	11.68	0	14.3	0	0	1.45
Western kingbird	Passerine	Resident	1	0	0	0	0	0	0.18	0	0.07
western meadowlark	Passerine	Resident	35	1.43	6.79	0.65	0.55	0	1.3	0	2.53
Western tanager	Passerine	Migrant	9	0	0	1.95	0.55	0	0.93	0	0.65
Western wood pewee	Passerine	Resident	1	0	0	0	0	0	0.18	0	0.07
White-crowned sparrow	Passerine	Resident	17	2.86	0	1.95	0.55	0	2.06	0	1.23
White-faced ibis	Water-Dependent Bird	Resident	1	0	0	0.65	0	0	0	0	0.07
White-throated swift	Other	Resident	8	2.86	0	0	0.55	0	0.93	0	0.58
White-winged dove	Doves/Pigeons	Resident	3	0	0	0.65	1.09	0	0	0	0.22
Wilson's warbler	Passerine	Migrant	13	1.43	0	3.25	0.55	0	1.12	0	0.94
Wood duck	Water-Dependent Bird	Resident	1	0	0	0	0	7.14	0	0	0.07
Yellow warbler	Passerine	Migrant	8	0	0.54	0	1.64	0	0.56	0	0.58
Yellow-billed	Other	Resident	1	0	0	0	0	0	0.18	0	0.07

Species	Species Group	Residency Status	Total Number of Detections	Percent Composition by Solar Facility (%)							Overall Composition (%)
				California Solar One	CVSR	Desert Sunlight	Genesis	Mojave Solar	Ivanpah	Topaz	
cuckoo											
Yellow-breasted chat	Passerine	Migrant	1	0	0	0	0	0	0.18	0	0.07
Yellow-headed blackbird	Passerine	Resident	13	2.86	0	1.95	3.82	0	0.18	0	0.94
Yellow-rumped warbler	Passerine	Resident	49	2.86	0.82	0.65	0	0	8.04	0	3.54
Yuma clapper rail	Water-Dependent Bird	Resident	1	0	0	0.65	0	0	0	0	0.07
Total			**1384**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

[a] Data presented from available reports as of December 2014. Sources: Genesis: fatalities recorded in available Monthly Compliance Reports submitted to CEC; CVSR: H.T. Harvey & Associates (2014a); ISEGS: H.T. Harvey & Associates (2014b,c) and Monthly Compliance Reports submitted to CEC; Topaz: Althouse and Meade, Inc. (2014); Mohave Solar: Monthly Compliance Reports submitted to CEC; Desert Sunlight: SPUT reports, Ironwood Consulting, Inc. 2013a-b, and WEST 2014; Solar One: McCrary et al. (1986).

[b] Considered to be a resident near the Ivanpah facility and a migrant near the Genesis facility.

[c] Considered to be a resident near the Ivanpah facility and a migrant near the Genesis and Solar One facilities.

B.2 Summary of Avian and Bat Protection Plans at Utility-Scale Solar Facilities

This section presents an overview of existing avian fatality monitoring and reporting requirements and related BMPs (e.g., mitigation or conservation measures), as identified in available solar project-specific ABPPs. The purpose of this section is to present the current state of measures to minimize avian impacts at utility-scale solar energy facilities. A summary of solar facility ABPPs is provided in Table B.2. Monitoring measures and BMPs employed in other applications are discussed in Section 4.

On the basis of efforts to collect data and information described in Section 2.2, BBCSs or similar avian monitoring plans (hereafter, all such plans are referred to as "BBCSs") were available for the following 10 solar energy facilities:

- Centinela
- Crescent Dunes
- Desert Sunlight
- Genesis
- Ivanpah Solar Electric Generating System (ISEGS)
- Palen Solar Electric Generating System (PSEGS)
- Rice Solar
- Silver State North
- Silver State South
- Topaz Solar Farm

Each monitoring plan was reviewed to identify measures used to monitor, analyze, and report avian fatalities. The following aspects of each plan were reviewed:

- The documented presence of threatened or endangered species listed under the ESA and specific monitoring requirements for those species;

- Plans to conduct pre-construction baseline surveys for bird activity and abundance;

- Analysis methods (models used, experimental design, methods, etc.); and

- Documented avoidance, minimization, and mitigation measures and BMPs.

TABLE B.2 Summary of Avian and Bat Protection Plans at Utility-Scale Solar Facilities

Project	Silver State South	Crescent Dunes	Genesis	Rice Solar	Topaz	Silver State North	Palen (PSEGS)	Ivanpah (ISEGS)	Desert Sunlight	Centinela
State	NV	NV	CA	CA	CA	NV	CA	CA	CA	CA
Technology	PV	Power tower	CSP - parabolic trough	Power tower	PV	PV	Power tower	Power tower	PV	PV
Acres	2,427	2,950	1,950	3,324	3,500	7,925	3,794	3,600	4,410	2,067
Year	2013	2011	2014	2011	2011	2011	2014	2013	2010	2012
ESA requirements	No ESA-listed species were described.	No ESA-listed species were described. However, the document mentions that all avian and bat species that are listed as threatened or endangered species will be protected.	No ESA-listed birds were documented in the study area.	No ESA-listed species were described. However, the document mentions that all species identified as rare, threatened, or endangered by the ESA and CESA will be protected.	No ESA-listed birds were documented in the study area.	No ESA-listed bird species were described. However, ESA Section 7 consultation for the desert tortoise was described.	No ESA-listed species were described. However, the document mentions that the BLM will coordinate with the USFWS to ensure that the plan meets ESA requirements.	No ESA-listed species were described. However, the document describes methods to conserve any state- and federally listed species observed on the site.	No ESA-listed bird species documented in the study area. The document discusses other state-listed and sensitive bird species.	Two ESA-listed bird species were discussed (southwestern willow flycatcher and Yuma clapper rail). Through ESA consultation with the USFWS, it was determined that the solar energy development "May affect, but not likely adversely affect" either species.
Baseline surveys	Yes	No pre-construction baseline surveys were reported.	Yes	Yes. Baseline surveys will be conducted before construction activities begin.	Yes	Yes. Surveys will be conducted to determine the presence of special-status and nesting birds.	Yes	No pre-construction baseline surveys were reported.	Yes	Yes
Number of monitoring years	4 (2010–2013)	NA[a]	3 (2007–2010)	NA	2 (2008–2010)	No formal pre-construction avian surveys have been conducted in the project area	2 (2013–2014)	2014-2015	1	2 (2009–2011)
Number of years/seasons of baseline monitoring	• 2010 (spring) - Golden Eagle Aerial Surveys; • 2011 (spring), 2012 (spring, fall) - Burrowing Owl Surveys; • 2012 (spring, fall), 2013 (winter, spring) - Avian Point Counts; • 2012 (winter, spring, fall), 2013 (winter, spring) - Golden Eagle Point Counts; • 2012, 2013 (winter, spring, fall) - Common Raven Point Counts; • 2013 (throughout breeding season) - Golden Eagle Nest Monitoring	NA	• Spring and winter 2009 avian point count surveys; • Golden eagle nest surveys: March 25–26 and April 2–3, 2010; March 23–24 and May 5–7, 2011 (2011 survey conducted for a different nearby project). • Western burrowing owl surveys: Phase I Habitat Assessment December 2007; Phase II burrow location 2009; Phase III breeding-season surveys spring 2009.	NA	• Nesting, wintering, protocol, and general bird surveys: March 2008–July 2010. • Aerial survey for golden eagle nests: 2010	NA	• Bird use count surveys: April–June 2013, August–December 2013, March–June 2014 • Small bird count surveys: April–June 2013, August-November 2013, March–June 2014 • Gila woodpecker surveys: April–June 2013 • Elf owl surveys: May–June 2013 • Habitat evaluation for elf owl and Gila woodpecker: July 2013 • Golden eagle surveys: March–August 2013, April–August 2014 • Golden eagle prey abundance surveys: April–June 2013	NA	Point count surveys - April– May 2010. Golden eagle surveys - April 2–3, 2010 and May 14, 2010. Nest Surveys - April 23-24 and May 20, 2010.	• Avian use and abundance survey: Winter and spring 2010 and 2011. • Burrowing owl surveys: 2009-2011 breeding seasons.

Table B.9 (Cont.)

Project	Silver State South	Crescent Dunes	Genesis	Rice Solar	Topaz	Silver State North	Palen	Ivanpah	Desert Sunlight	Centinela
Number of years/seasons of baseline monitoring (Cont.)							• Burrowing owl surveys: March–June 2009, April–June 2013 • Agricultural pond surveys: August–December 2013, March–June 2014 • Nocturnal radar surveys: August–October 2013, March–June 2014			
Offsite baseline surveys	The baseline avian surveys were conducted within the project site and a larger area surrounding the project site.	NA	Yes. Golden eagle surveys were conducted within a 16.1-km (10-mi) survey radius from the project site.	Yes	Yes	NA	Yes. A 1-mi buffer around the site was used for bird count surveys. Golden eagle surveys were conducted within a 10 mi buffer around the project site.	Yes. This plan details the onsite and offsite surveys to be conducted.	Yes	Yes
Models used	Bird point count data were used to develop distance models using the program DISTANCE. The model estimates total bird density on site by season.	The programs DISTANCE (Thomas et al. 2010) and MARK (White and Burnham 1999) were used to calculate distances from the transects and estimate total number of fatalities.	None reported.	None reported.	None reported.	None reported.	Model to assess risk to birds flying through regions of concentrated solar flux surrounding the two collection towers at the proposed PSEGS.	None reported.	None reported.	None reported.
Species-specific surveys	Two species received specific monitoring: burrowing owls and golden eagles.	None	Golden eagle and burrowing owl.	Golden eagle; burrowing owl; kit fox; badger; Couch's spadefoot toad; raven; desert tortoise	Burrowing owls, golden eagle nests,	Western burrowing owl pre-construction nest surveys will be conducted.	Golden eagle surveys; burrowing owl; desert tortoise	Western Burrowing owl and pre-construction nest surveys	Golden eagle; burrowing owl	Flat-tailed horned lizard, mountain plover, burrowing owl
Proposed Before-After Control-Impact (BACI) Studies	Yes	None reported.	None reported.	None reported.	None reported.	None reported.	None reported.	None reported.	None reported.	None reported.
Surveyor requirements	**Yes**	Yes	Yes	Yes	None reported.	None reported.	Yes	Yes	None reported.	
Reporting frequency	Monthly and quarterly.	None reported.	Monthly and quarterly.	Monthly	Quarterly	None reported.	Quarterly	Monthly and quarterly	Quarterly	Quarterly
Monitoring duration	During construction and 2–3 years post construction	No specific duration reported.	2 years post construction.	2 years post construction.	3-year construction period and 3 years post construction	No specific duration reported.	Minimum 3 years post construction.	Minimum 2 years post construction.	During construction and 5 years post construction	During construction and 1 year post construction.
Searcher efficiency trials	No measures to characterize searcher efficiency reported.	Yes	Yes	Yes	Yes	No measures to characterize searcher efficiency reported.	Yes	Yes	No measures to characterize searcher efficiency reported.	Yes
Carcass persistence trials	No measures to characterize carcass persistence reported.	Yes	Yes	Yes	Yes	No measures to characterize carcass persistence reported.	Yes	Yes	No measures to characterize carcass persistence reported.	No measures to characterize searcher efficiency reported.

Table B.9 (Cont.)

Project	Silver State South	Crescent Dunes	Genesis	Rice Solar	Topaz	Silver State North	Palen	Ivanpah	Desert Sunlight	Centinela
Template fatality /injury form	None reported.	Yes	Yes	Yes	Yes	None reported.	None reported.	Yes	None reported.	Yes
Data analysis	No detailed discussion of data analysis.	Two primary analyses would be conducted. The first would use the program DISTANCE to determine the most effective transect width to search for carcasses. The second would use the program MARK to estimate the total number of fatalities controlling for detection rate, scavenging rate, and proximity to the power tower.	To calculate the project-wide mortality rate (fatalities/MW/year) and the total project fatalities, using a mortality estimator (Huso 2011 or other appropriate statistical methods (e.g., Warren-Hicks, Komer-Nievergelt).	No detailed discussion of data analysis.	Bird utilization rates to be used in combination with bird mortality rates to calculate a Bird Risk Index. The Bird Risk Index would be used to identify project components that may require Adaptive Management and to assess those components that are successfully operating without impacts to birds.	No detailed discussion of data analysis.	Analyses will include preliminary adjusted mortality estimates, breakdown of fatalities by taxonomic group, resident or migratory status, location of fatality (e.g., tower, heliostats, road), and suspected cause of death (e.g.,. collision, flux). In addition, maps will be provided to display the spatial distribution of fatalities by taxonomic group and suspected cause of death. Gives a formula for determining overall mortality.	The total number of avian casualties will be estimated by adjusting for search frequency, removal bias (length of carcass persistence in the field), and searcher efficiency bias (percentage found).	No detailed discussion of data analysis.	Two primary analyses will be conducted. The first will use the program DISTANCE to determine the most effective transect width to search for carcasses. The second will use the program MARK to estimate total number of fatalities controlling for detection rate, scavenging rate, and proximity to project components.
Adaptive management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Avoidance/ minimization/ mitigation measures	Measures include: • Avoidance of: locations with federally or state-listed sensitive species and areas frequently used by birds and their nesting areas; • Reduce noise impacts; • Avoid using lattice-type structures to minimize perching and nesting; • Avoid use of guy wires; • Focus facility lights downward (light management); • Place electric lines underground; • Avoid creation of roads; • Place netting over evaporation ponds (if needed).	Measures include: • Minimize lighting; • Construct evaporation ponds in a manner to discourage wading; • Install anti-perching devices at evaporation ponds; • Install visual deterrents; and • Avoid land-clearing activities.	Measures include: • Minimize perching and nesting opportunities; • Bury telecommunication lines to minimize the risk of bird collisions; • Increase visibility of aboveground transmission lines to reduce collisions; and • Minimize lighting.	Measures include: • Limit disturbance areas and perimeter fencing, minimize road and traffic impacts; • Minimize impacts of transmission alignments; • Avoid use of toxic substances; • Minimize lighting and noise impacts; • Avoid wildlife pitfalls; • Minimize standing water; • Implement worker guidelines; • Implement erosion control measures; • Monitor ground-disturbing activities; and • Regulate fugitive dust.	A suite of measures are provided to minimize project conflicts with birds and bats, protect birds and bats from harm due to construction and operation of the project, and enhance habitat in the project vicinity for birds and bats.	Measures include: • Pre-construction surveys; • Worker environmental awareness program; • Migratory birds and raptors impacts reduction measures; • Burrowing owl measures; • If eagle fatality occurs as a result of the project, First Solar will work with the agencies to identify appropriate compensatory mitigation to ensure that the no net loss standard is maintained.	Measures include: • Project design; • Worker Environmental Awareness Program; • Noise minimization; • Pre-construction nest surveys and avoidance measures; • Avian enhancement and conservation plan; • Burrowing owl Impact minimization.	Specific measures are not described. The document states that substantial resources have been committed toward the development and implementation of avoidance, minimization, and mitigation actions to benefit the conservation of avian resources[a].	Siting criteria, design features, and BMPs have been incorporated into the project that will provide significant avoidance and minimization measures into the project to reduce the potential for adverse effects on protected avian and bat species. Measures include: • Nest avoidance.	Avoidance, minimization, and mitigation measures will be implemented to avoid or minimize bird impacts during construction and operation of the project. Examples of such avoidance, minimization and mitigation measures include the following: • Designing project electric lines in accordance with Avian Power Line Interaction Committee (APLIC) design standards; • Conducting pre-construction surveys to avoid impacts on nesting birds; • Providing for the protection of suitable habitat to compensate for impacts on burrowing owl foraging habitat; • Installing flight diverters where overhead lines cross certain riparian areas; and

Table B.9 (Cont.)

Project	Silver State South	Crescent Dunes	Genesis	Rice Solar	Topaz	Silver State North	Palen	Ivanpah	Desert Sunlight	Centinela
Avoidance/ minimization/ mitigation measures (Cont.)										• Avoidance of suitable threatened and endangered species habitat (southwestern willow flycatcher and Yuma clapper rail), including seasonal buffers for construction activities.
Compliance with APLIC Guidelines	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes- APLIC designs required as part of CEC permit process not detailed in ABMMP	Yes	Yes
Other related plans	Worker Environmental Awareness Plan, Raven Management Plan, Avian Mortality Monitoring Plan, Avian and Bat Fatality Monitoring Plan	Operations Plan (for evaporation ponds), Avian Protection Plan	Common Raven Monitoring, Management, and Control Plan; Nesting Bird Monitoring and Management Plan; Burrowing Owl Relocation and Mitigation Plan; Fire Prevention Plan; Weed Management Plan; Biological Resource Mitigation Implementation and Monitoring Plan (BRMIMP)	Raven Monitoring, Management, and Control Plan (BIO-17); Weed Management Plan (BIO-11); Revegetation Plan and Compensation for Impacts to Native Vegetation Communities (BIO-10); Special Status Plant Impact Avoidance and Minimization Plan; Desert Tortoise Translocation Plan (BIO-15); Evaporation Pond Design, Monitoring, and Management Plan (BIO-24); Burrowing Owl Monitoring and Mitigation Plan	Vegetation Management Plan (VMP); Topaz Habitat Restoration and Revegetation Plan; Bird Monitoring and Avoidance Plan; dust control pond management plan	Fire Management Plan; Noxious Weed Management and Rehabilitation Plan	Lighting Mitigation Plan; Nesting Bird Monitoring and Management Plan; Avian Enhancement and Conservation Plan; Retrofit Plan; Burrowing Owl Mitigation Plan; Eagle Protection Plan	CEC permits require Raven Management Plan, Closure, Revegetation and Rehabilititation Plan, Weed Management Plan, Special-Status Plant Protection and Monitoring Plan, Compensatory Mitigation Plan, Desert Tortoise Relocation/Translocation Plan, Biological Resources Mitigation Implementation and Monitoring Plan, Burrowing Owl Mitigation and Monitoring Plan	Common Raven Management Plan for the Desert Sunlight Solar Farm; Integrated Weed Management Plan	Burrowing Owl Mitigation and Monitoring Plan; Raven Control Plan

[a] Management actions must be feasible and commensurate with the impact. Some examples of measures include placement of visual and/or auditory bird flight diverters in critical locations, retrofitting power lines to APLIC standards, installing perch guards on overhead electric lines in the vicinity, modification of mirror resting angles, modifications to tower or other facility lighting.



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Appendix E
Cultural Resources Documentation

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Environmental Scientists *Planners* *Engineers*

M E M O R A N D U M

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Date: March 2021

To: Kern County Planning Department

Project: Aratina Solar Project

From: David Daitch, Ph.D., Principal

Subject: Addendum to Volumes II through VI of the Cultural Resources Assessment Report (August 2020) and Volume VII of the Cultural Resources Assessment Report (December 2020)

64NB 8ME LLC has recently submitted to the Kern County Planning Department a revised project footprint associated with Conditional Use Permit (CUP) application. This revision to the Aratina Solar Project reduces the project's proposed footprint from approximately 2,700 acres to approximately 2,300 acres. One consequence of the revised footprint is an increased setback from the nearby communities of Boron and Desert Lake. Attached for reference is a figure illustrating the previous and current proposed project footprint.

This Addendum to Volumes II through VI of the Cultural Resources Assessment Report (August 2020) and Volume VII of the Cultural Resources Assessment Report (December 2020) for the Aratina Solar Project has been prepared to document the above-described change in project footprint and to additionally document that the recent change in project footprint does not change the findings of the Cultural Resources Assessment Report, as described below.

Potential Impacts

The Cultural Resources Assessment Report found that the project footprint associated with Project Sites 1 through 5 and the Gen-Tie Route Alternatives was sensitive for historic and prehistoric archaeological resources. Mitigation Measures were proposed to reduce the potential for impacts to subsurface discoveries during construction. The Cultural Resources Assessment Report additionally found that Project Site 4 and the Gen-Tie Route Alternatives have the presence of prehistoric sites that have the potential to retain significant data potential and proposed additional mitigation measures associated with avoidance and/or archaeological testing. Site Aratina S-008 is associated with Project Site 4 and site Aratina S-004 and site Aratina S-006 are associated with the Gen-Tie Route Alternatives.

The 400-acre reduction in footprint associated with the proposed project is associated with Project Sites 1, 2, 3, and 4. The reduced footprint would reduce the total acres of the proposed project that are sensitive for historic and prehistoric archaeological resources. The reduced footprint would not avoid site Aratina S-008, associated with Project Site 4, or sites Aratina S-004 and S-006, which are associated with the Gen-Tie Route Alternatives.

Proposed Mitigation Measures

The Cultural Resources Assessment Study recommended four measures relating to the potential for impacts to subsurface discoveries during construction for Project Sites 1 through 5 plus the Gen-Tie Route Alternatives, as identified below:

- Archaeological Sensitivity Training
- Archaeological and Native American Monitoring
- Unanticipated Discovery of Cultural Resources
- Unanticipated Discovery of Human Remains

Additionally, for Project Site 4 and the Gen-Tie Route Alternatives, the following measures would be implemented:

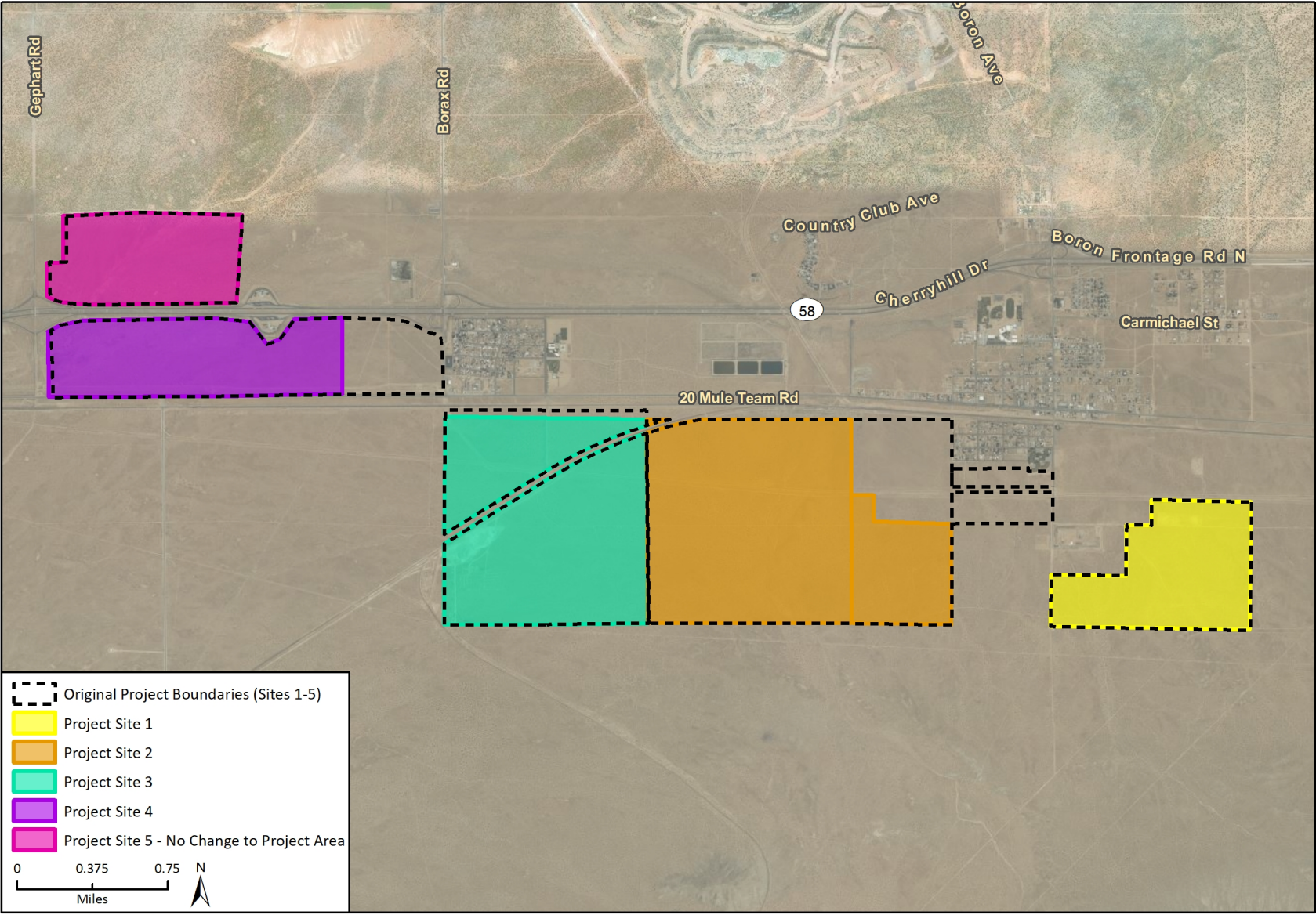
- Avoidance (associated with Aratina S-004, Aratina S-006, and Aratina S-008)
- Archaeological Testing (triggered if avoidance of Aratina S-004, Aratina S-006, or Aratina S-008 is not feasible)

Implementation of the above recommended mitigation measures would reduce potential project impacts to historic and prehistoric archaeological resources, as well as to prehistoric sites Aratina S-004, Aratina S-0006, and Aratina S-008, and would not change as a result of the reduced project footprint.

Conclusion

The revised footprint submitted by 64NB 8ME LLC to the Kern County Planning Department for the Aratina Solar Project would reduce the proposed project footprint by approximately 400 acres, which would shift the project footprint associated with Project Sites 1, 2, 3, and 4 away from the communities

of Boron and Desert Lake. The revised footprint does not change the existing conditions, the impacts analysis, or the proposed mitigation in any way. As such, the Cultural Resources Assessment Study prepared for the Aratina Solar Project represents the worst-case potential impacts related to archaeological resources for the proposed project and no additional analysis is required.



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Aratina Solar Project

Cultural Resources Assessment Report

Volume I

prepared for
64NB 8ME LLC
5455 Wilshire Boulevard, Suite 2010,
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August 2020

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1 Introduction

Rincon Consultants, Inc. (Rincon) was retained by 64NB 8ME LLC to conduct a Phase I cultural resources study for the Aratina Solar Project in the Antelope Valley of Kern County, California. The total project site and gen-tie alternatives consist of approximately 2672.53 acres located in the vicinity of the communities of Desert Lake and Boron (Figure 1 and Figure 2). This cultural resources study includes a cultural resources records search, a Sacred Lands File Search and Native American contacts program, a pedestrian survey, and the preparation of this technical report according to the Archaeological Resources Management Report guidelines set by the California Office of Historic Preservation and in compliance with the requirements of the California Environmental Quality Act (CEQA).

The Aratina Solar Project is divided into five separate project sites. The results of this study are presented by project site in Volumes II through VII. This volume, Volume I, presents a summary of the project and methods used for the study. A summary of report volumes is presented in Table 1.

Table 1 Volume Summary

Volume	Contents
Volume I	Introduction
Volume II	Project Site 1
Volume III	Project Site 2
Volume IV	Project Site 3
Volume V	Project Site 4
Volume VI	Project Site 5
Volume VII	Gen-Tie Route Alternatives
Volume VIII	Appendices

1.1 Project Location

The Aratina Solar Project area is located in the unincorporated area of Kern County, straddling State Route 58, between Gephart Road on the west and the San Bernardino County line on the east. The project area is in the vicinity of the unincorporated communities of Boron and Desert Lake.

1.2 Project Description

64NB 8ME LLC (the Applicant) is seeking approval of five (5) separate project sites for the construction of an up to 600 megawatt-alternating current (MW-AC) utility-scale solar farm with energy storage known as Aratina Solar Farm (“Aratina” or the “project”) in Kern County, California (Figure 1 and Figure 2). The Applicant proposes to construct, own, and operate Aratina. The five project sites are summarized in Table 2.

Figure 1 Project Location Map

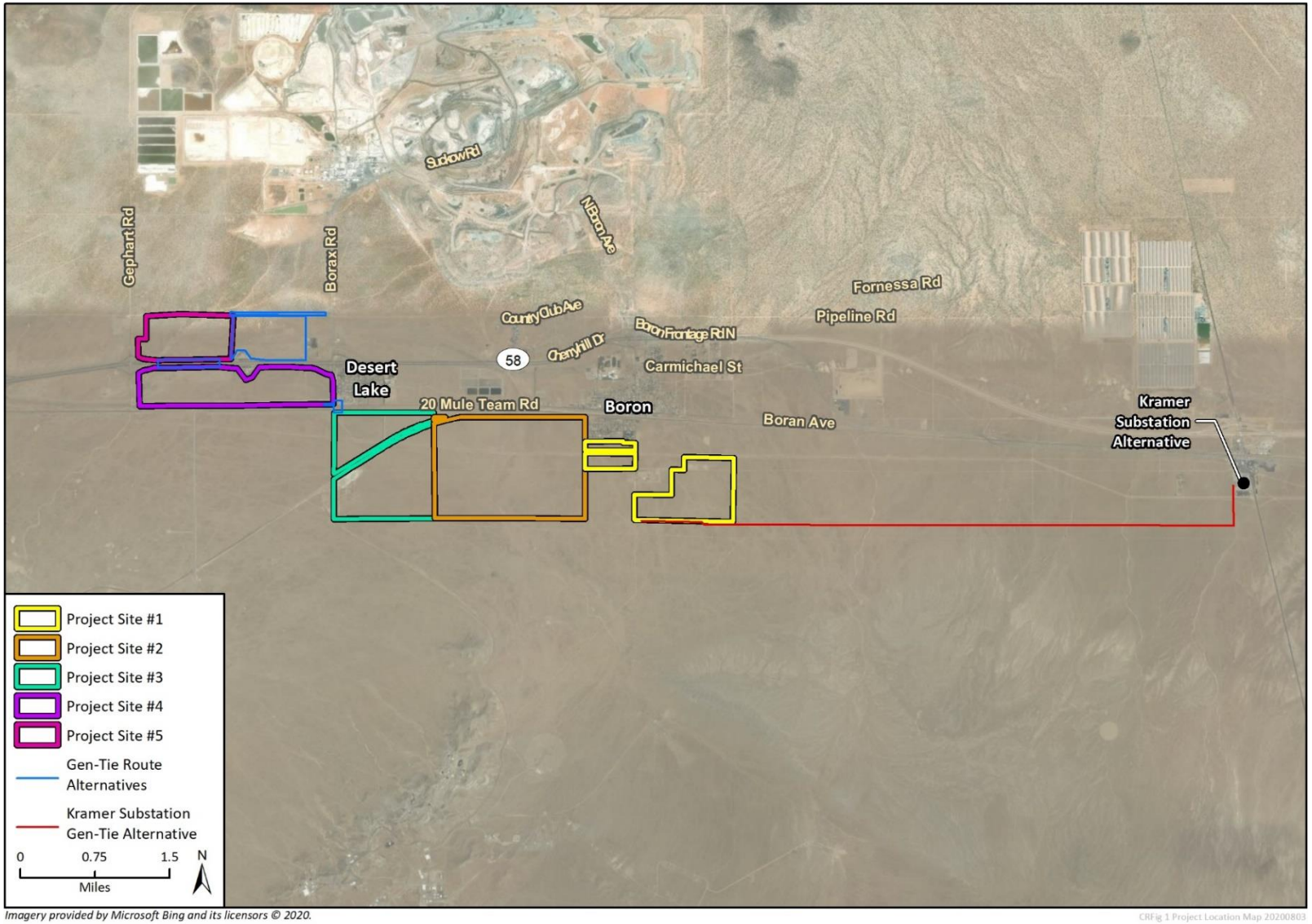
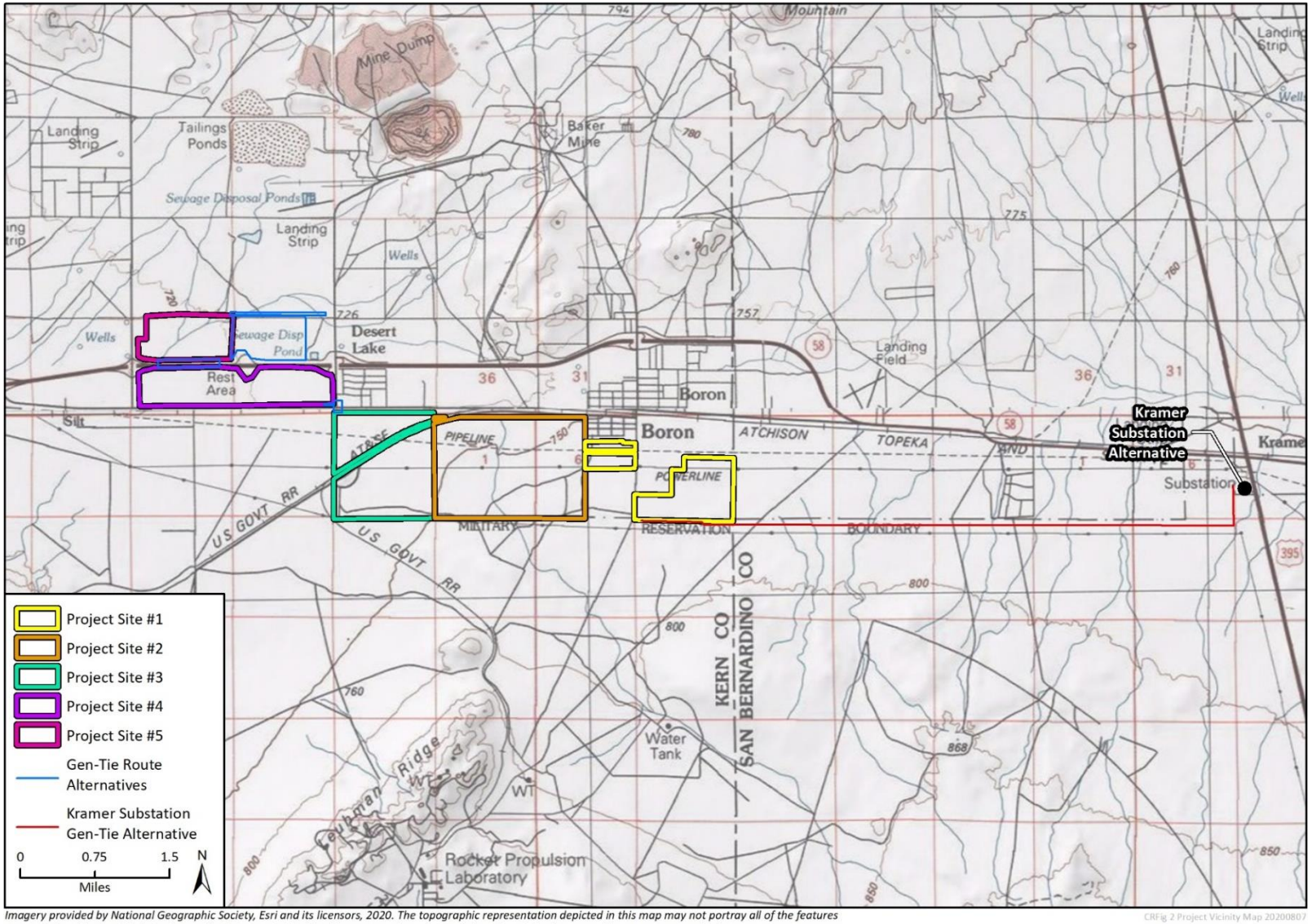


Figure 2 Project Vicinity Map



Imagery provided by National Geographic Society, Esri and its licensors, 2020. The topographic representation depicted in this map may not portray all of the features currently found in the vicinity today and/or features depicted in this map may havechanged since the original topographic map was assembled.

CRFig 2 Project Vicinity Map 20200807

Table 2 Project Site Summary

Project Site	Gross Acreage
Project Site 1	372.6
Project Site 2	957.3
Project Site 3	646.0
Project Site 4	455.9
Project Site 5	280.0
Total	**2,711.6**

The Applicant proposes to develop a photovoltaic (PV) energy facility with energy storage system (up to 600 MW-AC each of solar PV and energy storage) in the project area. Power generated by Aratina will be delivered from the project site via up to 230 kV overhead and/or underground electrical transmission line(s), originating from one or more on-site substation(s)/switchyard(s), and terminating at the Southern California Edison (SCE) Holgate substation. Alternatively, Aratina may interconnect at the SCE Kramer substation in San Bernardino County.

Each Aratina project site may include operations and maintenance (O&M) buildings, substations, energy storage systems, and/or transmission facilities, as necessary, or each project site may share such facilities with each other or with any future energy projects in the area, and/or it may be remotely operated. Any "unused" O&M building, substation, and/or transmission facility areas on-site may be covered by solar panels under such scenarios.

1.3 Personnel

Rincon archaeologist Hannah Haas, MA, RPA provided management oversight for this cultural resources study and serves as principal investigator. Ms. Haas meets the Secretary of the Interior's Professional Qualifications Standards for prehistoric and historic archaeology (National Park Service 1983). Rincon archaeologist Mark Strother, MA, led the field survey, and is the primary author of this report. Rincon archaeologist Dustin Merrick conducted the Native American outreach, assisted with the field survey, and is a contributing author to this report. Cultural resource specialists Kent Smolik, Daphne Douglas, Will Huey, Cynthia Stoddard, Nickolas Diaz, Kongmeng Vang, and Amber Blevins participated in the pedestrian survey. Geographic Information Systems analysts Allysen Valencia and John Donoghue prepared the figures for this report. Senior Technical Editor April Durham, PhD and Principal Christopher Duran, MA, RPA, reviewed this report for quality control.

2 Regulatory Setting

This section includes a discussion of the applicable state and local laws, ordinances, regulations, and standards governing cultural resources to which the proposed project should adhere before and during implementation.

2.1 State Regulations

CEQA requires a lead agency to determine whether a project may have a significant effect on historical resources (Public Resources Code [PRC], Section 21084.1) or tribal cultural resources (PRC Section 21074[a][1][A]-[B]). A historical resource is a resource listed, or determined to be eligible for listing in the California Register of Historical Resources (CRHR); a resource included in a local register of historical resources; or an object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be *historically significant* (State CEQA Guidelines, Section 15064.5[a][1-3]).

A resource shall be considered *historically significant* if it meets any of the following criteria:

1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage
2) Is associated with the lives of persons important to our past
3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values
4) Has yielded, or may be likely to yield, information important in prehistory or history

Generally, a cultural resource must be at least 50 years of age to be considered for listing on the CRHR. Resources that have achieved significance within the past 50 years may also be eligible for inclusion in the CRHR, provided that enough time has lapsed to obtain a scholarly perspective on the events or individuals associated with the resource (Office of Historic Preservation n.d.:3).

If it can be demonstrated that a project will cause damage to a *unique archaeological resource*, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that resources cannot be left undisturbed, mitigation measures are required (PRC Section 21083.2[a], [b]).

PRC Section 21083.2(g) defines a *unique archaeological resource* as an artifact, object, or site about which it can be demonstrated clearly that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1) Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information
2) Has a special and particular quality such as being the oldest of its type or the best available example of its type
3) Is directly associated with a scientifically recognized important prehistoric or historic event or person

2.2 Local Regulations

The Kern County General Plan covers specific information that states the County's policy and implementation measures regarding cultural resources.

2.2.1 Kern County General Plan

Policy 25

The County will promote the preservation of cultural and historic resources, which provide ties with the past and constitute a heritage value to residents and visitors.

Implementation Measures

Measure K Coordinate with the California State University, Bakersfield's Archaeology Inventory Center.

Measure L The County shall address archaeological and historical resources for discretionary projects in accordance with the California Environmental Quality Act (CEQA).

Measure M In areas of known paleontological resources, the County should address the preservation of these resources where feasible.

Measure N The County shall develop a list of Native American organizations and individuals who desire to be notified of proposed discretionary projects. This notification will be accomplished through the established procedures for discretionary projects and CEQA documents.

Measure O On a project specific basis, the County Planning Department shall evaluate the necessity for the involvement of a qualified Native American monitor for grading or other construction activities on discretionary projects that are subject to a CEQA document.

3 Setting

Archaeologists have proposed several chronological sequences to describe cultural change in southern California (Jones and Klar 2007, Moratto 2004). Most recently, Sutton et al. (2007) devised an updated Mojave Desert cultural history, dividing it into four temporal periods: Pleistocene, Early Holocene, Middle Holocene, and Late Holocene. This chronology is presented in Table 3.

3.1 Prehistoric Context

Table 3 Cultural Chronology for the Mojave Desert

Approximate Date Range	Temporal Period	Cultural Complex	Previously Known As
Pre- 12,000 cal BP*	Late Pleistocene	Pre-Clovis	Early Man Pre-Projectile Point
12,000- 10,000 cal BP	Terminal Pleistocene	Paleoindian	Clovis Big Game Hunting Tradition
10,000- 8,000 cal BP.	Early Holocene	Lake Mojave	Western Pluvial Lakes Tradition
		Pinto	San Dieguito Complex
9,000- 5,000 cal BP	Middle Holocene		Little Lake
		Deadman Lake	N/A
4,000 – 1,600 cal BP	Late Holocene	Gypsum	Newberry
1,600 – 850 cal BP		Rose Spring	Saratoga Springs I Haiwee
850 cal BP - Historic		Late Prehistoric	Shoshonean Marana Protohistoric

3.1.1 Pleistocene Period (12,000 to 10,000 cal BP)

The climate of the Pleistocene Period in the Mojave Desert is generally characterized as cool and wet (Sutton et al. 2007: 231). During this time, the Mojave Desert featured several pluvial lakes. The presence of lakes generally indicates an environment with plentiful food and water resources suitable for early human habitation, especially compared to the harsher desert environment now present. However, claims of pre-Clovis (ca. before 11,500 BP) archaeological sites in the Mojave Desert remain controversial and are not accepted by most professional archaeologists. Nonetheless, it is possible that such occupation occurred and sites with reliable early dates may yet be found, as has happened elsewhere in the Americas.

The Clovis Complex is the earliest and only Paleo-Indian cultural complex widely accepted in the Mojave Desert (Sutton et al. 2007:233-234). Dating to approximately 11,500 BP, this complex is defined predominantly by large lanceolate-shaped bifaces with fluting, prepared to thin and flatten the base of the artifact for hafting. Other tools associated with the Clovis Complex include large side

scrapers, blades derived from prepared cores, and a mixture of expedient flaked tools (Justice 2002:73). Paleo-Indian populations associated with fluted point technology consisted of small, mobile groups who hunted and gathered near permanent sources of water such as pluvial lakes. The tools associated with these populations are found most commonly in the drainage basins of the pluvial lakes (Sutton et al. 2007:234).

Fluted points have been interpreted traditionally as tools used for hunting Pleistocene megafauna due to their clear association with megafaunal remains in the Great Plains and Southwest, but most fluted points found in California have lacked corroborating Pleistocene radiocarbon dates (Arnold et al., 2004). One exception was found during excavations at China Lake in the early 1970s, where fluted points associated with burned remains of extinct megafauna were uncovered (Davis 1975). As Davis and Panlaqui (1978:31) noted, the sites at China Lake demonstrate that Paleo-Indians exploited many available resources, not just megafauna.

Evidence of terminal Pleistocene and early Holocene habitation in the Mojave Desert has remained sparse until recently. Evidence of late Pleistocene occupation was identified on the southern slopes of the Tehachapi Mountains near Cottonwood Creek in the form of a basal fragment of a fluted Clovis projectile point (Glennan, 1971, 1987). Basgall and Overly (2004) have found evidence of occupation near Pleistocene China Lake and Fort Irwin yielding radiocarbon dates from 9,500-8,000 cal BP

3.1.2 Early Holocene (10,000 to 8,000 cal BP)

Warmer temperatures, reduced precipitation, and the eventual drying up of the Pleistocene pluvial lakes mark the onset of the Early Holocene. These changes are believed to have caused an irregular distribution of resources available to the Early Holocene inhabitants (Sutton et al. 2007:237). The shallow lakes and marshes of the Mojave Desert during this period were biologically productive, but surrounded by desert vegetation typical of later periods, initially dominated by white bursage and later, by creosote bush (Grayson 1993:199-200). The Lake Mojave Complex is the only clear complex in the region during this time and reflects an increasingly diversified subsistence strategy that was necessary for successful adaptation to climatic changes.

The Lake Mojave Complex is identified primarily by heavy, stemmed projectile points attributable to the Great Basin Stemmed series, such as Lake Mojave and Silver Lake. Other Lake Mojave Complex tools include bifaces, steep-edged unifaces, crescents, the occasional cobble-core tool, and, infrequently, ground stone implements (Justice 2002:91). Settlement organization components include extensive residential accumulations, workshops, and small camps containing a handful of formed tools (Sutton et al. 2007: 237).

While earlier research presumed a dependence on lacustrine subsistence strategies, recent studies have found Lake Mojave Complex sites in other contexts (e.g., Basgall 2005, Basgall and Jurich 2006, Giambastiani and Berg 2008:14). Sutton et al. (2007:237) stated that the Lake Mojave assemblages included tools that are “consistent with long-term curation and transport.” The presence of exotic lithic materials and marine shell beads in Lake Mojave Complex assemblages further supports the assertion that these people were highly mobile and possibly traded with groups over long distances.

3.1.3 Middle Holocene (9,000 to 5,000 cal BP)

The middle Holocene climate was generally more arid than periods before and after, but experienced multiple oscillations between wetter and drier conditions throughout the middle Holocene. The desiccation of the lakes and marshes of the Pleistocene and early Holocene required

the region's inhabitants to rely on streams and springs for water, resulting in lower occupational densities (Aikens 1978, Basgall 2000, Cleland and Spaulding 1992, Sutton 1996, Warren 1984). Average temperatures and aridity increased, peaking between 8000 and 6000 cal BP Settlement patterns adapted, including a shift to upland settings where sources of water still existed and changes in tool assemblage content and diversity marking the emergence of the Pinto Complex (Sutton 1996).

Campbell and Campbell defined the Pinto Complex in 1935 based on their work at the Pinto Basin site, but the complex has a wider distribution throughout the Mojave Desert than previous ones. During the latter part of the Early Holocene, archaeological data indicate that the Pinto Complex overlaps the Lake Mojave Complex (Sutton et al., 2007:237). The Pinto Complex reflects shifts in subsistence patterns and adaptation to the shrinking of the Pleistocene lakes, including a greater emphasis on the exploitation of plants, with the continued pursuit of artiodactyls and smaller game. The broad distribution of this complex implies a high degree of residential mobility. The hallmarks of the Pinto Complex tool assemblage include concave base and bifurcate base projectile points with strong basal ears and more gradual shoulders (Justice 2002:126, Zyniecki 2003:12). Other diagnostic artifacts of this complex include domed and keeled scrapers, large and small leaf-shaped bifaces, core/cobble tools, large metates and milling slabs, and shaped and unshaped handstones.

Near the end of the middle Holocene the climate became increasingly hotter and more arid. Very few sites date to this period, falling between 5000 and 4000 cal BP This suggests that populations were very low. It is possible that some areas were abandoned during this hot period (Sutton et al. 2007:241).

3.1.4 Late Holocene (4,000 cal BP to European Contact)

The climate of the late Holocene was similar to current conditions: cooler and more moist than the middle Holocene, but not as cool and moist as the early Holocene. The climate remained highly variable with periods that included the Mojave lakes refilling to levels of earlier high stands, contrasted with at least two major droughts, circa 1124 to 904 BP, and circa 807 to 660 BP (Stine 1994). A cooler and wetter period occurred between 550 and 100 cal BP (Cleland and Spaulding 1992:4). These climatic changes at the onset of the late Holocene once again resulted in modified subsistence strategies and correlating tool kits of three progressive cultural complexes: Gypsum Complex, Rose Spring Complex, and Late Prehistoric Complex (or period).

Dart-point size projectile points including notched or eared (Elko), concave base (Humboldt), and small-stemmed (Gypsum) types characterized the projectile points of the Gypsum Complex. In addition to these diagnostic points, Gypsum Complex sites included leaf-shaped points, rectangular-based knives, flake scrapers, drills, and occasionally, large scraper planes, choppers, and hammerstones (Warren 1984:416). Manos and milling stones were common, and the mortar and pestle were also introduced during this period. Other artifacts found at Gypsum Complex sites include split-twig animal figurines, *Olivella* shell beads, and *Haliotis* spp. beads and ornaments, which are indicative of trade with people from the southern California coast and southern Great Basin. The inhabitants of the Mojave Desert exported high-quality locally available CCS tool stone such as obsidian, chalcedony, and chert in exchange for exotic materials.

By 1750 cal BP, a slightly cooler climate appears to have provided for increased population, based on a higher frequency of archaeological sites. The Rose Spring Complex was present from approximately 1815 to 915 cal BP, with regional temporal variations known as the Saratoga Springs, Haiwee, or Amargosa periods (Sutton 1996, Sutton et al. 2007:236). The smaller Rose Spring

projectile points replaced the dart-size points of previous complexes and heralded the introduction of the bow and arrow (Yohe 1998). The bow and arrow provided its user a way to rapidly fire multiple projectiles during hunting or warfare and from a position of relative security compared to the atl-atl or spear. This technological innovation appears to correspond with the onset of the Numic expansion westward to the coast, which some researchers believe started from southeastern California (Bettinger and Baumhoff 1982, Grayson 1993). Bedrock milling features supplement portable milling stones in villages and ancillary sites within the California deserts.

The Late Prehistoric period (circa 900–250 cal BP) corresponds to the introduction of ceramic artifacts in the Mojave Desert region as well as replacement of Rose Spring projectile points with even smaller Desert Side-notched points and Cottonwood series points. Use of mortar and pestle became more widespread during this period and evidence of food storage facilities becomes increasingly common in the archaeological record. In the central Mojave Desert, the Mojave River became a primary focus of occupation, and trade networks increased along the Mojave River and over the San Gabriel Mountains (Sutton 1996).

Archeological evidence left by highly mobile hunter-gatherers in the Mojave Desert during the Late Prehistoric period is typified by sparse scatters of flaked stone, ground stone, and ceramic artifacts and features such as hearths, rock rings, and trails

3.2 Ethnographic Context

The project area is within a transitional zone that was occupied by multiple cultural groups including the Serrano, Kitanemuk and Tataviam (cf., Bean and Smith 1978; Blackburn and Bean 1978; Kroeber 1925; Sutton 1988). All of these groups are better associated with portions of the surrounding mountains – Serrano to the northeast, Kitanemuk to the northwest, Tataviam to the southwest – but all of them likely visited the Antelope Valley floor as part of their resource exploitation strategies. Ethnographic boundaries in the Mojave Desert are loosely defined, owing to the highly mobile nature of desert settlement and resource extraction strategies, as well as the variety of interpretations presented by previous researchers. The following sections provide brief overviews of the three groups likely to have ethnographically used the project area.

3.2.1 Serrano

The Serrano occupied an area in and around the San Bernardino Mountains between approximately 450 and 3,350 meters (1,500-11,000 feet) above mean sea level. Their territory extended west of the Cajon Pass, east past Twentynine Palms, north of Victorville, and south to Yucaipa Valley. The Serrano language is part of the Serran division of a branch of the Takic family of the Uto-Aztecan linguistic stock (Mithun 2001:539, 543). The two Serran languages, Kitanemuk and Serrano, are closely related. Kitanemuk lands were northwest of Serrano lands. Serrano was spoken originally by a relatively small group located within the San Bernardino and Sierra Madre mountains, and the term “Serrano” has come to be ethnically defined as the name of the people in the San Bernardino Mountains (Kroeber 1925:611). The Vanyume, who lived along the Mojave River and associated Mojave Desert areas and are also referred to as the Desert Serrano, spoke either a dialect of Serrano or a closely related language (Mithun 2001:543). Year-round habitation tended to be located on the desert floor, at the base of the mountains, and up into the foothills, with all habitation areas requiring year-round water sources (Bean and Smith 1978).

Most Serrano lived in small villages located near water sources (Bean and Smith 1978:571). Houses measuring 12 to 14 feet in diameter were domed and constructed of willow branches and tule

thatching; they were occupied by a single extended family. Many of the villages had a ceremonial house, used both as a religious center and the residence of the lineage leaders. Additional structures within a village might include granaries and a large circular subterranean sweathouse. The sweathouses were typically built along streams or pools. A village was usually composed of at least two lineages. The Serrano were organized loosely along patrilineal lines and associated themselves with one of two exogamous moieties or "clans"—the Wahiyam (coyote) or the Tukum (wildcat) moiety.

The subsistence economy of the Serrano was one of hunting and collecting plant goods, with occasional fishing (Bean and Smith 1978:571). They hunted large and small animals, including mountain sheep, deer, antelope, rabbits, small rodents, and various birds, particularly quail. Plant staples consisted of seeds; acorn nuts of the black oak; piñon nuts; bulbs and tubers; and shoots, blooms, and roots of various plants, including yucca, berries, barrel cacti, and mesquite. The Serrano used fire as a management tool to increase yields of specific plants, particularly chía.

Trade and exchange was an important aspect of the Serrano economy. Those living in the lower-elevation, desert floor villages traded foodstuffs with people living in the foothill villages who had access to a different variety of edible resources. In addition to inter-village trade, ritualized communal food procurement events, such as rabbit and deer hunts and piñon, acorn, and mesquite nut-gathering events, integrated the economy and helped distribute resources that were available in different ecozones.

Contact between Serrano and Europeans was relatively minimal prior to the early 1800s. As early as 1790, however, Serrano began to be drawn into mission life (Bean and Vane 2002). More Serrano were relocated to Mission San Gabriel in 1811 after a failed indigenous attack on that mission. Most of the remaining western Serrano were moved to an asistencia built near Redlands in 1819 (Bean and Smith 1978:573).

A smallpox epidemic in the 1860s killed many indigenous southern Californians, including many Serrano (Bean and Vane 2002). Oral history accounts of a massacre in the 1860s at Twentynine Palms may have been part of a larger American military campaign that lasted 32 days (Bean and Vane 2002:10). Surviving Serrano sought shelter at Morongo with their Cahuilla neighbors; Morongo later became a reservation (Bean and Vane 2002). Other survivors followed the Serrano leader, Santos Manuel, down from the mountains and toward the valley floors and eventually settled what later became the San Manuel Band of Mission Indians Reservation, formally established in 1891.

Both the San Manuel Band of Mission Indians and the Morongo Band of Mission Indians are federally recognized tribes and include Serrano. People of both tribes participate in cultural programs to revitalize traditional languages, knowledge, and practices.

3.2.2 Kitanemuk

The Kitanemuk are one of the least-understood ethnographic groups in California, despite being considered by researchers as the primary aboriginal inhabitants of Antelope Valley (Sutton 1979, 1987, 1988). Kitanemuk territory extended from the Tehachapi Mountains at the northwestern edge of the Antelope Valley southeast to beyond Rosamond Lake, although their populations were most dense in the mountains at the southern end of the San Joaquin Valley (Blackburn and Bean 1978:564; Kroeber 1925:611). The Kitanemuk were primarily mountain dwellers who lived in semi-permanent village sites that functioned as year-round base camps; during the late winter and early spring, expeditions ventured onto the desert floor in pursuit of available seasonal resources (Earle 1997).

Kroeber (1925:611) noted that the Kitanemuk were a subdivision of the Serrano, and thus spoke a language of the Takic family that was similar to dialects spoken by groups living as far south and east as Yucca Valley and Twentynine Palms. Although some aspects of Kitanemuk social organization are similar to those of other Takic speaking groups, Blackburn and Bean (1978:564) argue that Kitanemuk ritual, mythology, and shamanism were most strongly shaped by their neighbors to the north (Kawaiisu and Tubatulabal) and west (Chumash). The Kitanemuk appear to have enjoyed particularly strong trade ties with coastal and inland Chumash groups (Blackburn and Bean 1978:564; Kroeber 1925:613). Modern-day descendants of the Kitanemuk live at the Tule River Reservation, Porterville, and Tejon Ranch (Four Directions Institute 2007).

3.2.3 Tataviam

Like the Kitenamuk, the Tataviam were not well documented by early ethnographers. However, researchers today generally agree that the Tataviam spoke a Uto-Aztecan language, most likely a Takic language (Hudson 1982). Tataviam territory included the upper Santa Clara River from Piru Creek eastward, extending over the Sawmill Mountains to the southwest edge of the Antelope Valley (King and Blackburn 1978). Their territory was bounded on the west and north by various Chumash groups; on the south by the Tongva (Gabrielino and Fernandeño, though some Tataviam were also identified as Fernandeño because of their association with Mission San Fernando); and to the east by the Kitanemuk and Serrano.

Exogamous marriage was common, with Tataviam intermarrying with Tongva, Chumash, and Kitanemuk neighbors (King and Blackburn 1978). King and Blackburn (1978) hypothesize that the Tataviam relied on yucca as a food source more than their neighbors because of the predominance of large south-facing slopes within their territory. Additional food resources included acorns, sage seeds, berries, small mammals, and deer. Settlement size ranged from 10 to 200 persons, with small settlements often ancillary to large villages. Archaeological evidence from Bower's Cave – located between Newhall and Piru – combined with ethnographic evidence suggest their ritual organization was similar to both the Chumash and Gabrielino, whose lifestyles were distinct from one another. By 1810, the Tataviam were almost completely "missionized" through baptism at Mission San Fernando.

3.3 Historic Setting

Post-European contact history for the state of California is divided generally into three periods: the Spanish Period (1769 to 1822), the Mexican Period (1822 to 1848), and the American Period (1848 to present). The following provides a general discussion of the history of California following European contact.

3.3.1 Spanish Period (1769 to 1822)

In 1542, Juan Rodriguez Cabrillo led the first European expedition to observe what is now called southern California. For more than 200 years, Cabrillo and other Spanish, Portuguese, British, and Russian explorers sailed the Alta (upper) California coast and made limited inland expeditions, but they did not establish permanent settlements (Bean 1968, Rolle 2003).

Gaspar de Portolá and Franciscan Father Junípero Serra established the first Spanish settlement in Alta California at Mission San Diego de Alcalá in 1769. This was the first of 21 missions erected by the Spanish between 1769 and 1823. While Spanish missions were established in San Bernardino

County, Native Americans in the region were influenced by other Native Americans migrating to the area, driven from their homelands by encroachment of the Spanish.

During this period, Spain also deeded ranchos to prominent citizens and soldiers, though very few in comparison to the following Mexican Period. To manage and expand herds of cattle on these large ranchos, colonists enlisted the labor of the surrounding Native American population (Engelhardt 1927a). The missions were responsible for administrating the local people as well as converting the population to Christianity (Engelhardt 1927b). Inevitably, this increased local population density and contact with diseases brought by Europeans greatly reduced the Native American population (McCawley 1996). Native American populations in San Bernardino County were less affected by the missions. However, in some cases, individuals were taken from their tribes to be educated at one of the missions before being sent back (Morgan 1914).

The first known Spanish explorers to enter the Mojave Desert were a group of soldiers led by Pedro Fages in 1772. In 1776, Friar Francisco Garcés, traveled through the area coming from the Colorado River (Hoover et al. 2002:321). Friar Garcés traveled as far as the Pacific coast along an ancient trade route, known as the Mojave Trail, and he named the Mojave River Arroyo de los Mártires (Stream of the Martyrs). The river was later named Rio de las Animas (River of Souls) by Fr. Joaquín Pasqual Nuez, who accompanied the 1819 expedition of Lt. Gabriel Moraga.

3.3.2 Mexican Period (1822 to 1848)

The Mexican period commenced when news of the success of the Mexican Revolution (1810-1821) against the Spanish crown reached California in 1822. This period saw extensive interior land grant development as well as exploration west of the Sierra Nevada Mountains by American fur trappers. The California missions declined in power and were ultimately secularized in 1834. The hallmark of the Mexican period was large ranchos deeded to prominent Mexican citizens, frequently soldiers, by the governor. These ranchos became important economic and social centers. However, no ranchos were claimed in the arid Mojave Desert. Rancho San Bernardino, situated in the southwestern corner of San Bernardino County, was the closest land grant to the current project site, located approximately 160 kilometers (100 miles) to the west. Governor Pío Pico and his predecessors made more than 600 rancho grants between 1833 and 1846, putting most of the state's lands into private ownership for the first time (Gumprecht 1999). During the Mexican period, trappers and explorers from the eastern United States repeatedly journeyed westward. Jedidiah Strong Smith, one of these early American adventurers, traveled through the Mojave Desert in 1826 and 1827 and nicknamed the Mojave River the "Inconstant River" because of its frequent disappearance beneath the ground surface.

3.3.3 American Period (1848 – Present)

The American Period officially began with the signing of the Treaty of Guadalupe Hidalgo in 1848, in which the United States agreed to pay Mexico $15 million for the conquered territory, including California, Nevada, Utah, and parts of Colorado, Arizona, New Mexico, and Wyoming. In 1850, California was admitted to the Union as the 31st state.

The discovery of gold in northern California in 1848 led to the California Gold Rush and subsequent farming and city/town development in the northern/central portions of California. Southern California remained dominated by cattle ranches in the early American Period, though droughts and increasing population resulted in ranching being increasingly supplanted by farming and more urban professions through the late nineteenth century. By 1853, the population of California exceeded

300,000. Thousands of settlers and immigrants continued to immigrate into the state, particularly after the completion of the transcontinental railroad in 1869.

During the Gold Rush, thousands of people traveled the Mojave River Trail from points east, attempting to reach the fabled goldfields of California. Captain John C. Frémont called the Mojave River Trail the Old Spanish Trail until he met a group of Native Americans northeast of Victorville who told Frémont they had lived along the Mojave River and the mountains to the north and traded with other indigenous peoples in the region along the Mojave River Trail (Frémont 1845:260).

3.3.4 Boron

Boron is a census-designated place in the County of Kern, California, and is most famous for its extensive colemanite (a borax ore) deposits used in the production of boron and boric acid. In 1925, one of the largest deposits of borax was discovered and led to the establishment of the world's largest boron mine (Shumway et al. 1980). This mine is still in existence today, employs nearly 800 people in Boron, and supplies nearly half the world's boron.

4 Background Research

Background research for the cultural resource assessment included records searches, a review of historical maps and aerial photographs, Native American outreach, and historical group consultation. A summary of each of these efforts follows.

4.1 Cultural Resources Record Search

On February 14, 2019, Rincon requested a search of the California Historical Resources Information System from the Southern San Joaquin Information Center (SSJVIC) at California State University, Bakersfield. The search was conducted to identify any previously recorded cultural resources and previously conducted cultural resources studies at the project site and within a 0.5-mile radius. The records search also included a review of the NRHP, the CRHR, the Archaeological Determinations Eligibility List, and the Historic Resources Inventory. Appendix A provides a summary of the records search results. Volumes II through VII present the records search results for each individual project site and the Gen-Tie route alternatives.

4.2 Historical Imagery Review

Rincon reviewed historic aerials and topographic maps from HistoricAerials.com and from the United States Geologic Survey (USGS) “Topoview” webpage. These images were reviewed to identify potential cultural resource concerns on the project site. Volumes II through VII present the results for each individual project site and the Gen-Tie route alternatives.

4.3 Native American Outreach

Rincon contacted the Native American Heritage Commission (NAHC) on April 11, 2019 to request a Sacred Lands File search of the project site. As part of this request, Rincon asked the NAHC to provide a list of Native American groups and/or individuals culturally affiliated with the area who may have knowledge of cultural resources in the project site. Rincon followed up with the NAHC on May 1, 2019. On May 14, 2019 the NAHC responded with negative results and two contacts that may have knowledge of resources in the region.

5 Field Survey

Rincon archaeologists Mark Strother, Kent Smolik, Daphne Douglas, Will Huey, Cynthia Stoddard, Nickolas Diaz, Kongmeng Vang, and Amber Blevins conducted a pedestrian survey of the project site from February 25 to March 16, 2019. The archaeologists surveyed the project site using transects spaced 15 meters apart. The entirety of the project site was surveyed.

The archaeologists examined all exposed ground surface for artifacts (e.g., flaked stone tools, tool-making debris, stone milling tools, ceramics, fire-affected rock [FAR]), ecofacts (marine shell and bone), soil discoloration that might indicate the presence of a cultural midden, soil depressions, and features indicative of the former presence of structures or buildings (e.g., standing exterior walls, postholes, foundations) or historic debris (e.g., metal, glass, ceramics). Ground disturbances such as burrows and drainages were visually inspected. Survey notes were prepared by the surveyor and are available upon request.

Volumes II through VII present the survey results for each individual project site and the Gen-Tie route alternatives.

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Aratina Solar Project

Cultural Resources Assessment Report

Volume II

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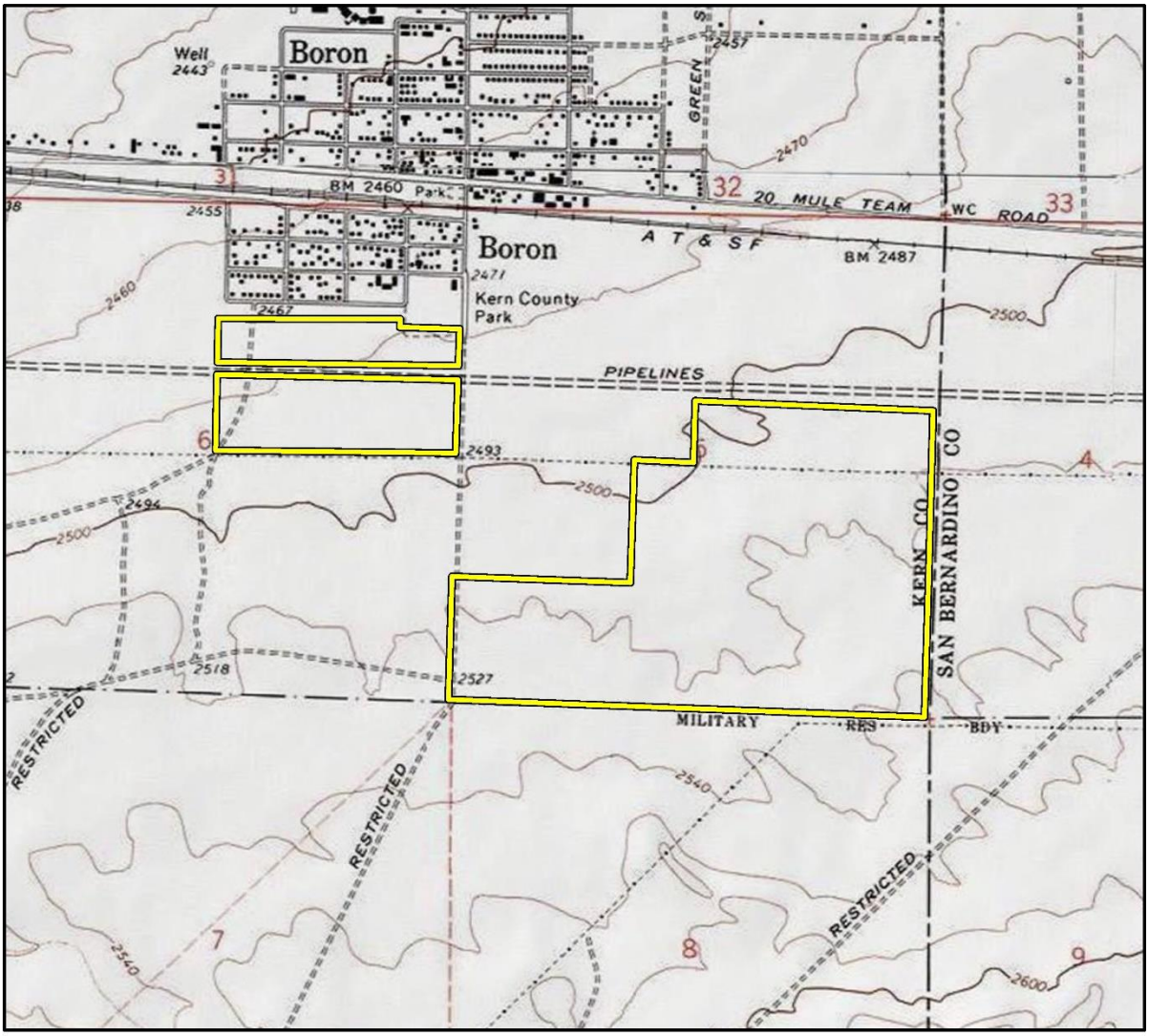
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1 Project Site 1 Description

Project Site 1 is located south and southeast of the unincorporated community of Boron, directly adjacent to either side of Boron Avenue, in the western Mojave Desert (Figure 1). The area is characterized by northwest/southeast trending mountains, and broad alluvial fans. Seasonable water sources including several local drainages can be found throughout the area. Plant communities are largely dominated by creosote bush (*Larrea tridentata*) with a low diversity of perennial species. Despite the relatively low levels of annual rainfall, scattered winter rains provide enough precipitation for the germination and growth of spring annuals and grasses. Several mammal and reptile species live in the area, including mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), wild burro (*Equus asinus*), horned lizards (*Phrynosoma sp*.), desert tortoise (*Gopherus agassizii*), and red-tailed hawk (*Buteo jamaicensis*). Figure 2 and Figure 3 are general overview photos of the project site.

Figure 1 Project Site 1

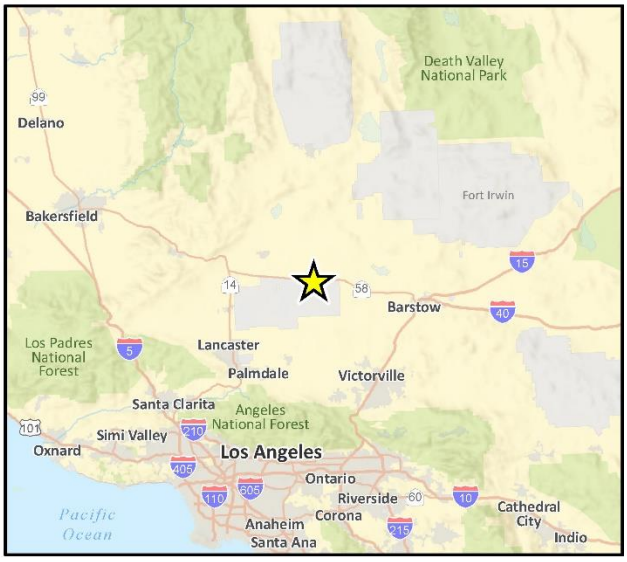


Imagery provided by National Geographic Society, Esri and its licensors © 2020. Leuhman Ridge Quadrangle. T10N R07W S05,06. The topographic representation depicted in this map may not portray all of the features currently found in the vicinity today and/or features depicted in this map may havechanged since the original topographic map was assembled.

Project Site #1

0 1,000 2,000 Feet

N



CRFig X CUP Proj Locn Map

Figure 2 Southeast Portion of Project Site 1, Facing South



Figure 3 Northwestern Portion of Project Site 1, Facing East



2 Background Research Results

As discussed in Volume I, background research for the cultural resource assessment included records searches, a review of historical maps and aerial photographs, Native American outreach, and historical group consultation. A summary of findings of each of these efforts follows.

2.1 Cultural Resources Record Search

2.1.1 Previous Studies

The SSJVIC records search identified six previously conducted cultural resources studies for Project Site 1. Table 1 provides a summary of each of these studies.

Table 1 Previous Cultural Resource Studies within Project Site 1

Report Number	Author	Year	Title
KE-00208	Jensen, Peter M.	1997	Archaeological Inventory Survey: Boron Sanitary Landfill Site, Buffer Zone Survey, Boron, Kern County, California
KE-00633	Macko, Michael E., Binning, Jeanne D., Earle, David D., and Langenwalter, Paul E.	1993	National Register Eligibility Determinations for Historic Resources Along the Proposed AT&T Lightguide System, Victorville to Bakersfield, California
KE-02610	Unknown	2002	Phase II Cultural Resource Evaluation for 62 Historic-Period Sites in Management Region 4, Edwards AFB, Kern County, California
KE-03239	Underwood, Jackson and Cleland, James H.	2002	Cultural Resources Survey of Line 1903, All American Pipeline Conversion Project from Mettler, Kern County, CA to Daggett, San Bernardino County, California
KE-04312	Thomas, Jennifer, Higgins, Courtney, and Meyer, Jack	2011	Cultural Resources Inventory of a Hydrostatic Pressure Test Segment on L300A Between Mileposts 180.94 and 188.4084, Kern and San Bernardino Counties, California
KE-04476	Higgins, Courtney, Kellawan, Rebecca, Duke, Daron G., and Lucas, Thomas	2013	Cultural Resources Inventory of 5,300 Acres for the PG&E Pipelines 300A and 300B, San Bernardino and Kern Counties, California

Source: SSJVIC 2019

2.1.2 Recorded Resources

The SSJVIC records search conducted for this effort identified four cultural resources at Project Site 1. Each resource is summarized in further detail in Table 2 and below.

Table 2 Previous Cultural Resources at Project Site 1

Primary Number	Trinomial	Resource Type	Description	Recorder(s) and Year(s)	NRHP/CRHR Status
P-15-006596	CA-KER-5330H	Historic site	Refuse deposit	J. Fogerty, et al. 2005	Not evaluated
P-15-007160	CA-KER-5510H	Historic site	Refuse deposit	G. Greene and M. Ronning 1998	Not evaluated
P-15-017320	CA-KER-9494H	Historic structure	Unnamed dirt road associated with PG&E gas line	D. Martinez, D. Mike, T. Lucas, C. Higgins, T. Newman, and L. Daub 2013	Recommended ineligible
P-15-017321	N/A	Historic structure	Boron Avenue	D. Martinez and D. Mike 2013	Recommended ineligible

SSJVIC 2019

2.1.2.1 P-15-006596

J. Fogerty, J. Farrell, B. Ludwig, S. Batchelor, C. Speckman, M. Mavety, D. Brietkreutz, and M. Zizzo recorded resource P-15-006596 in 2005 as a historic period refuse deposit comprising cans, glass fragments, earthenware fragments, milled lumber, and concrete fragments. The resource was not evaluated when it was recorded.

2.1.2.2 P-15-007160

G. Greene and M. Ronning recorded resource P-15-007160 1998 as a historic period refuse deposit comprising sanitary cans and glass jar fragments. The resource was not evaluated when it was recorded.

2.1.2.3 P-15-017320

D. Martinez, D. Mike, T. Lucas, C. Higgins, T. Newman, and L. Daub recorded Resource P-15-017320 in 2013as a linear, unnamed dirt road associated with a Pacific Gas & Electric gas line. The resource was recommended ineligible when it was recorded (Higgins et al. 2013).

2.1.2.4 P-15-017321

D. Martinez and D. Mike recorded resource P-15-017321 in 2013. The resource consists of the paved portion of Boron Avenue. The resource was recommended ineligible when it was recorded (Higgins et al. 2013).

2.2 Native American Outreach

Native American outreach did not identify any cultural resources concerns for Project Site 1.

2.3 Historic Map and Aerial Review

A review of historic USGS topographic maps historic aerials identified a historic road on Project Site 1, recorded as Aratina S-020H and discussed in further detail below.

According to the Bureau of Land Management General Land Office records, the land on which Project Site 1 is situated was partially owned by the Southern Pacific Railroad beginning in 1905, by Samuel A. Woodruff beginning in 1920, and by Jesse Dallas Nichols in 1936 (Bureau of Land Management General Land Office 2019). Rincon was unable to find information about Woodruff or Nichols that would indicate they are important persons in history.

3 Field Survey

Project Site 1 is located on a flat, sandy alluvial plain in a mostly undeveloped area with 50 to 80 percent ground visibility. The pedestrian survey identified and recorded 11 new resources, including one prehistoric site and ten historic sites. Each of these resources is discussed in further detail below. A map depicting the location of each resource in the project site can be found in the associated Department of Parks and Recreation (DPR) Series 523 Forms in Confidential Appendix C.

3.1 Previously Recorded Resources

This study identified four previously recorded historic resources on Project Site 1. These sites are summarized in detail below.

3.1.1 P-15-006596

The site was last updated by Tetra Tech EC, Inc. in 2005 and described as seven discrete concentrations of debris and scattered refuse in an area 385 meters from north to south by 122 meters from east to west. The site boundary was expanded during the current survey to encompass an area roughly 800 meters north-south by 400 meters east-west. [*Confidential information removed from public review]* Also included was a glass tumbler with a green tiki style design printed on it and a brick with a "CORONA" maker's mark. A segment of a dirt access road not mentioned in the last update that bisects the site was also recorded in this area. In the north half of the site, the road is 5.4 meters wide with a small berm along each side and is well traveled and maintained. Though still clearly visible, the road becomes narrower, appears less maintained and traveled, and is slightly overgrown with vegetation in some areas. The current survey added nine distinct loci as Loci 1-9, all north and east of the previously recorded site boundary.

Locus 1 is the northern most concentration within the expanded site boundary. It is a low-density scatter, roughly 15 square meters that contains approximately 60 cans, including steel, church key-opened beverage cans; rotary and P38 opened sanitary cans; church key-opened motor oil cans; small rectangular fuel cans; key strip-opened meat and sardine tins; condensed milk cans, one labeled "BORDENS"; rubber cement cans; crown bottle caps; small pieces of milled wood; small wire spools and clear, brown and green bottle glass fragments, including bases with Owens-Illinois, Latchford-Marble Glass Company maker's mark with a 1951 date, a Ball maker's mark with a 1943, and Duraglas/Owens-Illinois maker's mark with a 1947 date.

Locus 2, is located approximately 40 meters southeast of Locus 1, and comprises a low to moderately dense scatter of approximately 200 cans over a roughly 25-square-meter area. The scatter includes cone-top brake fluid cans; coffee cans; condensed milk cans; church key-opened motor oil cans; small spice cans; rubber cement cans; two Log Cabin Syrup cans; church key-opened beverage cans; rotary and church key-opened sanitary cans; hole-in-cap key strip opened meat tins; one bi-metal beverage can; automotive oil filters; metal strapping; one small metal wire spool; blue-on-white hand painted porcelain tableware fragments and clear, brown, and green glass bottle fragments, including two Coca-Cola bottle bases labeled "BAKERSFIELD", one dark green base with Fairmount Glass Company and a 1951 date, one clear "Miller/High Life" beer bottle base, several Glass Containers Corporation bases, two Owens-Illinois bases, with a 1950 and 1960 date, and one Owens-Illinois/Duraglas base with a 1951 date.

Locus 3, located approximately 183 meters south of Locus 2, is a discrete concentration, roughly 2.8 square meters, and contains approximately 200 cans. The assemblage of artifacts is similar to that of Locus 1, with the addition of: window glass; small aerosol cans; paint cans; tall church key-opened beverage cans; small and large rectangular fuel cans; transfer print decorated earthenware fragments; glass tumblers; one enamelware pot; one railroad spike; automotive headlight glass; bits of milled lumber; one brown glass bottle base with a Brockway Glass Company maker's mark, and one brown base with an Owens-Illinois mark.

Locus 4, located roughly 130 meters south of Locus 3, is a moderately dense refuse scatter within an area roughly 9 square meters, that contains over 300 cans and an artifact assemblage similar to Locus 1, with the addition of cone-top beverage cans; small aerosol cans and spice tins; automotive oil filters; one bi-metal beverage can; baby powder shaker tins; one rocket shaped baking mold; fragments of Bauerware; a porcelain cup fragment with a "TEPCO/USA/CHINA" maker's mark; one glue or toothpaste tube; chunks of concrete and mortar; solarized amethyst and yellow decorative glass fragments; milk glass; clear, brown, aqua, and cobalt blue bottle glass fragments, including 'PUREX" bottle bases, Owens-Illinois, Latchford-Marble Glass Company, Ball, Duraglas and Knox Glass Bottle Company maker's marks.

Locus 5 is located [*Confidential information removed from public review]*; it is a dense refuse scatter, roughly 15 square meters, that contains over 400 cans. Artifacts at the locus include church key-opened beverage cans; motor oil cans; rotary and church key-opened sanitary cans; coffee cans; key strip-opened meat tins; cone-top beverage cans; aerosol cans; one paint can; one large fuel can; glass tumbler fragments; bits of milled lumber; chunks of concrete/mortar and clear and brown bottle glass, including bases with Owens-Illinois, Anchor-Hocking and Glass Containers Corporation maker's marks.

Locus 6, located roughly 90 meters southwest of Locus 3, is a discrete, moderately dense refuse scatter of approximately 150 cans. Artifacts include condensed milk cans; church key- opened beverage cans; motor oil cans; rotary and church key-opened sanitary cans; coffee cans; key strip opened meat and sardine tins; small rectangular fuel/lamp oil cans; one leather shoe/boot sole; one metal and plastic toy pistol; one metal barrel loop; bits of milled lumber; milk glass; glazed earthenware tableware fragments and clear and brown bottle glass fragments, including one Duraglas base with a 1951 date and one Owens-Illinois liquor bottle base with a 1950 date.

Locus 7, located roughly 100 meters northwest of Locus 6, is a discrete refuse scatter, roughly 6. square meters, that contains approximately 30 cans. Artifacts include condensed milk cans; rotary and church key-opened sanitary cans; coffee cans; motor oil cans; rectangular fuel cans; aerosol cans; and glazed earthenware bowl fragment.

Locus 8, located roughly 60 meters northeast of Locus 7, is a low to moderately dense scatter of approximately 100 cans over a roughly 8 square meter area. Artifacts include church key-opened beverage cans; rotary and church key-opened sanitary cans; motor oil cans; coffee cans; paint cans; automotive oil filters; rectangular fuel cans; small aerosol and condensed milk cans; key strip opened meat and sardine tins; transfer print decorate porcelain tableware fragments and clear and green bottle glass fragments, including a Coca-Cola and 7 Up bottle body, a clear glass condiment bottle neck and body fragment, a dark green soda bottle base with painted label and a clear glass oval bottle base.

Locus 9, located roughly 75 meters northwest of Locus 8, is a moderately dense refuse concentration in a roughly 12 square-meter-area that contains approximately 500 cans. Artifacts include ice pick and church key-opened condensed milk cans; church key-opened beverage and

sanitary cans; rotary-opened sanitary cans; motor oil cans, coffee cans; small spice tins; small aerosol cans; hinged lid tobacco tins; cone top beverage cans; rectangular fuel cans; key strip opened meat tins; automotive oil filters and clear, brown and green bottle glass fragments, including one Coca-Cola bottle base with a “RENO/NEVADA” base; and two brown Duraglas bases with 1951 dates.

A diffuse scatter of historic period refuse is present between the loci, throughout the site. Based on the artifacts present, the site dates to the mid-twentieth century.

Figure 4 P-15-006596, Facing South



3.1.2 P-15-007160

Resource P-15-007160 is a concise refuse deposit containing six church key-opened cans. All cans were relocated during the current survey and appear to be in the same condition as during the original recording. The site dates to the mid-twentieth century.

Figure 5 P-15-007160, Facing South



3.1.3 P-15-017320

The resource was originally recorded by Far Western in 2013 as an unimproved, unnamed dirt road segment. The road was relocated during the current survey and is in a condition similar to that of its original recording. During the current survey, the road was divided into four distinct segments, labeled Segments A, B, C, and D, and the associated debris scatter was recorded as four distinct loci, (Loci 1 through 4; Figure 6), with diffuse scatters of refuse in between.

Locus 1, roughly 27 meters from north-south by 80 meters east-west, is a discrete scatter of approximately 75 cans and other refuse. Artifacts include rotary-opened sanitary cans; key strip-opened coffee and sardine cans; an internal friction lid baking soda can; paint cans; several unidentifiable crushed cans; blue and green Fiesta-ware bowl fragments; white glazed earthenware plate fragments; one small enamelware bowl; clear glass bottle and screw top jar fragments; brown bottle glass fragments; including one base with an Anchor-Hocking maker's mark and 1952 date; one green glass bottle neck with a crown finish; one piece of corrugated sheet metal; and approximately 20 small pieces of milled wood.

Figure 6 P-15-017320 Sketch Map

[*Confidential information removed from public review]*

Locus 2, roughly 90 meters north-south by 75 meters east-west, is located approximately 45 meters south-southwest of Locus 1. It is a moderately dense concentration of approximately 300 cans and other refuse. Artifacts include church key-opened beverage cans; rotary, church key and P38 opened sanitary cans; coffee cans; paint cans; small rectangular fuel cans; key strip-opened meat and sardine tins; condensed milk cans; unidentifiable crushed cans; clear glass, screw top jar fragments; and clear, brown and green glass bottle fragments, including necks with crown and screw top finishes.

Locus 3 is located approximately 30 meters south of Locus 2 and measures roughly 115 meters north-south by 137 feet east-west. Locus 3 spans both sides of Road Segment A and Road Segment B, the eastern-most spur that runs south of Segment A for approximately 800 meters. Locus 3 is a dense concentration of over 500 cans and other refuse. Artifacts include church key-opened beverage cans; rotary and church key-opened sanitary cans; key strip-opened meat and sardine tins; coffee cans; small aerosol cans; small rectangular spice tins; automotive oil filters; glazed earthenware fragments, including Fiesta-ware and some with hand painted floral design; and clear, green and brown bottle glass fragments, including bottle bases with Owens-Illinois, Maywood Glass Company, Latchford-Marble Glass Company and Duraglas maker's marks with 1950-1953 dates.

Locus 4 is located approximately 70 meters south of Locus 3 and measures roughly 300 meters north-south by 205 meters east-west; it is a dense concentration of over 2000 cans and other refuse. Artifacts include church key-opened beverage cans; condensed milk cans; rotary and church key-opened sanitary cans; coffee cans; key strip-opened meat and sardine tins; small rectangular spice tins; talcum powder shaker cans; oil cans; rectangular fuel cans; small aerosol cans; bi-metal pull tab beverage cans; various crushed unidentifiable cans; porcelain and glazed earthenware tableware fragments; decorative porcelain fragments, including a partial horse head; various milk glass vessel fragments; glazed stoneware fragments; and clear, brown, green and cobalt blue bottle glass fragments, including bottle bases with Owens-Illinois, Maywood Glass Company and Latchford-Marble Glass Company maker's marks with 1952, 1954 and 1958 dates.

Figure 7 P-15-017320, Facing South



3.1.4 P-15-017321

Resource P-15-017321 consists of a segment of Boron Avenue, depicted as an unnamed road on the 1956 Kramer 15-minute topographic map. The road was relocated during the current survey and is in the same condition as its original recording in 2013.

Figure 8 P-15-0017321, Facing North



3.2 Newly Recorded Resources

3.2.1 Prehistoric Sites

The survey identified one prehistoric site on Project Site 1. This site is summarized in Table 3 below.

Table 3 Newly Recorded Prehistoric Sites

Resource Designation	Age	Site Designation
Aratina S-011	Prehistoric	Lithic Scatter

3.2.1.1 Aratina S-011

Site Aratina S-011 consists of a dense scatter of approximately 228 pieces of lithic debitage, including three varieties of cryptocrystalline silicate (CCS; chalcedony, chert, and jasper), as well as basalt and quartz. Many of the flakes represent early reduction, but there are also approximately 50 biface thinning flakes, and two CCS biface fragments. The site measures approximately 62 meters north-south by 54 meters east-west, and is located on a flat, sandy alluvial plain. [*Confidential information removed from public review]*

Figure 9 Aratina S-011, Facing Southeast



3.2.2 Historic Sites

The survey identified ten historic sites within Project Site 1. These sites are summarized in Table 4 and discussed further below.

Table 4 Newly Recorded Historic Sites

Resource Designation	Age	Site Designation
S-011H	Historic	Refuse Scatter
S-012H	Historic	Refuse Scatter
S-013H	Historic	Refuse Scatter
S-017H	Historic	Road and Transmission Line
S-020H	Historic	Road
S-022H	Historic	Refuse Scatter
S-023H	Historic	Refuse Scatter
S-024H	Historic	Refuse Scatter
S-025H	Historic	Refuse Scatter
S-026H	Historic	Refuse Scatter

3.2.2.1 Aratina S-011H

The site represents a discrete, low-density refuse scatter consisting of approximately 15 cans. Artifacts include church key-opened beverage cans; rotary-opened sanitary cans; condensed milk cans; steel aerosol cans; one large rectangular fuel can; porcelain plate fragments; green, brown, and clear glass fragments, including two brown glass bottle bases with 1954 dates; and approximately 40 pieces of highly weathered milled lumber of various dimensions. The site measures approximately 14 meters north-south by 15 meters from east-west and is located on a mostly flat, sandy, alluvial plain with low to moderate density creosote, saltbush and various, patchy, low ground cover. Based on the artifacts present, the site likely dates to the mid-twentieth century.

Figure 10 Aratina S-011H, Facing Southeast



3.2.2.2 Aratina S-012H

Site Aratina S-012H represents a discrete refuse scatter consisting of approximately 25 cans including small rotary-opened sanitary cans of various sizes; three condensed milk cans; two hole-in-cap meat tins; one upright rectangular fuel can; one crushed, hinged-lid tobacco tin; one coffee can; and a bi-metal thermos. The site measures approximately 23 meters north-south by 33 meters east-west and is on a flat, sandy, alluvial plain with low to moderately dense saltbush, creosote, various low ground cover and a few Joshua trees. Based on the artifacts present, the site likely dates to the mid-twentieth century.

Figure 11 Aratina-012H, Facing South



3.2.2.3 Aratina S-013H

Site Aratina S-013H represents a moderately dense scatter of over 100 cans and other refuse. Artifacts include church key-opened beverage cans; condensed milk cans; P-38 and rotary-opened sanitary cans; key strip-opened coffee cans and meat tins; small rectangular spice tins; hinged-lid tobacco tins; small and large rectangular fuel cans; bi-metal beverage cans; small internal friction lid cans; various other rotary and knife opened sanitary cans; large-mouth screw top jars; milk glass; clear, brown, and green bottle glass fragments; and a small concentration of highly weathered milled lumber. The site measures approximately 16 meters north-south by 22 meters east-west and is on a flat, sandy alluvial plain with low to moderate density vegetation consisting primarily of creosote, saltbush, and Joshua trees. Based on the can types present, the site likely dates to the mid-twentieth century, post-1942, after the development of the P-38 can opener (Foster 2009).

Figure 12 Aratina-013H, Facing South



3.2.2.4 Aratina S-017H

Site Aratina S-017H represents a historical transmission line and associated dirt access road that runs east to west through Project Sites 1, 2, and 3. The site consists of a series of double poles, some wooden, but primarily steel and concrete, with ceramic insulators. At least one wooden transmission line pole has a nail in it with a raised “51” stamped on it.

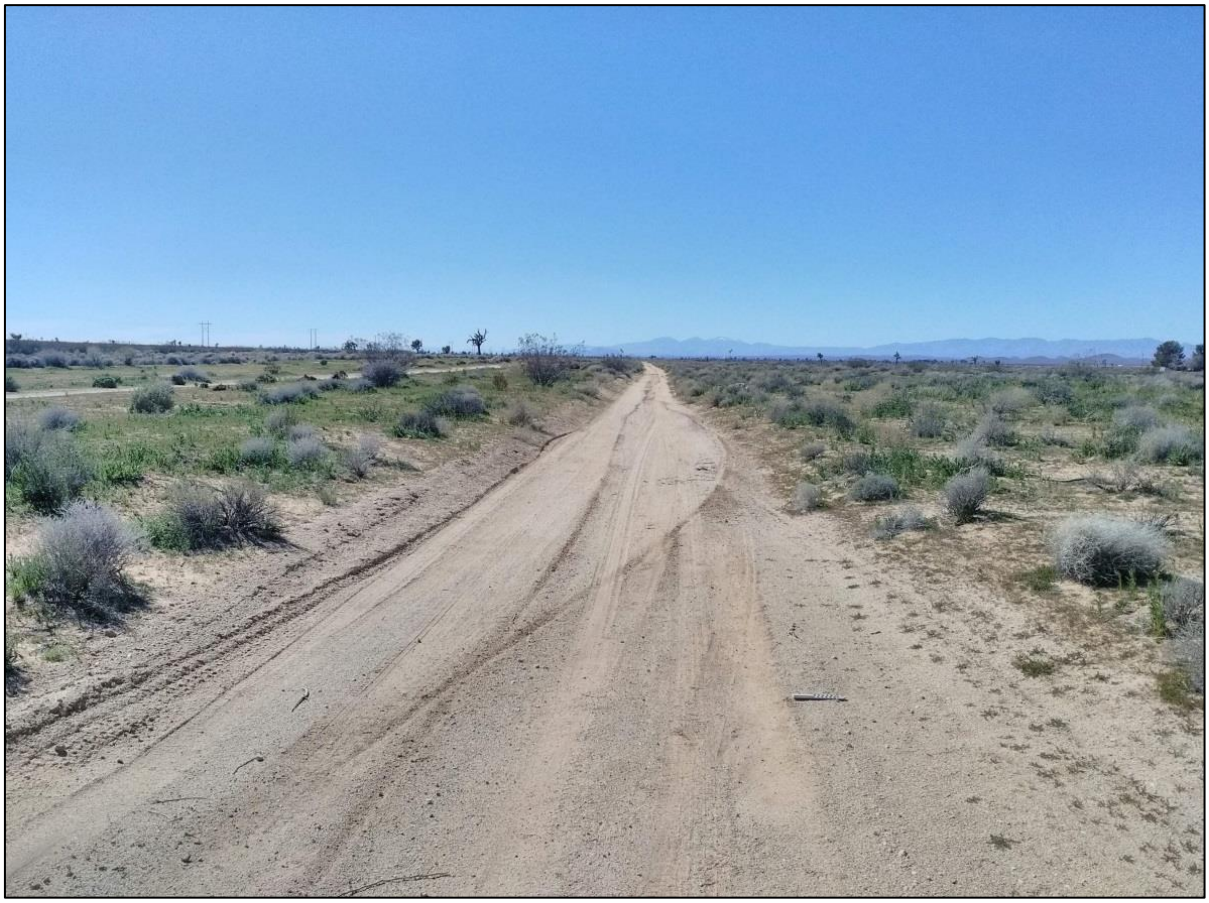
Figure 13 Aratina-017H, Facing West



3.2.2.5 Aratina S-020H

Site Aratina S-020H consists of a well-maintained dirt access road that parallels a Mojave Pipeline Company natural gas pipeline situated 5 meters to the south. The road is 3.7 meters wide, with no discernable berm on either side; it is heavily wash-boarded in places. The road runs east to west through Project Sites 1, 2, and 3. The road is visible on historic topographic maps and aerials dating to as early as 1952.

Figure 14 Aratina-020, Facing West



3.2.2.6 Aratina S-022H

The site is a concise, high-density, glass scatter of over 500 clear, blue, green, solarized amethyst, and brown bottle glass fragments. These include bases from the Latchford-Marble Glass Company from 1954 and Owens Illinois from 1950. The site measures approximately 9.5 meters from north to south by 9.5 meters from east to west, and is on a flat, sandy alluvial plain with low- to moderate-density creosote, saltbush, and patchy, low ground cover, next to a downed Joshua tree.

Figure 15 Aratina S-022H, Facing Southwest



3.2.2.7 Aratina S-023H

Site Aratina S-023H is a concise, low-density refuse scatter comprised of approximately 75 cans including mostly church key-opened beverage and sanitary cans as well as hole-in-top and rectangular oil cans. There are also clear, green and brown glass fragments as well as brown and blue ceramic sherds. Definitively historic bottle bases include Latchford-Marble Glass Company circa 1939-1957 and Owens Illinois from 1947 (Toulouse 1971). The site measures approximately 18 meters north-south by 20 meters east-west, and is on a flat, sandy alluvial plain with low- to moderate-density creosote, saltbush, and patchy, low ground cover and a few scattered Joshua trees. Based on the artifacts present, the site likely dates to the mid-twentieth century.

Figure 16 Aratina S-023H, Facing Southwest



3.2.2.8 Aratina S-024H

Site Aratina S-024H consists of an expansive, moderately dense refuse scatter with three distinct concentrations and sparse deposits of refuse in-between. The site includes over 500 cans and other refuse. Artifacts include church key-opened beverage and sanitary cans; hole-in-top cans; aerosol cans; paint cans; coffee tins; clear, brown and green glass; and yellow, purple, and blue ceramic fragments. The site measures approximately 134 meters north-south by 73 meters east-west; it is adjacent to Boron Avenue on a flat, sandy alluvial plain with creosote, saltbush and patchy, low ground cover. Based on the artifacts present, the site likely dates to the mid-twentieth century.

Figure 17 Aratina S-024H, Facing Southwest



3.2.2.9 Aratina S-025H

The site is a moderate-density refuse scatter of approximately 75 cans and other refuse. Artifacts include church key-opened beverage and sanitary cans; rotary-opened meat tins and sanitary cans; and clear, green, and brown glass fragments including two Owens Illinois bottle bases – one from 1951 and the other from 1952. The site measures approximately 28 meters from north to south by 25 meters from east to west and is located on a flat, sandy, alluvial plain with low to moderate density creosote, saltbush and patchy, low ground cover. Based on the artifacts present, the site likely dates to the mid-twentieth century.

Figure 18 Aratina S-025H, Facing North



3.2.2.10 Aratina S-026H

The site is a concise, moderate-density refuse scatter of approximately 50 cans and other refuse. Artifacts include church key-opened beverage and sanitary cans; hole-in-top cans; oil cans; and coffee tins. The site measures approximately 10.5 meters from north to south by 15 meters from east to west and is located on a flat, sandy alluvial plain with low to moderate density creosote, saltbush, and a few Joshua trees. Based on the artifacts present, the site likely dates to the mid-twentieth century.

Figure 19 Aratina S-026H, Facing Southwest



4 Resource Evaluations

Resources recorded and/or updated as part of the current study were evaluated for CRHR eligibility.

A cultural resource is considered historically significant and eligible for the CRHR if it:

1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage
2) Is associated with the lives of persons important in our past
3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values
4) Has yielded, or may be likely to yield, information important in prehistory or history

4.1 Previously Recorded Resources

4.1.1 P-15-006596

Resource P-15-006596 consists of an expansive historic-period refuse scatter last updated by Tetra Tech EC, Inc. in 2005, and described as seven discrete concentrations of debris and scattered refuse. The site boundary was expanded during the current survey to include nine additional refuse concentrations, all north and east of the previously recorded site boundary. Neither Greene and Ronning (1998) nor Tetra Tech (2005) evaluated the site for CRHR eligibility. However, the site cannot be associated with events that have made a significant contributions to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a scatter of ordinary mid-century refuse, the site does not embody any distinctive characteristics (does not meet Criterion 3). Recordation of the site during the current study has exhausted its data potential, and is not likely to yield any important information to state or local history (does not meet Criterion 4). Thus Rincon recommends site P-15-006596 ineligible for listing in the CRHR under all four criteria (1 through 4).

4.1.2 P-15-007160

Resource P-15-007160 was relocated during the current survey and appears to be in the same condition as when it was originally recorded. When P-15-007160 was recorded initially, by Greene and Ronning in 1998, they did not evaluate the site for CRHR eligibility. The resource cannot be associated with events that have made a significant contributions to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a scatter of ordinary mid-century refuse, the site does not embody any distinctive characteristics (does not meet Criterion 3). Recordation of the site during the current study has exhausted its data potential, and is not likely to yield any important information (does not meet Criterion 4); thus Rincon concurs with the previous evaluation that P-15-007160 is ineligible for listing in the CRHR under all four criteria (1 through 4).

4.1.3 P-15-017320

Resource P-15-017320 was relocated during the current survey and is in a similar condition to that at the time of its original recording. For the current survey, the road was divided into four distinct segments, and the associated debris scatter was recorded as four distinct concentrations with diffuse scatters of refuse in between. Far Western recommended the site ineligible for listing in the CRHR (Higgins et al. 2013). The site cannot be associated with events that have made a significant contributions to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a nondescript dirt road and scatter of ordinary mid-century refuse, the site does not embody any distinctive characteristics (does not meet Criterion 3). The data potential of the site has been exhausted through recordation and the site is not likely to yield any important information (does not meet Criterion 4). Thus Rincon concurs with the previous evaluation and is ineligible for the CRHR under all four criteria (1 through 4).

4.1.4 P-15-017321

Resource P-15-017321 was relocated during the current survey and is in a similar condition to its original recording. Far Western recommended the road ineligible for the listing in the CRHR. The road cannot be associated with events that have made a significant contributions to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a nondescript road, the site does not embody any distinctive characteristics (does not meet Criterion 3), and is not likely to yield any important information (does not meet Criterion 4); thus Rincon concurs with the previous evaluation.

4.2 Newly Recorded Resources

4.2.1 Prehistoric Sites

4.2.1.1 Aratina S-011

Site Aratina S-011 consists of a prehistoric lithic scatter. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). The resource is a relatively dense lithic scatter situated on a sandy alluvial plain; however it is located roughly 2.5 kilometers from the nearest drainage and does not contain any evidence of features, soil discoloration, or other indication that a subsurface deposit may be present. Because the site likely represents only a surface expression, the current recording has exhausted the data potential of the resource. The majority of the site represents simple early reduction with limited amounts of biface thinning flakes. Lithic scatters such as these are ubiquitous throughout the Mojave Desert and California in general, and the site does not have the potential to contribute new or significant information. Therefore, Aratina S-011 does not retain any potential to provide pertinent data to

local research themes, nor does it meet Criterion 4. Rincon recommends Aratina S-011 ineligible for listing in the CRHR under all four criteria (1 through 4).

4.2.2 Historic Sites

4.2.2.1 Aratina S-011H

Site S-011H consists of a historic-period refuse scatter composed of cans, metal fragments, and milled lumber. The site cannot be associated with events significant to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a scatter of ordinary mid-century refuse, the resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and EAFB. Aratina S-011H likely represents a single dumping episode and its data potential was exhausted by this recording (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR under all four criteria (1 through 4).

4.2.2.2 Aratina S-012H

S-012H consists of a historic-period refuse scatter. The site cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a scatter of ordinary mid-century refuse, the resource does not embody any distinctive characteristics (does not meet Criterion 3). The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.2.3 Aratina S-013H

S-013H consists of a historic-period refuse scatter. The site cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a scatter of ordinary mid-century refuse, the resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and EAFB. Aratina S-013H likely represents a single dumping episode. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.2.4 Aratina S-017H

S-017H consists of an historic-period unpaved road. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a nondescript dirt road, the resource does not embody any distinctive characteristics (does not meet Criterion 3) and is not likely to yield important information (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.2.5 Aratina S-020H

S-020H consists of an historic-period unpaved road. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a nondescript dirt road, the resource does not embody any distinctive characteristics (does not meet Criterion 3) and is not likely to yield important information (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.2.6 Aratina S-022H

S-022H consists of an historic-period glass scatter. The site cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). As a scatter of ordinary mid-century refuse, the resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and EAFB. Aratina S-022H likely represents a single dumping episode. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.2.7 Aratina S-023H

S-023H consists of an historic-period refuse scatter. The site cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a scatter of ordinary mid-century refuse, the resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and EAFB. Aratina S-023H likely represents a single dumping episode. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.2.8 Aratina S-024H

S-024H consists of an historic-period refuse scatter. The site cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a scatter of ordinary mid-century refuse, the resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and EAFB. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.2.9 Aratina S-025H

S-025H consists of an historic-period refuse scatter. The site cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a scatter of ordinary mid-century refuse, the resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and EAFB. Aratina S-025H likely represents a single dumping episode. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.2.10 Aratina S-026H

S-026H consists of an historic-period refuse scatter. The site cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a scatter of ordinary mid-century refuse, the resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and EAFB. Aratina S-026H likely represents a single dumping episode. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

5 Findings and Recommendations

Eleven newly identified cultural resources and four previously recorded cultural were identified during the current study within Project Site 1. All of these resources have been recommended ineligible for listing in the CRHR and do not require any additional work (Table 5). However, given the number of resources identified within Project Site 1 and the presence of prehistoric archaeological sites, the project site is considered sensitive for historic and prehistoric archaeological resources. To avoid impacts to subsurface discoveries during construction, Rincon recommends archaeological sensitivity training prior to project ground disturbance and archaeological and Native American monitoring during project ground disturbance.

Table 5 Summary of Resources and Recommendations

Resource	Description	Significance	Recommendation
S-011	Prehistoric lithic scatter	Recommended ineligible	No further work
S-011H	Historic-period refuse scatter	Recommended ineligible	No further work
S-012H	Historic-period refuse scatter	Recommended ineligible	No further work
S-013H	Historic-period refuse scatter	Recommended ineligible	No further work
S-017H	Historic-period road	Recommended ineligible	No further work
S-020H	Historic-period road	Recommended ineligible	No further work
S-022H	Historic-period refuse scatter	Recommended ineligible	No further work
S-023H	Historic-period refuse scatter	Recommended ineligible	No further work
S-024H	Historic-period refuse scatter	Recommended ineligible	No further work
S-025H	Historic-period refuse scatter	Recommended ineligible	No further work
S-026H	Historic-period refuse scatter	Recommended ineligible	No further work

5.1 Archaeological Sensitivity Training

Rincon recommends that the qualified archaeologist conduct a worker's environmental awareness program training for archaeological sensitivity for all construction personnel prior to the commencement of any ground disturbing activities. Archaeological sensitivity training should include a description of the types of cultural material that may be encountered, cultural sensitivity issues, regulatory issues, and the proper protocol for treatment of the materials in the event of a find.

5.2 Archaeological and Native American Monitoring

Rincon recommends archaeological and Native American monitoring of project-related ground-disturbing activities on Project Site 5. Archaeological monitoring should be performed under the direction of the qualified archaeologist. The qualified archaeologist, in consultation with the County of Kern and the Native American monitor, should have the power to reduce or stop monitoring depending upon observed conditions. If archaeological resources are encountered during ground-disturbing activities, work in the immediate area must halt and the find evaluated for significant under CEQA.

5.3 Unanticipated Discovery of Cultural Resources

If cultural resources are encountered during ground-disturbing activities, work in the immediate area must halt and an archaeologist meeting the Secretary of the Interior's Professional Qualification Standards for archaeology (National Park Service 1983) should be contacted immediately to evaluate the find. If the discovery proves to be eligible for listing in the NRHP or CRHR, additional work such as data recovery excavation and Native American consultation may be warranted to mitigate any significant impacts/adverse effects.

5.4 Unanticipated Discovery of Human Remains

The discovery of human remains is always a possibility during ground-disturbing activities. If human remains are found, the State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the County Coroner must be notified immediately. If the human remains are determined to be Native American, the Coroner will notify the Native American Heritage Commission, which will determine and notify a most likely descendant, who has 48 hours from being granted site access to make recommendations for the disposition of the remains. If the most likely descendant does not make recommendations within 48 hours, the land owner shall reinter the remains in an area of the property secure from subsequent disturbance.



Aratina Solar Project

Cultural Resources Assessment Report

Volume III

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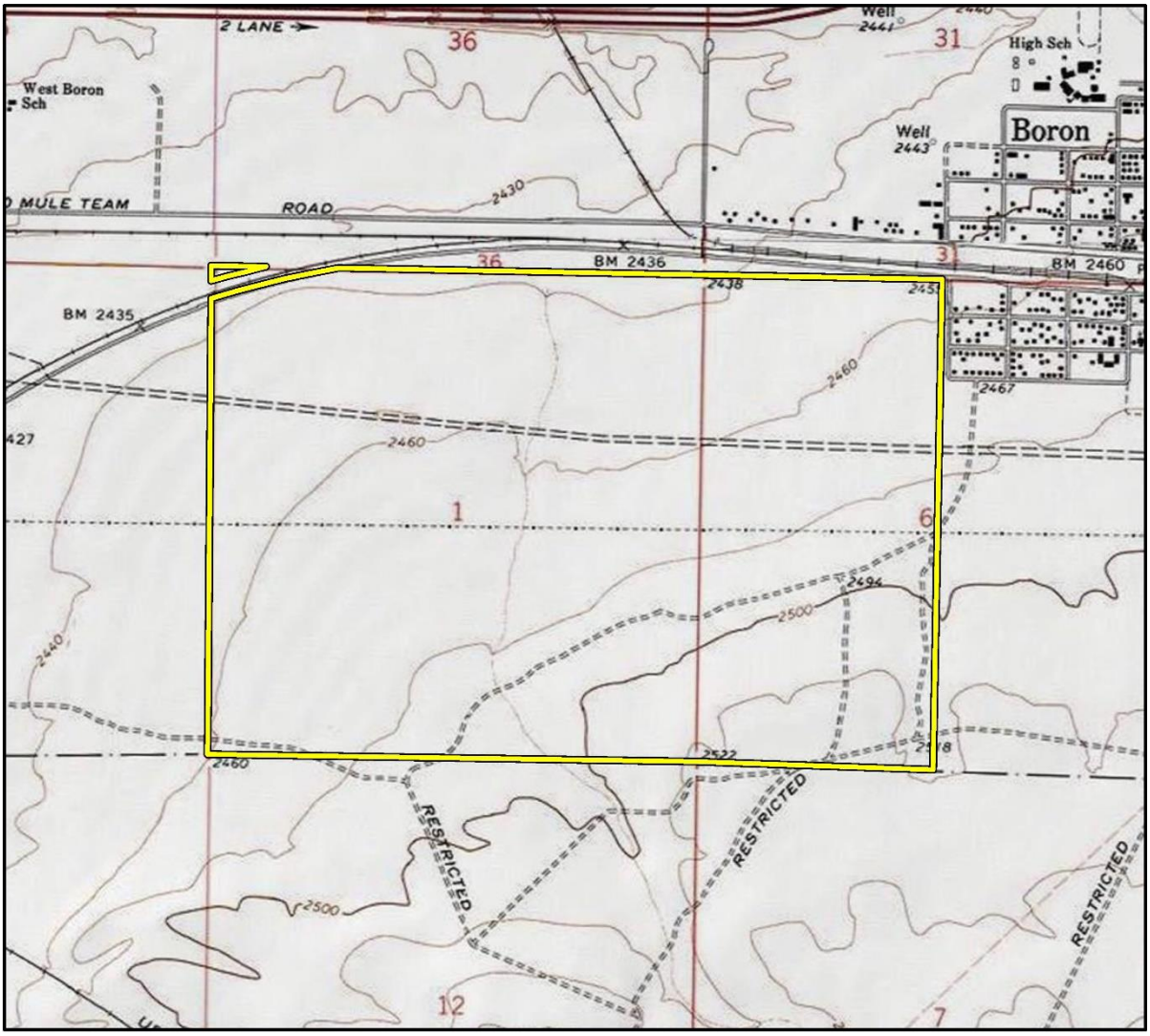
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1 Project Site 2 Description

Project Site 2 is located northwest of the Town of Desert Lake, directly adjacent to the intersection of Gephart Road and California State Highway 58 in the western Mojave Desert (Figure 1). The area is characterized by northwest/southeast trending mountains, and broad alluvial fans. Seasonable water sources including several local drainages can be found throughout the area. Plant communities are largely dominated by creosote bush (*Larrea tridentata*) with a low diversity of perennial species. Despite the relatively low levels of annual rainfall, scattered winter rains provide enough precipitation for the germination and growth of spring annuals and grasses. Several mammal and reptile species live in the area including mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), wild burro (*Equus asinus*), horned lizards (*Phrynosoma sp.*), desert tortoise (*Gopherus agassizii*), and red-tailed hawk (*Buteo jamaicensis*). Figure 2 and Figure 3 are general overview photos of the project site.

Figure 1 Project Site 2



Imagery provided by National Geographic Society, Esri and its licensors © 2020. Leuhman Ridge Quadrangle. T10N R07W S06 &T10N R08W S01. The topographic representation depicted in this map may not portray all of the features currently found in the vicinity today and/or features depicted in this map may havechanged since the original topographic map was assembled.

Project Site #2

0 1,000 2,000 Feet

N



CRFig X CUP Proj Locn Map

Figure 2 Western Portion of Project Site 2, Facing North



Figure 3 Eastern Portion of Project Site 2, Facing South



2 Background Research Results

As discussed in Volume I, background research for this cultural resource assessment included records searches, a review of historical maps and aerial photographs, and Native American outreach. A summary of findings of each of these efforts specific to Project Site 2 follows.

2.1 Cultural Resources Record Search

2.1.1 Previous Studies

The SSJVIC records search identified four previously conducted cultural resources studies for Project Site 2 (Table 1).

Table 1 Previous Cultural Resource Studies within Project Site 2

Report Number	Author	Year	Title
KE-00633	Macko, M., J. Binning, D. Earle, and P. Langenwalter	1993	National Register Eligibility Determinations for Historic Resources Along the Proposed AT&T Lightguide System, Victorville to Bakersfield, California
KE-00902	Lewis Pruett, C.	1989	Environmental Impact Evaluation: An Archaeological Survey of 320 Acres Southwest of Boron, Kern County
KE-02610	Unknown	2002	Phase II Cultural Resource Evaluation for 62 Historic-Period Sites in Management Region 4, Edwards AFB, Kern County, California
KE-04476	Higgins, C., R. Kellawan, D. Duke, and T. Lucas	2013	Cultural Resources Inventory of 5,300 Acres for the PG&E Pipelines 300A and 300B, San Bernardino and Kern Counties, California

Source: SSJVIC 2019

2.1.2 Recorded Resources

The SSJVIC records search conducted for this effort identified four previously recorded cultural resources at Project Site 2, listed in Table 2. The resources are two isolated flakes and two historic period roads.

Table 2 Previously Recorded Cultural Resource within Project Site 2

Primary Number	Trinomial	Resource Type	Description	Recorder(s) and Year(s)	NRHP/CRHR Status
15-008723	-	Prehistoric Isolate	Chalcedony Flake	T. Baker 1989)	Not Evaluated
15-008724	-	Prehistoric Isolate	Chalcedony Flake	T. Baker 1989	Not Evaluated
15-017319	-	Historic Structure	Historic Road	D. Martinez, D. Mike 2013	Recommended ineligible
P-15-017320	CA-KER-9494H	Historic Site	Historic Road	D. Martinez, D. Mike, T. KE-04476 Lucas, C. Higgins, T. Newman, L. Daub 2013	Recommended ineligible

Source: SSJVIC 2019

2.1.2.1 P-15-008723

Resource P-15-008723 was originally recorded as an isolated pink chalcedony flake in 1989 by T. Baker of California State University (CSU) Bakersfield.

2.1.2.2 P-15-008724

Resource P-15-008723 was originally recorded as an isolated pink chalcedony flake in 1989 by T. Baker of CSU Bakersfield.

2.1.2.3 P-15-017319

P-15-017319 is historic road originally recorded by Far Western in 2013 as a 0.5-mile long segment of Jessie Street and associated historic era refuse scatter. The road is depicted on the 1956 Kramer 15-minute topographic map. The refuse scatter included church key-opened, flat top beverage cans, a condensed milk can, and nondescript sanitary cans. The road was recommended ineligible for the NRHP (Higgins et al. 2013).

2.1.2.4 P-15-017320

Resource P-15-017320 was recorded by D. Martinez, D. Mike, T. Lucas, C. Higgins, T. Newman, and L. Daub in 2013. The resource was recorded as a linear unnamed dirt road associated with a Pacific Gas & Electric gas line. The resource was recommended ineligible when it was recorded (Higgins et al. 2013).

2.2 Native American Outreach

Native American outreach did not identify any cultural resources concerns for Project Site 2.

2.3 Historic Map and Aerial Review

A review of historic USGS topographic maps historic aerials did not identify any specific cultural resources concerns for Project Site 2.

According to the Bureau of Land Management (BLM) General Land Office (GLO) records, the land on which Project Site 2 is situated was owned by Samuel A. Woodruff beginning in 1920, William Picker in 1924, and Jesse Dallas Nichols in 1936 (Bureau of Land Management General Land Office 2019). Rincon was unable to find information about Woodruff, Picker, or Nichols that would indicate they are important persons in history.

3 Field Survey

Project Site 2 is located on a flat, sandy alluvial plain in a mostly undeveloped area with 50 to 80 percent ground visibility. The pedestrian survey identified and recorded seven new resources, including three prehistoric isolates, three prehistoric sites, and one historic site. Each of these resources is discussed in further detail below. A map depicting the location of each resource in the project site can be found in the associated Department of Parks and Recreation (DPR) Series 523 Forms in Confidential Appendix D.

3.1 Previously Recorded Resources

3.1.1 Isolates

Two previously recorded isolates were identified within the project site as a result of the records search: P-15-008723 and P-15-008724.Both consist of isolated pink chalcedony flakes recorded in 1989. Rincon closely examined a roughly 50-foot buffer of the mapped location of each isolate during the current survey and was unable to relocate either isolate.

3.1.2 P-15-017319

Far Western recorded the resource originally in 2013 as a 0.8-kilometer long segment [*Confidential information removed from public review]* and associated historic era refuse scatter. The road was relocated during the current survey and is in a similar condition to its original recording. For the current survey, the associated debris scatter was recorded as four distinct loci, (Loci 1 through 4; Figure 4 through Figure 7), with diffuse scatters of refuse in between. The segment of [*Confidential information removed from public review]* recorded during the current survey is roughly 8.9 kilometers long and the associated refuse scatter is contained within a 2.8-kilometer east-west x 0.3-kilometer north-south area along the south side of Jessie Street.

Locus 1 is located [*Confidential information removed from public review]*, and is the southwestern most locus within the site boundary. Locus 1 measures roughly 15.2 meters north-south by 21.3 meters east-west and is a low-density scatter of over 70 cans and other refuse. Artifacts include condensed milk cans; rotary opened sanitary cans; church key-opened beverage cans; key strip opened meat tins; glazed earthenware tableware fragments; clear glass screw top jar fragments and clear and brown glass bottle fragments, including liquor, medicine/extract and crown finish beverage bottles, and one clear glass bottle base with “PAT. NO. 99839/Hires” embossed on the bottom and “12 FLD. OZ. NET CONTENTS” on the heel.

Locus 2, located [*Confidential information removed from public review]*, is a moderately dense scatter of over 200 cans and other refuse roughly 15.8 meters north-south by 25.9 meters east-west. Artifacts at Locus 2 include condensed milk cans; rotary and church key-opened sanitary cans; church key-opened beverage cans; coffee cans; motor oil cans; key strip opened meat tins; glazed earthenware tableware fragments; and clear, decorative glass and glass bottle and screw top jar fragments.

Figure 4 P-15-017319 Sketch Map, Locus 1

[*Confidential information removed from public review]*

Figure 5 P-15-017319 Sketch Map, Locus 2

[*Confidential information removed from public review]*

Figure 6 P-15-017319 Sketch Map, Locus 3

[*Confidential information removed from public review]*

Figure 7 P-15-017319 Sketch Map, Locus 4

[*Confidential information removed from public review]*

Locus 3 is located [*Confidential information removed from public review]*, and comprises a low-density refuse scatter, roughly 7.6 meters in diameter. Locus 2 contains 27 cans, including church key opened beverage cans; rotary opened sanitary cans; key strip opened meat cans; coffee cans, including one with a partially intact printed label that reads, "…YUBAN/COFFEE…"; and five clear glass jar/bottle fragments.

Locus 4 is located [*Confidential information removed from public review]*. It consists of six distinct refuse scatters of various dimensions and densities labeled Concentrations A-F. The east end of Locus 4 is roughly 70.1 meters west of the intersection of Jessie Street and South Wesley Street. Refuse is present between each concentration. Each concentration is discussed in more detail below.

- Concentration A, at the southwest corner of Locus 4, is a low to moderately dense scatter of over 200 cans and other debris. Artifacts include condensed milk cans; cone-top beverage cans; key strip-opened meat and sardine tins; church key opened beverage cans; large and small rectangular fuel cans; coffee cans; motor oil cans; hinged lid tobacco tins; one sanitary can with "GHEE?/R/24-5-47/?6-37?-80/STC" embossed on the bottom; one 5-gallon metal bucket; bits of bailing wire and milled wood; glazed earthenware tableware fragments; one engine head gasket fragment; two railroad spikes; and numerous clear, brown, and green glass bottle fragments, including bottle bases with Owens-Illinois, Maywood Glass Company and Duraglas maker's marks and dates of 1950 and 1954.
- Concentration B, located approximately 85.3 meters northwest of Concentration A, is a dense scatter, roughly 121.9 meters north-south by 73.2 meters east-west, that contains approximately 3,000 cans, primarily motor oil cans, and other refuse. Artifacts consist of motor oil cans, church key-opened beverage cans; rotary opened sanitary cans; condensed milk cans; rectangular fuel cans; coffee cans; clear and brown bottle glass fragments; concrete cinder block fragments; fragments of mortar and milled wood; and one vehicle tire. Almost all the motor oil cans are very densely concentrated within an area roughly 6.1 meters in diameter, with the remaining debris scattered more diffusely throughout the concentration.
- Concentration C, located approximately 192.0 meters northeast of Concentration B, is a low to moderately dense refuse scatter, roughly 50.3 meters north-south by 121.9 meters east-west, that contains approximately 300 cans and other debris. Artifacts include condensed milk cans; church key-opened beverage cans; rotary and church key-opened sanitary cans; rectangular fuel cans; one automotive air filter fragment; porcelain and glazed earthenware tableware fragments, some with blue on white transfer print decoration; glass tumbler fragments; milk glass; clear glass screw top jar fragments; and clear and brown glass bottle fragments, including soda bottle fragments with printed labels, bottle necks with crown finishes and bottle bases with 1949 and 1952 dates, including Anchor-Hocking, Owens-Illinois, Latchford-Marble Glass Company and Duraglas maker's marks.
- Concentration D, located approximately 71.6 meters southeast of Concentration C, is a low to moderately dense scatter of over 150 cans and other debris, roughly 65.8 meters north-south x 39.6 meters east-west. Artifacts include church key-opened beverage cans; rotary and church key-opened sanitary cans; key strip-opened meat and fish tins; coffee cans; motor oil cans; small rectangular fuel cans; bits of mortar and concrete; milled wood; and clear and brown bottle glass fragments, including necks with crown finishes and one clear base with "WHITE ROCK…", a 1949 date and Owens-Illinois/Duraglas maker's mark.
- Concentration E, located roughly 121.9 meters east-southeast of Concentration D, is a low-density refuse scatter, roughly 17.7 meters north-south x 23.5 meters east-west, that contains

over 60 cans and other debris. Artifacts include rotary and P38-opened sanitary cans; church key-opened beverage cans; condensed milk cans; key strip-opened meat tins; hinged lid tobacco tins; porcelain fragments; and clear and light green bottle glass fragments, including one clear base with a 1948 date and an Owens-Illinois maker's mark.

- Concentration F, located approximately 51.8 meters north of Concentration E, is a moderately dense scatter of predominately clear, brown and green bottle glass fragments, roughly 17.7 meters north-south x 68.6 meters east-west. Concentration F contains thousands of bottle glass fragments, including: a clear Hires Root Beer bottle base; a green 7 Up bottle base and body fragment with a white and red printed label and Owens-Illinois maker's mark; a clear body fragment with a faded red printed label, "…YOO/…NNER OF/…19/…MEDALS…"; a brown base with an Anchor-Hocking maker's mark and 1944 date; a clear base with an Alexander H. Kerr & Company maker's mark; a clear base with a Maywood Glass Company mark; a clear base with an Anchor-Hocking mark; and a brown base with a Thatcher Manufacturing Company maker's mark and a 1949 date.

3.1.3 P-15-017320

Far Western originally recorded the resource was in 2013 as an unimproved, unnamed dirt road segment. The road was relocated during the current survey and is in a similar condition to that observed during its original recording. For the current survey, the road was divided into four distinct segments, labeled Segments A, B, C & D, and the associated debris scatter was recorded as four distinct loci, (Loci 1 through 4; Figure 8), with diffuse scatters of refuse in between.

Locus 1, roughly 27 meters from north-south by 80 meters east-west, is a discrete scatter of approximately 75 cans and other refuse. Artifacts include rotary-opened sanitary cans; key strip-opened coffee and sardine cans; an internal friction lid baking soda can; paint cans; several unidentifiable crushed cans; blue and green Fiesta-ware bowl fragments; white glazed earthenware plate fragments; one small enamelware bowl; clear glass bottle and screw top jar fragments; brown bottle glass fragments; including one base with an Anchor-Hocking maker's mark and 1952 date; one green glass bottle neck with a crown finish; one piece of corrugated sheet metal; and approximately 20 small pieces of milled wood.

Locus 2, roughly 90 meters north-south by 75 meters east-west, is located approximately 45 meters south-southwest of Locus 1. It is a moderately dense concentration of approximately 300 cans and other refuse. Artifacts include church key-opened beverage cans; rotary, church key and P38 opened sanitary cans; coffee cans; paint cans; small rectangular fuel cans; key strip-opened meat and sardine tins; condensed milk cans; unidentifiable crushed cans; clear glass, screw top jar fragments; and clear, brown and green glass bottle fragments, including necks with crown and screw top finishes.

Locus 3 is located approximately 30 meters south of Locus 2 and measures roughly 115 meters north-south by 137 feet east-west. Locus 3 spans both sides of Road Segment A and Road Segment B, the eastern most spur that runs south of Segment A for approximately 800 meters. Locus 3 is a dense concentration of over 500 cans and other refuse. Artifacts include church key-opened beverage cans; rotary and church key-opened sanitary cans; key strip-opened meat and sardine tins; coffee cans; small aerosol cans; small rectangular spice tins; automotive oil filters; glazed earthenware fragments, including Fiesta-ware and some with hand painted floral design; and clear, green and brown bottle glass fragments, including bottle bases with Owens-Illinois, Maywood Glass Company, Latchford-Marble Glass Company and Duraglas maker's marks with 1950-1953 dates.

Figure 8 P-15-017320 Sketch Map

[*Confidential information removed from public review]*

Locus 4 is located approximately 70 meters south of Locus 3 and measures roughly 300 meters north-south by 205 meters east-west and is a dense concentration of over 2000 cans and other refuse. Artifacts include church key-opened beverage cans; condensed milk cans; rotary and church key-opened sanitary cans; coffee cans; key strip-opened meat and sardine tins; small rectangular spice tins; talcum powder shaker cans; oil cans; rectangular fuel cans; small aerosol cans; bi-metal pull tab beverage cans; various crushed unidentifiable cans; porcelain and glazed earthenware tableware fragments; decorative porcelain fragments, including a partial horse head; various milk glass vessel fragments; glazed stoneware fragments; and clear, brown, green and cobalt blue bottle glass fragments, including bottle bases with Owens-Illinois, Maywood Glass Company and Latchford-Marble Glass Company maker's marks with 1952, 1954 and 1958 dates.

3.2 Newly Recorded Resources

3.2.1 Isolates

The survey identified seven isolated prehistoric artifacts at Project Site 2. These isolates are summarized in Table 3 below.

Table 3 Newly Recorded Isolates

Resource Designation	Age	Artifact Type
Iso-020	Prehistoric	Obsidian pressure flake
Iso-021	Prehistoric	Chalcedony interior flake
Iso-022	Prehistoric	Basalt interior flake
Iso-024	Prehistoric	CCS interior flake
Iso-025	Prehistoric	CCS interior flake
Iso-026	Prehistoric	Two CCS flakes
Iso-027	Prehistoric	CCS cortical flake

Figure 9 Aratina Iso-020

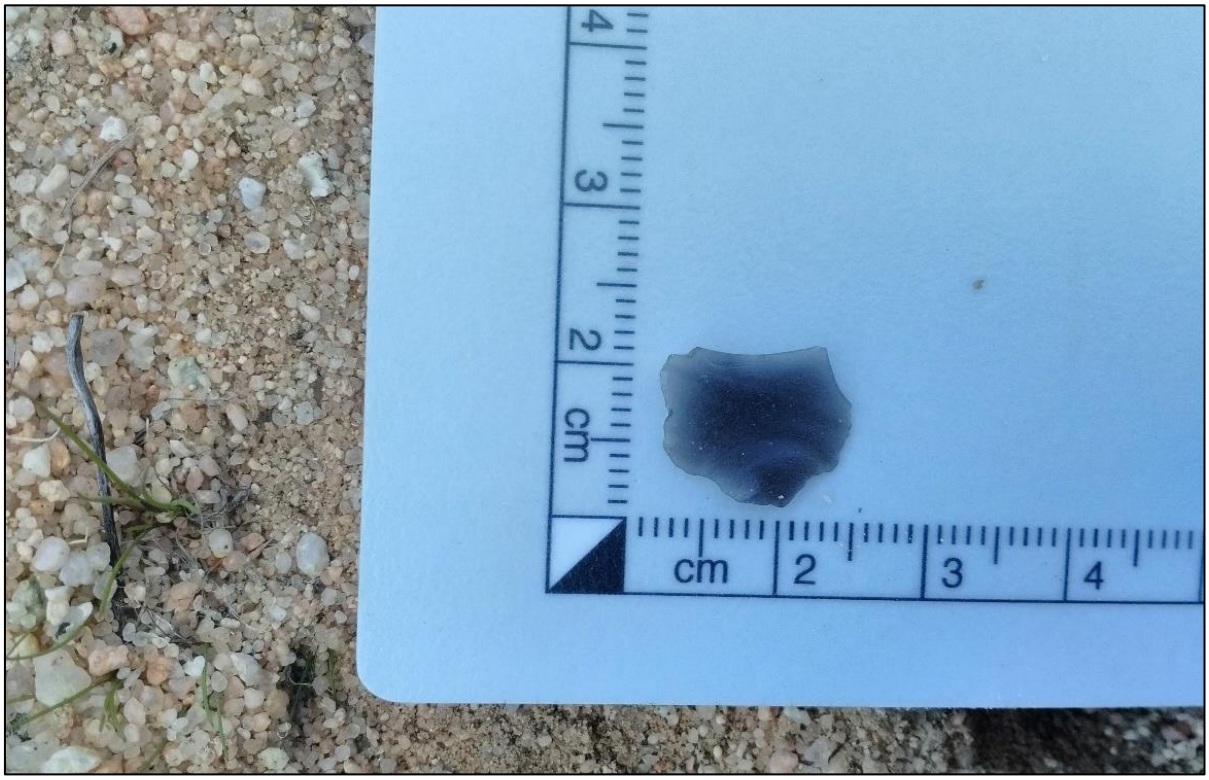


Figure 10 Aratina Iso-021



Figure 11 Aratina Iso-022

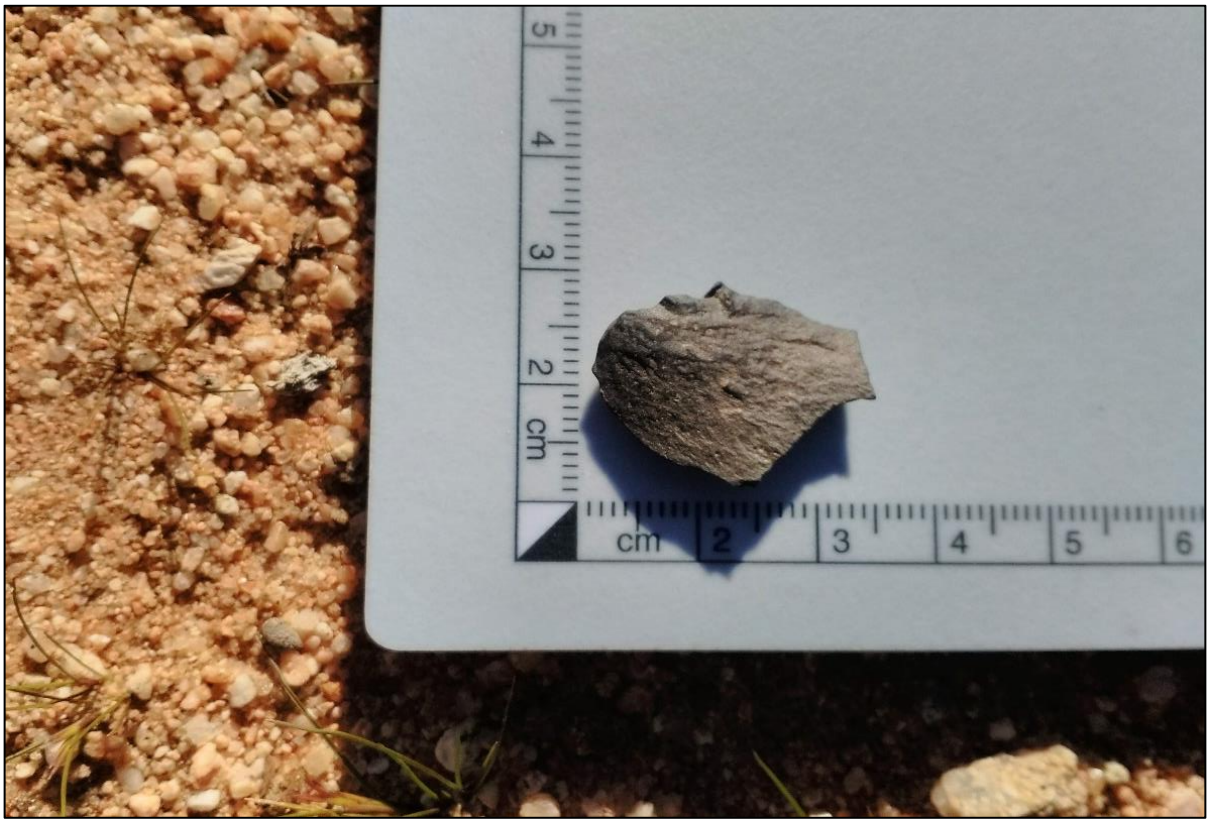


Figure 12 Aratina Iso-024



Figure 13 Aratina Iso-025



Figure 14 Aratina Iso-026, CCS Flake



Figure 15 Aratina Iso-026, CCS Flake



Figure 16 Aratina Iso-027



3.2.2 Prehistoric Sites

The survey identified five prehistoric sites on Project Site2. These sites are summarized further in Table 1 below.

Table 4 Newly Record Prehistoric Sites

Resource Designation	Age	Site Designation
Aratina S-012	Prehistoric	Lithic Scatter
Aratina S-013	Prehistoric	Lithic Scatter
Aratina S-014	Prehistoric	Lithic Scatter
Aratina S-015	Prehistoric	Lithic Scatter
Aratina S-016	Prehistoric	Lithic Scatter

3.2.2.1 Aratina S-012

The site is a scatter of lithic debitage containing approximately 38 flakes of various material types including three varieties of CCS (chert, jasper, and chalcedony), and basalt. Many of the flakes present represent early reduction, but, there are also three biface thinning flakes. The site measures approximately 70 meters north-south by 30 meters east-west and is located [*Confidential information removed from public review]*.

Figure 17 Aratina S-012, Facing Southwest



3.2.2.2 Aratina S-013

The site is a sparse scatter of lithic debitage containing approximately 13 CCS flakes including one biface thinning flake. The site measures 15 meters north-south by 30 meters east-west and is located [*Confidential information removed from public review]*.

Figure 18 Aratina S-013, Facing Northeast



3.2.2.3 Aratina S-014

The site is a small scatter of lithic debitage containing four CCS biface thinning flakes, one CCS interior flake, and one quartzite interior flake. The site measures approximately 55 meters north-south by 25 meters east-west and is located [*Confidential information removed from public review]*

Figure 19 Aratina S-014, Facing South



3.2.2.4 Aratina S-015

The site is a small scatter of lithic debitage containing two interior CCS flakes, one cortical CCS flake, and one CCS core fragment. The site measures approximately 10 meters north-south by 40 meters east-west and is located [*Confidential information removed from public review]*.

Figure 20 Aratina S-015, Facing South



3.2.2.5 Aratina S-016

The site is a scatter of lithic debitage containing approximately 33 flakes of various material types including three varieties of CCS (chalcedony, chert, and jasper) and basalt. Many of the flakes present represent early reduction, but, two CCS biface thinning flakes suggests late tool reduction occurred at the location as well. The site measures approximately 65 meters north-south by 20 meters east-west and is located [*Confidential information removed from public review]*.

Figure 21 Aratina S-016, Reduction Flake



3.2.3 Historic Sites

The survey identified three historic sites with Project Site 2. These sites are summarized further in Table 5 below.

Table 5 Newly Recorded Historic Sites

Resource Designation	Age	Site Designation
S-014H	Historic	Road
S-016H	Historic	Refuse Scatter
S-017H	Historic	Road
S-019H	Historic	Refuse Scatter

3.2.3.1 Aratina S-014H

The site is a moderately well-maintained dirt road 2.6 meters -wide that runs east to west the length of Project Sites 2 and 3 and parallels the northern border fence of Edwards Air Force Base, approximately 300 meters to the south. The road is also adjacent to, but just outside of, Project Site 1. The road runs through a flat, sandy alluvial plain with low to moderately dense creosote, saltbush, scattered Joshua trees, and patchy, low ground cover. The road is present on historic maps and aerials from 1958 to 2012 (HistoircAerials.com 2019; USGS 2019).

Figure 22 Aratina S-0014H, Facing West



3.2.3.2 Aratina S-016H

The site is a discrete concentration of over 70 cans – predominately large coffee cans, with one condensed milk can, several unidentifiable crushed cans, seven bottle glass fragments (including one Hazel Atlas glass jug base), and two glazed earthenware plate fragments. The site measures approximately 16 meters north-south by 15 meters east-west and is located on a flat, sandy alluvial plain, with low to moderate-density creosote, saltbush, and scattered Joshua trees.

Figure 23 Aratina S-016H, Facing South



3.2.3.3 Aratina S-017H

Site Aratina S-017H represents is a historical transmission line and associated dirt access road that runs east to west through Project Sites 1, 2, and 3. The site consists of a series of double poles, some wooden, but primarily steel and concrete, with ceramic insulators. At least one wooden transmission line pole has a nail in it with a raised “51” stamped on it.

3.2.3.4 Aratina S-019H

The site is a low-density refuse scatter including condensed milk cans, sanitary cans, hole-in-cap meat tins, and glass jar fragments. None of the artifacts had identifiable features. The site measures approximately 12 meters north-south by 24 meters east-west and is located on a flat, sandy, alluvial plain with low to moderate density vegetation consisting primarily of creosote, saltbush and scattered patches of low ground cover.

Figure 24 Aratina S-019H, Facing West



4 Resource Evaluations

Resources recorded and/or updated as part of the current study were evaluated for CRHR eligibility. A cultural resource is considered historically significant and eligible for the CRHR if it:

1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage
2) Is associated with the lives of persons important in our past
3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values
4) Has yielded, or may be likely to yield, information important in prehistory or history

4.1 Previously Recorded Resources

4.1.1 P-15-017319

Resource P-15-017319 consists of a segment of Jessie Road and a large associated historic refuse scatter dating to the mid-twentieth century. According to the site record, it was recommended ineligible for listing in the NRHP at the time of recording. The results of the current study have expanded the boundary of P-15-017319 to formalize the boundary of the associated refuse, though artifact types remain consistent throughout the site addition and no new significant information or data potential was identified as part of the current site update. There is no indication that the site is associated with events that made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). The resource does not embody any distinctive characteristics (does not meet Criterion 3) and is not likely to yield any information important to history as a surficial historic refuse scatter (does not meet Criterion 4). Thus, Rincon concurs with the previous recommendation that the resource is ineligible for the CRHR under all four criteria (1 through 4).

4.1.2 P-15-017320

Resource P-15-017320 was relocated during the current survey and is in a similar condition to its original recording. For the current survey, the road was divided into four distinct segments, and the associated debris scatter was recorded as four distinct concentrations with diffuse scatters of refuse in between. Far Western recommended the site ineligible for listing in the CRHR (Higgins et al. 2013). The site cannot be associated with events that have made a significant contributions to the broad patterns of California's history and cultural heritage (does not meet Criterion 1), nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a nondescript dirt road and scatter of ordinary mid-century refuse, the site does not embody any distinctive characteristics (does not meet Criterion 3). The data potential of the site has been exhausted through recordation and the site is not likely to yield any important information (does not meet Criterion 4). Thus Rincon concurs with the previous evaluation that the site is ineligible for the CRHR under all four criteria (1 through 4).

4.1.3 Isolates

Two isolates were previously recorded at Project Site 2: P-15-008723 andP-15-008724. Neither isolate was relocated, but isolates are generally recommended ineligible for CRHR listing due to a lack of association, context, and data potential.

4.2 Newly Recorded Resources

4.2.1 Isolates

The survey identified eight newly recorded isolated artifacts: Iso-013, -020, -021, -022, -024, -025, -026, and -027. Isolates are typically ineligible for CRHR listing as their data potential is exhausted during the initial recording. Therefore, Rincon recommends each of the aforementioned isolates as ineligible for the CRHR. A full list and description of each isolate can be found in Table 6.

4.2.2 Prehistoric Sites

4.2.2.1 Aratina S-012

S-012 consists of a sparse prehistoric lithic scatter of 38 CCS and basalt flakes. The flake types were noted and recorded as part of this study and consist primarily of early reduction. The resource cannot be associated with events that made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). Given the paucity of surface artifacts, the site likely represents a segregated reduction locus, indicating that the site is the result of a single reduction event and not of continued use over time. Although it contains no features or soil discoloration indicative of a subsurface deposit, the site is located directly adjacent to a seasonal drainage that may have buried portions of the site under alluvium. However, these buried deposits are likely to occur within the first 10 centimeters below the surface and will provide similar artifacts to those encountered on the surface. Based on the site condition and site components, Aratina S-012 retains little, if any, data potential to contribute to regional research themes. The majority of the site represents simple early reduction with limited amounts of biface thinning flakes. Lithic scatters such as these are ubiquitous throughout the Mojave Desert and California in general; thus the site does not have the potential to contribute new or significant information: site Aratina S-012 is recommended as ineligible for the CRHR under Criterion 4. Site Aratina S-012 is recommended as ineligible for the CRHR under all four criteria (1 through 4).

4.2.2.2 Aratina S-013

S-013 consists of a sparse prehistoric lithic scatter of 13 CCS flakes. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). The majority of the site represents simple early reduction with limited amounts of biface thinning flakes. Lithic scatters such as these are ubiquitous throughout the Mojave Desert and California in general. Thus the site does not have the potential to contribute new or significant information. Given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the

site is the result of a single reduction event and not the result of continued use over time. The resource is a relatively dense lithic scatter situated on a sandy alluvial plain, but it is located roughly 1 kilometer from the nearest drainage and does not contain any evidence of features, soil discoloration, or other indication that a subsurface deposit may be present. Because the site likely exists only on the surface, the current recording has exhausted its data potential. Thus it does not meet Criterion 4. Rincon recommends Aratina S-013 ineligible for listing in the CRHR under all four criteria (1 through 4).

4.2.2.3 Aratina S-014

S-014 consists of a sparse prehistoric lithic scatter comprised of six flakes. No evidence is present that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). Given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time. Although the site contains no features or soil discoloration indicative of a subsurface deposit, the site is located directly adjacent to a seasonal drainage that may have buried portions of the site under alluvium. However, these buried deposits are likely to occur within the first 10cm below the surface and will provide similar artifacts to those encountered on the surface. Based on the site condition and site components, Aratina S-014 retains little, if any, data potential to contribute to regional research themes. The majority of the site represents simple early reduction with limited amounts of biface thinning flakes. Lithic scatters such as these are ubiquitous throughout the Mojave Desert and California in general. Thus the site does not have the potential to contribute new or significant information. Therefore, site Aratina S-014 is recommended as ineligible for the CRHR under Criterion 4. Site Aratina S-012 is recommended as ineligible for the CRHR under all four criteria (1 through 4).

4.2.2.4 Aratina-S-015

S-015 consists of a sparse prehistoric lithic scatter comprised of four CCS flakes. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). The majority of the site represents simple early reduction with limited amounts of biface thinning flakes. Lithic scatters such as these are ubiquitous throughout the Mojave Desert and California in general. Thus the site does not have the potential to contribute new or significant information. Given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time. It is located roughly 0.29 kilometer from the nearest drainage and does not contain any evidence of features, soil discoloration, or other indication that a subsurface deposit may be present. Because the site likely exists only on the surface, the current recording has exhausted its data potential. Thus it does not meet Criterion 4. Rincon recommends Aratina S-013 ineligible for listing in the CRHR under all four criteria (1 through 4).

4.2.2.5 Aratina S-016

S-016 consists of a prehistoric lithic scatter comprised of 33 CCS and basalt flakes, primarily consisting of early reduction flakes. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). The majority of the site represents simple early reduction with limited amounts of biface thinning flakes. Lithic scatters such as these are ubiquitous throughout the Mojave Desert and California in general. Thus the site does not have the potential to contribute new or significant information. Given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time. The resource is situated on a sandy alluvial plain, but it is located roughly 0.36 kilometer from the nearest drainage and does not contain any evidence of features, soil discoloration, or other indication that a subsurface deposit may be present. The site likely exists only on the surface based on the site type and soil formations. Therefore, the current recording has exhausted its data potential. Thus it does not meet Criterion 4. Rincon recommends Aratina S-013 ineligible for listing in the CRHR.

4.2.3 Historic Sites

4.2.3.1 Aratina S-014H

S-014H consists of a historic-age unnamed dirt road. No evidence is present that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2).). No information was identified that would indicate past owners of the land were important persons in Boron's history. The resource does not embody any distinctive characteristics and represents a two-track road commonly found in the Mojave area (does not meet Criterion 3). The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.3.2 Aratina S-016H

S-016H consists of a historic refuse deposit of roughly 70 cans. No evidence is present that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2).). No information was identified that would indicate past owners of the land were important persons in Boron's history. The resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and Edwards Air Force Base. Because the site consists primarily of the same type of can, Aratina S-016H likely represents a single dumping episode. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.3.3 Aratina S-017H

S-017H consists of an historic-period unpaved road. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. As a nondescript dirt road, the resource does not embody any distinctive characteristics (does not meet Criterion 3) and is not likely to yield important information (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.3.4 Aratina S-019H

S-019H consists of a historic refuse deposit. No evidence is present that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. The resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and Edwards Air Force Base. As a low-density scatter, Aratina S-019H likely represents a single dumping episode. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR under all four criteria (1 through 4).

5 Findings and Recommendations

Seventeen newly identified cultural resources and four previously recorded cultural resources were identified during the current study for Project Site 2. All of these resources have been recommended ineligible for listing in the CRHR and do not require any additional work (Table 6).

However, given the number of resources identified within Project Site 2 and the presence of prehistoric archaeological sites, the project is considered sensitive for historic and prehistoric archaeological resources. To avoid impacts to subsurface discoveries during construction, Rincon recommends archaeological sensitivity training prior to project ground disturbance and archaeological and Native American monitoring during project ground disturbance.

Table 6 Summary of Resources and Recommendations

Resource	Description	Significance	Recommendation
P-15-008723	Chalcedony Flake	Recommended ineligible	No further work
P-15-008724	Chalcedony Flake	Recommended ineligible	No further work
P-15-017319	Historic Road	Recommended ineligible	No further work
P-15-017320	Historic Road	Recommended ineligible	No further work
Aratina Iso-020	Obsidian pressure flake	Recommended ineligible	No further work
Aratina Iso-021	Chalcedony interior flake	Recommended ineligible	No further work
Aratina Iso 022	Basalt interior flake	Recommended ineligible	No further work
Aratina Iso-024	Cryptocrystalline silica (CCS) flake	Recommended ineligible	No further work
Aratina Iso-025	CCS interior flake	Recommended ineligible	No further work
Aratina Iso-026	Two CCS flakes	Recommended ineligible	No further work
Aratina Iso-027	CCS cortical flake	Recommended ineligible	No further work
Aratina S-014H	Road	Recommended ineligible	No further work
Aratina S-016H	Refuse Scatter	Recommended ineligible	No further work
Aratina S-017H	Road	Recommended ineligible	No further work
Aratina S-019H	Refuse Scatter	Recommended ineligible	No further work
Aratina S-012	Lithic Scatter	Recommended ineligible	No further work
Aratina S-013	Lithic Scatter	Recommended ineligible	No further work
Aratina S-014	Lithic Scatter	Recommended ineligible	No further work
Aratina S-015	Lithic Scatter	Recommended ineligible	No further work
Aratina S-016	Lithic Scatter	Recommended ineligible	No further work

5.1 Archaeological Sensitivity Training

Rincon recommends that the qualified archaeologist conduct a worker's environmental awareness program training for archaeological sensitivity for all construction personnel prior to the commencement of any ground disturbing activities. Archaeological sensitivity training should include a description of the types of cultural material that may be encountered, cultural sensitivity issues, regulatory issues, and the proper protocol for treatment of the materials in the event of a find.

5.2 Archaeological and Native American Monitoring

Rincon recommends archaeological and Native American monitoring of project-related ground disturbing activities within the project site but outside of the lakebed. Archaeological monitoring should be performed under the direction of the qualified archaeologist. The qualified archaeologist, in consultation with the County of San Bernardino and the Native American monitor, should have the power to reduce or stop monitoring depending upon observed conditions. If archaeological resources are encountered during ground-disturbing activities, work within the immediate area must halt and the find evaluated for significant under CEQA.

5.3 Unanticipated Discovery of Cultural Resources

If cultural resources are encountered during ground-disturbing activities, work in the immediate area must halt and an archaeologist meeting the Secretary of the Interior's Professional Qualification Standards for archaeology (National Park Service 1983) should be contacted immediately to evaluate the find. If the discovery proves to be eligible for listing in the NRHP or CRHR, additional work such as data recovery excavation and Native American consultation may be warranted to mitigate any significant impacts/adverse effects.

5.4 Unanticipated Discovery of Human Remains

The discovery of human remains is always a possibility during ground-disturbing activities. If human remains are found, the State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the County Coroner must be notified immediately. If the human remains are determined to be prehistoric, the Coroner will notify the Native American Heritage Commission, which will determine and notify a most likely descendant, who has 48 hours from being granted site access to make recommendations for the disposition of the remains. If the most likely descendant does not make recommendations within 48 hours, the land owner shall reinter the remains in an area of the property secure from subsequent disturbance.

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Aratina Solar Project

Cultural Resources Assessment Report

Volume IV

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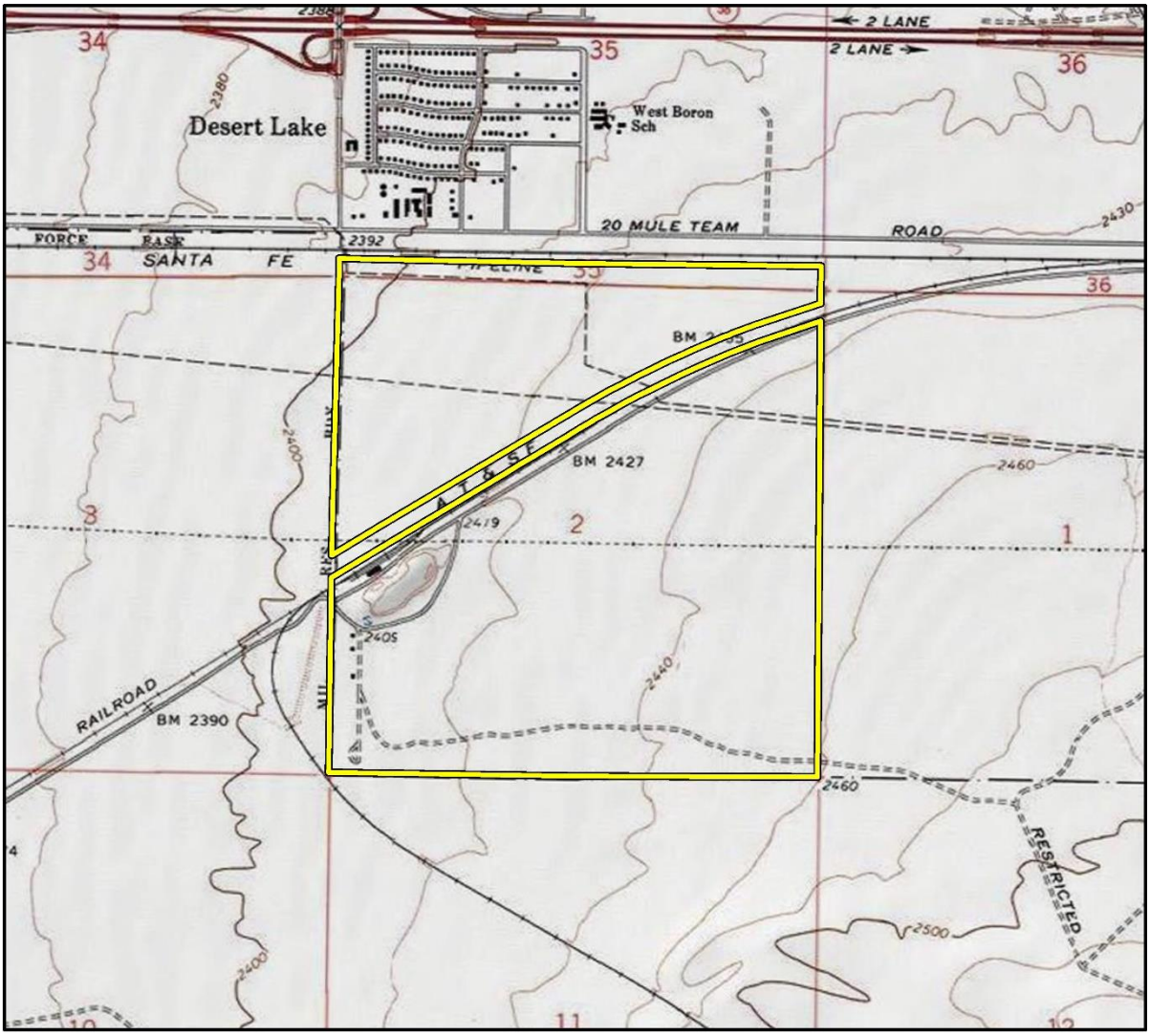
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1 Project Site 3 Description

Project Site 3 is located south of the community of Desert Lake, directly adjacent to Twenty Mule Team Road (Figure 1). The area is characterized by northwest/southeast trending mountains, and broad alluvial fans. Seasonable water sources including several local drainages can be found throughout the area. Plant communities are largely dominated by creosote bush (*Larrea tridentata*) with a low diversity of perennial species. Despite the relatively low levels of annual rainfall, scattered winter rains provide enough precipitation for the germination and growth of spring annuals and grasses. Several mammal and reptile species live in the area, including mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), wild burro (*Equus asinus*), horned lizards (*Phrynosoma sp*.), desert tortoise (*Gopherus agassizii*), and red-tailed hawk (*Buteo jamaicensis*). Figure 1, Figure 2, and Figure 3 provide general overview images of the project site.

Figure 1 Project Site 3



Imagery provided by National Geographic Society, Esri and its licensors © 2020. Leuhman Ridge Quadrangle. T10N R08W S02 & T11N R08W S35. The topographic representation depicted in this map may not portray all of the features currently found in the vicinity today and/or features depicted in this map may havechanged since the original topographic map was assembled.

Project Site #3

0 1,000 2,000 Feet

N



CRFig X CUP Proj Locn Map

Figure 2 Project Site 3, Facing Southwest



Figure 3 Project Site 3, Facing East



2 Background Research Results

As discussed in Volume I, background research for this cultural resource assessment included records searches, a review of historical maps and aerial photographs, and Native American outreach. A summary of findings of each of these efforts specific to Project Site 3 follows.

2.1 Cultural Resources Record Search

2.1.1 Previous Studies

The SSJVIC records search identified five prior cultural resources studies in Project Site 3 (Table 1).

Table 1 Previous Cultural Resource Studies within Project Site 3

Report Number	Author	Year	Title
KE-00019	Macko, M.	1988	Final Report on Archaeological Survey Results for United States Borax and Chemical Company's Boron Cogeneration Facility--Plant Site, Waterline Route, and Electrical and Gas Transmission Route Corridors
KE-00633	Macko, M., J. Binning, D. Earle, and P. Langenwalter	1993	National Register Eligibility Determinations for Historic Resources Along the Proposed AT&T Lightguide System, Victorville to Bakersfield, California
KE-02610	Unknown	2002	Phase II Cultural Resource Evaluation for 62 Historic-Period Sites in Management Region 4, Edwards AFB, Kern County, California
KE-03239	Underwood, J. and J. Cleland	2002	Cultural Resources Survey of Line 1903, All American Pipeline Conversion Project from Mettler, Kern County, CA to Daggett, San Bernardino County, California
KE-04476	Higgins, C., R. Kellawan, D. Duke, and T. Lucas	2013	Cultural Resources Inventory of 5,300 Acres for the PG&E Pipelines 300A and 300B, San Bernardino and Kern Counties, California

Source: SSJVIC 2019

2.1.2 Recorded Resources

The SSJVIC records search conducted for this effort identified two previously recorded cultural resources at Project Site 3, listed in Table 2. They are a historic period refuse scatter and a historic road segment.

Table 2 Previously Recorded Cultural Resource within Project Site 3

Primary Number	Trinomial	Resource Type	Description	Recorder(s) and Year(s)	NRHP/CRHR Status
P-15-012426	CA-KER-007019H	Historic Site	Refuse Scatter	J. Fogerty, J. Farrell, B. Ludwig, S. Batchelor, C. Speckman, M. Mavety, D. Brietkreutz, M. Zizzo 2005	Recommended ineligible for NRHP
P-15-017319	-	Historic Structure	Dirt road	D. Martinez and D. Mike 2013	Recommended ineligible for NRHP

Source: SSJVIC 2019

2.1.2.1 P-15-012426

P-15-012426 is a historic-aged refuse scatter originally recorded in 2003. The site is 297 meters long northeast/southwest and 83 meters wide northwest to southeast and contains five distinct dump points. The site area was intensively surveyed and presumed to lack any sub surface deposits. All five dump points date to the mid-twentieth century based on seriation of glass bottles and the multitude of cans.

2.1.2.2 P-15-017319

P-15-017319 is historic road originally recorded by Far Western in 2013 as a 0.5 mile long [*Confidential information removed from public review]* and associated historic era refuse scatter. The road is depicted on the 1956 Kramer 15-minute topographic map. The refuse scatter included church key-opened, flat top beverage cans, a condensed milk can, and nondescript sanitary cans. The road was recommended ineligible for the NRHP (Higgins et al. 2013).

2.2 Native American Outreach

Native American outreach did not identify any cultural resources concerns for Project Site 3.

2.3 Historic Map and Aerial Review

A review of historic USGS topographic maps and historic aerials identified a historic-age clay plant within Project Site 3. The plant was recorded as part of the current effort as Aratina S-018H and is discussed in further detail below.

According to the Bureau of Land Management General Land Office records, the land on which Project Site 3 is situated was owned by James Joseph Fitzgerrell in 1919, Ruth Myrick in 1921, and the Mojave Corporation in 1954 (Bureau of Land Management General Land Office 2019). Rincon was unable to find information about Fitzgerrell, Myrick, or the Mojave Corporation that would indicate they are important persons or entities in history.

3 Field Survey

Project Site 3 is located on a flat, sandy alluvial plain in a mostly undeveloped area with 50 to 80 percent ground visibility. The pedestrian survey identified and recorded seven new resources, including five prehistoric isolates and two historic sites. Each of these resources is discussed in further detail below. A map depicting the location of each resource in the project site can be found in the associated Department of Parks and Recreation (DPR) Series 523 Forms in Confidential Appendix E.

3.1 Previously Recorded Resources

3.1.1 P-15-012426

Resource P-15-012426 was originally recorded as a refuse deposit with five concentrated dump points. The portion of the site within the current project boundary was relocated and noted to be in a similar condition to its original recording. As a result of the current survey, the site boundary was extended roughly 122 meters north and 487.7 meters west. Five additional refuse concentrations have been added to the resource record as Loci 1-5 (Figure 4). [*Confidential information removed from public review]*.

Locus 1 is located near the east end of the expanded site boundary, roughly 38 meters west of the original site boundary. Locus 1 measures approximately 38 meters from north to south by 68.6 meters from east to west and consists of a dense concentration of over 500 cans, including: regular and tall-boy church key opened beverage cans; church key opened sanitary cans (likely juice); rotary opened sanitary cans (likely fruit and vegetables); coffee cans; condensed milk cans; cone-top beverage cans (crown tops); brake fluid cans (screw tops); key strip opened meat and sardine tins; and lamp oil cans. Other artifact types identified included: milk glass; glazed earthenware and porcelain tableware; metal barrel straps; small bits of milled lumber; brick fragments; and clear, brown, green and cobalt blue bottle glass. Identifiable glass fragments included a brown PUREX base with a 1959 date and a Latchford Glass Company maker's mark, two brown bases with Northwestern Glass Company maker's marks and 1960 dates, one Coca-Cola bottle base with an Owens-Illinois maker's mark and "SAN BERNARDINO/CALIF" embossed text; Ponds and Jergens milk glass cold cream jars, and an earthenware plate with a "UNIVERSAL OVEN-PROOF/BALLERINA/UNION MADE IN U.S.A." maker's mark.

Locus 2, located approximately 18.3 meters west of Locus 1, is a dense refuse scatter, roughly 47.2 meters from north to south by 41.1 meters from east to west, that contains over 1000 cans with a similar artifact assemblage as Locus 1. Additional artifact types identified at Locus 2 include: aerosol cans; rectangular fuel cans; decorative brick; glazed stoneware fragments; a small rectangular aspirin tin with an exterior friction lid; a padlock with key; a small round, metal alarm clock; automobile headlight fragments; a decorative wooden furniture leg; a glazed earthenware plate fragment with a "FRAFT PINK/HOMER LAUGHLIN/MADE IN U.S.A." maker's mark; a Suncrest soda bottle fragment with blue and white printed label; a clear glass orange juice bottle fragment; Pepsi and 7 Up bottle fragments; a brown glass base with Owens-Illinois/Duraglass maker's mark and a

Figure 4 P-15-012426 Sketch Map

[*Confidential information removed from public review]*

1958 date; a brown base with a Northwestern Glass Company maker's mark and a 1950 date; a brown base with a 1959 date and Maywood Glass Company maker's mark; a Gallo wine bottle base and a brown base with an Owens-Illinois maker's mark and 1951 date.

Locus 3, located roughly 27.4 meters northwest of Locus 3, is a dense refuse concentration of over 300 cans, roughly 33.5 meters from north to south by 27.4 meters from east to west, that contains an artifact assemblage similar to Locus 1. Additional artifact types identified at Locus 3 include: a Coca-Cola bottle base with "BAKERSFIELD/CALIF."; a Coca-Cola bottle base with an Owens-Illinois maker's mark; terra cotta pot fragments; metal clothes hangers; bed springs; a clear bottle base with an Owens-Illinois maker's mark and 1936 date; a light green bottle base with an Owens-Illinois mark and 1952 date; a glazed earthenware cup fragment with a raised, painted floral design; a "…Nesbitt's/Of CALIFORNIA…" soda bottle fragment with white printed label; a clear bottle body fragment with a white printed label "AUQUAMARINE/LOTION/Revlon/LOTION FOR SOOTHING/…HANDS AND BODY" and a can base with a logo of a standing person with upstretched arms embossed on the bottom.

Locus 4, located roughly 88.4 meters southwest of Locus 3, roughly 30.5 meters from north tosouth by 42.7 meters from east towest, is a moderately dense refuse scatter of over 200 cans. Artifacts at Locus 4 include: church key opened beverage and sanitary cans; rotary opened sanitary cans; key strip opened meat tins; paint cans; lamp oil cans; small rectangular fuel cans; an internal friction lid from a cottage cheese can with a yellow and red printed label; coffee cans; motor oil cans; clear, brown and green bottle fragments; clear and brown jug and screw top jar fragments; and milk glass fragments.

Locus 5, located roughly 157 meters southwest of Locus 4, near the west end of the expanded site boundary, is a light to moderately dense refuse scatter 15.2 meters from north tosouth by 30.1 meters from east towest. Artifacts at Locus 5 include: church key opened beverage cans; church key and rotary opened sanitary cans; coffee cans; motor oil cans; condensed milk cans; milk glass and clear, brown and green bottle glass, including one brown Anchor-Hocking base with a 1961 date, a Gallo wine bottle base, a clear Owens-Illinoi/Duraglas bottle base, a brown Hazel Atlas base, white and light green milk glass cup fragments with an Anchor Hocking/Fire-King Ware maker's marks; and a church key opened beverage can with a notched seam and a red and white printed label that says "diet SHASTA/CHERRY COLA/…HAYWARD, CALIFORNIA U.S.A…."

Figure 5 P-15-012426 Locus 2, Facing South



3.1.2 P-15-017319

The resource was originally recorded by Far Western in 2013 as a 0.8-kilometer long segment of [*Confidential information removed from public review]* and associated historic era refuse scatter. The road was relocated during the current survey and is in a similar condition to its original recording. As a result of the current survey, the associated debris scatter was recorded as four distinct loci, (Loci 1-4), with diffuse scatters of refuse in between. [*Confidential information removed from public review]*.

Locus 1, located [*Confidential information removed from public review]*, is the southwestern most locus within the site boundary. Locus 1 measures roughly 15.2 meters north-south by 21.3 meters east-west and is a low density scatter of over 70 cans and other refuse. Artifacts include: condensed milk cans; rotary opened sanitary cans; church key-opened beverage cans; key strip opened meat tins; glazed earthenware tableware fragments; clear glass screw top jar fragments and clear and brown glass bottle fragments, including liquor, medicine/extract and crown finish beverage bottles, and one clear glass bottle base with “PAT. NO. 99839/Hires” embossed on the bottom and “12 FLD. OZ. NET CONTENTS” on the heel.

Locus 2, located [*Confidential information removed from public review]*, is a moderately dense scatter of over 200 cans and other refuse roughly 15.8 meters north-south by 25.9 meters east-west. Artifacts at Locus 2 include: condensed milk cans; rotary and church key-opened sanitary cans; church key-opened beverage cans; coffee cans; motor oil cans;

Figure 6 P-15-017319 Sketch Map, Locus 1

[*Confidential information removed from public review]*

Figure 7 P-15-017319 Sketch Map, Locus 2

[*Confidential information removed from public review]*

Figure 8 P-15-017319 Sketch Map, Locus 3

[*Confidential information removed from public review]*

Figure 9 P-15-017319 Sketch Map, Locus 4

[*Confidential information removed from public review]*

key strip opened meat tins; glazed earthenware tableware fragments; and clear, decorative glass and glass bottle and screw top jar fragments.

Locus 3, located [*Confidential information removed from public review]*, is a low density refuse scatter, roughly 7.6 meters in diameter. Locus 2 contains 27 cans, including: church key opened beverage cans; rotary opened sanitary cans; key strip opened meat cans; coffee cans, including one with a partially intact printed label that reads, "…YUBAN/COFFEE…"; and five clear glass jar/bottle fragments.

Locus 4 is located [*Confidential information removed from public review]*. Locus 4 consists of six distinct refuse scatters of various dimensions and densities labeled Concentrations A-F. The east end of Locus 4 is roughly 70.1 meters west of the intersection of Jessie Street and South Wesley Street. Refuse is present between each concentration. Each concentration is discussed in more detail below.

Concentration A, at the southwest corner of Locus 4, is a low to moderately dense scatter of over 200 cans and other debris. Artifacts include: condensed milk cans; cone-top beverage cans; key strip-opened meat and sardine tins; church key opened beverage cans; large and small rectangular fuel cans; coffee cans; motor oil cans; hinged lid tobacco tins; one sanitary can with "GHEE?/R/24-5-47/?6-37?-80/STC" embossed on the bottom; one 5-gallon metal bucket; bits of bailing wire and milled wood; glazed earthenware tableware fragments; one engine head gasket fragment; two railroad spikes; and numerous clear, brown, and green glass bottle fragments, including bottle bases with Owens-Illinois, Maywood Glass Company and Duraglas maker's marks and dates of 1950 and 1954.

Concentration B, located approximately 85.3 meters northwest of Concentration A, is a dense scatter, roughly 121.9 meters north-south by 73.2 meters east-west, that contains approximately 3,000 cans, primarily motor oil cans, and other refuse. Artifacts consist of: motor oil cans, church key-opened beverage cans; rotary opened sanitary cans; condensed milk cans; rectangular fuel cans; coffee cans; clear and brown bottle glass fragments; concrete cinder block fragments; fragments of mortar and milled wood; and one vehicle tire. Almost all the motor oil cans are very densely concentrated within an area roughly 6.1 meters in diameter, with the remaining debris scattered more diffusely throughout the concentration.

Concentration C, located approximately 192.0 meters northeast of Concentration B, is a low to moderately dense refuse scatter, roughly 50.3 meters north-south by 121.9 meters east-west, that contains approximately 300 cans and other debris. Artifacts include: condensed milk cans; church key-opened beverage cans; rotary and church key-opened sanitary cans; rectangular fuel cans; one automotive air filter fragment; porcelain and glazed earthenware tableware fragments, some with blue on white transfer print decoration; glass tumbler fragments; milk glass; clear glass screw top jar fragments; and clear and brown glass bottle fragments, including soda bottle fragments with printed labels, bottle necks with crown finishes and bottle bases with 1949 and 1952 dates, including Anchor-Hocking, Owens-Illinois, Latchford-Marble Glass Company and Duraglas maker's marks.

Concentration D, located approximately 71.6 meters southeast of Concentration C, is a low to moderately dense scatter of over 150 cans and other debris, roughly 65.8 meters north-south by 39.6 meters east-west. Artifacts include: church key-opened beverage cans; rotary and church key-opened sanitary cans; key strip-opened meat and fish tins; coffee cans; motor oil cans; small rectangular fuel cans; bits of mortar and concrete; milled wood; and clear and brown bottle glass

fragments, including necks with crown finishes and one clear base with “WHITE ROCK…”, a 1949 date and Owens-Illinois/Duraglas maker’s mark.

Concentration E, located roughly 121.9 meters east-southeast of Concentration D, is a low density refuse scatter, roughly 17.7 meters north-south by 23.5 meters east-west, that contains over 60 cans and other debris. Artifacts include: rotary and P38-opened sanitary cans; church key-opened beverage cans; condensed milk cans; key strip-opened meat tins; hinged lid tobacco tins; porcelain fragments; and clear and light green bottle glass fragments, including one clear base with a 1948 date and an Owens-Illinois maker’s mark.Concentration F, located approximately 51.8 meters north of Concentration E, is a moderately dense scatter of predominately clear, brown and green bottle glass fragments, roughly 17.7 meters north-south by 68.6 meters east-west. Concentration F contains thousands of bottle glass fragments, including: a clear Hires Root Beer bottle base; a green 7 Up bottle base and body fragment with a white and red printed label and Owens-Illinois maker’s mark; a clear body fragment with a faded red printed label, “…YOO/…NNER OF/…19/…MEDALS…”; a brown base with an Anchor-Hocking maker’s mark and 1944 date; a clear base with an Alexander H. Kerr & Company maker’s mark; a clear base with a Maywood Glass Company mark; a clear base with an Anchor-Hocking mark; and a brown base with a Thatcher Manufacturing Company maker’s mark and a 1949 date.

3.2 Newly Recorded Resources

3.2.1 Isolates

The survey identified a total of five isolated prehistoric artifacts within Project Site 3. These isolates are summarized further in Table 3 below.

Table 3 Newly Recorded Isolates

Resource Designation	Age	Artifact Type
Iso-023	Prehistoric	One obsidian and one chalcedony flake
Iso-028	Prehistoric	Cryptocrystalline silica (CCS) flake
Iso-029	Prehistoric	Obsidian flake
Iso-030	Prehistoric	Chalcedony flake
Iso-031	Prehistoric	Slate pendant

Figure 10 Aratina Iso-023, Obsidian Flake



Figure 11 Aratina Iso-023, Chalcedony Flake



Figure 12 Aratina Iso-028



Figure 13 Aratina Iso-029



Figure 14 Aratina Iso-030



Figure 15 Aratina Iso-031



3.2.2 Historic Sites

The survey identified two historic sites with Project Site 3. These sites are summarized in Table 4 below.

Table 4 Newly Recorded Historic Sites

Resource Designation	Age	Site Designation
S-018H	Historic	Remnants of clay plant
S-021H	Historic	Refuse Scatter

3.2.2.1 Aratina S-018H

The site is the location of a clay plant, as labeled on USGS topographic maps, that contains a number of concrete foundations, collapsed wooden structures, barbed wire fencing, and debris piles. Several dirt access roads of various dimensions run through the site in multiple directions. An historical transmission line and associated dirt access road, (Aratina S-017H, discussed in detail below), runs east to west through the north end of the site. Most of the foundations and construction debris lie within the southern half of the site, with the northern half taken up primarily by a graded, sandy flat with large spoils piles of sand and clay. The site measures roughly 0.8 kilometers from north to south by 0.4 kilometers from east to west and is on a flat, sandy, alluvial plain. The clay plant is visible and labeled as a "Clay Plant" on USGS Topographic maps from 1958 to 1986 (HistoricAerials.com 2019; USGS Topoview 2019).

Rincon was unable to identify the name or origin of the clay plant. A review of the Bureau of Land Management General Land Office records did not identify any land patent records for the Public Land Survey section on which the clay plant sits (Bureau of Land Management General Land Office 2019). No signage or indication of a company name was identified during the survey and recording of the site. Thus, the owner, operator, and dates of operation of the clay plant are unclear.

Figure 16 Aratina S-018H, Facing North



3.2.2.2 Aratina S-021H

The site is a low density refuse scatter of 12 cans, approximately 12 brown bottle glass fragments, and one metal barrel strap. The cans consist of four knife opened condensed milk cans, two ribbed-top, rotary and knife opened sanitary cans, two knife opened sanitary cans with stamped ends, and three knife opened motor oil cans. The bottle fragments include one neck with a crown finish. The site measures approximately 12 meters from north to south by 24 meters from east to west and is on a flat, sandy, alluvial plain. The site dates to the mid-twentieth century.

Figure 17 Aratina S-021H



4 Resource Evaluations

Resources recorded and/or updated as part of the current study were evaluated for CRHR eligibility.

A cultural resource is considered historically significant and eligible for the CRHR if it:

1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2) Is associated with the lives of persons important in our past;
3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
4) Has yielded, or may be likely to yield, information important in prehistory or history.

4.1 Previously Recorded Resources

4.1.1 P-15-012426

Resource P-15-012426 consists of a large historic refuse scatter dating to the mid-twentieth century. According to the site record, it was recommended ineligible for listing in the NRHP at the time of recording. The results of the current study have expanded the boundary of P-15-012426, though artifact types remain consistent throughout the site addition and no new information or data potential was identified as part of the current site update. There is no indication that the site is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. The resource does not embody any distinctive characteristics (does not meet Criterion 3) and is not likely to yield any information important to history (does not meet Criterion 4). Thus, Rincon recommends P-15-012426 ineligible for listing in the CRHR.

4.1.2 P-15-017319

Resource P-15-017319 consists of a segment of [*Confidential information removed from public review]* and a large associated historic refuse scatter dating to the mid-twentieth century. According to the site record, it was recommended ineligible for listing in the NRHP at the time of recording. The results of the current study have expanded the boundary of P-15-017319 to formalize the boundary of the associated refuse, though artifact types remain consistent throughout the site addition and no new significant information or data potential was identified as part of the current site update. There is no indication that the site is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. The resource does not embody any distinctive characteristics (does not meet Criterion 3) and is not likely to yield any information important to history as a surficial historic refuse scatter (does not meet Criterion 4). Thus, Rincon concurs with the previous recommendation as ineligible for the CRHR under all four criteria (1-4).

4.2 Newly Recorded Resources

4.2.1 Isolates

The survey identified a total of five newly recorded isolated artifacts: Iso-023, -028, -029, -030, and -031. Isolates are typically ineligible for CRHR listing as their data potential is exhausted during the initial recording. Therefore, Rincon recommends each of the aforementioned isolates as ineligible for the CRHR. A full list and description of each isolate can be found in Table 3 on page 13.

4.2.2 Historic Sites

4.2.2.1 Aratina S-018H

S-018H consists of the ruins of a historic period clay plant, including associated foundations, roads, rubble piles, and refuse scatters. No evidence is present that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). Though mining was an important historical feature of Boron and the surrounding area, this was due to its rich colemanite, not for its clay mines. The resource does not embody any distinctive characteristics (does not meet Criterion 3). The site is a surface scatter of artifacts, foundations, and debris, and its data potential was exhausted by this recording (does not meet does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.2.2 Aratina S-021H

S-021H consists of a historic refuse scatter. No evidence is present that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. The resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and Edwards Air Force Base and adjacent to roadways and rail lines. Aratina S-021H is located near Jessie Street and the Southern Pacific Railroad alignment and likely represents a single dumping episode. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

5 Findings and Recommendations

Seven newly identified cultural resources and two previously recorded cultural resources were identified during the pedestrian survey. All of these resources have been recommended ineligible for listing in the CRHR and do not require any additional work (see Table 5). However, given the number of resources identified within Project Site 3, the project site is considered sensitive for archaeological resources. To avoid impacts to subsurface discoveries during construction, Rincon recommends archaeological sensitivity training prior to project ground disturbance and archaeological and Native American monitoring during project ground disturbance.

Additionally, Iso-031, while not eligible for listing in the CRHR, consists of a slate pendant which is an uncommonly found artifact type that would be commonly looted or stolen. Rincon recommends, if possible, that the pendant be collected and donated to a regional museum such as the Antelope Valley Indian Museum.

Table 5 Summary of Resources and Recommendations

Resource	Description	Significance	Recommendation
P-15-012426	Historic refuse scatter	Recommended ineligible	No further work
P-15-017319	Historic dirt road	Recommended ineligible	No further work
S-018H	Historic clay plant ruins	Recommended ineligible	No further work
S-021H	Historic refuse scatter	Recommended ineligible	No further work
Iso-023	Two prehistoric flakes	Recommended ineligible	No further work
Iso-028	Prehistoric flake	Recommended ineligible	No further work
Iso-029	Prehistoric flake	Recommended ineligible	No further work
Iso-030	Prehistoric flake	Recommended ineligible	No further work
Iso-031	Prehistoric slate pendant	Recommended ineligible	No further work; Optional collection

5.1 Archaeological Sensitivity Training

Rincon recommends that the qualified archaeologist conduct a worker's environmental awareness program (WEAP) training for archaeological sensitivity for all construction personnel prior to the commencement of any ground disturbing activities. Archaeological sensitivity training should include a description of the types of cultural material that may be encountered, cultural sensitivity issues, regulatory issues, and the proper protocol for treatment of the materials in the event of a find.

5.2 Archaeological and Native American Monitoring

Rincon recommends archaeological and Native American monitoring of project-related ground disturbing activities within Project Site 3. Archaeological monitoring should be performed under the direction of the qualified archaeologist. The qualified archaeologist, in consultation with the County of Kern and the Native American monitor, should have the power to reduce or stop monitoring

depending upon observed conditions. If archaeological resources are encountered during ground-disturbing activities, work within the immediate area must halt and the find evaluated for significant under CEQA.

5.3 Unanticipated Discovery of Cultural Resources

If cultural resources are encountered during ground-disturbing activities, work in the immediate area must halt and an archaeologist meeting the Secretary of the Interior's Professional Qualification Standards for archaeology (National Park Service 1983) should be contacted immediately to evaluate the find. If the discovery proves to be eligible for listing in the NRHP or CRHR, additional work such as data recovery excavation and Native American consultation may be warranted to mitigate any significant impacts/adverse effects.

5.4 Unanticipated Discovery of Human Remains

The discovery of human remains is always a possibility during ground-disturbing activities. If human remains are found, the State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the County Coroner must be notified immediately. If the human remains are determined to be Native American, the Coroner will notify the Native American Heritage Commission, which will determine and notify a most likely descendant (MLD). The MLD has 48 hours from being granted site access to make recommendations for the disposition of the remains. If the most likely descendant does not make recommendations within 48 hours, the land owner shall reinter the remains in an area of the property secure from subsequent disturbance.

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Aratina Solar Project

Cultural Resources Assessment Report

Volume V

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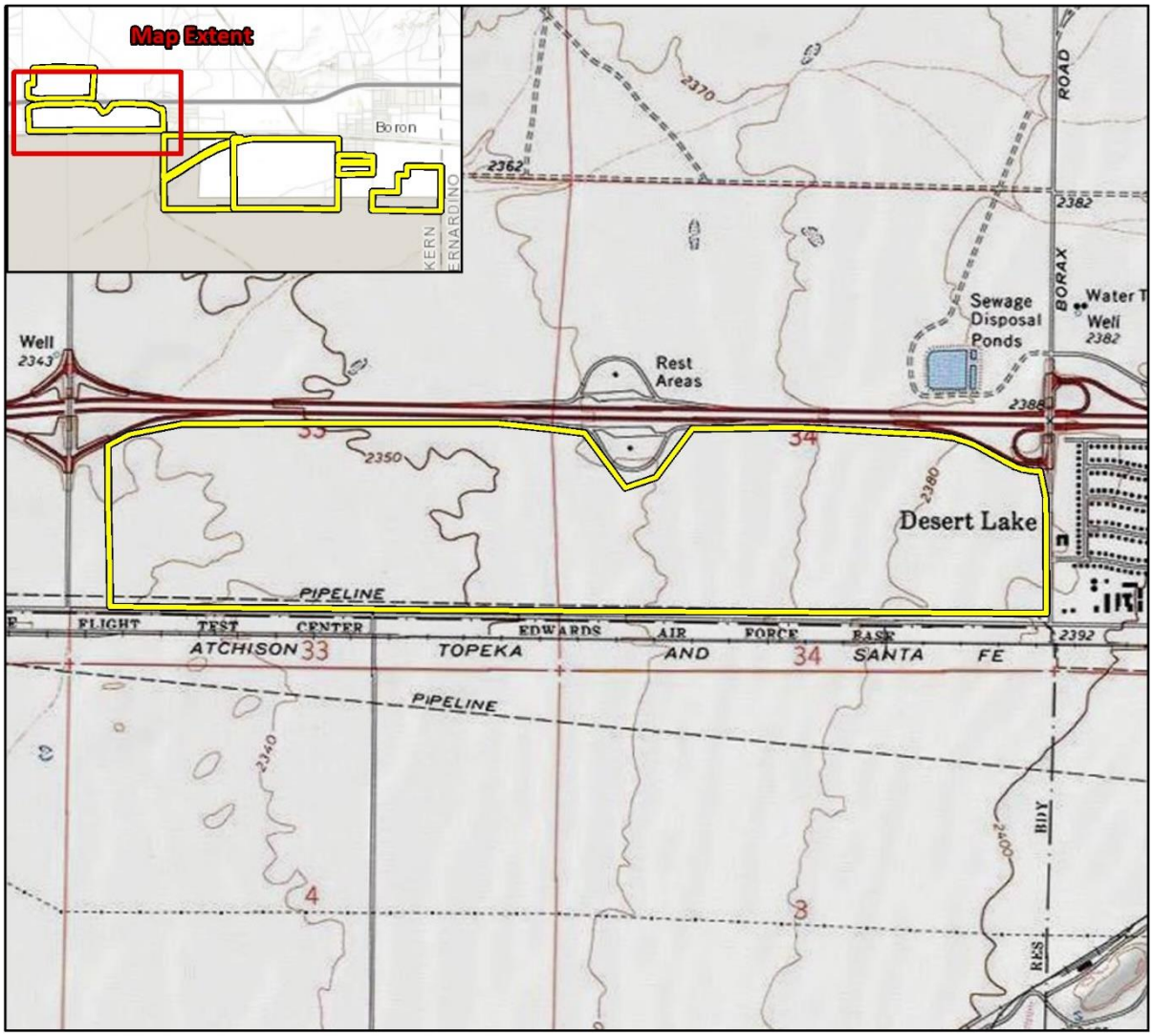
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1 Project Site 4 Description

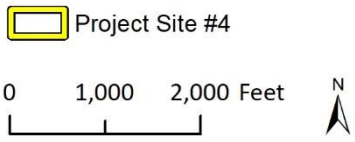
1.1 Project Location

Project Site 4 is located west of the Town of Desert Lake, directly adjacent to the intersection of Borax Road and California State Highway 58 in the western Mojave Desert (Figure 1). The area is characterized by northwest/southeast trending mountains, and broad alluvial fans. Seasonable water sources including several local drainages can be found throughout the area. Plant communities are largely dominated by creosote bush (*Larrea tridentata*) with a low diversity of perennial species. Despite the relatively low levels of annual rainfall, scattered winter rains provide enough precipitation for the germination and growth of spring annuals and grasses. Several mammal and reptile species live in the area including mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), wild burro (*Equus asinus*), horned lizards (*Phrynosoma sp.*), desert tortoise (*Gopherus agassizii*), and red-tailed hawk (*Buteo jamaicensis*).

Figure 1 Project Site 4



Imagery provided by National Geographic Society, Esri and its licensors © 2020. Boron Quadrangle. T11N R08W S33,34. The topographic representation depicted in this map may not portray all of the features currently found in the vicinity today and/or features depicted in this map may havechanged since the original topographic map was assembled.





CRFig X CUP Proj Locn Map

Figure 2 East Central Portion of Project Site 4, Facing South



Figure 3 Northwest portion of Project Site 4, Facing South



2 Background Research Results

As discussed in Volume I, background research for this cultural resource assessment included records searches, a review of historical maps and aerial photographs, and Native American outreach. A summary of findings of each of these efforts specific to Project Site 4 follows.

2.1 Cultural Resources Record Search

2.1.1 Previous Studies

The SSJVIC records search identified two previously conducted cultural resources studies within Project Site 4 (Table 1).

Table 1 Previous Cultural Resource Studies within Project Site 4

Report Number	Author	Year	Title
KE-02131	Hudlow	1998	A Phase I Cultural Resource Survey at Route 58 and Gephart Road Kern County, California
KE-04476	Higgins, Kellawan, Duke, and Thomas	2013	Cultural Resources Inventory of 5,300 Acres for the PG&E Pipelines 300A and 300B, San Bernardino and Kern Counties, California

Source: SSJVIC 2019

2.1.2 Recorded Resources

The SSJVIC records search conducted for this effort identified one previously recorded cultural resource within Project Site 4, listed in Table 2 below. The resource is a historic period road, depicted in the 1947 Johannesburg SW 7.5-minute topographic map as an improved dirt road.

Table 2 Previously Recorded Cultural Resource within Project Site 4

Primary Number	Trinomial	Resource Type	Description	Recorder(s) and Year(s)	NRHP/CRHR Status
P-15-017318	CA-KER-9493H	Historic Road	Improved dirt road	Martinez and Mike 2013	Presumed Ineligible

Source: SSJVIC 2019

2.1.2.1 Resource P-15-017318

P-15-017318 was originally recorded by Far Western in 2013 as an unnamed, improved, well-travelled dirt road that runs within the Pacific Gas and Electric right of way and terminates at Twenty Mule Team road. Segments of the road were depicted on the in the 1947 Johannesburg SW 7.5-minute topographic map as an improved dirt road. Historic refuse associated with the road includes historic cans and a bottle base that dates to the mid-twentieth century.

2.2 Native American Outreach

Native American outreach did not identify any cultural resources concerns for Project Site 4.

2.3 Historic Map and Aerial Review

A review of historic USGS topographic maps historic aerials did not identify any specific cultural resources concerns within Project Site 4.

According to the Bureau of Land Management (BLM) General Land Office (GLO) records, the land on which Project Site 4 is situated was partially owned by Frank Barham beginning in 1917 (Bureau of Land Management General Land Office 2019).Rincon was unable to find information about Barham that would indicate he is an important person in history.

3 Field Survey

Project Site 4 is located on a flat, sandy alluvial plain in a mostly undeveloped area with 50-80% ground visibility. The pedestrian survey identified a total of ten newly recorded resources, including four prehistoric isolates, one historic isolate, three prehistoric sites, one historic site, and one multi component site. Each of these resources is discussed in further detail below. A map depicting the location of each resource in the project site can be found in the associated Department of Parks and Recreation (DPR) Series 523 Forms in Confidential Appendix F.

3.1 Previously Recorded Resources

3.1.1 P-15-017318

Resource P-15-017318 consists of a historical-period road that terminates at 20 Mule Team Road. The road is a well-maintained dirt road that was relocated during the current survey. The road is in the same condition as its original recording in 2013, although the diagnostic RC cola bottle dating between 1941 and 1952 that was recorded in 2013 was not relocated.

Figure 4 P-15-017318, Facing Southwest



3.2 Newly Recorded Resources

3.2.1 Isolates

The survey identified a total of five isolated prehistoric artifacts within Project Site 4. These isolates are summarized further in Table 3 below.

Table 3 Newly Recorded Isolates

Resource Designation	Age	Artifact Type
Iso-012	Prehistoric	Two cryptocrystalline silica (CCS) flakes
Iso-013	Prehistoric	CCS flake
Iso-014	Historic	One diesel engine
Iso-015	Prehistoric	One chalcedony Silver Lake projectile point
Iso-032	Prehistoric	CCS flake

Figure 5 Aratina Iso-012, CCS Flake



Figure 6 Aratina Iso-012, CCS Flake



Figure 7 Aratina Iso-013



Figure 8 Aratina Iso-014



Figure 9 Aratina Iso-015



Figure 10 Aratina Iso-032



3.2.2 Prehistoric Sites

The survey identified a total of three prehistoric sites within Project Site 4. These sites are summarized further in Table 4 below.

Table 4 Newly Recorded Prehistoric Sites

Resource Designation	Age	Site Designation
Aratina S-008	Prehistoric	Lithic Scatter
Aratina S-009	Prehistoric	Lithic Scatter
Aratina S-010	Prehistoric	Lithic Scatter

3.2.2.1 Aratina S-008

The site is a moderate density lithic scatter containing approximately 113 flakes of various material types including three varieties of cryptocrystalline silica (CCS; chert, jasper, and chalcedony), quartz, and basalt. A majority of the flakes (approximately 100) are basalt. Many of the flakes present represent early reduction, however, there are also 13 biface thinning flakes. The site measures approximately 150 meters from north to south by 200 meters from east to west, and is[*Confidential information removed from public review]*. No features were identified associated with the site.

Figure 11 Aratina S-008, Facing North



3.2.2.2 Aratina S-009

The site is a low-density yet expansive lithic scatter containing approximately 20 flakes of various material types including three varieties of CCS (chert, jasper, and chalcedony), obsidian, and basalt. Many of the flakes present represent early reduction, however, there is also one obsidian biface thinning flake, two CCS cores, and one heavily weathered granitic mano. The site measures approximately 100 meters from north to south by 300 meters from east to west and is located [*Confidential information removed from public review]*. No features were identified associated with the site.

Figure 12 Aratina S-009, Facing North towards Highway CA-58

[*Confidential information removed from public review]*

3.2.2.3 Aratina S-010

The site is a low density lithic scatter containing approximately 38 flakes of various material types including three varieties of CCS (chert, jasper, and chalcedony), and basalt. Many of the flakes present represent early reduction, however, there are also three biface thinning flakes. The site measures approximately 40 meters from north to south by 40 meters from east to west and is located [*Confidential information removed from public review]*. No features were identified associated with the site.

Figure 13 Aratina S-010



3.2.3 Historic Sites

The survey identified one historic site with Project Site 4, discussed in further detail below.

3.2.3.1 Aratina S-004H

The site is a discrete, low-density concentration of approximately ten cans, including church key-opened beverage cans, metal scraps, and an assortment of ceramic and glass, including approximately ten bottle bases. Of these bottle bases one included the maker's mark of Kimble Glass Company and is potentially modern. The site measures approximately 40 meters from north

to south by 43 meters from east to west and [*Confidential information removed from public review]*. Aratina S-004H likely dates to the mid-twentieth century.

Figure 14 Aratina S-004H, Facing South



3.2.4 Multi-component Sites

The survey identified one multi-component site within Project Site 4, discussed in further detail below.

3.2.4.1 Aratina S-001M

The site is an historic well and associated can scatter and a prehistoric lithic scatter. The historic component of the site consists of a concrete cased well date stamped “California Borate Company 1-27-1958”. It is marked in the concrete that Mathis Clay drilled the well and a Jack W. was the boss for the drilling. There are three church-key opened Pennzoil oil cans and a crushed steel bucket. The prehistoric component of the site is a low-density scatter of lithic debitage containing approximately 14 flakes of various material types including two varieties of CCS (chert and chalcedony) and quartzite. Eight of the flakes present represent early reduction; six are biface thinning flakes. The site measures roughly 75 meters from north to south by 85 meters from east to west and is on a flat, sandy, alluvial plain.

Figure 15 Aratina S-001M, Facing South



4 Resource Evaluations

Resources recorded and/or updated as part of the current study were evaluated for CRHR eligibility.

A cultural resource is considered historically significant and eligible for the CRHR if it:

1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2) Is associated with the lives of persons important in our past;
3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
4) Has yielded, or may be likely to yield, information important in prehistory or history.

4.1 Previously Recorded Resources

4.1.1 P-15-017318

Resource P-15-017318 is a historic period road first recorded in 2013. It is depicted in the 1947 Johannesburg SW 7.5-minute topographic map as an improved dirt road. The road was not evaluated when it was recorded in 2013, but was described by Higgins et al. (2013) as "potentially" eligible because it leads to Suckow Borax Company Mine. However, the Suckow Borax Company Mine was not evaluated by Higgins et al. (2013) and it is not listed on the Kern County Historic Property Database, so its significance is unknown. Evaluating the Suckow Borax Company Mine is out of the scope of this report. Dr. J.K. Suckow was the first to identify boron in the region, however the point of discovery was acquired by Pacific Coast Borax Company and was not part of the Suckow Borax Company Mine (Digital-Desert.com 2019). Thus, the road is not associated with the discovery of boron in the area. As an unnamed dirt road, it cannot be shown that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). As a nondescript dirt road, it does not embody any distinctive characteristics (does not meet Criterion 3), and is not likely to yield any important information (does not meet Criterion 4). Thus, Rincon recommends P-15-017318 ineligible for listing in the CRHR under all four criteria.

4.2 Newly Recorded Resources

4.2.1 Isolates

The survey identified a total of five newly recorded isolated artifacts: Iso-012, -013, -014, -015, and -032. Isolates are typically ineligible for CRHR listing as their data potential is exhausted during the initial recording. Therefore, Rincon recommends each of the aforementioned isolates as ineligible for the CRHR. A full list and description of each isolate can be found in Table 3 on page 11.

4.2.2 Prehistoric Sites

4.2.2.1 Aratina S-008

Site Aratina S-008 consists of a prehistoric lithic scatter of 113 CCS, quartz, and basalt flakes. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). Although the site contains no features or soil discoloration indicative of a subsurface deposit, the site is located adjacent to a seasonal drainage that may have buried portions of the site under alluvium. Though the surface of the site was fully recorded during the current survey and the data potential of the surface exhausted, it is possible that a subsurface component of the site exists. Thus, the site has the potential to retain significant data potential (Criterion 4). Rincon recommends avoidance of the site if testing is infeasible. Testing of the site would assist in determining if a subsurface component is present allowing for a complete evaluation of the site to occur.

4.2.2.2 Aratina S-009

Site Aratina S-009 consists of a prehistoric lithic scatter of 20 CCS, obsidian, and basalt flakes. The flake types were noted and recorded as part of this study and consist primarily of early reduction. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). The resource is a moderately dense lithic scatter situated on a sandy alluvial plain, however it is located roughly 0.31 kilometer from the nearest drainage and does not contain any evidence of features, soil discoloration, or other indication that a subsurface deposit may be present. Moreover, given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time. Because the site likely exists only on the surface, and likely represents a single reduction event, the current recording has exhausted its data potential, thus it does not meet Criterion 4. Site Aratina S-009 is recommended as ineligible for the CRHR under all four criteria (1-4).

4.2.2.3 Aratina S-010

Site Aratina S-010 consists of a prehistoric lithic scatter of 38 CCS and basalt flakes. The flake types were noted and recorded as part of this study and consist primarily of early reduction. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). The resource is a relatively dense lithic scatter situated on a sandy alluvial plain, however it is located roughly 2.34 kilometers from the nearest drainage and does not contain any evidence of features, soil discoloration, or other indication that a subsurface deposit may be present. Moreover, given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time. Because the site likely exists only on the surface, and likely represents a single reduction event, the current

recording has exhausted its data potential, thus it does not meet Criterion 4. Site Aratina S-010 is recommended as ineligible for the CRHR under all four criteria (1-4).

4.2.3 Historic Sites

4.2.3.1 Aratina S-004H

Site Aratina S-004H consists of a historic refuse deposit. No evidence is present that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. The resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and Edwards Air Force Base. Aratina S-013H likely represents a single dumping episode. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR under all four criteria.

4.2.4 Multi-component Sites

4.2.4.1 Aratina S-001M

The historic component of Aratina S-001M consists of a historic refuse deposit and the prehistoric components consist of a sparse lithic scatter of 14 CCS and quartzite flakes. The flake types were noted and recorded as part of this study and consist primarily of early reduction. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). Given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time. Although the site contains no features or soil discoloration indicative of a subsurface deposit, the site is located adjacent to a seasonal drainage that may have buried prehistoric components of the site under alluvium. However, these buried deposits are likely to occur within the first 10cm below the surface and will provide similar artifacts to those encountered on the surface. Based on the site condition and site components, Aratina S-001M retains little, if any, data potential to contribute to regional research themes. Therefore, site Aratina S-001M is recommended as ineligible for the CRHR under Criterion 4. Site Aratina S-001M is recommended as ineligible for the CRHR under all four criteria (1-4).

5 Findings and Recommendations

Ten newly identified and one previously recorded cultural resources were identified during the current study. Nine of these resources have been recommended ineligible for listing in the CRHR and do not require any additional work (See Table 5).

Rincon recommends avoidance of prehistoric site Aratina S-008 plus a 100-foot buffer around the site. Additional mitigation is required if avoidance becomes infeasible. Additionally, Rincon recommends archaeological and Native American monitoring of all project-related ground-disturbance outside of the lakebed and a brief worker training program to assist in identifying any unanticipated cultural resources that may be encountered during ground disturbing activities associated with project construction.

Table 5 Summary of Resources and Recommendations

Resource	Description	Significance	Recommendation
P-15-017318	Historic Road	Recommended ineligible	No further work
S-008	Prehistoric lithic scatter	Potentially eligible	Archaeological Testing OR Avoidance
S-009	Prehistoric lithic scatter	Recommended ineligible	No further work
S-010	Prehistoric lithic scatter	Recommended ineligible	No further work
S-004H	Historic refuse scatter	Recommended ineligible	No further work
S-001M	Multi-component lithic and refuse scatter	Recommended ineligible	No further work
Iso-012	Prehistoric flake	Recommended ineligible	No further work
Iso-013	Prehistoric flake	Recommended ineligible	No further work
Iso-014	Historic diesel engine	Recommended ineligible	No further work
Iso-015	Prehistoric projectile point	Recommended ineligible	No further work; Optional collection
Iso-032	Prehistoric flake	Recommended ineligible	No further work

5.1 Avoidance

Preservation in place (avoidance) is the preferred manner of mitigating impacts to archaeological sites. Preservation in place maintains the relationship between artifacts and the archaeological context. Preservation may also avoid conflict with religious or cultural values of groups associated with the site (e.g., tribal organizations). If feasible, prehistoric archaeological sites Aratina S-008 identified within the project site during the current study plus a 100-ft buffer should be avoided. Additional mitigation is required if avoidance becomes infeasible

5.2 Archaeological Testing

If avoidance becomes infeasible, Rincon recommends archaeological testing of Aratina S-008. All archaeological excavation should be conducted by a qualified archaeologist(s) under the direction of a principal investigator meeting the Secretary of the Interior's (SOI) Professional Qualification Standards for archaeology (NPS 1983). Rincon recommends that archaeological excavation be

observed by a Native American monitor. Testing would begin with and Extended Phase I (XPI) study to determine the extent of the resource on the project site. XPI testing should comprise a series of shovel test pits and/or hand augured units and mechanical trenching intended to establish the subsurface boundaries of Aratina S-008.

If the results of the XPI indicate the presence of a subsurface deposit within the current project site, a Phase II investigation is recommended to identify whether Aratina S-008 is eligible for listing in the CRHR. A Phase II evaluation should include any necessary archival research to identify significant historical associations as well as mapping of surface artifacts, collection of functionally or temporally diagnostic tools and debris, and excavation of a sample of the cultural deposit to characterize the nature of the resource, define the artifact and feature contents, determine horizontal boundaries and depth below surface, and retrieve representative samples of artifacts and other remains.

Cultural materials collected from the resource should be processed and analyzed in the laboratory according to standard archaeological procedures. The age of the materials should be determined using radiocarbon dating and/or other appropriate procedures; lithic artifacts, faunal remains, and other cultural materials should be identified and analyzed according to current professional standards. The significance of the resource should be evaluated according to the criteria of the CRHR. The results of the investigations should be presented in a technical report following the standards of the California Office of Historic Preservation publication "Archaeological Resource Management Reports: Recommended Content and Format (1990 or latest edition)" (http://ohp.parks.ca.gov/pages/1054/files/armr.pdf). Upon completion of the work, all artifacts, other cultural remains, records, photographs, and other documentation should be curated at an appropriate curation facility. All fieldwork, analysis, report production, and curation should be fully funded by the applicant.

5.3 Archaeological Sensitivity Training

Rincon recommends that the qualified archaeologist conduct a worker's environmental awareness program (WEAP) training for archaeological sensitivity for all construction personnel prior to the commencement of any ground disturbing activities. Archaeological sensitivity training should include a description of the types of cultural material that may be encountered, cultural sensitivity issues, regulatory issues, and the proper protocol for treatment of the materials in the event of a find.

5.4 Archaeological and Native American Monitoring

Rincon recommends archaeological and Native American monitoring of project-related ground disturbing activities within Project Site 4. Archaeological monitoring should be performed under the direction of the qualified archaeologist. The qualified archaeologist, in consultation with the County of Kern and the Native American monitor, should have the power to reduce or stop monitoring depending upon observed conditions. If archaeological resources are encountered during ground-disturbing activities, work within the immediate area must halt and the find evaluated for significant under CEQA.

5.5 Unanticipated Discovery of Cultural Resources

If cultural resources are encountered during ground-disturbing activities, work in the immediate area must halt and an archaeologist meeting the Secretary of the Interior's Professional

Qualification Standards for archaeology (National Park Service 1983) should be contacted immediately to evaluate the find. If the discovery proves to be eligible for listing in the NRHP or CRHR, additional work such as data recovery excavation and Native American consultation may be warranted to mitigate any significant impacts/adverse effects.

5.6 Unanticipated Discovery of Human Remains

The discovery of human remains is always a possibility during ground-disturbing activities. If human remains are found, the State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the County Coroner must be notified immediately. If the human remains are determined to be prehistoric, the Coroner will notify the Native American Heritage Commission, which will determine and notify a most likely descendant, who has 48 hours from being granted site access to make recommendations for the disposition of the remains. If the most likely descendant does not make recommendations within 48 hours, the land owner shall reinter the remains in an area of the property secure from subsequent disturbance.



Aratina Solar Project

Cultural Resources Assessment Report

Volume VI

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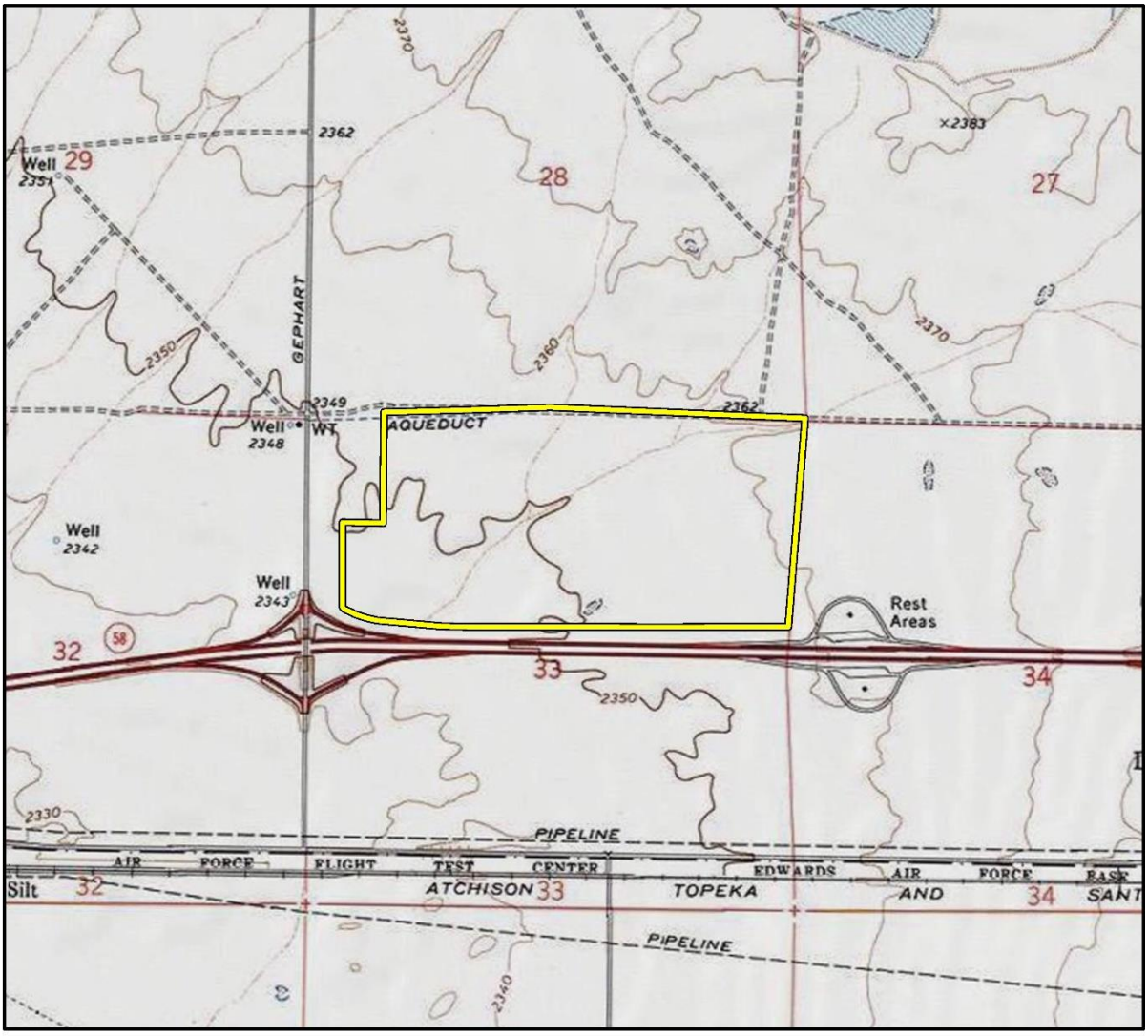
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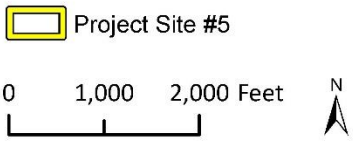
1 Project Site 5 Description

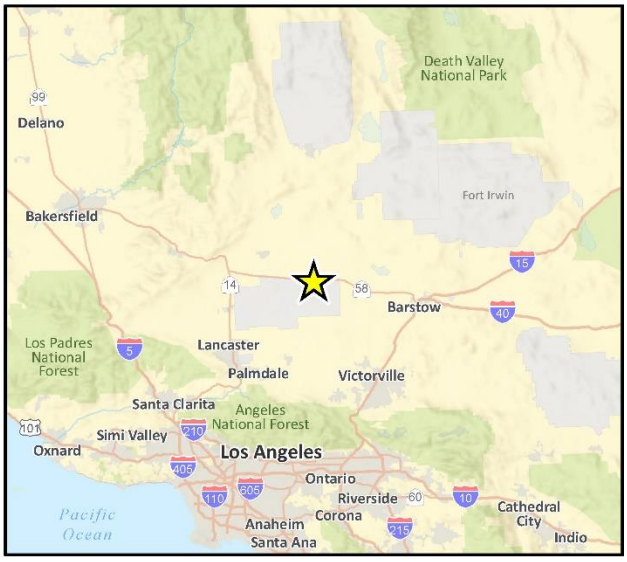
Project Site 5 is located northwest of the unincorporated community of Desert Lake, directly adjacent to the intersection of Gephart Road and California State Highway 58 in the western Mojave Desert (Figure 1). The area is characterized by northwest/southeast trending mountains, and broad alluvial fans. Seasonable water sources including several local drainages can be found throughout the area. Plant communities are largely dominated by creosote bush (*Larrea tridentata*) with a low diversity of perennial species. Despite the relatively low levels of annual rainfall, scattered winter rains provide enough precipitation for the germination and growth of spring annuals and grasses. Several mammal and reptile species live in the area including mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), wild burro (*Equus asinus*), horned lizards (*Phrynosoma sp.*), desert tortoise (*Gopherus agassizii*), and red-tailed hawk (*Buteo jamaicensis*). Figure 2 and Figure 3 are general overview photos of the project site.

Figure 1 Project Site 5



Imagery provided by National Geographic Society, Esri and its licensors © 2020. Boron Quadrangle. T11N R08W S33. The topographic representation depicted in this map may not portray all of the features currently found in the vicinity today and/or features depicted in this map may havechanged since the original topographic map was assembled.





CRFig X CUP Proj Locn Map

Figure 2 Northwestern Portion of Project Site 5, Facing South (Highway 58 Overpass in Background)



Figure 3 Northwestern portion of Project Site 5, facing south



2 Background Research Results

As discussed in Volume I, background research for this cultural resource assessment included records searches, a review of historical maps and aerial photographs, and Native American outreach. A summary of findings of each of these efforts specific to Project Site 5 follows.

2.1 Cultural Resources Record Search

2.1.1 Previous Studies

The SSJVIC records search identified one previously conducted cultural resources study within Project Site 5 (Table 1).

Table 1 Previous Cultural Resource Studies within Project Site 5

Report Number	Author	Year	Title
KE-02131	Hudlow	1998	A Phase I Cultural Resource Survey at Route 58 and Gephart Road Kern County, CA

Source: SSJVIC 2019

2.1.2 Recorded Resources

The SSJVIC records search conducted for this effort did not identify any cultural resources within or adjacent to Project Site 5.

2.2 Native American Outreach

Native American outreach did not identify any cultural resources concerns for Project Site 5.

2.3 Historic Map and Aerial Review

A review of historic USGS topographic maps historic aerials did not identify any specific cultural resources concerns within Project Site 5.

The Bureau of Land Management (BLM) General Land Office (GLO) records do not contain any records for the Public Lands Survey System section on which the project is situated (Bureau of Land Management General Land Office 2019 [Township 11N, Range 8W, Section 33]).

3 Field Survey

Project Site 5 is located on a flat, sandy alluvial plain in a mostly undeveloped area with 50-80% ground visibility. The pedestrian survey identified a total of seven newly recorded resources, including three prehistoric isolates, three prehistoric sites, and one historic site. Each of these resources is discussed in further detail below. A map depicting the location of each resource in the project site can be found in the associated Department of Parks and Recreation (DPR) Series 523 Forms in Confidential Appendix G.

3.1 Newly Recorded Resources

3.1.1 Isolates

The survey identified a total of three isolated prehistoric artifacts within Project Site 5. These isolates are summarized further in Table 2 below and depicted in Figure 4 through Figure 6.

Table 2 Newly Recorded Isolates

Resource Designation	Age	Artifact Type
Iso-001	Prehistoric	Chalcedony flake
Iso-002	Prehistoric	cryptocrystalline silica (CCS) flake
Iso-003	Prehistoric	CCS flake

Figure 4 Iso-001



Figure 5 Iso-002



Figure 6 Iso-003



3.1.2 Prehistoric Sites

The survey identified a total of three prehistoric sites within Project Site 5. These sites are summarized further in Table 6 below.

Table 3 Newly Recorded Prehistoric Sites

Resource Designation	Age	Site Designation
Aratina S-001	Prehistoric	Lithic Scatter
Aratina S-002	Prehistoric	Lithic Scatter
Aratina S-003	Prehistoric	Lithic Scatter

3.1.2.1 Aratina S-001

The site is a small, diffuse scatter of five pieces of lithic debitage, including one obsidian interior flake, one piece of obsidian shatter, one chalcedony interior flake, one chalcedony pressure flake, and one edge modified cryptocrystalline silica (CCS) flake. The site measures approximately 26 meters from north to south by 24 meters from east to west, and is located [*Confidential information removed from public review]*. No features were identified associated with the site.

Figure 7 Aratina S-001, Facing North



3.1.2.2 Aratina S-002

The site is a diffuse scatter of ten pieces of lithic debitage consisting of four CCS cortical flakes, one meta-volcanic interior flake, one CCS interior flake, three CCS thinning flakes, and one chalcedony thinning flake. The site measures approximately 78 meters from north to south by 70 meters from east to west and is located [*Confidential information removed from public review]*. No features were identified associated with the site.

Figure 8 Aratina S-002, Facing South



3.1.2.3 Aratina S-003

The site is a small, diffuse scatter of five pieces of lithic debitage consisting of one CCS interior flake, two chalcedony interior flakes, one chalcedony pressure flake and one CCS cortical flake. The site measures approximately 24 meters from north to south by 26 meters from east to west, and is located [*Confidential information removed from public review]*. No features were identified associated with the site.

Figure 9 Aratina S-003, facing east



3.1.3 Historic Sites

The survey identified one historic site within Project Site 5, discussed in further detail below.

3.1.3.1 Aratina S-001H

The site is a historic refuse scatter consisting of five cans (church key-opened beverage cans and knife-opened sanitary cans), several glazed earthenware fragments, and a small pile of lumber and white “Carnegie” brick. The site measures approximately 15 meters from north to south by 18 meters from east to west, and [*Confidential information removed from public review]*. Based on the can types identified at the site, Aratina S-001H likely dates to the mid-twentieth century.

Figure 10 Aratina S-001H, facing south



4 Resource Evaluations

Resources recorded and/or updated as part of the current study were evaluated for CRHR eligibility.

A cultural resource is considered historically significant and eligible for the CRHR if it:

1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2) Is associated with the lives of persons important in our past;
3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
4) Has yielded, or may be likely to yield, information important in prehistory or history.

4.1 Newly Recorded Resources

4.1.1 Isolates

The survey identified a total of three newly recorded isolated artifacts: Iso-001, -002, and -003. Isolates are typically ineligible for CRHR listing as their data potential is exhausted during the initial recording. Therefore, Rincon recommends each of the aforementioned isolates as ineligible for the CRHR. A full list and description of each isolate can be found in Table 3 on page 11.

4.1.2 Prehistoric Sites

4.1.2.1 Aratina S-001

Site Aratina S-001 consists of a sparse prehistoric lithic scatter of five obsidian and CCS flakes. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). Given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time. The resource is a relatively dense lithic scatter situated on a sandy alluvial plain, however it is located roughly 0.3 kilometer from the nearest drainage and does not contain any evidence of features, soil discoloration, or other indication that a subsurface deposit may be present. Lithic scatters such as these are ubiquitous throughout the Mojave Desert and California in general, thus the site does not have the potential to contribute new or significant information. Because the site likely exists only on the surface, the current recording has exhausted its data potential, thus it does not meet Criterion 4. Rincon recommends Aratina S-001 ineligible for listing in the CRHR.

4.1.2.2 Aratina S-002

Site Aratina S-002 consists of a prehistoric lithic scatter of 10 CCS flakes. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with

the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). Given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time. The resource is a relatively dense lithic scatter situated on a sandy alluvial plain, however it is located roughly 0.58 kilometer from the nearest drainage and does not contain any evidence of features, soil discoloration, or other indication that a subsurface deposit may be present. Lithic scatters such as these are ubiquitous throughout the Mojave Desert and California in general, thus the site does not have the potential to contribute new or significant information. Because the site likely exists only on the surface, the current recording has exhausted its data potential, thus it does not meet Criterion 4. Rincon recommends Aratina S-002 ineligible for listing in the CRHR.

4.1.2.3 Aratina S-003

Site Aratina S-003 consists of a prehistoric lithic scatter of five CCS flakes. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). Given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time. The resource is a relatively dense lithic scatter situated on a sandy alluvial plain, however it is located roughly 0.71 kilometer from the nearest drainage and does not contain any evidence of features, soil discoloration, or other indication that a subsurface deposit may be present. Lithic scatters such as these are ubiquitous throughout the Mojave Desert and California in general, thus the site does not have the potential to contribute new or significant information. Because the site likely exists only on the surface, the current recording has exhausted its data potential, thus it does not meet Criterion 4. Rincon recommends Aratina S-003 ineligible for listing in the CRHR.

4.1.3 Historic Sites

4.1.3.1 Aratina S-001H

Site Aratina S-001H consists of a historic refuse scatter. No evidence is present that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history. The resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and Edwards Air Force Base. Because the site consists primarily of the same type of can, Aratina S-001H likely represents a single dumping episode. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

5 Findings and Recommendations

Seven newly identified cultural resources were identified during the pedestrian survey. All of these resources have been recommended ineligible for listing in the CRHR and do not require any additional work (See Table 4). However, given the number of resources identified within Project Site 5, the project site is considered sensitive for archaeological resources. To avoid impacts to subsurface discoveries during construction, Rincon recommends archaeological sensitivity training prior to project ground disturbance and archaeological and Native American monitoring during project ground disturbance.

Table 4 Summary of Resources and Recommendations

Resource	Description	Significance	Recommendation
S-001	Prehistoric lithic scatter	Recommended ineligible	No further work
S-002	Prehistoric lithic scatter	Recommended ineligible	No further work
S-003	Prehistoric lithic scatter	Recommended ineligible	No further work
S-001H	Historic refuse scatter	Recommended ineligible	No further work
Iso-001	Prehistoric flake	Recommended ineligible	No further work
Iso-002	Prehistoric flake	Recommended ineligible	No further work
Iso-003	Prehistoric flake	Recommended ineligible	No further work

5.1 Archaeological Sensitivity Training

Rincon recommends that the qualified archaeologist conduct a worker's environmental awareness program (WEAP) training for archaeological sensitivity for all construction personnel prior to the commencement of any ground disturbing activities. Archaeological sensitivity training should include a description of the types of cultural material that may be encountered, cultural sensitivity issues, regulatory issues, and the proper protocol for treatment of the materials in the event of a find.

5.2 Archaeological and Native American Monitoring

Rincon recommends archaeological and Native American monitoring of project-related ground disturbing activities within Project Site 5. Archaeological monitoring should be performed under the direction of the qualified archaeologist. The qualified archaeologist, in consultation with the County of Kern and the Native American monitor, should have the power to reduce or stop monitoring depending upon observed conditions. If archaeological resources are encountered during ground-disturbing activities, work within the immediate area must halt and the find evaluated for significant under CEQA.

5.3 Unanticipated Discovery of Cultural Resources

If cultural resources are encountered during ground-disturbing activities, work in the immediate area must halt and an archaeologist meeting the Secretary of the Interior's Professional

Qualification Standards for archaeology (National Park Service 1983) should be contacted immediately to evaluate the find. If the discovery proves to be eligible for listing in the NRHP or CRHR, additional work such as data recovery excavation and Native American consultation may be warranted to mitigate any significant impacts/adverse effects.

5.4 Unanticipated Discovery of Human Remains

The discovery of human remains is always a possibility during ground-disturbing activities. If human remains are found, the State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the County Coroner must be notified immediately. If the human remains are determined to be Native American, the Coroner will notify the Native American Heritage Commission, which will determine and notify a most likely descendant (MLD). The MLD has 48 hours from being granted site access to make recommendations for the disposition of the remains. If the most likely descendant does not make recommendations within 48 hours, the land owner shall reinter the remains in an area of the property secure from subsequent disturbance.



Aratina Solar Project

Cultural Resources Assessment Report

Volume VII

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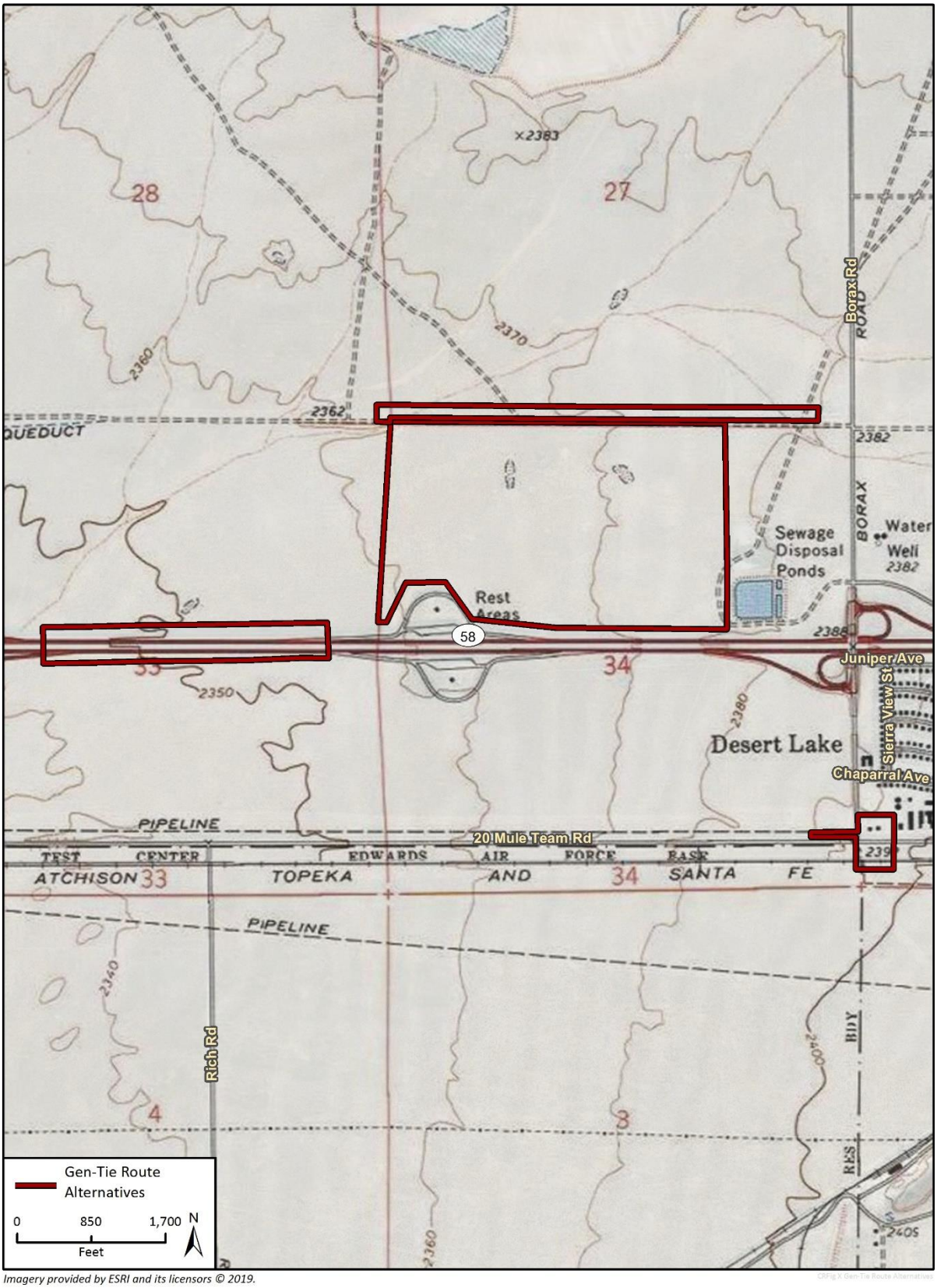
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1 Gen-Tie Route Alternatives Description

The Gen-Tie Route Alternatives are located within and northwest of the unincorporated community of Desert Lake, directly adjacent to California State Highway 58 as well as 20 Mule Team Road in the western Mojave Desert (Figure 1). The area is characterized by northwest/southeast trending mountains, and broad alluvial fans. Seasonable water sources including several local drainages can be found throughout the area. Plant communities are largely dominated by creosote bush (*Larrea tridentata*) with a low diversity of perennial species. Despite the relatively low levels of annual rainfall, scattered winter rains provide enough precipitation for the germination and growth of spring annuals and grasses. Several mammal and reptile species live in the area including mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), wild burro (*Equus asinus*), horned lizards (*Phrynosoma sp.*), desert tortoise (*Gopherus agassizii*), and red-tailed hawk (*Buteo jamaicensis*). Figure 2 and Figure 3 are general overview photos of the project site.

Figure 1 Gen-Tie Route Alternatives



Imagery provided by ESRI and its licensors © 2019.

Figure 2 Northern Portion of Gen-Tie Route Alternatives, Facing South (Highway 58 in Background)



Figure 3 Northcentral Portion of Gen-Tie Route Alternatives, Facing North



2 Background Research Results

As discussed in Volume I, background research for this cultural resource assessment included records searches, a review of historical maps and aerial photographs, and Native American outreach. A summary of findings of each of these efforts specific to the Gen-Tie Route Alternatives follows.

2.1 Cultural Resources Record Search

2.1.1 Previous Studies

The SSJVIC records search identified four previously conducted cultural resources study within the Gen-Tie Route Alternatives (Table 1).

Table 1 Previous Cultural Resource Studies within the Gen-Tie Route Alternatives

Report Number	Author	Year	Title
KE-00019	Macko	1998	Final Report on Archaeological Survey Results for United States Borax and Chemical Company's Boron Cogeneration Facility--Plant Site, Waterline Route, and Electrical and Gas Transmission Route Corridors
KE-00508	Hunter	1991	A Cultural Resources Inventory of the United States Borax Lateral Line in Kern County, California
KE-04472	Honey	2014	Phase I Cultural Resources Assessment for the Fremont Valley Preservation Project Proposed Transmission Line and Pipeline, Kern County and San Bernardino County, California
KE-04476	Higgins et al.	2013	Cultural Resources Inventory of 5,300 Acres for the PG&E Pipelines 300A and 300B, San Bernardino and Kern Counties, California

Source: SSJVIC 2019

2.1.2 Recorded Resources

The SSJVIC records search conducted for this effort identified two cultural resources within the Gen-Tie Route Alternatives, listed in Table 2 below. The resources are a historic railroad and roadway.

Table 2 Previously Recorded Cultural Resources within the Gen-Tie Route Alternatives

Primary Number	Trinomial	Resource Type	Description	Recorder(s) and Year(s)	NRHP/CRHR Status
P-15-000560	CA-KER-000560H	Historic Railroad	Burlington Northern Santa Fe Railroad	Sutton and Temblay 1977; Haynal et al. 1988; Macko 1993; Wahoff et al. 1994; Lawrence et al. 1994; Hayden et al. 1995; Lark et al. 1995; Kimball and Cunkelman 1996; O'Brien at al. 1998; Underwood 2000, Wedding 2001; Puckett 2007; Allen 2009; Kellawan et al. 2013	3B Appears eligible for NR both individually and as a contributor to an NR eligible district
P-15-017304	CA-KER-09492H	Historic Highway	State Route 58/ 20 Mule Team Road	Higgins and Lucas 2013	Point of Historical Interest

Source: SSJVIC 2019

2.1.2.1 P-15-000560

P-15-000560 is a historic railroad originally recorded by Sutton and Tremblay in 1977 as an old railroad bed and associated historic era refuse deposits on Edwards Air Force Base. Since 1977, the resource has been updated several times to include other areas of the alignment, including the segment within the current project site. The segment within the Gen-Tie Alternatives area was recorded during a site record update in 2007 and was given an NRHP status code of 3B: Appears eligible for listing on the NR[HP] both individually and as a contributor to a NR[HP] eligible district through survey evaluation.

2.1.2.2 P-15-017304

P-15-017304 consists of the historic period Twenty Mule Team Road and State Route 58 recorded by Far Western in 2013. Segment 2, the segment within the Gen-Tie Alternatives Area, is a segment of Twenty Mule Team Road previously designated as State Route 58 before this segment of the road was bypassed in the 1970s. This resource was not evaluated when it was recorded in 2013, however Twenty Mule Team Road is a California Point of Historical Interest.

2.2 Native American Outreach

Native American outreach did not identify any cultural resources concerns for the Gen-Tie Route Alternatives.

2.3 Historic Map and Aerial Review

A review of historic USGS topographic maps and historic aerials identified a segment of an historic-age highway (Resource P-15-017304) within the Gen-Tie Route Alternatives. The record for resource P-15-017304 was updated as part of the current effort and is discussed in further detail below.

The Bureau of Land Management (BLM) General Land Office (GLO) records indicate that a portion of the land on which the project site is situated was patented to Lulu Vieregg (formerly McPherson) in 1922 (Bureau of Land Management General Land Office 2019 [Township 11N, Range 8W, Section 34,

N ½]). Rincon was unable to find information about Vieregg that would indicate she was an important person in history (Bay Cities Directory 1930; United States Census 1920).

3 Field Survey

The Gen-Tie Route Alternatives are located on a flat, sandy alluvial plain in a mostly undeveloped area with 50-80% ground visibility. Portions of the Gen-Tie Route Alternatives directly adjacent to and in the median of State Route 58 were note surveyed due to safety concerns. The pedestrian survey identified a total of eleven newly recorded resources, including three prehistoric isolates, one historic isolate, four prehistoric sites, and three historic sites. Each of these resources is discussed in further detail below. A map depicting the location of each resource in the project site can be found in the associated Department of Parks and Recreation (DPR) Series 523 Forms in Confidential Appendix G.

3.1 Previously Recorded Resources

3.1.1 P-15-000560

Resource P-15-000560 consists of a segment of an historical-period alignment of the Santa Fe Railway, now the Burlington Northern Santa Fe Railroad. The portion of the railway encountered during the survey is in the same condition as its last update in 2013. However, due to the active nature of the railroad, a thorough and detailed inspection was not undertaken.

Figure 4 P-15-000560, Facing East



3.1.2 P-15-017304

Resource P-15-017304 consists of Twenty Mule Team Road. The road was relocated during the current survey and is in the same condition as its last site update in 2013.

Figure 5 P-15-017304, Facing East



3.2 Newly Recorded Resources

3.2.1 Isolates

The survey identified a total of three isolated prehistoric artifacts and one isolated historic artifact within the Gen-Tie Route Alternatives. These isolates are summarized further in Table 3 below and depicted in Figure 6 through Figure 9.

Table 3 Newly Recorded Isolates

Resource Designation	Age	Artifact Type
Iso-004	Prehistoric	Quartz core
Iso-005	Prehistoric	Quartzite flake
Iso-006	Prehistoric	Cryptocrystalline silica (CCS) flake
Iso-033	Historic	1937 United States Geological Land Office Survey Marker

Figure 6 Aratina Iso-004



Figure 7 Aratina Iso-005

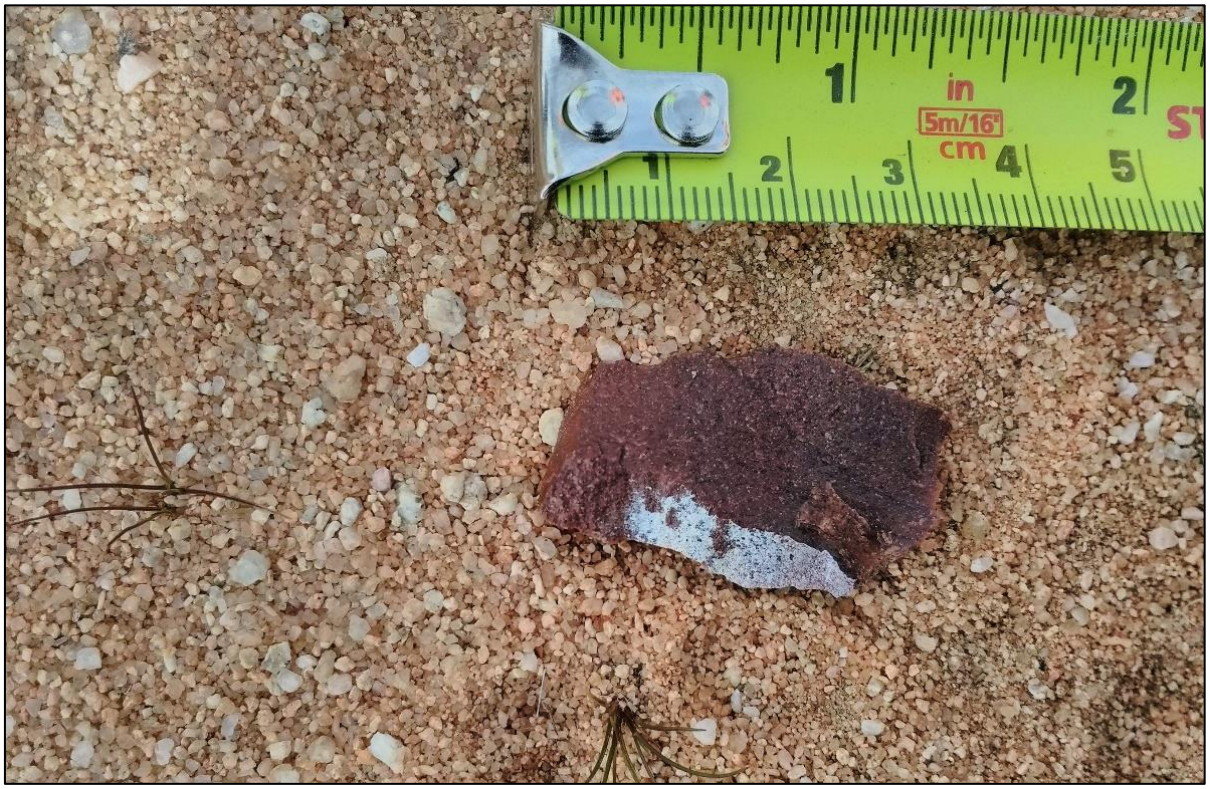


Figure 8 Aratina Iso-006



Figure 9 Aratina Iso-033



3.2.2 Prehistoric Sites

The survey identified a total of four prehistoric sites within the Gen-Tie Route Alternatives. These sites are summarized further in Table 4 below.

Table 4 Newly Recorded Prehistoric Sites

Resource Designation	Age	Site Designation
Aratina S-004	Prehistoric	Lithic Scatter with Hearth Feature
Aratina S-005	Prehistoric	Lithic Scatter
Aratina S-006	Prehistoric	Lithic Scatter with Thermal Features
Aratina S-009	Prehistoric	Lithic Scatter

3.2.2.1 Aratina S-004

The site is a diffuse scatter of 12 pieces of lithic debitage, including various material types including chalcedony, quartz, obsidian, and basalt. Many of the flakes present represent early reduction, however, there is also one mid-stage obsidian biface fragment, and a hearth feature of volcanic, quartzite, sandstone, and granitic fire affected rock and ground stone fragments. The site measures approximately 67 meters from north to south by 52 meters from east to west, and is located [*Confidential information removed from public review]*.

Near the southwest corner of the site is one small, deflated thermal feature measuring 1.55 meters by 1.15 meters, roughly oval in shape and containing three volcanic fire affected rock (FAR), one granitic FAR, one sandstone FAR, one vesicular basalt FAR, one fire affected quartzite mano fragment, (6.0 by 5.0 by 5.0 centimeters), one small, fire affected granitic metate fragment, (5.7 by 6.7 by 5.5 centimeters), and one fire affected granitic metate fragment broken into four pieces. The FAR fragments range from 6 to 15 centimeters in diameter. The feature is highly degraded but a thin veneer of burnt soil remains just below the surface in various spots within the feature.

Despite the paucity of surface artifacts, the presence of a thermal feature and associated groundstone indicates that the site may have been used for food processing and is potentially the result of continued use over time.

Figure 10 Aratina S-004, Facing Northwest, Archaeologist Kneeling near Hearth Feature



Figure 11 Aratina S-004, Hearth Feature Overview



3.2.2.2 Aratina S-005

The site is a diffuse scatter of 17 pieces of lithic debitage consisting of three varieties of CCS (chalcedony, chert, and jasper) and one complete obsidian stemmed projectile point. The obsidian point is highly weathered. The site measures approximately 95 meters from north to south by 161 meters from east to west and is located [*Confidential information removed from public review]*. No features were identified associated with the site.

Given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time.

Figure 12 Obsidian Stemmed Projectile Point, Aratina S-005



Figure 13 Aratina S-005, Facing South



3.2.2.3 Aratina S-006

The site is a diffuse scatter of 18 pieces of lithic debitage consisting of chert, jasper, and basalt. There is also one meta-volcanic core/tool, one granitic metate fragment, one quartzite mano fragment, and four thermal features made up of concentrations of fire affected scoria. The site measures approximately 90 meters from north to south by 106 meters from east to west, and is located [*Confidential information removed from public review]*.

Feature 1 consists of a deflated thermal feature consisting of a concentration of 100+ rounded to sub-angular fire affected scoria ranging in size from 3 to 16 centimeters in diameter within an area measuring roughly 10 meters north-south by 12 meters east-west. Near the west end of the feature is a unifacial scoria metate measuring 23 by 19 by 7 by 5 centimeters.

Feature 2 is a deflated thermal feature consisting of a concentration of 30+ rounded and sub-angular fire affected scoria ranging in size from 3 to 16 centimeters in diameter in an area measuring roughly 7 meters north-south by 5 meters east-west.

Feature 3 is a deflated thermal feature consisting of a concentration of 60+ rounded and sub-angular fire affected scoria ranging in size from 3 to 12 centimeters in diameter within an area measuring roughly 8 meters north-south by 10 meters east-west.

Feature 4 is a deflated thermal feature consisting of a concentration of 30+ sub-angular fire affected scoria ranging in size from 3 to 16 centimeters in diameter in an area measuring roughly 8 meters north-south by 8 meters east-west. Near the west edge of the feature is a fire-affected meta-volcanic core/tool with one steeply retouched edge, possibly used as a scraper.

Despite the paucity of surface artifacts, the presence of four thermal features and associated groundstone indicates that the site may have been used for food processing and is potentially the result of continued use over time.

Figure 14 Aratina S-006, Facing Southeast



Figure 15 Aratina S-006, Overview of Feature 1



3.2.2.4 Aratina S-009

The site is a low-density yet expansive lithic scatter containing approximately 20 flakes of various material types including three varieties of CCS (chert, jasper, and chalcedony), obsidian, and basalt. Many of the flakes present represent early reduction, however, there is also one obsidian biface thinning flake, two CCS cores, and one heavily weathered granitic mano. The site measures approximately 100 meters from north to south by 300 meters from east to west and is located [*Confidential information removed from public review]*. No features were identified associated with the site. Given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time.

Figure 16 Aratina S-009, Facing North towards Highway CA-58

[*Confidential information removed from public review]*

3.2.3 Historic Sites

The survey identified four historic sites within the Gen-Tie Route Alternatives. These resources are discussed in further detail below.

Resource Designation	Age	Site Description
Aratina S-002H	Historic	Refuse scatter
Aratina S-003H	Historic	Refuse scatter
Aratina S-005H	Historic	Structure
Aratina S-0027H	Historic	Structure

3.2.3.1 Aratina S-002H

The site is a historic refuse scatter consisting of four church key-opened beverage cans, one external friction lid coffee can, an electric toaster, solarized amethyst decorative glass fragments, milk glass and various glazed earthenware fragments, and several clear and brown glass bottle bases with maker's marks, one with a 1957 date and one with a date of 1959. The site measures approximately 18 meters from north to south by 14 meters from east to west, and is on a flat, sandy, alluvial plain, roughly 800 meters east of a large seasonal drainage. Based on the dated bottle bases and can types identified at the site, Aratina S-002H likely dates to the mid to late 1950s based on the dates from the bottle fragments.

Figure 17 Aratina S-002H, Facing South



3.2.3.2 Aratina S-003H

The site is a historic refuse scatter consisting of steel church key-opened beverage cans, bi-metal beverage cans, rotary-opened sanitary cans, external friction lid coffee cans, brown and clear glass bottle bases with 1962-1968 dates, green milk glass fragments, dark green glass ashtray fragments, one glass television tube, blue on white painted earthenware from Japan, oil filters, and one ceramic button. The site measures approximately 10 meters from north to south by 12 meters from east to west, and is [*Confidential information removed from public review]*. Based on the dated bottle bases and can types identified at the site, Aratina S-003H likely dates to the 1960s.

Figure 18 Aratina S-003H, Facing North



3.2.3.3 Aratina S-005H

The subject property is a one-story commercial building designed in no discernible architectural style. The roughly L-plan building sits on a concrete foundation and is capped with a roof that alternately flat and pent and clad in a combination of rolled composition material and asphalt shingles. T1-11 siding envelopes most of its wood-frame structural system, though sections are clad in stucco and non-original plywood. Windows feature wood and aluminum sashes in various configurations. Entrances are located on the east and west elevations and include glazed aluminum and solid wood doors. Plywood doors at the rear (north) access a storage closet. Architectural detailing is minimal and includes a horizontal wood cladding element and a shallow, canted overhang tracing much of the building's perimeter. Alterations include the boarding over of windows and construction of north- and west-elevation additions. A freestanding pole sign stands immediately south of the building. The level corner parcel is unpaved and overgrown with weeds in some locations. The structure likely operated as a service station. The structure is currently abandoned and remains in poor condition.

Figure 19 Aratina S-005H, Facing North



3.2.3.4 Aratina S-027H

The subject is a prefabricated one-story commercial building manufactured by the Stran-Steel Corporation. Rectangular in plan, it rises from a concrete foundation to culminate in a moderate-pitched front-gabled roof clad in corrugated metal. Its standing-seam metal siding envelops a steel-frame structural system. Fenestration includes a steel-sash, 3/3 awning window and a glazed wood-panel door, both located on the south-facing main elevation. The level parcel is located mid-block and is mostly paved. While the parcel is not landscaped, it is overgrown with weeds in many locations. The building is in good condition.

Figure 20 Aratina S-027H, Facing North



4 Resource Evaluations

Resources recorded and/or updated as part of the current study were evaluated for CRHR eligibility.

A cultural resource is considered historically significant and eligible for the CRHR if it:

1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
2) Is associated with the lives of persons important in our past;
3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
4) Has yielded, or may be likely to yield, information important in prehistory or history.

4.1 Previously Recorded Resources

4.1.1 P-15-000560

Resource P-15-000560 is a historic period railroad first recorded in 1977 and last updated in 2013. The segment within the Gen-Tie Alternatives area was given an NRHP status code of 3B: Appears eligible for listing on the NR[HP] both individually and as a contributor to a NR[HP] eligible district through survey evaluation. The railroad is actively used and will not be directly impacted by the proposed project. Thus, for the purposes of this study P-15-00560 is assumed eligible for listing in the CRHR.

4.1.2 P-15-017304

P-15-017304 consists of the historic period Twenty Mule Team Road and State Route 58 recorded by Far Western in 2013. This resource was not evaluated when it was recorded in 2013, however Twenty Mule Team Road is a California Point of Historical Interest. Twenty Mule Team Road is actively used and will not be directly impacted by the current project. Thus, for the purposes of this study P-15-017304 is assumed eligible for listing in the CRHR.

4.2 Newly Recorded Resources

4.2.1 Isolates

The survey identified a total of four newly recorded isolated artifacts: Iso-004, -005, -006, and -033. Isolates are typically ineligible for CRHR listing as their data potential is exhausted during the initial recording. Therefore, Rincon recommends each of the aforementioned isolates as ineligible for the CRHR and require no further management consideration under the current project. A full list and description of each isolate can be found in Table 3 on page 8.

4.2.2 Prehistoric Sites

4.2.2.1 Aratina S-004

Site Aratina S-004 consists of a sparse prehistoric lithic scatter of 20 flakes of various material types including chalcedony, quartz, obsidian, and basalt. There is also one mid-stage obsidian biface fragment, and a concise thermal feature of volcanic, quartzite, sandstone, and granitic fire affected rock and ground stone fragments. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). Despite the paucity of surface artifacts, the presence of a thermal feature and associated groundstone indicates that the site may have been used for food processing and is potentially the result of continued use over time. Thermal features also present a high likelihood of datable materials such as charcoal suggesting that the site may provide information about resource procurement, subsistence strategies, and the ability to place those activities within the timeline of prehistoric use of the region. Though the surface of the site was fully recorded during the current survey and the data potential of the surface exhausted, it is possible that a subsurface component of the site exists. Thus, the site has the potential to retain significant data potential (Criterion 4) to contribute to local research themes pertaining to prehistory. Based on the surface constituents, Site Aratina S-004 appears eligible for the CRHR. Rincon recommends avoidance of site Aratina S-004. If avoidance is infeasible, Phase II testing program would be necessary to provide a formal recommendation for CRHR eligibility and to determine if the current project would have a significant impact on a historical resource (i.e., CRHR eligible site).

4.2.2.2 Aratina S-005

Site Aratina S-005 consists of a prehistoric lithic scatter of seventeen CCS flakes and one complete obsidian stemmed projectile point. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). Given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time. The resource is a relatively dense lithic scatter situated on a sandy alluvial plain, however it is located roughly 0.30 kilometer from the nearest drainage and does not contain any evidence of features, soil discoloration, or other indication that a subsurface deposit may be present. Additionally, the obsidian point identified at the site is highly weathered and is not a candidate for obsidian hydration and thus cannot contribute to the data potential of the site. Lithic scatters such as these are ubiquitous throughout the Mojave Desert and California in general, thus the site does not have the potential to contribute new or significant information. Because the site likely exists only on the surface, the current recording has exhausted its data potential, thus it does not meet Criterion 4. Rincon recommends Aratina S-002 ineligible for listing in the CRHR.

4.2.2.3 Aratina S-006

Site Aratina S-006 consists of a prehistoric lithic scatter of 18 chert, jasper, and basalt flakes. There is also one meta-volcanic core/tool, one granitic metate fragment, one quartzite mano fragment, and four thermal features made up of concentrations of fire affected scoria. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). Despite the paucity of surface artifacts, the presence of four thermal features and associated groundstone indicates that the site may have been used for food processing and is potentially the result of continued use over time. Thermal features also present a high likelihood of datable materials such as charcoal suggesting that the site may provide information about resource procurement, subsistence strategies, and the ability to place those activities within the timeline of prehistoric use of the region. Though the surface of the site was fully recorded during the current survey and the data potential of the surface exhausted, it is possible that a subsurface component of the site exists. Thus, the site has the potential to retain significant data potential (Criterion 4). to contribute to local research themes pertaining to prehistory. Based on the surface constituents, Site Aratina S-006 appears eligible for the CRHR. Rincon recommends avoidance of site Aratina S-006. If avoidance is infeasible, Phase II testing program would be necessary to provide a formal recommendation for CRHR eligibility and to determine if the current project would have a significant impact on a historical resource (i.e., CRHR eligible site).

4.2.2.4 Aratina S-009

Site Aratina S-009 consists of a prehistoric lithic scatter of approximately 20 CCS, obsidian, and basalt flakes. The resource cannot be associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) nor can it be associated with the lives of persons important in our past (does not meet Criterion 2). The site does not contain any structures or features that embody any distinctive characteristics (does not meet Criterion 3). Given the paucity of surface artifacts, the site likely represents a segregated reduction locus indicating that the site is the result of a single reduction event and not the result of continued use over time. The resource is a relatively dense lithic scatter situated on a sandy alluvial plain, however it is located roughly 0.31 kilometer from the nearest drainage and does not contain any evidence of features, soil discoloration, or other indication that a subsurface deposit may be present. Lithic scatters such as these are ubiquitous throughout the Mojave Desert and California in general, thus the site does not have the potential to contribute new or significant information. Because the site likely exists only on the surface, the current recording has exhausted its data potential, thus it does not meet Criterion 4. Rincon recommends Aratina S-009 ineligible for listing in the CRHR.

4.2.3 Historic Sites

4.2.3.1 Aratina S-002H

Site Aratina S-002H consists of a historic refuse scatter. No evidence is present that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified

that would indicate past owners of the land were important persons in Boron's history (BLM GLO 2019). The resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and Edwards Air Force Base. Because the site consists primarily of the same type of can, Aratina S-001H likely represents a single dumping episode. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.3.2 Aratina S-003H

Site Aratina S-003H consists of a historic refuse scatter. No evidence is present that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Boron's history (BLM GLO 2019). The resource does not embody any distinctive characteristics (does not meet Criterion 3). Twentieth-century refuse scatters are ubiquitous throughout the Mojave Desert, particularly on the margins of communities such as Boron and Edwards Air Force Base. Because the site consists primarily of the same type of can, Aratina S-001H likely represents a single dumping episode. The site is a surface scatter of artifacts and its data potential was exhausted by this recording (does not meet does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.3.3 Aratina S-005H

Site Aratina S-005H is a historic period commercial building that was formerly known as Perez Truck Washing. No evidence is present that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the property were important persons in Desert Lake's history. The resource does not embody any distinctive characteristics (does not meet Criterion 3). A review of available evidence and records search results did not indicate that it may yield important information about prehistory or history (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

4.2.3.4 Aratina S-027H

Site Aratina S-027H is a historic period commercial building. No evidence is present that the resource is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage (does not meet Criterion 1) or that it is associated with the lives of persons important in our past (does not meet Criterion 2). No information was identified that would indicate past owners of the land were important persons in Desert Lake's history. The resource does not embody any distinctive characteristics (does not meet Criterion 3). A review of available evidence and records search results did not indicate that it may yield important information about prehistory or history (does not meet Criterion 4). Thus, Rincon recommends the resource ineligible for listing in the CRHR.

5 Findings and Recommendations

12 newly identified and two previously recorded cultural resources were identified during the pedestrian survey. Eight of these resources have been recommended ineligible for listing in the CRHR and do not require any additional work (See Table 5). Resources P-15-00560 and P-15-017304 have been assumed eligible for listing in the CRHR for the purposes of the current project. The project will not involve any direct impacts to either resource and no further management is recommended.

Rincon recommends avoidance of prehistoric sites Aratina S-004 and Aratina S-006 plus a 100-foot buffer around the sites. Additional mitigation is required if avoidance becomes infeasible. Additionally, Rincon recommends archaeological and Native American monitoring of all project-related ground-disturbance outside of the lakebed and a brief worker training program to assist in identifying any unanticipated cultural resources that may be encountered during ground disturbing activities associated with project construction.

Table 5 Summary of Resources and Recommendations

Resource	Description	Significance	Recommendation
P-15-000560	Historic Railroad	Assumed eligible	No further work
P-15-017304	Historic Road	Assumed eligible	No further work
S-004	Prehistoric lithic scatter and thermal feature	Potentially eligible	Archaeological Testing or Avoidance
S-005	Prehistoric lithic scatter	Recommended ineligible	No further work
S-006	Prehistoric lithic scatter and thermal features	Potential eligible	Archaeological Testing or Avoidance
S-009	Prehistoric lithic scatter	Recommended ineligible	No further work
S-002H	Historic refuse scatter	Recommended ineligible	No further work
S-003H	Historic refuse scatter	Recommended ineligible	No further work
S-005H	Historic Building	Recommended ineligible	No further work
S-027H	Historic Building	Recommended ineligible	No further work
Iso-004	Prehistoric flake	Recommended ineligible	No further work
Iso-005	Prehistoric flake	Recommended ineligible	No further work
Iso-006	Prehistoric flake	Recommended ineligible	No further work
Iso-033	Historic survey marker	Recommended ineligible	No further work

5.1 Avoidance

Preservation in place (avoidance) is the preferred manner of mitigating impacts to archaeological sites. Preservation in place maintains the relationship between artifacts and the archaeological context. Preservation may also avoid conflict with religious or cultural values of groups associated with the site (e.g., tribal organizations). If feasible, prehistoric archaeological sites Aratina S-004 and Aratina S-006 identified within the project site during the current study plus a 100-ft buffer should be avoided. Additional mitigation is required if avoidance becomes infeasible

5.2 Archaeological Testing

If avoidance becomes infeasible, Rincon recommends archaeological testing of Aratina S-004 and Aratina S-006. All archaeological excavation should be conducted by a qualified archaeologist(s) under the direction of a principal investigator meeting the Secretary of the Interior's (SOI) Professional Qualification Standards for archaeology (NPS 1983). Rincon recommends that archaeological excavation be observed by a Native American monitor. Testing would begin with and Extended Phase I (XPI) study to determine the extent of the resource on the project site. XPI testing should comprise a series of shovel test pits and/or hand augured units and mechanical trenching intended to establish the subsurface boundaries of the archaeological sites.

If the results of the XPI indicate the presence of a subsurface deposit within the current project site, a Phase II investigation is recommended to identify whether Aratina S-004 and Aratina S-006 are eligible for listing in the CRHR. A Phase II evaluation should include any necessary archival research to identify significant historical associations as well as mapping of surface artifacts, collection of functionally or temporally diagnostic tools and debris, and excavation of a sample of the cultural deposit to characterize the nature of the resource, define the artifact and feature contents, determine horizontal boundaries and depth below surface, and retrieve representative samples of artifacts and other remains.

Cultural materials collected from the resource should be processed and analyzed in the laboratory according to standard archaeological procedures. The age of the materials should be determined using radiocarbon dating and/or other appropriate procedures; lithic artifacts, faunal remains, and other cultural materials should be identified and analyzed according to current professional standards. The significance of the resource should be evaluated according to the criteria of the CRHR. The results of the investigations should be presented in a technical report following the standards of the California Office of Historic Preservation publication "Archaeological Resource Management Reports: Recommended Content and Format (1990 or latest edition)" (http://ohp.parks.ca.gov/pages/1054/files/armr.pdf). Upon completion of the work, all artifacts, other cultural remains, records, photographs, and other documentation should be curated at an appropriate curation facility. All fieldwork, analysis, report production, and curation should be fully funded by the applicant.

5.3 Archaeological Sensitivity Training

Rincon recommends that the qualified archaeologist conduct a worker's environmental awareness program (WEAP) training for archaeological sensitivity for all construction personnel prior to the commencement of any ground disturbing activities. Archaeological sensitivity training should include a description of the types of cultural material that may be encountered, cultural sensitivity

issues, regulatory issues, and the proper protocol for treatment of the materials in the event of a find.

5.4 Archaeological and Native American Monitoring

Rincon recommends archaeological and Native American monitoring of project-related ground disturbing activities within Project Site 5. Archaeological monitoring should be performed under the direction of the qualified archaeologist. The qualified archaeologist, in consultation with the County of Kern and the Native American monitor, should have the power to reduce or stop monitoring depending upon observed conditions. If archaeological resources are encountered during ground-disturbing activities, work within the immediate area must halt and the find evaluated for significant under CEQA.

5.5 Unanticipated Discovery of Cultural Resources

If cultural resources are encountered during ground-disturbing activities, work in the immediate area must halt and an archaeologist meeting the Secretary of the Interior's Professional Qualification Standards for archaeology (National Park Service 1983) should be contacted immediately to evaluate the find. If the discovery proves to be eligible for listing in the CRHR, additional work such as data recovery excavation and Native American consultation may be warranted to mitigate any significant impacts.

5.6 Unanticipated Discovery of Human Remains

The discovery of human remains is always a possibility during ground-disturbing activities. If human remains are found, the State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the County Coroner must be notified immediately. If the human remains are determined to be Native American, the Coroner will notify the Native American Heritage Commission, which will determine and notify a most likely descendant (MLD). The MLD has 48 hours from being granted site access to make recommendations for the disposition of the remains. If the most likely descendant does not make recommendations within 48 hours, the land owner shall reinter the remains in an area of the property secure from subsequent disturbance.

Appendix F
Energy Consumption Technical Memorandum

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Memo

Date:	Tuesday, March 2, 2021
Project:	Aratina Solar Farm Project
To:	Alexander Sundquist, 8minute Solar Energy
From:	Tim Gnibus, Project Manager, HDR
Subject:	Aratina Solar Farm – Energy Consumption Technical Memorandum

Introduction

This memorandum assesses possible construction and operational energy demand impacts by the development of the Aratina Solar Farm project.

Project Description

The project site is located in unincorporated Kern County, straddling State Route 58 between Gephart Road on the west and the San Bernardino County line on the east. The project site is in the vicinity of the unincorporated communities of Boron and Desert Lake and north of the boundaries of Edwards Air Force Base. The project proponent proposes to develop five photovoltaic (PV) solar facilities (Sites 1 through 5) and associated infrastructure on approximately 2,317 acres of privately-owned land. Collectively, the five solar facility sites would generate up to 530 megawatts (MW) of renewable energy, including up to 600 MW of energy storage. The project would be supported by a 230-kilovolt (kV) gen-tie overhead and/or underground electrical transmission line(s) originating from one or more on-site substations and terminating at the Southern California Edison's (SCE) Holgate Substation. Alternatively, the proposed project may transmit its power to the Kramer Substation located in San Bernardino via a transmission line located within an Edwards Air Force Base utility corridor. The project's permanent facilities would include, service roads, a power collection system, communication cables, overhead and underground transmission lines, electrical switchyards, project substations, energy storage system(s), and operations and maintenance facilities.

The construction period for the proposed project from site preparation through construction, testing, and commercial operation is expected to commence as early as fourth quarter of 2021 and would extend for approximately 12 to 18 months.

Fuel Consumption Standards of Significance

The 2019 California Environmental Quality Act Guidelines Appendix G includes Section VI – *Energy*, which is an analysis of potential impacts of a project related to the consumption of energy resources. The thresholds as written in the Guidelines are:

- Would the Project result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

- Would the Project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

While no quantitative thresholds related to energy are included, the Guidelines states as follows:

The goal of conserving energy implies the wise and efficient use of energy. The means of achieving this goal include:

1. Decreasing overall per capita energy consumption;

2. Decreasing reliance on natural gas and oil, and

3. Increasing reliance on renewable energy resources.

Fuel Consumption Impact Analysis

Methodology

The diesel and gasoline fuel consumptions were calculated using the carbon dioxide (CO_2) emissions contained in the *Aratina Solar Project Air Quality and Greenhouse Gas Study* (Rincon 2020) and the United States Environmental Protection Agency's (EPA) default emission rates of 19.4 pounds of CO_2 per gallon of gasoline and 22.2 pounds of CO_2 per gallon of diesel[1]. The fuel consumption calculations are provided in Appendix A.

CONSTRUCTION PHASE ENERGY USAGE

Electricity. Electricity is not expected to be consumed in large quantity during project construction, as construction equipment and vehicles are typically diesel- or gas-powered, not electric. Electricity for construction would be provided by SCE and a hookup would be installed on the project site (and this hookup would also provide electricity onsite for the operational phase of the project); however, electricity usage from such connection is anticipated to be minimal (i.e. mostly for security lighting). Therefore, electricity associated with construction- or decommissioning-related activities was not calculated.

Natural Gas. Natural gas is not expected to be consumed in large quantity during project construction (i.e., no natural gas-powered equipment or vehicles). Therefore, natural gas associated with construction activities was not calculated.

Diesel and Gasoline. Regarding transportation-related fuel consumption during construction, it is assumed that only diesel fuel would be used in off-road construction equipment and for haul trucks used during delivery of solar panels to the project site. On-road vehicles for construction workers are assumed to be solely powered by gasoline.

[1] U.S. EPA, Average Carbon Dioxide Emissions Resulting from Gasoline and Diesel Fuel, February 2005.

Construction of the project would result in fuel consumption from the use of construction tools and equipment, haul truck trips, and vehicle trips generated from construction workers traveling to and from the site. Project construction is expected to consume a total of approximately 529,081 gallons of diesel fuel from construction equipment and vendor, hauling, and water truck trips, and approximately 458,462 gallons of gasoline from construction worker vehicle trips.

Construction activities and corresponding fuel energy consumption would be temporary and localized, as the use of diesel fuel and heavy-duty equipment would not be a typical condition of the project. As shown on Table 1, the gasoline consumed during construction represents approximately 0.12 percent of all gasoline sold within Kern County in 2018 (396 millions of gallons) (California Energy Commission 2019). As shown on Table 1, the diesel consumed during project construction would represent approximately 0.49 percent of all diesel sold in Kern County in 2018 (108 millions of gallons) (California Energy Commission 2019). In addition, there are no unusual project characteristics that would cause the use of construction equipment to be less energy efficient compared with other similar construction sites in other parts of the State. Therefore, construction-related fuel consumption by the project would not result in inefficient, wasteful, or unnecessary energy use compared with other construction sites in the region. The project would have a less than significant impact on gasoline and diesel consumption.

Table 1. Fuel Consumption During Construction

Fuel Consumption During Project Construction (gallons)	2018 Kern County Fuel Sales (gallons) [2]	Project Fuel Consumption (%)
Gasoline		
458,462	396,000,000	0.12
Diesel		
529,081	108,000,000	0.49

OPERATION PHASE ENERGY USAGE

Operational energy usage would be minimal involving a very limited amount of worker trips for facility maintenance including the occasional washing of solar panels.

[2] California Energy Commission. 2019. 2010-2018 California Retail Fuel Outlet Annual Reporting Results and Analysis. Available at: https://ww2.energy.ca.gov/almanac/transportation_data/gasoline/piira_retail_survey.html. Accessed April 2020.

Electricity. Electricity required during operation (e.g., to operate lights and air conditioners) would be greatly offset by the electricity produced by the solar facility. As discussed in the *Aratina Solar Project Air Quality and Greenhouse Gas Study* (Rincon 2020), construction and operation of renewable energy facilities would offset greenhouse gas (GHG) emissions by replacing energy generated by fossil-fueled power plants. The project would generate approximately 1,480 gigawatt-hours (GWh) of solar-generated electricity each year, totaling approximately 44,400 GWh over a 30-year life span that would be added to the power grid and be used in place of electricity generated by fossil-fuel sources. Based on these considerations, the project would have a less than significant impact on electricity consumption.

Natural Gas. Natural gas is not expected to be consumed during construction-, decommissioning-, or operation-related activities by construction equipment (i.e., no natural gas-powered equipment or vehicles). Therefore, the proposed project would have no significant impact on natural gas consumption.

Diesel and Gasoline. During operation it is estimated that the operational and maintenance activities would consume approximately 17,102 gallons of gasoline and 8,237 gallons of diesel annually.

Potential Changes in Electricity Usage

No major changes in electricity usage are anticipated throughout the construction and operation of the proposed project. The project would generate 1,480 GWh of solar-generated electricity each year, totaling approximately 44,400 GWh over a 30-year life span. This production is anticipated to remain relatively constant throughout the operation of the proposed project. Additionally, the electricity required to construct and operate the project is anticipated to be negligible compared to the amount of electricity generated by the project. Activities involved with the decommissioning of the solar facility would be similar to those involved with construction but would be expected to result in lower fuel demand, as technology improves, and equipment becomes more fuel efficient.

Compliance with State and Local Renewable Energy Plans

Executive Order S-14-08

Executive Order S-14-08 was established by California Governor Schwarzenegger in November 2008. The order establishes a Renewables Portfolio Standard (RPS) for all retail sellers of electricity. The specifics of this executive order including the following:

- Requires retail sellers of electricity to serve 33 percent of their load with renewable energy by 2020;
- Requires various state agencies to streamline processes for the approval of new renewable energy facilities and determine priority renewable energy zones; and.
- Establishes the requirement for the creation/adoption of the Desert Renewable Energy Conservation Plan (DRECP) process for the Mojave and Colorado Desert regions.

California's Renewable Portfolio Standard (RPS) Program

First established in 2002 under Senate Bill (SB) 1078, California's Renewables Portfolio Standards (RPS) requires retail sellers of electric services to increase procurement from eligible renewable energy resources to 33 percent by 2020 and 50 percent by 2030 (California Public Utilities Commission 2019).

In 2018, SB 100 further increased California's RPS and required retail sellers and local publicly owned electric utilities to procure eligible renewable electricity for 44 percent of retail sales by the end of 2024, 52 percent by the end of 2027, and 60 percent by the end of 2030; and that the California Air Resources Board (CARB) should plan for 100 percent eligible renewable energy resources and zero-carbon resources by the end of 2045. The California Public Utilities Commission (CPUC) and the California Energy Commission jointly implement the RPS program. The CPUC's responsibilities include: (1) determining annual procurement targets and enforcing compliance; (2) reviewing and approving each investor-owned utility's renewable energy procurement plan; (3) reviewing contracts for RPS-eligible energy; and (4) establishing the standard terms and conditions used in contracts for eligible renewable energy. Refer to the *Aratina Solar Project Air Quality and Greenhouse Gas Study* (Rincon 2020) for additional details regarding this regulation.

KERN COUNTY GENERAL PLAN

The goals, policies, and implementation measures in the Energy Element of the Kern County General Plan (Kern County 2009) applicable to energy, as related to the project, are provided below. The Kern County General Plan contains additional policies, goals, and implementation measures that are more general in nature and not specific to development such as the project. Therefore, they are not listed below.

Chapter 5. Energy Element

5.4.5 Solar Energy Development

Goal

Goal 1: Encourage safe and orderly commercial solar development.

Policies

Policy 1: The County shall encourage domestic and commercial solar energy uses to conserve fossil fuels and improve air quality.

Policy 3: The County should permit solar energy development in the desert and valley planning regions that does not pose significant environmental or public health and safety hazards.

Construction

Construction equipment would comply with federal, State, and regional requirements where applicable. With respect to truck fleet operators, the USEPA and National Highway Traffic Safety Administration (NHTSA) have adopted fuel efficiency standards for medium- and heavy-duty trucks. The Phase 1 heavy-duty truck standards apply to combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles for model years 2014 through 2018 and will result in a reduction in fuel consumption from 6 to 23 percent over the 2010 baseline, depending on the

vehicle type. The USEPA and NHTSA also adopted the Phase 2 heavy-duty truck standards, which cover model years 2021 through 2027 and require the phase-in of a 5 to 25 percent reduction in fuel consumption over the 2017 baseline depending on the compliance year and vehicle type (USEPA and NHTSA 2016). The energy modeling for trucks does not take into account specific fuel reductions from these regulations, since they would apply to fleets as they incorporate newer trucks meeting the regulatory standards; however, these regulations would have an overall beneficial effect on reducing fuel consumption from trucks over time as older trucks are replaced with newer models that meet the standards.

In addition, construction equipment and trucks are required to comply with CARB regulations (Title 13, California Code of Regulations, Section 2485) regarding heavy-duty truck idling limits of five minutes at a location and the phase-in of off-road emission standards that result in an increase in energy savings in the form of reduced fuel consumption from more fuel efficient engines. Although these regulations are intended to reduce criteria pollutant emissions, compliance with the anti-idling and emissions regulations would also result in the efficient use of construction-related energy.

Operations

The Scoping Plan addresses the 2030 target established by SB 32, and establishes a proposed framework of action for California to meet a 40 percent reduction in GHG emissions by 2030 compared to 1990 levels. One of the key programs that the Scoping Plan builds on includes increasing the use of renewable energy in the state. In order to meet the SB 32 GHG emissions reduction mandate of 40 percent below 1990 levels by 2030, the 2017 Climate Change Scoping Plan (Scoping Plan) relies on achievement of the 50 percent RPS by 2030. SB 100 further increased California's RPS and required retail sellers and local publicly owned electric utilities to procure eligible renewable electricity for 44 percent of retail sales by the end of 2024, 52 percent by the end of 2027, and 60 percent by the end of 2030; and that CARB should plan for 100 percent eligible renewable energy resources and zero-carbon resources by the end of 2045.The project and other similar projects are essential to achieving the RPS. Further, as discussed previously, the project is reasonably expected to displace region-wide and statewide emissions of GHGs over the expected life of the project. The reduction in GHG emissions are a direct result of increasing the share of renewable energy available to investor owned utilities required to meet RPS. The project directly aligns with the goals of RPS by generating 1,480 GWh of solar-generated electricity each year, totaling approximately 44,400 GWh over a 30-year life span.

The Office of the California Attorney General has listed examples of types of mitigation measures that local agencies may consider to offset or reduce global climate change impacts from a project. The Attorney General assures that the presented lists are examples and not intended to be exhaustive, but instead provide measures and policies that could be undertaken. Specifically, the project complies with the following Attorney General's Recommended Measures:

- Install solar, wind, and geothermal power systems and solar hot water heaters.
- Include energy storage where appropriate to optimize renewable energy generation systems and avoid peak energy use (State of California Department of Justice, Attorney General's Office 2010).

As the project would project would generate up to 530 MW of renewable energy, including up to 600 MW of energy storage, the project would be consistent with the Office of the California Attorney General's recommended measures to reduce GHG emissions. Therefore, the project would be compliant with the Attorney General's Recommended Measures regarding renewable energy. Because the project is below regional regulatory thresholds and could result in a reduction of GHG emissions, no mitigation measures are required. Additionally, as shown on Table 2, development of the project would be consistent with the goal and related policies in the Energy Element of the Kern County General Plan to encourage safe and orderly commercial solar development, like the project.

Table 2. Consistency Analysis with Energy Element of the Kern County General Plan

Chapter 5, Energy Element		
5.4.5 Solar Energy Development		
Goal 1: Encourage safe and orderly commercial solar development.	Consistent	Consistent with this goal, the proposed project would develop a solar PV facility that would generate up to 530 MW of solar energy and up to 600 MW of energy storage and offset an equivalent amount of fossil fuel-generated electrical power. The site is on privately owned land, which has been previously disturbed. The proposed project would be designed in compliance with all applicable regulations and requirements (i.e., Zoning Ordinance, Grading Ordinance, and Floodplain Management Ordinance) to ensure a safe and orderly development of the solar facility.
Policy 1: The County shall encourage domestic and commercial solar energy uses to conserve fossil fuels and improve air quality.	Consistent	Consistent with this policy, the proposed project would develop a solar PV facility capable of generating up to 530 MW of solar energy and up to 600 MW of energy storage and would offset an equivalent amount of fossil fuel-generated electrical power in the desert region of Kern County, on a previously disturbed site. Operation of the proposed project would improve air quality within the County and assist the County in meeting attainment goals.
Policy 3: The County should permit solar energy development in the desert and valley planning regions that does not pose significant environmental or public health and safety hazards.	Consistent	Consistent with this policy, the project proposes the development of a PV power generation facility in the desert region of Kern County. Final review of the proposed project by the Kern County Planning and Natural Resources Department, as well as adherence to all applicable local, state and federal regulations, would ensure that the proposed project would not pose significant environmental or public health and safety hazards.

Overall, because the main objectives of the project are to assist California Investor-Owned utilities in meeting their obligations under California's RPS Program and assist California in meeting the GHG emissions reduction goal of 40 percent below 1990 levels by 2030, the project would be compliant with the applicable recommended actions of the CARB Climate Change Scoping Plan, as well as applicable federal, State, and local policies. Specifically, the project would assist the

State and regulated utility providers to generate a greater portion of energy from renewable sources consistent with the 2030 RPS. Therefore, this impact would be less than significant.

Energy Saving Measures Included in the Project

The construction of the proposed project would result in the annual generation of 1,480 GWh of solar-generated electricity each year, totaling approximately 44,400 GWh over a 30-year life span. Because the project is intended to generate electricity from a renewable source of energy, operation of the project would displace energy production that would otherwise be generated by non-renewable energy facilities using either natural gas or coal.

Approximately 318,611 metric tons (MT) CO_2e of net greenhouse gases annually would be displaced by the implementation of the project (Rincon 2020). Over the lifetime of the project, the total displaced emissions would be approximately 9,558,317 $MTCO_2e$ (Rincon 2020) which would assist in the attainment of the State's goal to reduce GHG emissions to 40 percent below 1990 levels by 2030. Appendix B contains the detailed calculations related to the project's annual energy generation and associated displacement of emissions.

Conclusion

The construction phase of the proposed project would result in the consumption of approximately 529,081 gallons of diesel fuel and 458,462 gallons of gasoline, while the operation phase would result in a yearly consumption of approximately 17,102 gallons of gasoline and 8,237 gallons of diesel annually. Once operational, the project would result in the annual generation of 1,480 GWh of solar-generated electricity each year, totaling approximately 44,400 GWh over a 30-year life span. Because the project is intended to generate electricity from a renewable source of energy, operation of the project would displace energy production that would otherwise be generated by non-renewable energy facilities using either natural gas or coal.

The project would therefore not result in potentially significant impacts due to wasteful, inefficient or unnecessary consumption of energy resources. In addition, the project will be consistent and not conflict with or obstruct a State or local plan for renewable energy. Impacts would be less than significant.

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A

Fuel Consumption Calculations

March 2, 2021

Aratina Solar Project - Energy

Construction Activities

Construction - Off-road Equipment Emissions

		CO2 (Metric Tons)		Fuel (Gallons)	
Phase	**Duration (days)**	**Diesel**	**Gasoline**	**Diesel**	**Gasoline**
Phase 1 - Site Prep and Grading	86	431.0	0.0	42,798.6	0.0
Phase 2 - Tracker Foundations	150	985.9	0.0	97,904.9	0.0
Phase 3 - Underground Cabling	150	672.1	0.0	66,742.7	0.0
Phase 4 - Mechanical Installation	175	1,213.5	0.0	120,510.5	0.0
Phase 5 - Electrical Installation	200	1,066.8	0.0	105,935.8	0.0
Total		**4,369.2**	**0.0**	**433,892.5**	**0.0**

Construction - On-site Mobile Emissions

		CO2 (Metric Tons)		Fuel (Gallons)	
Phase	**Duration (days)**	**Diesel**	**Gasoline**	**Diesel**	**Gasoline**
Activity 1 - Site Preparation	86	1.4	0.0	143.6	0.0
Activity 2 - Grading and Earthwork	86	1.4	0.0	143.6	0.0
Activity 3, 4, 5 - Concrete Foundations, Structural Steel Work, and Electrical/Instrumentation Work	301	11.1	0.0	1,103.9	0.0
Activity 6 - Collector Line Installation	40	0.4	0.0	39.9	0.0
Total		**14.4**	**0.0**	**1,431.1**	**0.0**

Construction - On-road Emissions

		CO2 (Metric Tons)		Fuel (Gallons)	
Phase	**Duration (days)**	**Diesel**	**Gasoline**	**Diesel**	**Gasoline**
Activity 1 - Site Preparation	86	94.7	100.0	9,406.6	11,362.5
Activity 2 - Grading and Earthwork	86	94.7	399.9	9,406.6	45,449.8
Activity 3, 4, 5 - Concrete Foundations, Structural Steel Work, and Electrical/Instrumentation Work	301	728.3	3,499.6	72,326.2	397,686.2
Activity 6 - Collector Line Installation	40	26.4	34.9	2,618.1	3,963.6
Total		**944.1**	**4,034.4**	**93,757.6**	**458,462.1**

Total Construction Diesel Gallons = 529,081.3
Total Construction Gasoline Gallons = 458,462.1

Operational Activities

		CO2 (Metric Tons)		Fuel (Gallons)	
Activity	**Duration (days)**	**Diesel**	**Gasoline**	**Diesel**	**Gasoline**
On-site Mobile Emissions	244	10.2	9.4	1,014.3	1,069.9
Off-Site Mobile Emissions	244	72.7	141.1	7,222.4	16,032.6
Total		**82.9**	**150.5**	**8,236.7**	**17,102.4**

Annual Operational Diesel Gallons = 8,236.7
Annual Operational Gasoline Gallons = 17,102.4

B

Displacement Emissions Calculations

March 2, 2021

Aratina Solar Project - 600 MW

Displaced Energy Production during 30-year Project life

Annual Energy Production	
Grid Size (MW)	600
Total hrs/year	8760
% Operational time [1]	28%
Operational hours/year	2,467
KWh produced per year	1,480,440,000
Assumed Heat Rate (Btu/KWh)	10,000
Annual Fuel Equivalent (MMBtu) [2]	14,804,400

California Power Mix [3]		Annual Fuel Displacement (MMBtu)
Coal [4]	4.13%	611,422
Large Hydro	14.72%	2,179,208
Natural Gas [4]	33.67%	4,984,641
Nuclear	9.08%	1,344,240
Oil	0.01%	1,480
Other (petroleum coke/waste heat)	0.14%	20,726
Renewables	29.00%	4,293,276
Unspecified sources of Power	9.25%	1,369,407
Total	**100.00%**	**14,804,400**

Annual Pollutant Displacement [4]

Natural Gas Turbine Emissions

Pollutant	AP-42 Emission Factor (lb/MMBtu) [5]	Controlled Emission Factor (lb/MMBtu)	Controlled Emissions (lb)	Controlled Emissions (ton)	AP-42 Emission Factor Source Notes [5]
NO_2	0.099	0.099	493,480	246.74	Table 3.1-1, lean premix; Assume SCR Control Efficiency
CO	0.015	0.015	74,770	37.38	Table 3.1-1, lean premix; Assume Ox. Cat. Control Efficiency
PM_{10}	0.0047	0.0047	23,428	11.71	Table 3.1-2a, PM (condensible)
$PM_{2.5}$	0.0019	0.0019	9,471	4.74	Table 3.1-2a, PM (filterable)
SO_2	0.0034	0.0034	16,948	8.47	Table 3.1-2a
CO_2	110	110	548,310,563	274,155.28	Table 3.1-2a

Coal Combustion Emissions

Pollutant	AP-42 Emission Factor (lb/ton) [6]	Controlled Emission Factor (lb/ton)	Emissions (lb) [7]	Emissions (ton)	AP-42 Emission Factor Source Notes [9]
NOx	12	12	305711	152.86	Table 1.1-3 pulverized coal, wall fired, bituminous coal NSPS
CO	0.5	0.5	12738	6.37	Table 1.1-3 pulverized coal, wall fired, bituminous coal NSPS
PM_{10} [8]	0.46	0.084	2140	1.07	Table 1.1-4, PC-fired dry bottom wall-fired, scrubber control
$PM_{2.5}$ [8]	0.12	0.06	1529	0.76	Table 1.1-4, PC-fired dry bottom wall-fired, scrubber control
SO_2 [9]	2.85	0.57	14521	7.26	Table 1.1-3 pulverized coal, wall fired, bituminous coal NSPS
CO_2	6040	6040	153874466	76,937.23	Table 1.1-20
Total NMHC	0.06	0.06	1529	0.76	Table 1.1-19; assumed all hydrocarbons are reactive
CH_4	0.04	0.04	1019	0.51	Table 1.1-19
N_2O	0.03	0.03	764	0.38	Table 1.1-19

Total Displaced Emissions Associated With Direct Combustion

Pollutant	tons/year [8]	tons/lifetime (30 years)
ROG (NMHC)	0.76	22.93
NO_X	399.60	11,987.86
CO	43.75	1,312.61
PM_{10}	12.78	383.52
$PM_{2.5}$	5.50	164.99
SO_X	15.73	472.04
CO_2E	318,610.58	9,558,317.44

Notes:

1. Operational time is based on annual average solar radiation hours per day per year (6.76) for the project area. Source: National Renewable Energy Laboratories, U.S. Department of Energy (https://pvwatts.nrel.gov/pvwatts.php)
2. The Project is assumed to displace existing power generation equivalent to the current power mix(each year of operation.
3. California Power Mix assumptions are based on data from Total California Electrical System Power (http://www.energyalmanac.ca.gov/electricity/total_system_power.html).
4. Combustion of natural gas and coal for power are of the greatest concern related to the generation of criteria pollutants and GHG emissions, therefore only fuel displacement of natural gas and coal due to electricty production from the Solar Scarlet facility are considered in this assessment.
5. EPA Air Pollution Emission Factors AP-42 Section 3.1, Stationary Gas Turbines
6. EPA Air Pollution Emission Factors AP-42 Section 1.1, Bituminous and Subbituminous Coal Combustion
7. Coal characteristics used for conversion: Assumed coal heat content = 24 MMBtu/ton
8. Total particulate matter (CPM-TOT) is expressed in terms of coal ash content therefore emission factor is determined by multiplying % ash content of coal (assumed to be 20% herein) by value listed in Table 1.1-4. Organic fraction of particulate matter is 20% of total CPM-TOT (Table 1.1-5) and listed as controlled emission factor.
9. SO_x emission factor calculated by multiplying the weight percent of sulfur (assumed to be 7.5%) by the value listed in Table 1.1-3
10. CO_2E volumes are in metric tons rather than short (US) tons

Source: Rincon 2020

Appendix G
CEQA Level Geotechnical Study

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Stantec Consulting Services Inc.
735 East Carnegie Drive Suite 280, San Bernardino CA 92408-3588

February 23, 2021

Attention: Mr. Alexander Sundquist
64NB 8me, LLC
5455 Wilshire Boulevard, Suite 2010
Los Angeles, California 90036

Dear Mr. Sundquist,

Reference: Aratina Solar Farm – Phase I and Phase II Environmental Site Assessment Reports and CEQA Level Geotechnical Study
Kern County, California

Stantec was informed by 64NB 8ME LLC that the areal footprint of the Aratina Solar Farm has been reduced from approximately 2,700 acres to 2,300 acres in order to create additional separation from communities of Boron and Desert Lake. In an abundance of caution, 64NB 8ME LLC contacted Stantec to evaluate whether the reduced footprint would change the conclusions of the Phase I and Phase II Environmental Site Assessment (ESA) reports or the CEQA Level Geotechnical Study report. Based on our discussions with 64NB 8ME LLC and review of the revised project layout provided, the referenced reports prepared by Stantec covered a larger project footprint and no new properties were being added to the project under the revised, reduced project footprint. Therefore, the conclusions of our Phase I and II ESAs and CEQA Level Geotechnical Study previously prepared for the Aratina Solar Farm would remain applicable as of the date the reports were produced.

Regards,

Stantec Consulting Services Inc.

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Stantec Consulting Services Inc.
735 East Carnegie Drive, Suite 280
San Bernardino, California 92408

March 18, 2019

Mr. Alexander Sundquist
64NB 8me LLC
5455 Wilshire Boulevard, Suite 2010
Los Angeles, California 90036

Reference: CEQA LEVEL GEOTECHNICAL STUDY (REVISED)
Aratina Solar Project – Phase I
27 Parcels bounded by 20 Mule Team Road and California State Highway 58 to the west, Kern County/San Bernardino County line to the east, and approximately one Mile North and South of 20 Mule Team Road
Boron, Kern County, California
Stantec Project No. 185804366

Dear Mr. Sundquist:

Stantec Consulting Services Inc. (Stantec) has prepared this California Environmental Quality Act (CEQA) Level Geotechnical Study to provide support documentation for the "Environmental Checklist Form" in accordance with the CEQA Guidelines for the proposed Aratina solar development, located east of California Highway 58 and 20 Mule Team Road, in the City of Boron, California.

PURPOSE AND SCOPE OF WORK

- Review available subsurface information for the Sites,
- Excavate and sample a total of 14 test pits to a maximum depth of 10 feet at the Site,
- Perform percolation testing at a depth of 3 feet at one test pit location,
- Perform soil mechanics laboratory testing on select soil samples,
- Evaluate geotechnical properties of soils pertinent to the CEQA Guidelines, and
- Summarize findings, conclusions, and recommendations in this letter.

SITE DESCRIPTION

The proposed Aratina Solar Farm comprises 27 assessor's parcels (Project Area) totaling approximately 2,667 gross acres. The permanent disturbance acreage associated with development of the solar facility and associated infrastructure (Project Site) within the Project Area would be less than the gross acreage of the Project Area. The Project Area is south of the existing U.S. Borax mine in Boron. The topography of the Project Area is relatively flat and is located near Boron, California in the area shown on Figure 1.

PRE-FIELD ACTIVITIES

Test pit exploration locations were selected based on review of conceptual development plans and confirmed in the field at the time of field sampling. In addition, a site-specific Health and Safety Plan (HASP) was developed in accordance with California Occupational Safety and Health Administration (Cal OSHA) requirements to guide field activities.

FIELD EXPLORATION ACTIVITIES

Fourteen shallow test pits (TP1 through TP14) were advanced at selected locations throughout the site to a maximum depth of ten feet below the existing ground surface (bgs) (Figures 2 to 5). Relatively undisturbed samples were obtained using a modified California (CAL) sampler, which is a ring-lined split tube sampler with a 3-inch outer diameter and 2½-inch inner diameter. CAL sampling followed ASTM D3550 (Standard Practice for Ring-Lined Barrel Sampling of Soils) procedures. Disturbed bulk samples were also obtained from the excavation at locations where CAL sampling could not be completed. The CAL sampler was advanced with a backhoe bucket.

Samples were classified in the field using the Unified Soil Classification System (USCS), in accordance with ASTM D2488 (Standard Practice for Description and Identification of Soils [Visual-Manual Method]) procedures. The laboratory testing confirmed or modified field classifications as necessary for presentation on the boring logs. Soil samples were removed from the samplers, placed in appropriate containers, and transported in accordance with ASTM D4220 (Standard Practice for Preserving and Transporting Soil Samples).

The test pit logs are located in Attachment A. Soils are classified in accordance with the USCS, which is explained in "Symbols and Terms Used on Borehole and Test Pit Records" in Attachment A. the approximate test pit locations are shown on Figures 3 to 5.

LABORATORY SOIL TESTING

The following laboratory tests were performed on samples collected at the Site either in general accordance with the American Society for Testing and Materials (ASTM) or contemporary practices of the soil engineering profession:

Table 1 – Summary of Laboratory Tests

Type of Test	ASTM Designation	Number Performed
In-Situ Moisture and Density	ASTM D-2216	22
Sieve Analysis	ASTM D422 and ASTM C136	15

The results of the laboratory tests are presented in Attachment B.

REGIONAL GEOLOGY

The Site is located in the western portion of the Mojave Desert Geomorphic Province in the southern part of California. The surface topography within the province is controlled by two sets of faults – a prominent northwest to southeast trending set and a secondary set trending east to west.

According to the California Geological Survey (CGS) website, the Mojave Desert Geomorphic Province is a broad interior region of isolated mountains separated by desert plains with an enclosed drainage system. The Mojave Desert Geomorphic Province is wedged in a sharp angle between the San Andreas and Garlock faults (CGS, 2008). Displacement along both faults is predominantly strike slip (right-lateral in the case of the San Andreas Fault; left lateral in the case of the Garlock fault).

Based on information depicted on available geologic maps (Diblee, 1964) and shown on Figure 6 (Geologic Map), the site is located within an area underlain by Quaternary Alluvium (Qa). Portions of the project are also located in areas mapped as Quaternary Older Alluvium (Qoa) and Quaternary Surficial (Qs) deposits.

A description of the mapped soil units is provided below.

Quaternary Alluvial (Qa) Deposits – Very young alluvial-valley deposits (late Holocene) consisting of unconsolidated silt, sand, and cobbles (USGS, 2003).

Quaternary Older Alluvial (Qoa) Deposits – Moderately to well consolidated old alluvial deposits of the late to middle Pleistocene era consisting of silt, sand, and gravel (USGS, 2003).

Quaternary Surficial (Qs) Deposits – Mostly unconsolidated very young surficial deposits (late Holocene) consisting of silt, sand, gravel, and small cobbles (USGS, 2003).

SUBSURFACE CONDITIONS IN TEST PIT EXPLORATIONS

The near surface (approximately 10 feet deep) soils encountered in the test pits we performed are sand with variable amount of silt (SP, SW-SM, SP-SM and SM USCS soil type). Near surface sandy soil with variable amounts of silt and gravel were dry to the maximum depth of exploration.

The subsurface soils were not difficult to penetrate, and the test pit excavations did not cave to the maximum depth of exploration. Groundwater was not encountered during this investigation.

REGIONAL GROUNDWATER

Antelope Valley Groundwater Basin underlies the western portion of the Mohave Desert and is part of the South Lahontan Hydrologic Region. The basin is bounded on the northwest by the Garlock Fault Zone, on the southwest by the San Andreas Fault Zone, on the east by ridges, buttes, and low hills that form a drainage divide, and on the north by the Fremont Valley Groundwater Basin (DWR, 2004).

Static groundwater was not encountered in the test performed for this investigation. Groundwater data from an offsite location approximately 3 miles northeast of the site indicates the depth to groundwater is approximately 168 feet below the ground surface (DWR, 2018). Groundwater levels may fluctuate in the future due to rainfall, irrigation, broken pipes, or changes in site drainage.

REGIONAL SEISMICITY

The project site is located within a highly active seismic zone. A Regional Faulting and Seismicity Map is presented in Figure 7. This fault map also provides information regarding recent earthquakes in the project area. Several of the more recent earthquakes in the project area include the 1992 Johnson earthquake, the 1992 Big Bear earthquake, the 1994 Northridge earthquake, and the 1999 Hector Mine earthquake (CGS, 2016).

The estimated distance of the Site to the nearest expected surface expression of major active faults is presented in the table below. The purple colored faults noted in Figure 7 are either inactive or have a very low slip rate. The distance measurement was taken from a location at the southwest corner of the site which is closest to the Helendale South Lockhart fault (the closest active fault

relative to the site). The location from which measurements were obtained has a latitude of 34.991271°, and a longitude of -117.680345°.

Table 2 - United States Geological Survey – Significant Faults

Fault	Distance (miles) (2)	Maximum Moment Magnitude (1)
Helendale – South Lockhart	9.2	7.4
Lenwood – Lockhart – Old Woman Springs	9.9	7.5
Gravel Hills – Harper Lake	22.2	7.1
Garlock	26.8	7.6
South Sierra Nevada	28.5	7.5
Blackwater	31.0	7.1
South San Andreas	38.1	8.2

1. 2008 National Seismic Hazard Maps – USGS.
2. Measured from approximate center of site.

REGIONAL SEISMIC HAZARDS

Fault Rupture Hazard

The Site is not located within a currently mapped Alquist-Priolo Special Studies Fault Zone (CDMG, 2002b). As noted above, the nearest active major fault is the Helendale – South Lockhart fault, located approximately 9.2 miles northeast of the Site. Based on the fault's distance from the project site, and since the fault does not project towards the project site, it is our opinion that the potential for surface fault rupture to occur on the project site is low.

The Kramer Hills Fault Zone extends into the southwest portion of the site as shown on Figure 8. The most recent earthquake within the Kramer Hills Fault zone was in 2017 and registered a magnitude 3.5 with an approximate depth of 0.4 miles. Based on the slow slip rate of the Kramer Hills Fault Zone, it is our opinion that the potential for surface fault rupture to occur on the project site is low to moderate.

Strong Ground Shaking

Strong ground shaking can be expected at the Site during moderate to severe earthquakes in the general region. This is common to most areas in Southern California.

Information published by the Unites States Geologic Survey (USGS) indicates the Peak Ground Acceleration (PGA) with a 2 percent probability of being exceeded at the Site in 50 years is 0.42g (USGS, 2008); where g is the acceleration due to gravity; determined in accordance with the US Seismic Design Maps web site. Mitigation of strong ground shaking is typically provided by designing structures in accordance with the latest addition of the California Building Code.

Liquefaction

Liquefaction of saturated sandy soils is generally caused by the sudden decrease in soil shear strength due to vibration. During cyclic shaking, typically caused by an earthquake, the soil mass is distorted, and inter-particle stresses are transferred from the soil particles to the pore water. As pore pressure increases the bearing capacity decreases and the soil may behave temporarily as a viscous fluid (liquefaction) and, consequently, loses its capacity to support the structures founded thereon.

Engineering research of soil liquefaction potential (Seed, et. al., 1982 and 1985) indicates that generally three basic factors must exist concurrently in order for liquefaction to occur, namely:

- A source of ground shaking, such as an earthquake, capable of generating soil mass distortions.
- A relatively loose sandy soil fabric exhibiting a potential for volume reduction.
- A relative shallow groundwater table (within approximately 50 feet below ground surface) or completely saturated soil conditions that will allow positive pore pressure generation.

The Site is not located within a current, mapped California Liquefaction Hazard Zone. In addition, groundwater in the site vicinity is expected to be approximately 162 feet below the ground surface (DWR, 2010). Based on the near surface soil conditions and depth to groundwater, it is our opinion that the potential for liquefaction related ground failure, including liquefaction, is low.

Lateral Spreading

Lateral spreading typically occurs as a form of horizontal displacement of relatively flat-lying alluvial material toward an open or "free" face such as an open body of water, channel, or excavation. This movement is generally due to failure along a weak plane, and may often be associated with liquefaction. As cracks develop within the weakened material, blocks of soil displace laterally toward the open face. Cracking and lateral movement may gradually propagate away from the face as blocks continue to break free.

Due to the low potential for liquefaction, the depth of groundwater, and the fact that the Site is not located near free faces or bodies of water, the potential for lateral spreading is considered low.

SUBSIDENCE

Groundwater levels in the Antelope Valley have declined more than 270 feet since the 1970s (USGS, 2017) in some parts of the groundwater basin, especially near the City of Lancaster. These groundwater level declines have caused the aquifer system to compact, resulting in land subsidence. Land subsidence within the Antelope Valley has been most recently evaluated by the USGS through the use of InSAR (Interferometric Synthetic Aperture Radar) between 1992 and 2009 (USGS, 2014). Based on these recent studies, the site is not within an area that has sustained measurable subsidence due to groundwater draw down. Due to the depth of groundwater and the fact that the Site is not located in a mapped subsidence area, the potential for subsidence is considered low.

EXPANSIVE SOIL POTENTIAL

Expansion and contraction of volume can occur when expansive soils undergo alternating cycles of wetting (swelling) and drying (shrinking). Since near-surface soils encountered during the recent geotechnical investigation are mostly sandy soils whose expansion potential is considered low. As such, special design for expansive soils will likely not be necessary for the proposed development.

SLOPES

The Site is relatively flat, with a topographic gradient less than 2%. Permanent slopes steeper that 5:1 (horizontal to vertical) or higher than 5 feet are not anticipated for the project. Due to the existing

topography and the proposed grading, landslides are not considered a potential hazard for the project. The stability of slopes, if any, should be verified when design-grading information becomes available.

EROSION

The predominately coarse-grained soils underlying the site are potentially susceptible to erosion or the loss of topsoil due to surface water flows.

Mitigation of soil erosion may include selective grading, establishment of anchoring vegetation, design of runoff control features such as drainage ditches, and construction of erosion control features such as pavements and surface mats. These mitigation options should be addressed in the design level evaluations for the project.

INFILTRATION FEASIBILITY

Percolation testing was performed in test pit (TP-08) in general accordance with the guidelines described in Kern County Department of Public Health's Percolation Test Requirements (KCDPH, 2014).

Based on the laboratory sieve test results, the natural soils located at the bottom of the percolation well soil borings consist of sand (USCS: SM) with variable amounts of silt. The sands were brown, dry, and loose.

The shallow percolation test was performed in a 1-foot square, 3 feet deep trench. Pre-soaking was performed the day of percolation testing. The stabilized percolation rate from the final tests was measured as 27 inches per hour or over 2 minutes per inch which corresponds to a high percolation rate (un-factored).

Kern County requirements for infiltration include converting the percolation rate to an infiltration rate (I_t) and applying a safety factor. Once the infiltration rate was calculated and a factor of safety of 3 is applied, the design infiltration rate is 3.7 inches per hour for the shallow and deep test locations. Note that this infiltration rate is applicable at the locations tested. Different locations and depths may have different rates and soil compaction will reduce the infiltration rate. An appropriate factor of safety, if necessary, should be applied to the overall system design in accordance with the KCSMP.

Soil percolation rates from in situ tests can vary significantly from one location to another due to heterogeneous characteristics of subsurface conditions. The test results from these borings should be considered a screening level value and additional testing should be performed if an on-site disposal system is to be constructed for the project. Soil compaction can decrease infiltration rates significantly. Final percolation testing should be performed in as graded conditions so that effects from soil compaction are incorporated in the test results.

Based on the soil properties completed at each test pit location and the preliminary permeability test results, it appears the soils are suitable to support septic tanks and leach fields, if applicable. However, appropriate percolation testing should be completed once the site layout has been established and the location of the septic system has been determined.

CONCLUSIONS

Based on the currently planned development, it is our opinion that the soils will require additional assessment to determine mitigation measures for strong ground shaking and erosion as discussed above.

Mitigation options for these hazards are provided in the preceding sections. Impacts should be mitigated through the application of standard conditions of development, which require preparation of a design-level geotechnical study as a condition of grading permit issuance.

Based on the findings of this CEQA Level Geotechnical Study, a completed CEQA questionnaire for the Geology and Soils Section has been included in Attachment D. As recommended above, items checked as "Less than Significant with Mitigation" should be addressed in the scope of a future design-level geotechnical investigation.

We trust that the information provided herein meets the project requirements. If there are any questions regarding this project, please contact the undersigned at your convenience.

Respectfully submitted,
Stantec Consulting Services Inc.



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FIGURES
Figure 1 - Site Location Map
Figure 2 – Property Area and Vicinity Map
Figure 3 – Subsurface Exploration Map – Area A
Figure 4 – Subsurface Exploration Map – Area B
Figure 5 – Subsurface Exploration Map – Area C
Figure 6 – Geologic Map
Figure 7 – Regional Faulting Map
Figure 8 – Earthquake Fault Map

ATTACHMENTS
Attachment A – Test Pit Logs
Attachment B – Laboratory Test Results
Attachment C – Percolation Test Results
Attachment D – CEQA Guidelines Form – Geology and Soils

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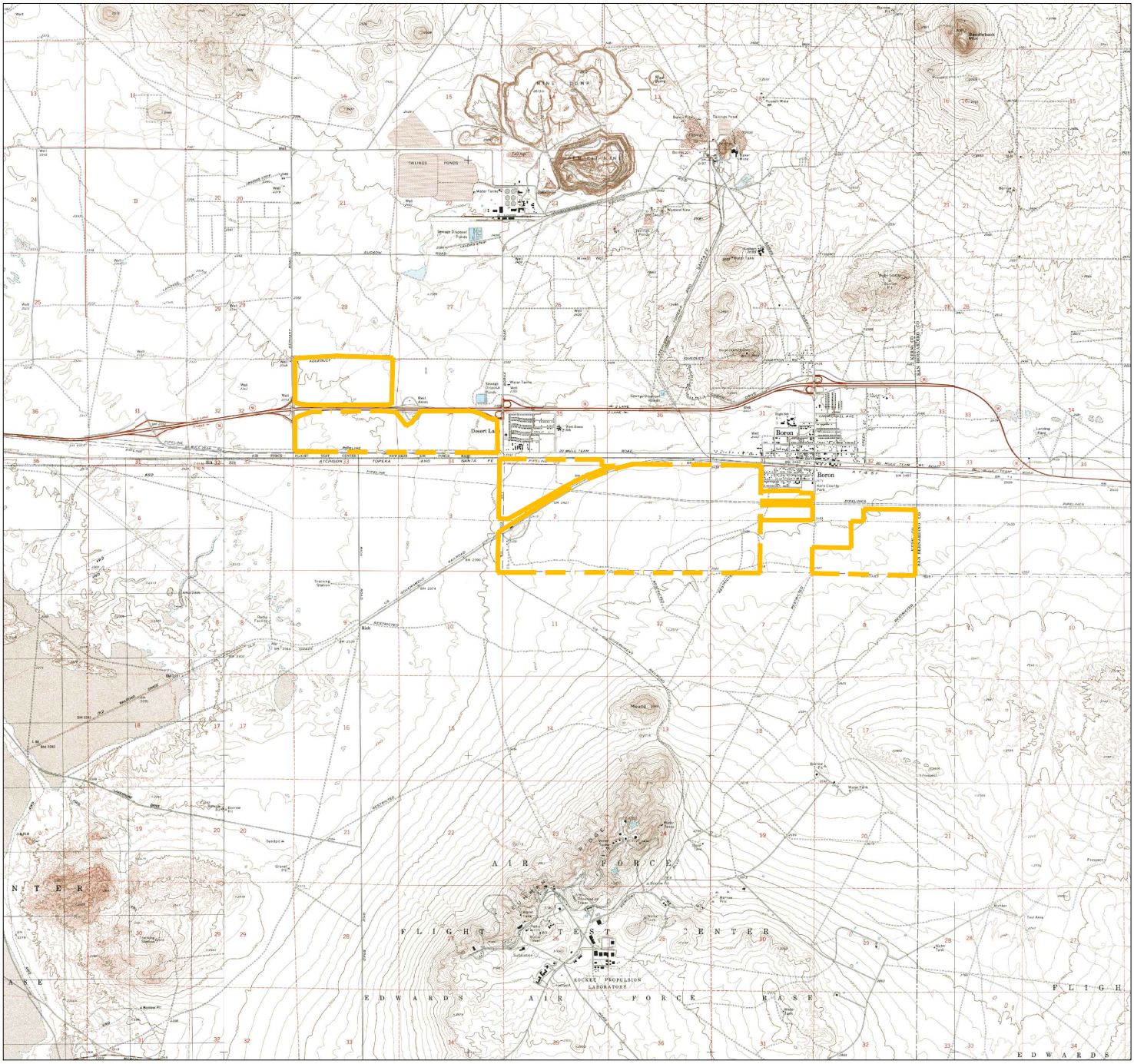
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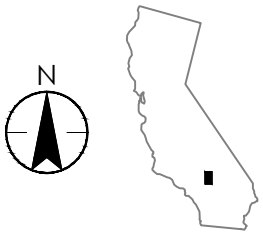
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FIGURES





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SCALE IN MILE

4000 0 4000 8000 12000 16000 20000 24000 28000

SCALE IN FEET

REFERENCE: USGS 7.5 X 15 MINUTE QUADRANGLE; BORON; 1973

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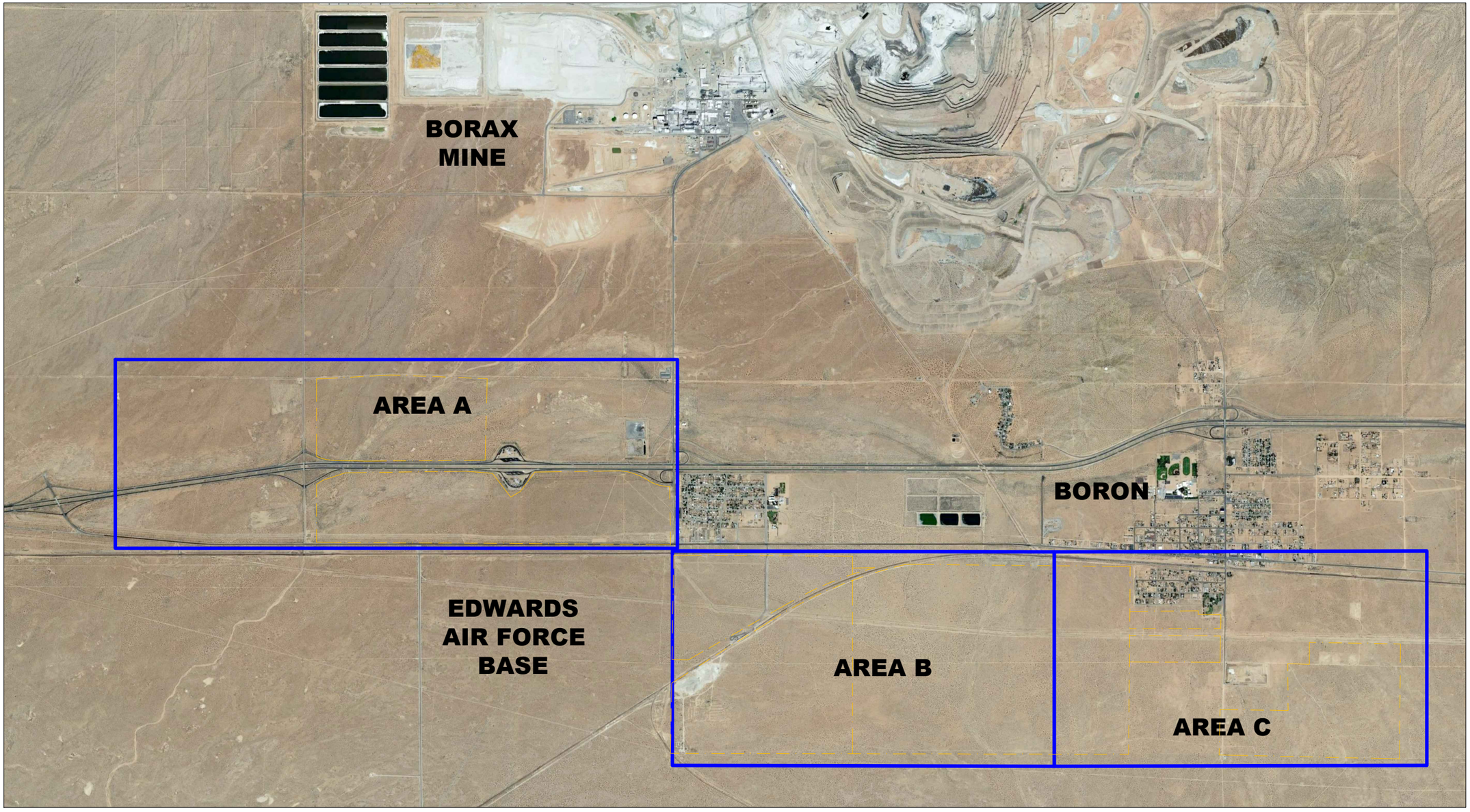
ARATINA SOLAR FARM PROJECT
KERN COUNTY, CALIFORNIA

SITE LOCATION MAP

FIGURE: 1

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LEGEND

APPROXIMATE LIMITS OF PROPERTY

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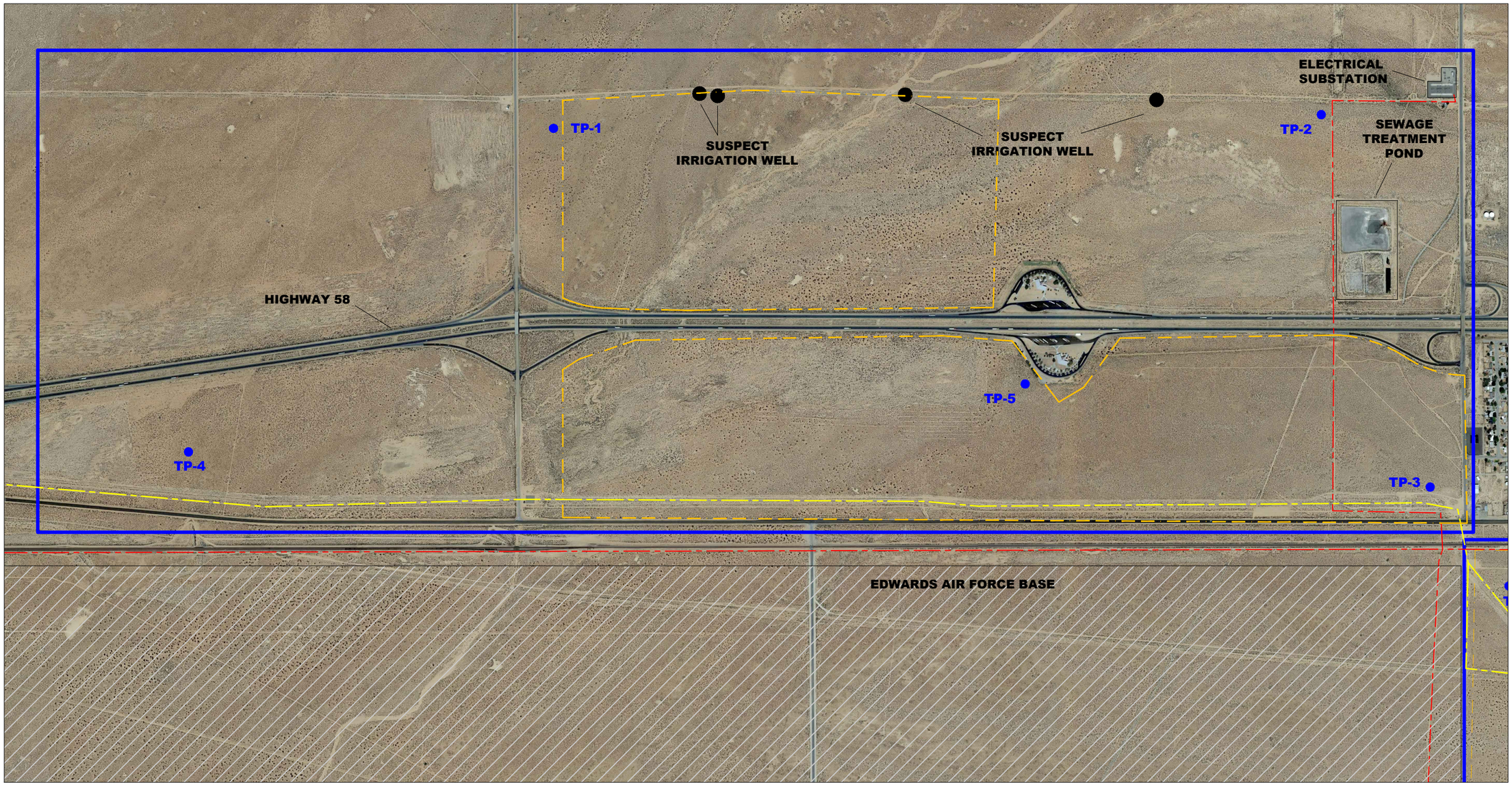
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KERN COUNTY, CALIFORNIA

PROPERTY AREA AND VICINITY MAP

FIGURE: 2

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- APPROXIMATE LIMITS OF PROPERTY
- APPROXIMATE LOCATION OF UNDERGROUND NATURAL GAS PIPELINE
- APPROXIMATE LOCATION OF ABOVEGROUND POWER UTILITIES
- TP-5 APPROXIMATE LOCATION OF TEST PIT

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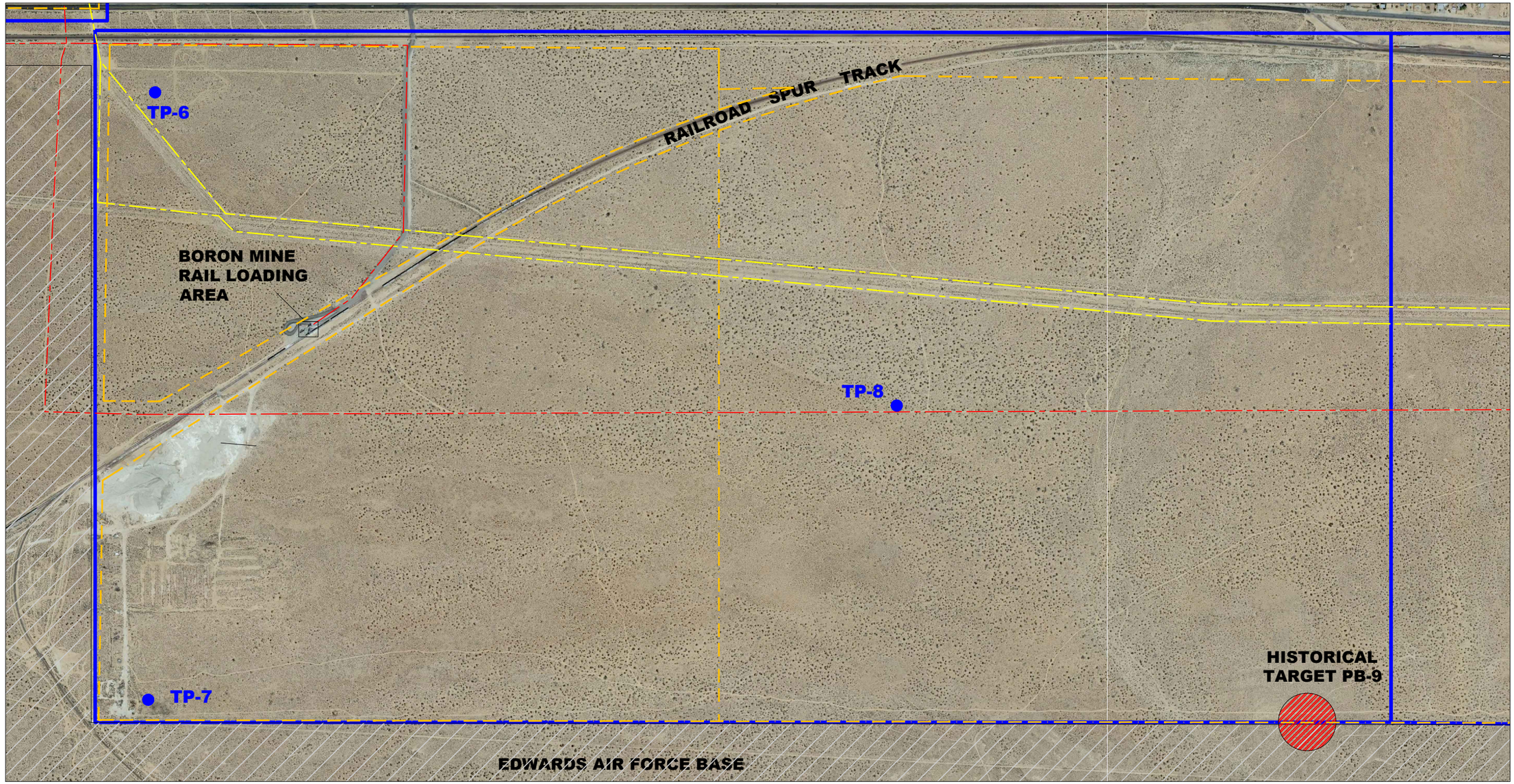
FOR: ARATINA SOLAR FARM PROJECT
KERN COUNTY, CALIFORNIA

SUBSURFACE EXPLORATION MAP-
AREA A

FIGURE: 3

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LEGEND

- APPROXIMATE LIMITS OF PROPERTY
- APPROXIMATE LOCATION OF UNDERGROUND NATURAL GAS PIPELINE
- APPROXIMATE LOCATION OF ABOVEGROUND POWER UTILITIES
- TP-8 APPROXIMATE LOCATION OF TEST PIT

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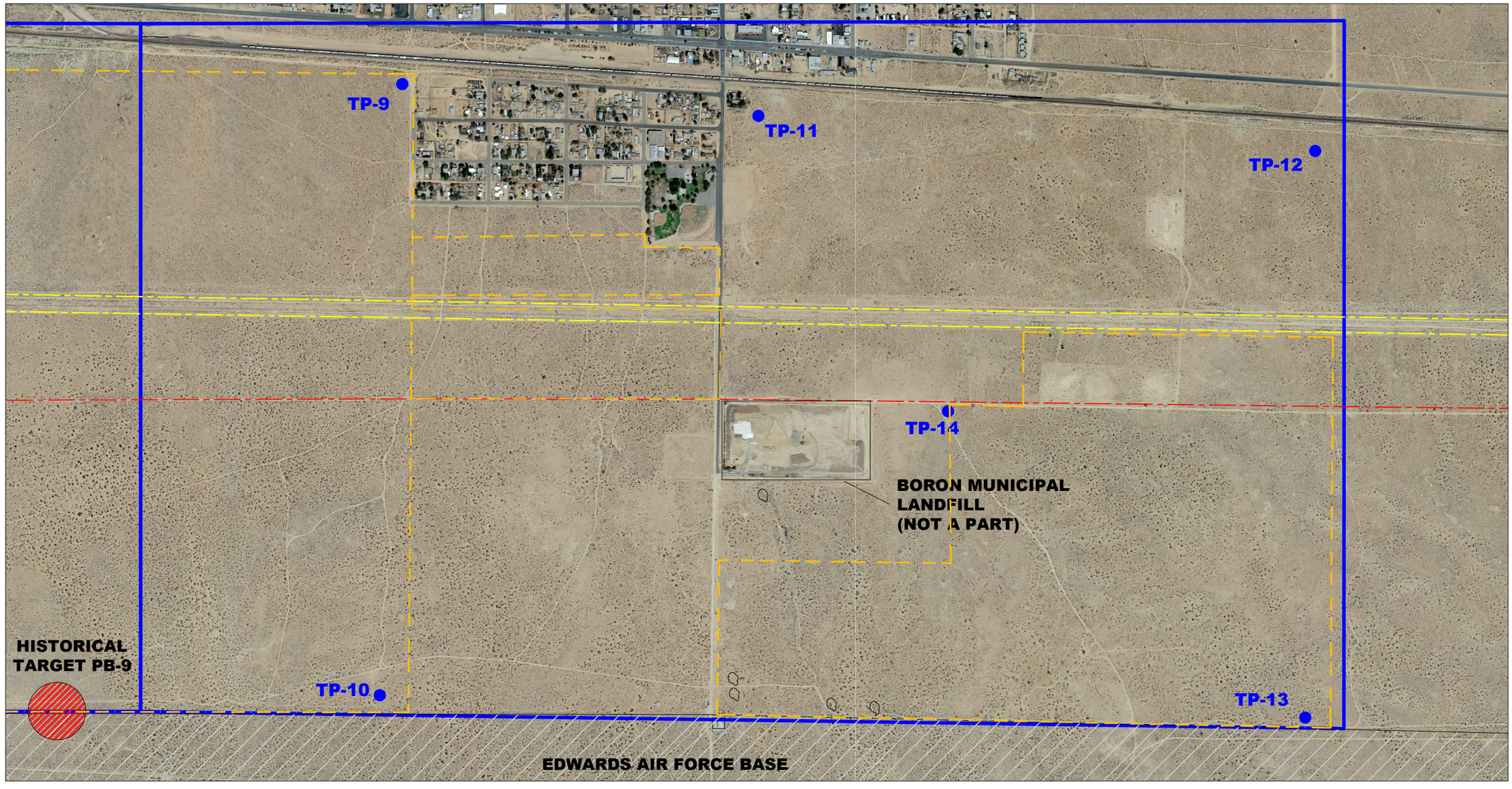
FOR: ARATINA SOLAR FARM PROJECT
KERN COUNTY, CALIFORNIA

SUBSURFACE EXPLORATION MAP-
AREA B

FIGURE: 4

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LEGEND

- APPROXIMATE LIMITS OF PROPERTY
- APPROXIMATE LOCATION OF UNDERGROUND NATURAL GAS PIPELINE
- APPROXIMATE LOCATION OF ABOVEGROUND POWER UTILITIES
- TP-13 APPROXIMATE LOCATION OF TEST PIT

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SCALE (FEET)

Stantec
735 EAST CARNEGIE DRIVE, SUITE 280
SAN BERNARDINO, CA 92408
PHONE:(909) 335-6116 FAX:(909) 335-6120

FOR: ARATINA SOLAR FARM PROJECT
KERN COUNTY, CALIFORNIA

SUBSURFACE EXPLORATION MAP-
AREA C

FIGURE: 5

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185804366	JEF	JEF	JEF	3/17/19

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LEGEND

- APPROXIMATE LIMITS OF PROPERTY
- **Qa** UNCONSOLIDATED ALLUVIAL GRAVEL, SAND, AND SILT
- **Qoa** WEAKLY CONSOLIDATED ALLUVIAL GRAVEL, SAND, AND SILT
- **Qs** ALLUVIAL WIND BLOWN SAND

No warranty is made by Stantec as to the accuracy, reliability, or completeness of these data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed electronically, and may be updated without notification. Any reproduction may result in a loss of scale and or information.

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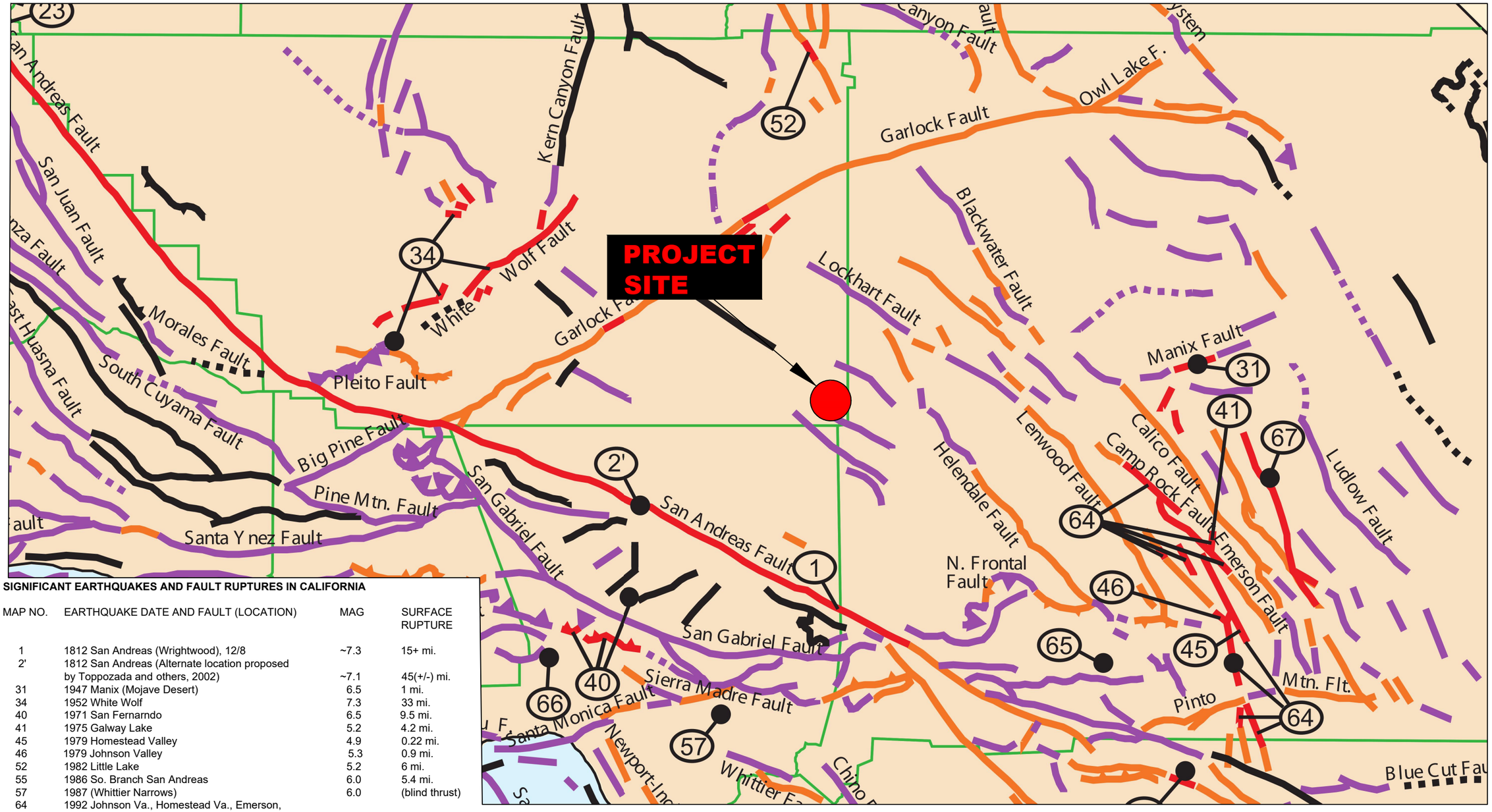
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SCALE (FEET)

Stantec
735 EAST CARNEGIE DRIVE, SUITE 280
SAN BERNARDINO, CA 92408
PHONE: (909) 335-6116 FAX: (909) 335-6120

FOR:		GEOLOGIC MAP		FIGURE:
ARATINA SOLAR FARM PROJECT KERN COUNTY, CALIFORNIA				6
JOB NUMBER: 185804366	DRAWN BY: JEF	CHECKED BY: JEF	APPROVED BY: JEF	DATE: 3/17/19

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SIGNIFICANT EARTHQUAKES AND FAULT RUPTURES IN CALIFORNIA

MAP NO.	EARTHQUAKE DATE AND FAULT (LOCATION)	MAG	SURFACE RUPTURE
1	1812 San Andreas (Wrightwood), 12/8	~7.3	15+ mi.
2'	1812 San Andreas (Alternate location proposed by Toppozada and others, 2002)	~7.1	45(+/-) mi.
31	1947 Manix (Mojave Desert)	6.5	1 mi.
34	1952 White Wolf	7.3	33 mi.
40	1971 San Fernarndo	6.5	9.5 mi.
41	1975 Galway Lake	5.2	4.2 mi.
45	1979 Homestead Valley	4.9	0.22 mi.
46	1979 Johnson Valley	5.3	0.9 mi.
52	1982 Little Lake	5.2	6 mi.
55	1986 So. Branch San Andreas	6.0	5.4 mi.
57	1987 (Whittier Narrows)	6.0	(blind thrust)
64	1992 Johnson Va., Homestead Va., Emerson, Camp Rock, Eureka Pk., Burnt Mtn. (Landers)	7.3	53 mi.
65	1992 (Big Bear)	6.5	NA
66	1994 Northridge (Northridge)	6.7	(blind thrust)
67	1999 Lavik Lake, Bullion (Hector Mine)	7.1	30 mi.

FAULT WITH KNOWN ACTIVITY IN LAST 200 YEARS

FAULT WITH KNOWN ACTIVITY IN LAST 10,000 YEARS

FAULT WITH KNOWN ACTIVITY IN LAST 1,600,000 YEARS

No warranty is made by Stantec as to the accuracy, reliability, or completeness of these data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed electronically, and may be updated without notification. Any reproduction may result in a loss of scale and or information.

N

0 15 30

SCALE (MILES)

Stantec
735 EAST CARNEGIE DRIVE, SUITE 280
SAN BERNARDINO, CA 92408
PHONE:(909) 335-6116 FAX:(909) 335-6120

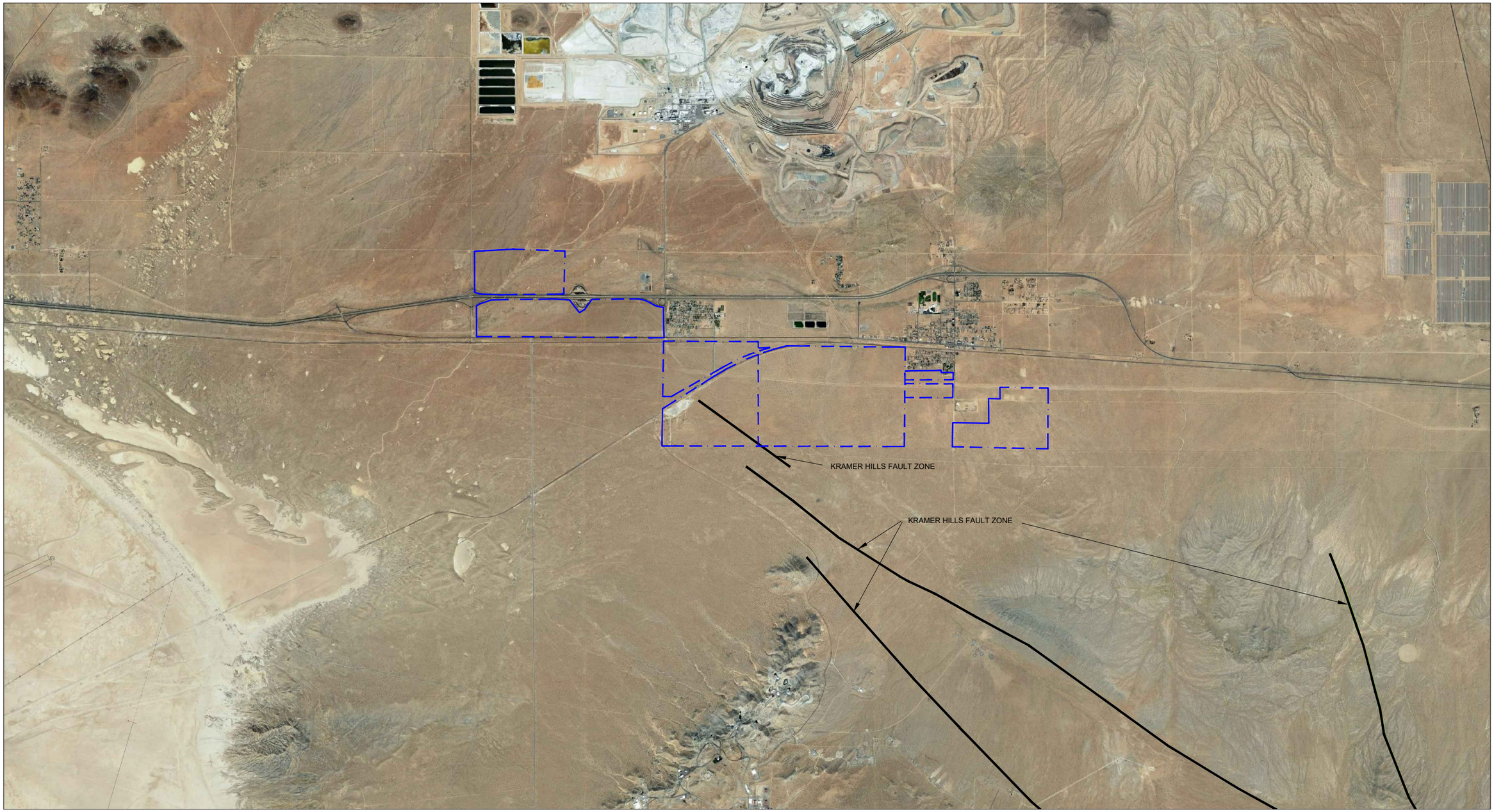
FOR: ARATINA SOLAR FARM PROJECT
KERN COUNTY, CALIFORNIA

REGIONAL FAULT MAP

FIGURE: 7

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185804366	JEF	JEF	JEF	3/17/19

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LEGEND

APPROXIMATE LIMITS OF PROPERTY

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N

0 5,000 10,000

SCALE (FEET)

Stantec
735 EAST CARNEGIE DRIVE, SUITE 280
SAN BERNARDINO, CA 92408
PHONE: (909) 335-6116 FAX: (909) 335-6120

FOR: ARATINA SOLAR FARM PROJECT
KERN COUNTY, CALIFORNIA

EARTHQUAKE FAULT MAP

FIGURE: 8

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
185804366	JEF	JEF	JEF	3/17/19

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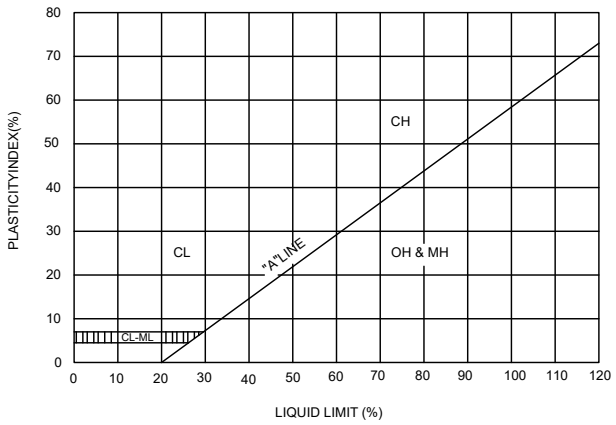
ATTACHMENT A
TEST PIT LOGS

UNIFIED SOIL CLASSIFICATION (ASTM D-2487)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	*CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL
		*GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	*CLEAN SANDS <5% FINES	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND
		*SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LEAN CLAY
			PI>4 AND PLOTS<"A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	FAT CLAY
			PI PLOTS <"A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

* Dual symbols required for fines content between 5% and 12%

PLASTICITY CHART



SAMPLER TYPES

- SPT
- Modified California (2.5" I.D.)
- Rock Core
- Shelby Tube
- No Recovery
- Grab Sample

ADDITIONAL TESTS

COR	-	CHEMICAL ANALYSIS (CORROSIVITY)	PI	-	PLASTICITY INDEX
CD	-	CONSOLIDATED DRAINED TRIAXIAL	EI	-	EXPANSION INDEX
CN	-	CONSOLIDATION	TC	-	CYCLIC TRIAXIAL
CU	-	CONSOLIDATED UNDRAINED TRIAXIAL	TV	-	TORVANE SHEAR
DS	-	DIRECT SHEAR	UC	-	UNCONFINED COMPRESSION
PP	-	POCKET PENETROMETER (TSF)	(1.5)	-	(WITH SHEAR STRENGTH IN KSF)
#200	-	Percent Passing #200 SIEVE			
RV	-	R-VALUE	UU	-	UNCONSOLIDATED UNDRAINED TRIAXIAL
SA	-	SIEVE ANALYSIS: % PASSING			
▼	-	WATER LEVEL			

PENETRATION RESISTANCE (RECORDED AS BLOWS / FOOT)

SAND & GRAVEL		SILT & CLAY		
RELATIVE DENSITY	BLOWS/FOOT*	CONSISTENCY	BLOWS/FOOT*	STRENGTH** (KSF)
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.5
MEDIUM DENSE	10 - 30	MEDIUM STIFF	4 - 8	0.5-1.0
DENSE	30 - 50	STIFF	8 - 15	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	15 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

* * UNDRAINED SHEAR STRENGTH IN KIPS/SQ. FT. AS DETERMINED BY LABORATORY TESTING OR APPROXIMATED BY THE STANDARD PENETRATION TEST, POCKET PENETROMETER, TORVANE, OR VISUAL OBSERVATION.

LEGEND TO BORING LOGS AND SOIL DESCRIPTIONS

Stantec

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/21/19** COMPLETED: **2/21/19**
INSTALLATION: STARTED **2/21/19** COMPLETED: **2/21/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-01

Stantec

NORTHING (ft): EASTING (ft):
LATITUDE: **35° 0' 47.62"** LONGITUDE: **117° 44' 19.19"**
GROUND ELEV (ft): **2357** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY ALLUVIAL (Qa) DEPOSITS						
		SM	**SILTY SAND** ; SM; 10YR 4/6 yellowish brown; 85% fine to medium grained sand; 15% fines; loose; dry						
5		SW-SM	**WELL GRADED SAND WITH SILT** ; SW-SM; 10YR 4/6 yellowish brown; 10% fine gravel; 82% fine to coarse grained sand; 8% fines; loose; dry		TP1-5'	SA, MD			5
10		SP	**POORLY GRADED SAND** ; SP; 10YR 5/6 yellowish brown; 5% fine gravel; 90% fine to coarse grained sand; 5% fines; loose; dry		TP1-10'	MD			10
			Hole terminated at 10.5 feet.						

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/21/19** COMPLETED: **2/21/19**
INSTALLATION: STARTED **2/21/19** COMPLETED: **2/21/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-02

NORTHING (ft): EASTING (ft):
LATITUDE: **35° 0' 47.68"** LONGITUDE: **117° 42' 31.29"**
GROUND ELEV (ft): **2379** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY ALLUVIAL (Qa) DEPOSITS						
		SM	**SILTY SAND** ; SM; 10YR 4/6 yellowish brown; 85% fine to medium grained sand; 15% fines; loose; dry						
5			73% fine to coarse grained sand; 27% fines below 5 feet		TP2-5'	SA			5
10		SP	**POORLY GRADED SAND** ; SP; 10YR 5/3 brown; 5% fine gravel; 90% fine to coarse grained sand; 5% fines; loose; dry		TP2-10'	MD			10
			Hole terminated at 10.5 feet.						

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/21/19** COMPLETED: **2/21/19**
INSTALLATION: STARTED **2/21/19** COMPLETED: **2/21/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-03

NORTHING (ft): EASTING (ft):
LATITUDE: **35° 0' 5.65"** LONGITUDE: **117° 42' 15.31"**
GROUND ELEV (ft): **2393** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY ALLUVIAL (Qa) DEPOSITS						
		SP	**POORLY GRADED SAND** ; SP; 10YR 4/6 dark yellowish brown; 15% fine gravel; 80% fine to coarse grained sand; 5% fines; loose; dry						
5		SW-SM	**WELL GRADED SAND WITH SILT** ; SW-SM; 10YR 6/3 pale brown; 1% fine gravel; 93% fine to coarse grained sand; 6% fines; loose; dry		TP3-5'	SA			5
10		SP	**POORLY GRADED SAND** ; SP; 10YR 7/4 yellow; 5% fine gravel; 80% fine to coarse grained sand; 15% fines; loose; dry		TP3-10'	MD			10
			Hole terminated at 10.5 feet.						

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/21/19** COMPLETED: **2/21/19**
INSTALLATION: STARTED **2/21/19** COMPLETED: **2/21/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-04 PAGE 1 OF 1

NORTHING (ft): EASTING (ft):
LATITUDE: **35° 0' 10.67"** LONGITUDE: **117° 45' 13.14"**
GROUND ELEV (ft): **2339** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY ALLUVIAL (Qa) DEPOSITS						
		SP	**POORLY GRADED SAND** ; SP; 10YR 4/6 dark yellowish brown; 15% fine gravel; 80% fine to coarse grained sand; 5% fines; loose; dry						
5		SM	**SILTY SAND** ; SM; 10YR 6/4 yellowish brown; 1% fine gravel; 78% fine to coarse grained sand; 21% fines; loose; dry		TP4-5'	SA			5
10		SP	**POORLY GRADED SAND** ; SP; 10YR 7/4 yellow; 5% fine gravel; 80% fine to coarse grained sand; 15% fines; loose; dry		TP4-10'	MD			10
			Hole terminated at 10.5 feet.						

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/21/19** COMPLETED: **2/21/19**
INSTALLATION: STARTED **2/21/19** COMPLETED: **2/21/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-05 PAGE 1 OF 1

Stantec

NORTHING (ft): EASTING (ft):
LATITUDE: **35° 0' 17.55"** LONGITUDE: **117° 43' 10.09"**
GROUND ELEV (ft): **2367** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY ALLUVIAL (Qa) DEPOSITS						
		SM	**SILTY SAND** ; SM; 10YR 4/6 dark yellowish brown; 80% fine to coarse grained sand; 20% fines; loose; dry						
5		SW-SM	**WELL GRADED SAND WITH SILT** ; SW-SM; 10YR 6/3 pale brown; 94% fine to coarse grained sand; 6% fines; loose; dry		TP5-5'	SA, MD			5
10		SM	**SILTY SAND** ; SM; 10YR 7/4 yellow; 85% fine to coarse grained sand; 15% fines; loose; dry		TP5-10'	MD			10
			Hole terminated at 10.5 feet.						

GEO FORM 304 8ME_ARATINA_LOGS.GPJ SECOR INTL.GDT 3/27/19

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/21/19** COMPLETED: **2/21/19**
INSTALLATION: STARTED **2/21/19** COMPLETED: **2/21/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-06

NORTHING (ft): EASTING (ft):
LATITUDE: **34° 59' 55.83"** LONGITUDE: **117° 42' 7.88"**
GROUND ELEV (ft): **2405** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY ALLUVIAL (Qa) DEPOSITS						
		SM	**SILTY SAND** ; SM; 10YR 4/3 brown; 85% fine to coarse grained sand; 15% fines; loose; dry						
5			9% fine gravel; 79% fine to coarse grained sand; 12% fines below 5 feet		TP6-5'	SA, MD			5
10			5% fine gravel; 75% fine to coarse grained sand; 20% fines below 10 feet		TP6-10'	MD			10
			Hole terminated at 10.5 feet.						

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/22/19** COMPLETED: **2/22/19**
INSTALLATION: STARTED **2/22/19** COMPLETED: **2/22/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-07

Stantec

NORTHING (ft): EASTING (ft):
LATITUDE: **35° 59' 5.67"** LONGITUDE: **117° 42' 4.95"**
GROUND ELEV (ft): **2418** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY SURFICIAL (Qs) DEPOSITS						
		SM	**SILTY SAND** ; SM; 10YR 5/6 strong brown; 85% fine to coarse grained sand; 15% fines; loose; dry						
5		SP	**POORLY GRADED SAND** ; SP; 10YR 6/6 brownish yellow; 1% fine gravel; 97% fine to coarse grained sand; 2% fines; loose; dry		TP7-5'	SA			5
10					TP7-10'				10
			Hole terminated at 10.5 feet.						

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/22/19** COMPLETED: **2/22/19**
INSTALLATION: STARTED **2/22/19** COMPLETED: **2/22/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-08

NORTHING (ft): EASTING (ft):
LATITUDE: **35° 59' 28.58"** LONGITUDE: **117° 40' 49.24"**
GROUND ELEV (ft): **2471** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY ALLUVIAL (Qa) DEPOSITS						
		SM	**SILTY SAND** ; SM; 10YR 5/6 strong brown; 85% fine to coarse grained sand; 15% fines; loose; dry						
5					TP8-5'	SA, MD			5
10			9% fine gravel; 79% fine to coarse grained sand; 12% fines; loose; dry		TP8-10'				10
			Hole terminated at 10.5 feet.						

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/22/19** COMPLETED: **2/22/19**
INSTALLATION: STARTED **2/22/19** COMPLETED: **2/22/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-09

Stantec

NORTHING (ft): EASTING (ft):
LATITUDE: **35° 59' 54.33"** LONGITUDE: **117° 39' 32.11"**
GROUND ELEV (ft): **2461** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY ALLUVIAL (Qa) DEPOSITS						
		SM	**SILTY SAND** ; SM; 10YR 6/3 brown; 85% fine to coarse grained sand; 15% fines; loose; dry						
5			85% fine to coarse grained sand; 15% fines below 5 feet		TP9-5'	SA, MD			5
10		SP	**POORLY GRADED SAND** ; SP; 10YR 6/6 brownish yellow; 95% fine to coarse grained sand; 5% fines; loose; dry		TP9-10'	MD			10
			Hole terminated at 10.5 feet.						

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/22/19** COMPLETED: **2/22/19**
INSTALLATION: STARTED **2/22/19** COMPLETED: **2/22/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-10

NORTHING (ft): EASTING (ft):
LATITUDE: **35° 59' 2.92"** LONGITUDE: **117° 39' 34.43"**
GROUND ELEV (ft): **2525** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY OLD ALLUVIAL (Qoa) DEPOSITS						
		SM	**SILTY SAND** ; SM; 10YR 4/3 brown; 85% fine to coarse grained sand; 15% fines; loose; dry						
5			9% fine gravel; 70% fine to coarse grained sand; 21% fines below 5 feet		TP10-5'	SA, MD			5
10			5% fine gravel; 75% fine to coarse grained sand; 20% fines below 10 feet		TP10-10'	MD			10
			Hole terminated at 10.5 feet.						

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/22/19** COMPLETED: **2/22/19**
INSTALLATION: STARTED **2/22/19** COMPLETED: **2/22/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-11

Stantec

NORTHING (ft):
EASTING (ft):
LATITUDE: **35° 59' 52.47"**
LONGITUDE: **117° 38' 56.62"**
GROUND ELEV (ft): **2477**
TOC ELEV (ft):
INITIAL DTW (ft): **NE**
BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE**
WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---**
BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg**
CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY ALLUVIAL (Qa) DEPOSITS						
		SM	**SILTY SAND** ; SM; 10YR 4/3 brown; 85% fine to coarse grained sand; 15% fines; loose; dry						
5		SP-SM	**POORLY GRADED SAND WITH SILT** ; SP-SM; 10YR 6/6 brownish yellow; 15% fine gravel; 74% fine to coarse grained sand; 11% fines; loose; dry		TP11-5'	SA, MD			5
10					TP11-10'				10
			Hole terminated at 10.5 feet.						

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/22/19** COMPLETED: **2/22/19**
INSTALLATION: STARTED **2/22/19** COMPLETED: **2/22/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-12 PAGE 1 OF 1

NORTHING (ft): EASTING (ft):
LATITUDE: **35° 59' 50.03"** LONGITUDE: **117° 37' 57.05"**
GROUND ELEV (ft): **2501** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY ALLUVIAL (Qa) DEPOSITS						
		SP-SM	**POORLY GRADED SAND WITH SILT** ; SP-SM; 10YR 4/6 yellowish brown; 90% fine to coarse grained sand; 10% fines; loose; dry						
5		SW-SM	**WELL GRADED SAND WITH SILT** ; SW-SM; 10YR 6/6 brownish yellow; 13% fine gravel; 78% fine to coarse grained sand; 9% fines; loose; dry		TP12-5'	SA, MD			5
10					TP12-10'	MD			10
			Hole terminated at 10.5 feet.						

GEO FORM 304 8ME_ARATINA_LOGS.GPJ SECOR INTL.GDT 3/27/19

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/22/19** COMPLETED: **2/22/19**
INSTALLATION: STARTED **2/22/19** COMPLETED: **2/22/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-13 PAGE 1 OF 1

Stantec

NORTHING (ft): EASTING (ft):
LATITUDE: **35° 59' 1.11"** LONGITUDE: **117° 37' 58.01"**
GROUND ELEV (ft): **2552** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY OLDER ALLUVIAL (Qoa) DEPOSITS						
		SM	**SILTY SAND** ; SM; 10YR 4/3 brown; 85% fine to coarse grained sand; 15% fines; loose; dry						
5		SW	**WELL GRADED SAND** ; SW; 10YR 6/6 brownish yellow; 9% fine gravel; 87% fine to coarse grained sand; 4% fines; loose; dry		TP13-5'	SA, MD			5
10					TP13-10'	MD			10
			Hole terminated at 10.5 feet.						

GEO FORM 304 8ME_ARATINA_LOGS.GPJ SECOR INTL.GDT 3/27/19

PROJECT: **Aratina Solar Project**
LOCATION: **Boron, California**
PROJECT NUMBER: **185804366**
DRILLING: STARTED **2/22/19** COMPLETED: **2/22/19**
INSTALLATION: STARTED **2/22/19** COMPLETED: **2/22/19**
DRILLING COMPANY: **4 Granite Inc.**
DRILLING EQUIPMENT: **Backhoe**
DRILLING METHOD:
SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

TP-14 PAGE 1 OF 1

NORTHING (ft): EASTING (ft):
LATITUDE: **35° 59' 27.83"** LONGITUDE: **117° 38' 36.57"**
GROUND ELEV (ft): **2506** TOC ELEV (ft):
INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **10.0**
STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in):
LOGGED BY: **N. Drachenberg** CHECKED BY: **J Fischer**

Time & Depth (feet)	Graphic Log	USCS	Description	Sample	Time Sample ID	Geotechnical Lab Testing	Blow Count	PID Reading (ppmv)	Depth (feet)
			QUATERNARY OLDER ALLUVIAL (Qoa) DEPOSITS						
		SW	**WELL GRADED SAND** ; SW; 10YR 4/3 brown; 95% fine to coarse grained sand; 5% fines; loose; dry						
5		SM	**SILTY SAND** ; SM; 10YR 7/6 yellow; 2% fine gravel; 84% fine to coarse grained sand; 14% fines; loose; dry		TP14-5'	SA, MD			5
10			80% fine to coarse grained sand; 20% fines below 10 feet		TP14-10'	MD			10
			Hole terminated at 10.5 feet.						

ATTACHMENT B
LABORATORY TEST RESULTS

Stantec

SUMMARY OF MOISTURE DENSITY TEST RESULTS
ASTM D 2216

Boring Location	Sample Depth (ft)	Wet Density (lb/ft^3)	Dry Density (lb/ft^3)	Moisture Content (percent)
TP1-5'	5	96.2	92.6	3.9
TP1-10'	10	77.3	71.8	7.7
TP2-10'	10	80.9	75.4	7.3
TP3-5'	5	104.6	103.2	1.4
TP3-10'	10	89.7	87.7	2.3
TP4-10'	10	101.5	97.5	4.2
TP5-5'	5	92.9	90.3	2.9
TP5-10'	10	97.6	92.7	5.3
TP6-5'	5	85.5	78.0	9.6
TP6-10'	10	92.5	89.3	3.7
TP8-5'	5	105.0	103.6	1.3
TP9-5'	5	96.6	92.4	4.5
TP9-10'	10	111.5	98.1	13.6
TP10-5'	5	88.3	82.0	7.7
TP10-10'	10	107.6	103.6	3.8
TP11-5'	5	119.6	113.3	5.6
TP12-5'	5	122.3	115.2	6.2
TP12-10'	10	89.7	83.4	7.4
TP13-5'	5	108.0	103.1	4.8
TP13-10'	10	104.2	97.4	6.9
TP14-5'	5	97.2	92.2	5.4
TP14-10'	10	100.6	96.7	4.0

Stantec

Gradation Analysis
ASTM D 422

Project Name	Aratina Solar Farm	Project Number	185804366
Source	Grab	Lab ID	TP1-5'
		Date Received	03-01-2019
Preparation Method	ASTM D 1140 Method A	Preparation Date	03-07-2019
Particle Shape		Test Date	03-09-2019
Particle Hardness			
Sample Dry Mass (g)	333.60	Analysis based on total sample.	
Moisture Content (%)	3.9		

Sieve Size	Grams Retained	% Retained	% Passing
1/2"	16.80	5.0	95.0
3/8"	6.00	1.8	93.2
No. 4	10.70	3.2	90.0
No. 8	17.10	5.1	84.8
No. 16	46.10	13.8	71.0
No. 30	47.00	14.1	56.9
No. 50	63.10	18.9	38.0
No. 100	69.90	21.0	17.1
No. 200	30.00	9.0	8.1
Pan	26.90	8.1	---

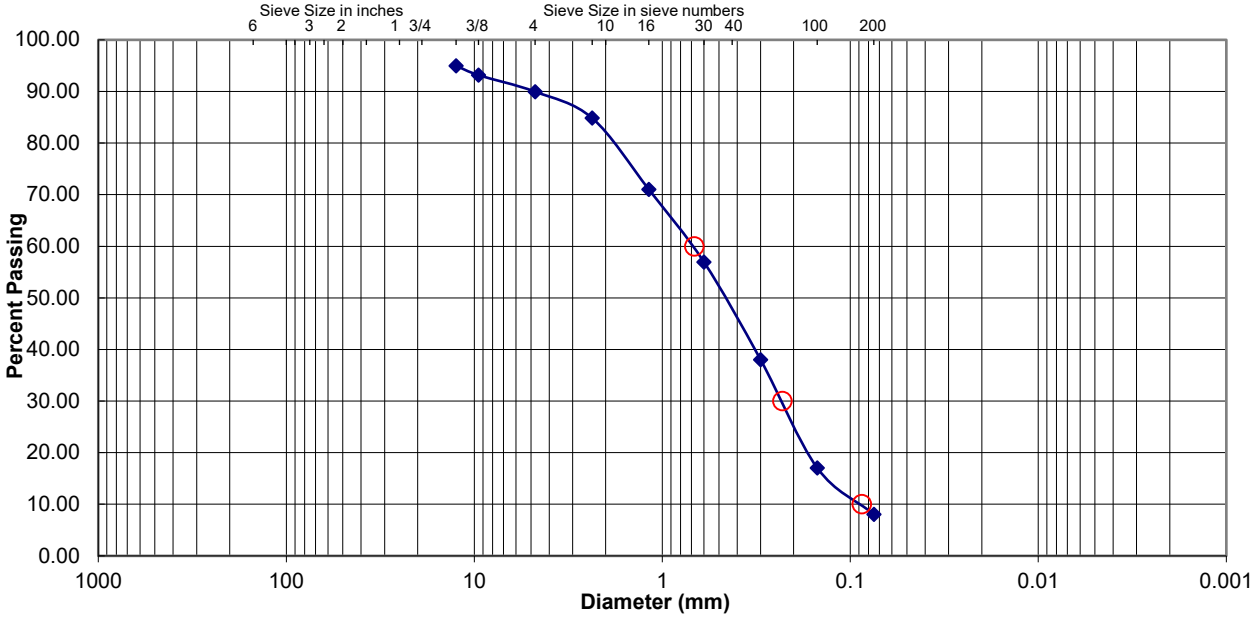
% Gravel	10.0
% Sand	81.9
% Fines	8.1
Fines Classification	ML
D_{10} (mm)	0.0871
D_{30} (mm)	0.2302
D_{60} (mm)	0.6755
Cu	7.76
Cc	0.90

Classification

Well Graded Sand (SW-SM) with Silt

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By JF

Stantec

Gradation Analysis
ASTM D 422

Project Name: Aratina Solar Farm
Source: Grab

Project Number: 185804366
Lab ID: TP2-5'
Date Received: 03-01-2019
Preparation Date: 03-04-2019
Test Date: 03-05-2019

Preparation Method: ASTM D 1140 Method A
Particle Shape:
Particle Hardness:
Sample Dry Mass (g): 314.30
Moisture Content (%): 6.3

Analysis based on total sample.

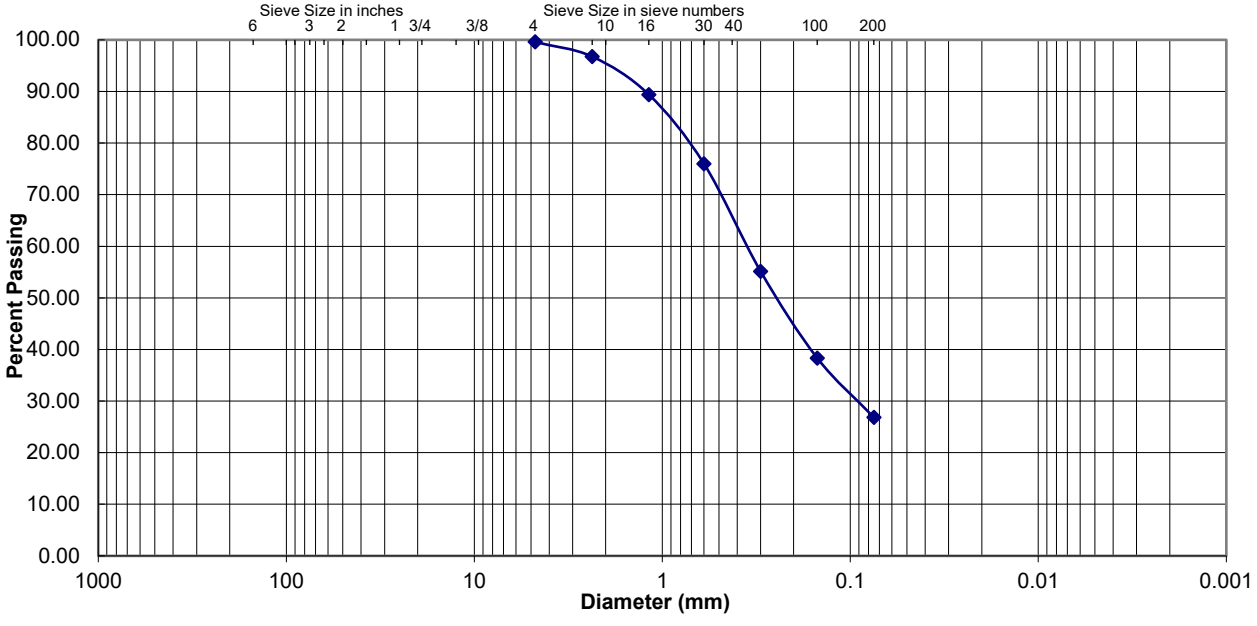
Sieve Size	Grams Retained	% Retained	% Passing
No. 4	1.30	0.4	99.6
No. 8	8.90	2.8	96.8
No. 16	23.10	7.3	89.4
No. 30	42.20	13.4	76.0
No. 50	65.50	20.8	55.1
No. 100	52.80	16.8	38.3
No. 200	36.10	11.5	26.9
Pan	84.40	26.9	---

% Gravel	0.4
% Sand	72.7
% Fines	26.9
Fines Classification	ML
D_{10} (mm)	N/A
D_{30} (mm)	N/A
D_{60} (mm)	N/A
Cu	N/A
Cc	N/A

Classification
Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By: JF

Stantec

Gradation Analysis
ASTM D 422

Project Name	Aratina Solar Farm	Project Number	185804366
Source	Grab	Lab ID	TP3-5'
		Date Received	03-01-2019
Preparation Method	ASTM D 1140 Method A	Preparation Date	03-07-2019
Particle Shape		Test Date	03-09-2019
Particle Hardness			
Sample Dry Mass (g)	331.70	Analysis based on total sample.	
Moisture Content (%)	1.4		

Sieve Size	Grams Retained	% Retained	% Passing
No. 4	4.40	1.3	98.7
No. 8	28.60	8.6	90.1
No. 16	53.70	16.2	73.9
No. 30	64.80	19.5	54.3
No. 50	79.20	23.9	30.4
No. 100	53.50	16.1	14.3
No. 200	27.70	8.4	6.0
Pan	19.80	6.0	---

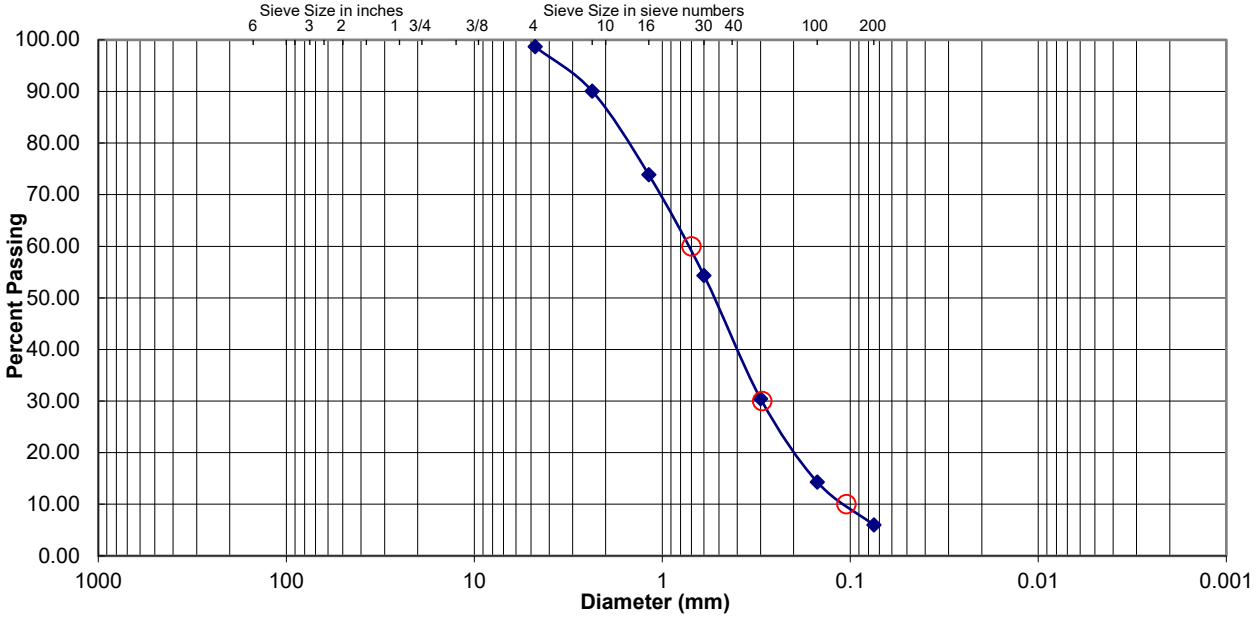
% Gravel	1.3
% Sand	92.7
% Fines	6.0
Fines Classification	ML
D_{10} (mm)	0.1048
D_{30} (mm)	0.2943
D_{60} (mm)	0.7002
Cu	6.68
Cc	1.18

Classification

Well Graded Sand (SW-SM) with Silt

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By JF

Stantec

Gradation Analysis
ASTM D 422

Project Name	Aratina Solar Farm	Project Number	185804366
Source	Grab	Lab ID	TP4-5'
		Date Received	03-01-2019
Preparation Method	ASTM D 1140 Method A	Preparation Date	03-04-2019
Particle Shape		Test Date	03-05-2019
Particle Hardness			
Sample Dry Mass (g)	271.10	Analysis based on total sample.	
Moisture Content (%)	8.3		

Sieve Size	Grams Retained	% Retained	% Passing
No. 4	3.50	1.3	98.7
No. 8	3.90	1.4	97.3
No. 16	18.70	6.9	90.4
No. 30	32.90	12.1	78.2
No. 50	62.90	23.2	55.0
No. 100	59.40	21.9	33.1
No. 200	32.40	12.0	21.2
Pan	57.40	21.2	---

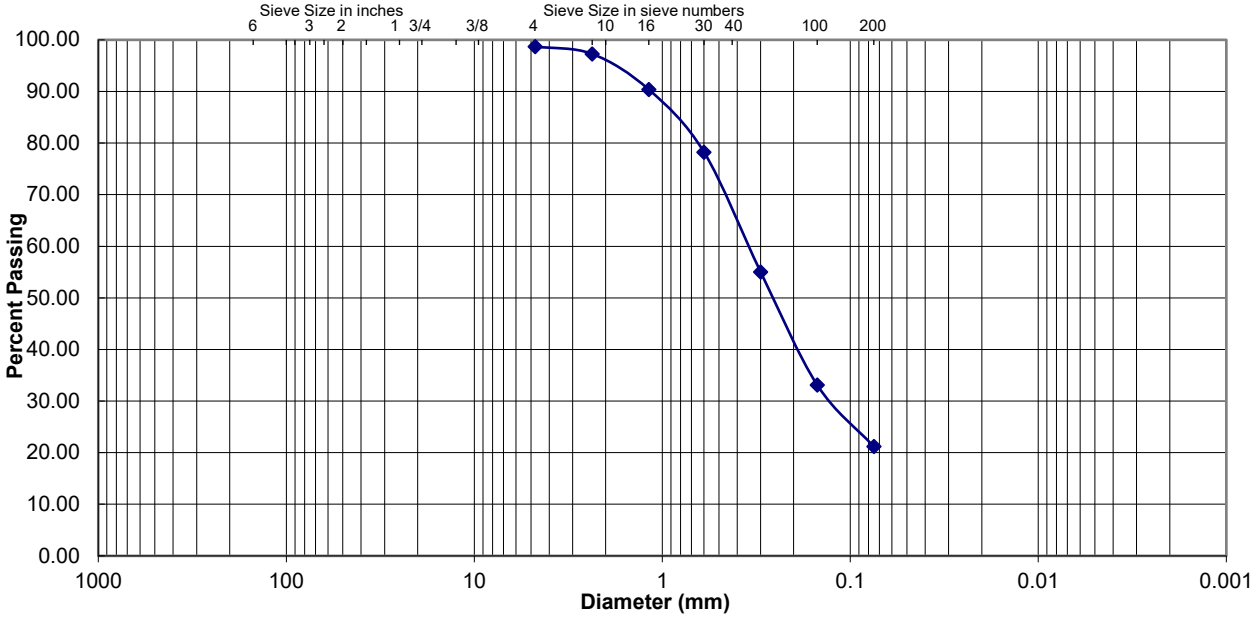
% Gravel	1.3
% Sand	77.5
% Fines	21.2
Fines Classification	ML
D_{10} (mm)	N/A
D_{30} (mm)	N/A
D_{60} (mm)	N/A
Cu	N/A
Cc	N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By JF

Stantec

Gradation Analysis
ASTM D 422

Project Name	Aratina Solar Farm	Project Number	185804366
Source	Grab	Lab ID	TP5-5'
		Date Received	03-01-2019
Preparation Method	ASTM D 1140 Method A	Preparation Date	03-07-2019
Particle Shape		Test Date	03-09-2019
Particle Hardness			
Sample Dry Mass (g)	215.60		
Moisture Content (%)	2.9		

Analysis based on total sample.

Sieve Size	Grams Retained	% Retained	% Passing
No. 4	0.08	0.0	100.0
No. 8	41.50	19.2	80.7
No. 16	68.40	31.7	49.0
No. 30	47.40	22.0	27.0
No. 50	30.60	14.2	12.8
No. 100	10.90	5.1	7.8
No. 200	3.60	1.7	6.1
Pan	13.12	6.1	---

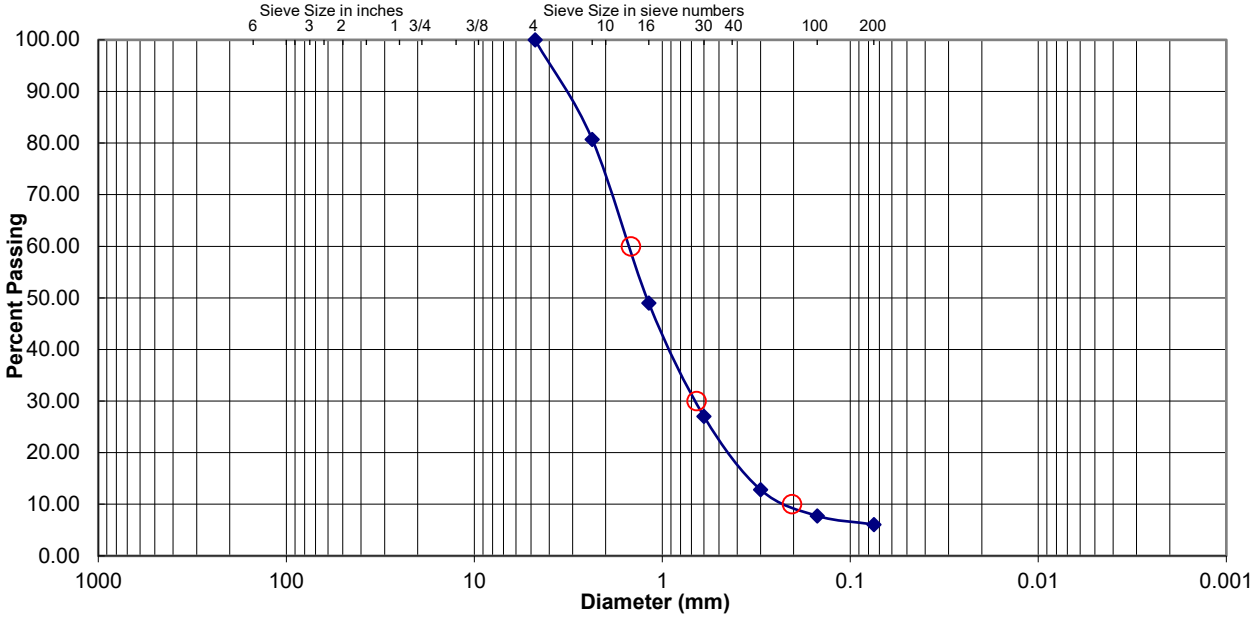
% Gravel	0.0
% Sand	93.9
% Fines	6.1
Fines Classification	ML
D_{10} (mm)	0.2041
D_{30} (mm)	0.6579
D_{60} (mm)	1.4709
Cu	7.21
Cc	1.44

Classification

Well Graded Sand (SW-SM) with Silt

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By JF

Stantec

Gradation Analysis
ASTM D 422

Project Name: Aratina Solar Farm
Source: Grab

Project Number: 185804366
Lab ID: TP6-5'
Date Received: 03-01-2019
Preparation Date: 03-07-2019
Test Date: 03-09-2019

Preparation Method: ASTM D 1140 Method A
Particle Shape:
Particle Hardness:
Sample Dry Mass (g): 182.50
Moisture Content (%): 9.6

Analysis based on total sample.

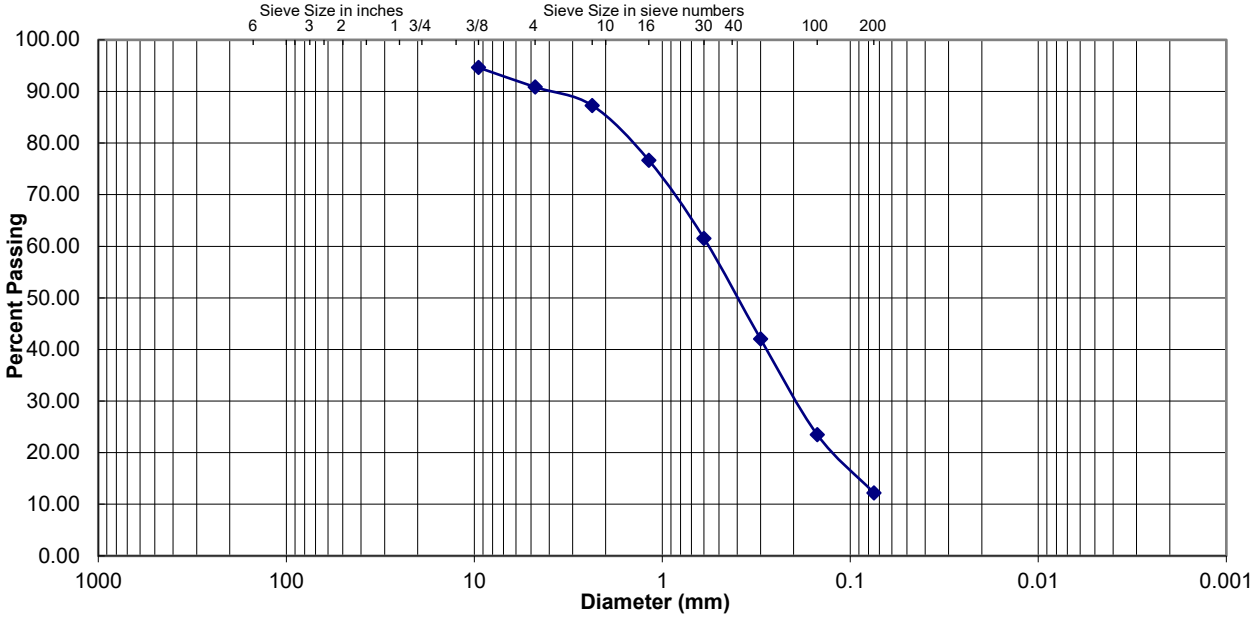
Sieve Size	Grams Retained	% Retained	% Passing
3/8"	9.80	5.4	94.6
No. 4	6.90	3.8	90.8
No. 8	6.50	3.6	87.3
No. 16	19.40	10.6	76.7
No. 30	27.60	15.1	61.5
No. 50	35.60	19.5	42.0
No. 100	33.80	18.5	23.5
No. 200	20.60	11.3	12.2
Pan	22.30	12.2	---

% Gravel	9.2
% Sand	78.6
% Fines	12.2
Fines Classification	ML
D_{10} (mm)	N/A
D_{30} (mm)	N/A
D_{60} (mm)	N/A
Cu	N/A
Cc	N/A

Classification
Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By: JF

Stantec

Gradation Analysis
ASTM D 422

Project Name: Aratina Solar Farm
Source: Grab

Preparation Method: ASTM D 1140 Method A
Particle Shape:
Particle Hardness:
Sample Dry Mass (g): 290.60
Moisture Content (%): 2.0

Project Number: 185804366
Lab ID: TP7-5'
Date Received: 03-01-2019
Preparation Date: 03-04-2019
Test Date: 03-05-2019

Analysis based on total sample.

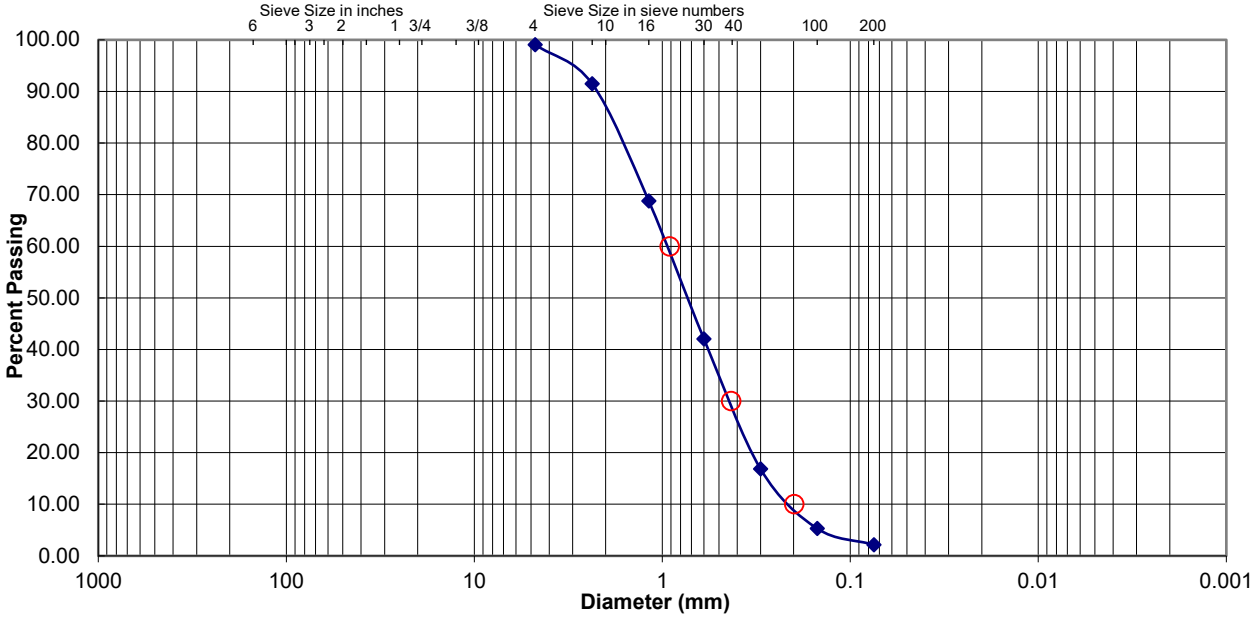
Sieve Size	Grams Retained	% Retained	% Passing
No. 4	2.70	0.9	99.1
No. 8	22.10	7.6	91.5
No. 16	66.00	22.7	68.8
No. 30	77.70	26.7	42.0
No. 50	73.20	25.2	16.8
No. 100	33.50	11.5	5.3
No. 200	9.10	3.1	2.2
Pan	6.30	2.2	---

% Gravel	0.9
% Sand	96.9
% Fines	2.2
Fines Classification	ML
D_{10} (mm)	0.1990
D_{30} (mm)	0.4311
D_{60} (mm)	0.9156
Cu	4.60
Cc	1.02

Classification
Poorly Graded Sand (SP)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By JF

Stantec

Gradation Analysis
ASTM D 422

Project Name	Aratina Solar Farm	Project Number	185804366
Source	Grab	Lab ID	TP7-10'
		Date Received	03-01-2019
Preparation Method	ASTM D 1140 Method A	Preparation Date	03-04-2019
Particle Shape		Test Date	03-05-2019
Particle Hardness			
Sample Dry Mass (g)	382.30	Analysis based on total sample.	
Moisture Content (%)	2.4		

Sieve Size	Grams Retained	% Retained	% Passing
1/2"	14.30	3.7	96.3
3/8"	5.10	1.3	94.9
No. 4	11.20	2.9	92.0
No. 8	59.50	15.6	76.4
No. 16	117.20	30.7	45.8
No. 30	91.60	24.0	21.8
No. 50	54.60	14.3	7.5
No. 100	14.70	3.8	3.7
No. 200	3.60	0.9	2.7
Pan	10.50	2.7	---

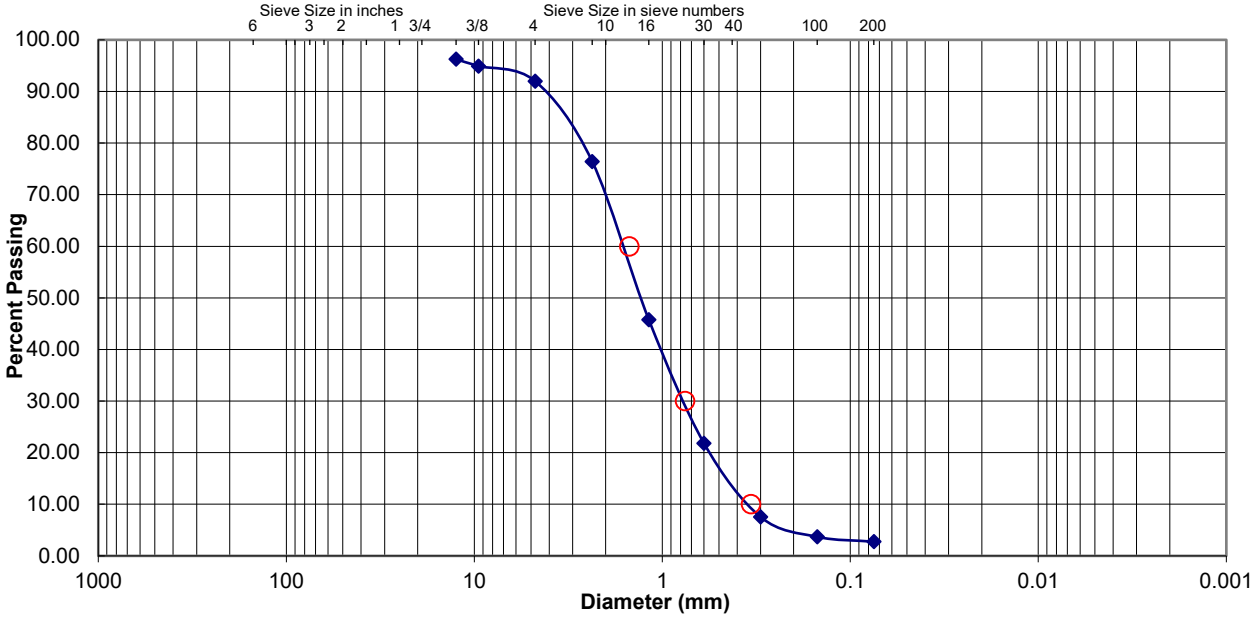
% Gravel	8.0
% Sand	89.2
% Fines	2.7
Fines Classification	ML
D_{10} (mm)	0.3382
D_{30} (mm)	0.7559
D_{60} (mm)	1.4976
Cu	4.43
Cc	1.13

Classification

Poorly Graded Sand (SP)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By JF

Stantec

Gradation Analysis
ASTM D 422

Project Name	Aratina Solar Farm	Project Number	185804366
Source	Grab	Lab ID	TP8-10'
		Date Received	03-01-2019
Preparation Method	ASTM D 1140 Method A	Preparation Date	03-04-2019
Particle Shape		Test Date	03-05-2019
Particle Hardness			
Sample Dry Mass (g)	375.40	Analysis based on total sample.	
Moisture Content (%)	5.2		

Sieve Size	Grams Retained	% Retained	% Passing
3/8"	6.50	1.7	98.3
No. 4	27.60	7.4	90.9
No. 8	42.20	11.2	79.7
No. 16	48.80	13.0	66.7
No. 30	77.20	20.6	46.1
No. 50	109.10	29.1	17.0
No. 100	15.40	4.1	12.9
No. 200	3.50	0.9	12.0
Pan	45.10	12.0	---

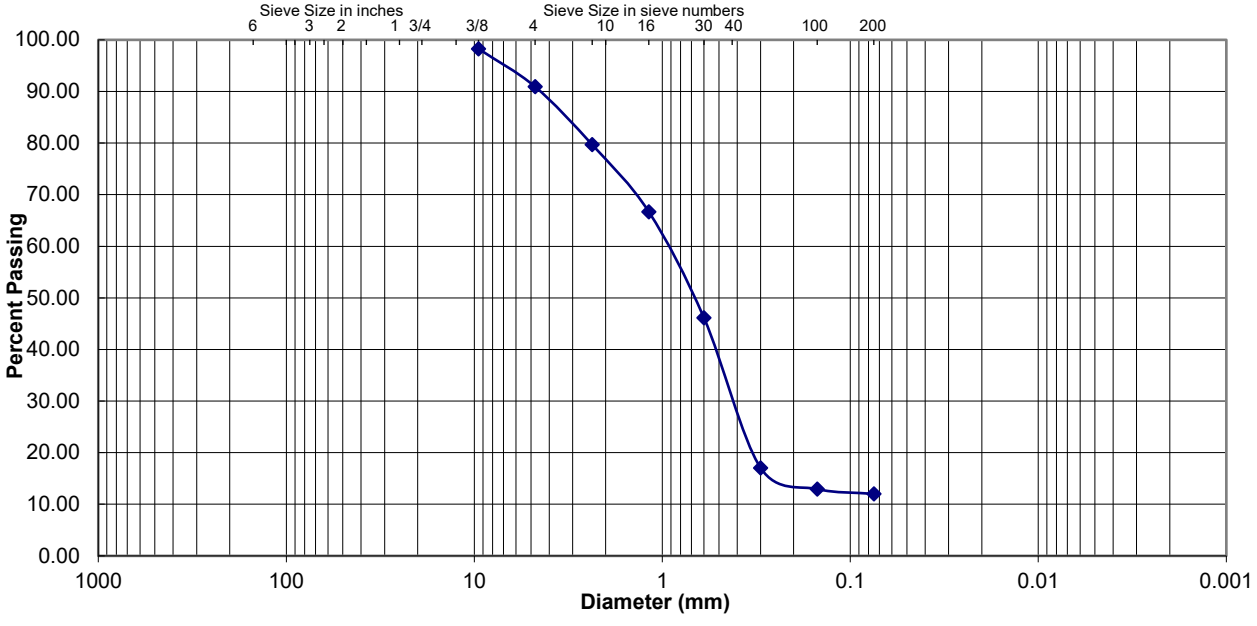
% Gravel	9.1
% Sand	78.9
% Fines	12.0
Fines Classification	ML
D_{10} (mm)	N/A
D_{30} (mm)	N/A
D_{60} (mm)	N/A
Cu	N/A
Cc	N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By JF

Stantec

Gradation Analysis
ASTM D 422

Project Name	Aratina Solar Farm	Project Number	185804366
Source	Grab	Lab ID	TP9-5'
		Date Received	03-01-2019
Preparation Method	ASTM D 1140 Method A	Preparation Date	03-07-2019
Particle Shape		Test Date	03-09-2019
Particle Hardness			
Sample Dry Mass (g)	293.80	Analysis based on total sample.	
Moisture Content (%)	4.5		

Sieve Size	Grams Retained	% Retained	% Passing
No. 8	3.60	1.2	98.8
No. 16	7.50	2.6	96.2
No. 30	39.50	13.4	82.8
No. 50	90.20	30.7	52.1
No. 100	71.80	24.4	27.6
No. 200	36.30	12.4	15.3
Pan	44.90	15.3	---

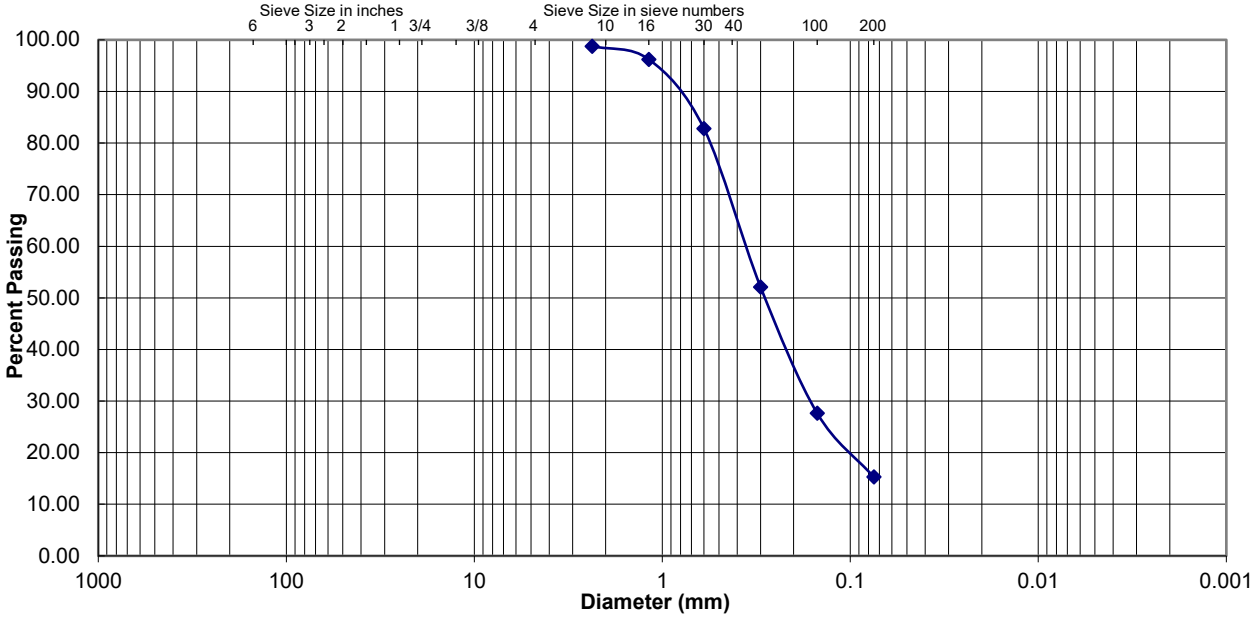
% Gravel	0.0
% Sand	84.7
% Fines	15.3
Fines Classification	ML
D_{10} (mm)	N/A
D_{30} (mm)	N/A
D_{60} (mm)	N/A
Cu	N/A
Cc	N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By JF

Stantec

Gradation Analysis
ASTM D 422

Project Name	Aratina Solar Farm	Project Number	185804366
Source	Grab	Lab ID	TP10-5'
		Date Received	03-01-2019
Preparation Method	ASTM D 1140 Method A	Preparation Date	03-06-2019
Particle Shape		Test Date	03-08-2019
Particle Hardness			
Sample Dry Mass (g)	194.10	Analysis based on total sample.	
Moisture Content (%)	7.7		

Sieve Size	Grams Retained	% Retained	% Passing
3/8"	5.90	3.0	97.0
No. 4	10.90	5.6	91.3
No. 8	20.10	10.4	81.0
No. 16	29.30	15.1	65.9
No. 30	26.10	13.4	52.4
No. 50	23.20	12.0	40.5
No. 100	21.90	11.3	29.2
No. 200	15.00	7.7	21.5
Pan	41.70	21.5	---

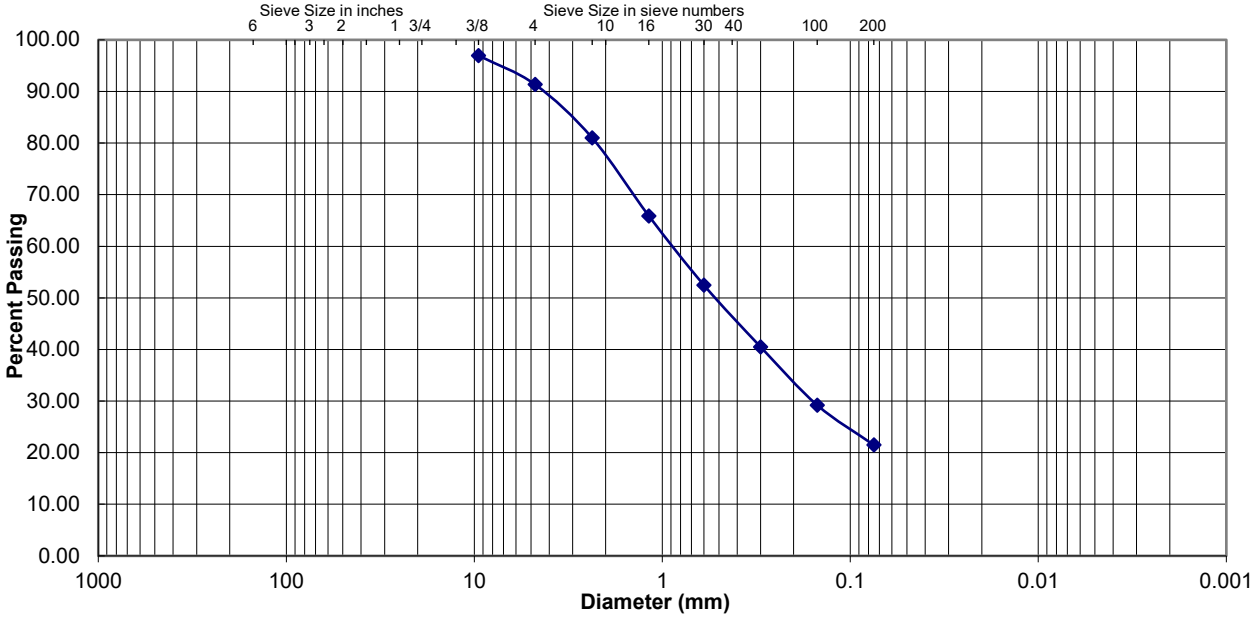
% Gravel	8.7
% Sand	69.9
% Fines	21.5
Fines Classification	ML
D_{10} (mm)	N/A
D_{30} (mm)	N/A
D_{60} (mm)	N/A
Cu	N/A
Cc	N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By JF

Stantec

Gradation Analysis
ASTM D 422

Project Name: Aratina Solar Farm
Source: Grab

Preparation Method: ASTM D 1140 Method A
Particle Shape:
Particle Hardness:
Sample Dry Mass (g): 208.30
Moisture Content (%): 5.6

Project Number: 185804366
Lab ID: TP11-5'
Date Received: 03-01-2019
Preparation Date: 03-06-2019
Test Date: 03-08-2019

Analysis based on total sample.

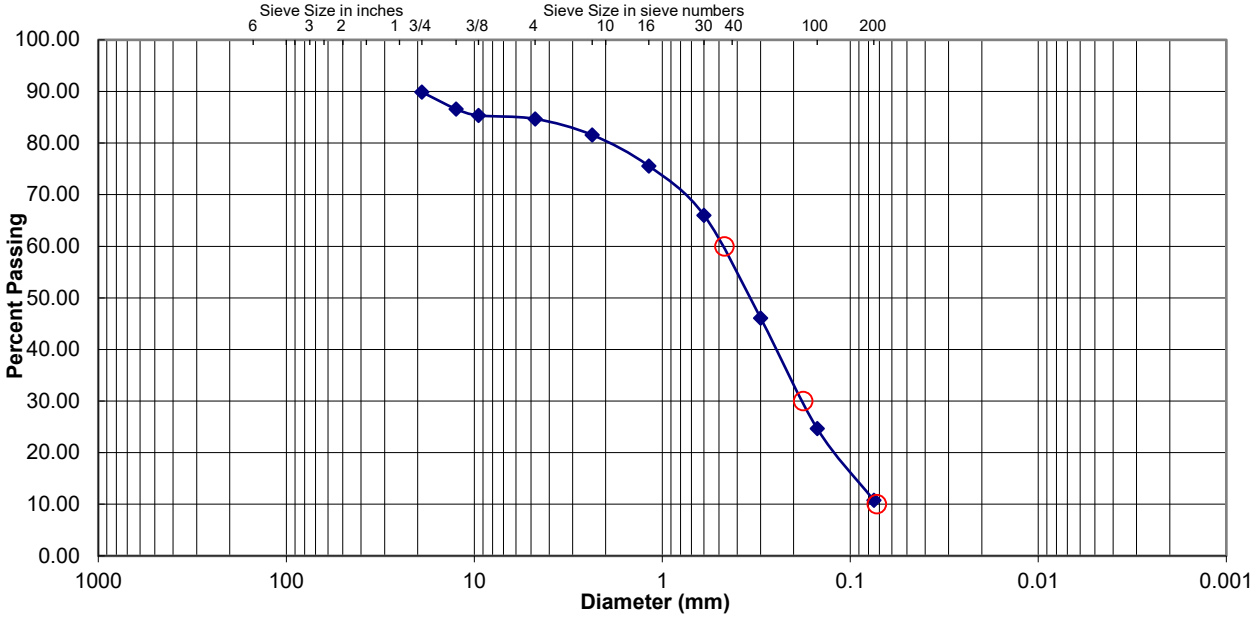
Sieve Size	Grams Retained	% Retained	% Passing
3/4"	21.10	10.1	89.9
1/2"	6.80	3.3	86.6
3/8"	2.60	1.2	85.4
No. 4	1.40	0.7	84.7
No. 8	6.50	3.1	81.6
No. 16	12.50	6.0	75.6
No. 30	19.90	9.6	66.0
No. 50	41.50	19.9	46.1
No. 100	44.60	21.4	24.7
No. 200	29.00	13.9	10.8
Pan	22.40	10.8	---

% Gravel	15.3
% Sand	73.9
% Fines	10.8
Fines Classification	ML
D_{10} (mm)	0.0722
D_{30} (mm)	0.1782
D_{60} (mm)	0.4668
Cu	6.46
Cc	0.94

Classification
Poorly Graded Sand (SP-SM) with Silt and Gravel

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By JF

Stantec

Gradation Analysis
ASTM D 422

Project Name: Aratina Solar Farm
Source: Grab

Project Number: 185804366
Lab ID: TP12-5'
Date Received: 03-01-2019
Preparation Date: 03-06-2019
Test Date: 03-08-2019

Preparation Method: ASTM D 1140 Method A
Particle Shape:
Particle Hardness:
Sample Dry Mass (g): 266.50
Moisture Content (%): 6.2

Analysis based on total sample.

Sieve Size	Grams Retained	% Retained	% Passing
3/8"	14.00	5.3	94.7
No. 4	21.40	8.0	86.7
No. 8	37.80	14.2	72.5
No. 16	42.90	16.1	56.4
No. 30	43.60	16.4	40.1
No. 50	38.30	14.4	25.7
No. 100	28.10	10.5	15.2
No. 200	16.40	6.2	9.0
Pan	24.00	9.0	---

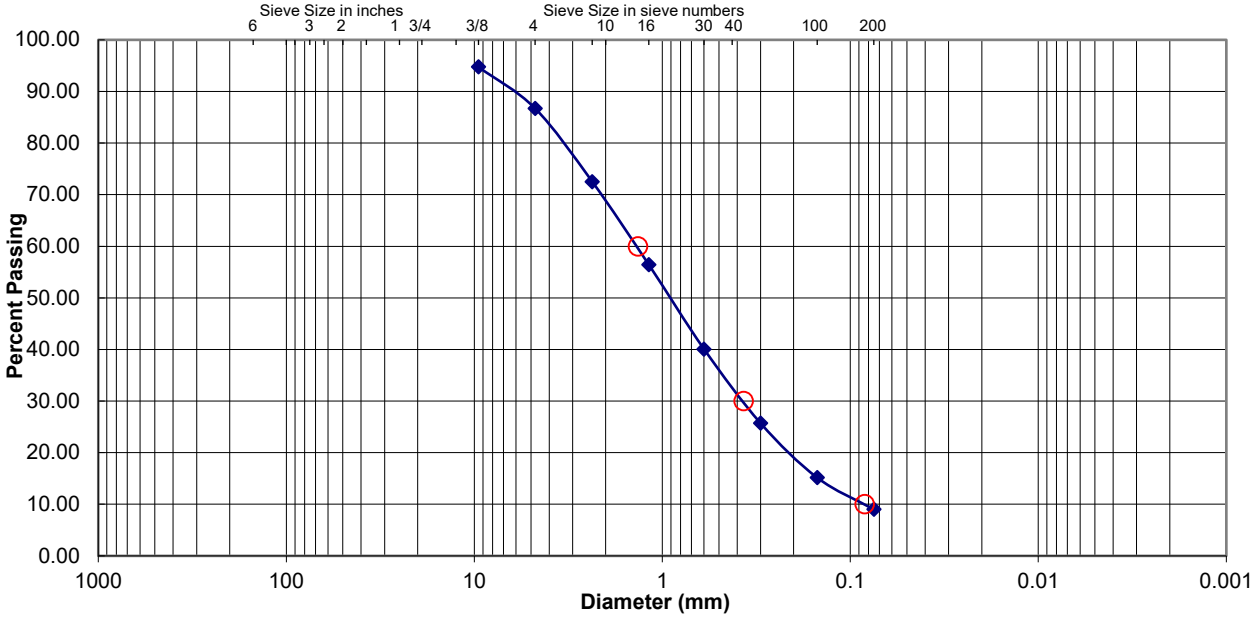
% Gravel	13.3
% Sand	77.7
% Fines	9.0
Fines Classification	ML
D_{10} (mm)	0.0839
D_{30} (mm)	0.3691
D_{60} (mm)	1.3458
Cu	16.04
Cc	1.21

Classification

Well Graded Sand (SW-SM) with Silt

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By: JF

Stantec

Gradation Analysis
ASTM D 422

Project Name: Aratina Solar Farm
Source: Grab

Project Number: 185804366
Lab ID: TP13-5'
Date Received: 03-01-2019
Preparation Date: 03-06-2019
Test Date: 03-08-2019

Preparation Method: ASTM D 1140 Method A
Particle Shape:
Particle Hardness:
Sample Dry Mass (g): 258.80
Moisture Content (%): 4.8

Analysis based on total sample.

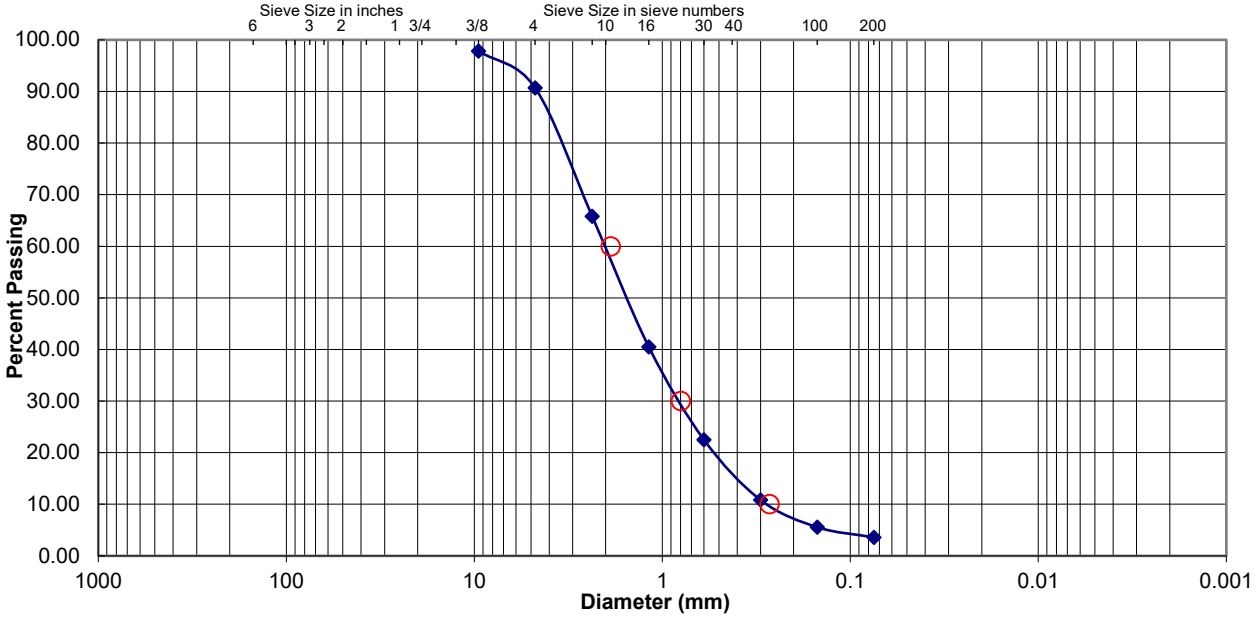
Sieve Size	Grams Retained	% Retained	% Passing
3/8"	5.60	2.2	97.8
No. 4	18.50	7.1	90.7
No. 8	64.40	24.9	65.8
No. 16	65.50	25.3	40.5
No. 30	46.60	18.0	22.5
No. 50	30.20	11.7	10.8
No. 100	13.60	5.3	5.6
No. 200	5.10	2.0	3.6
Pan	9.30	3.6	---

% Gravel	9.3
% Sand	87.1
% Fines	3.6
Fines Classification	ML
D_{10} (mm)	0.2693
D_{30} (mm)	0.7956
D_{60} (mm)	1.8832
Cu	6.99
Cc	1.25

Classification
Well Graded Sand (SW)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By: JF

Stantec

Gradation Analysis
ASTM D 422

Project Name	Aratina Solar Farm	Project Number	185804366
Source	Grab	Lab ID	TP14-5'
		Date Received	03-01-2019
Preparation Method	ASTM D 1140 Method A	Preparation Date	03-06-2019
Particle Shape		Test Date	03-08-2019
Particle Hardness	Hard and Durable		
Sample Dry Mass (g)	221.30	Analysis based on total sample.	
Moisture Content (%)	5.4		

Sieve Size	Grams Retained	% Retained	% Passing
No. 4	3.50	1.6	98.4
No. 8	22.10	10.0	88.4
No. 16	47.70	21.6	66.9
No. 30	40.40	18.3	48.6
No. 50	34.00	15.4	33.3
No. 100	27.10	12.2	21.0
No. 200	14.90	6.7	14.3
Pan	31.60	14.3	---

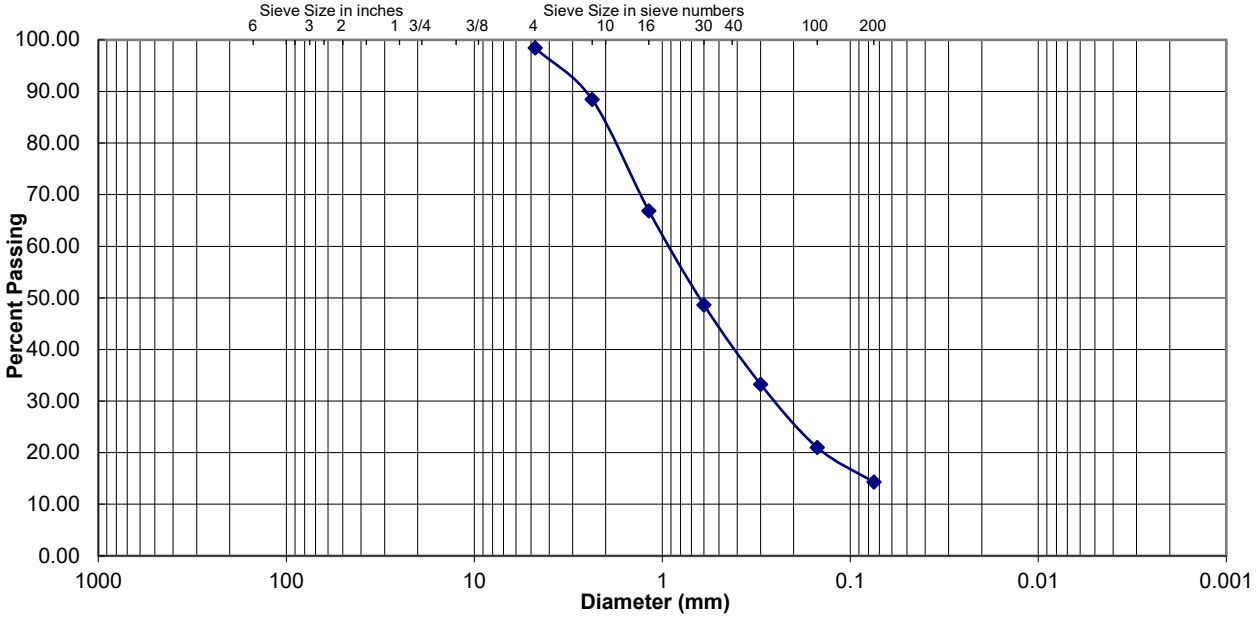
% Gravel	1.6
% Sand	84.1
% Fines	14.3
Fines Classification	ML
D_{10} (mm)	N/A
D_{30} (mm)	N/A
D_{60} (mm)	N/A
Cu	N/A
Cc	N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution



Comments

Reviewed By JF

ATTACHMENT C
PERCOLATION TEST RESULTS

PERCOLATION TEST DATA SHEET

Project:	8me Aratina	Project No.	185804366	Date:	2/28/2019
Test Hole No.	TP-08	Tested By:	ND		
Depth of Test Hole, D_T:	12	USCS Soil Classification	SM		
Test Hole Dimensions (inches)		Length	Width		
Diameter (if round)		Sides (if rectangular)	12	12	

Sandy Soil Test Criteria*

Trial No.	Start Time	Stop Time	Time Interval, (min)	Initial Depth of Water (in)	Final Depth of Water (in)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1	10:00	10:30	30	12.0	0.0	12.0	y
2	10:30	11:00	30	12.0	0.0	12.0	y

*If two consecutive measurements show that twelve inches of water seeps away in less than 30 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) for a minimum of four hours before running test. Obtain at least eight measurements per hole over at least four hours (approximately 30 minute intervals) with a precision of at least 1/8" until the last 3 consecutive readings are within 10% of each other.

Trial No.	Start Time	Stop Time	Δt, Time Interval, (min)	D_o, Initial Depth of Water (in)	D_f, Final Depth of Water (in)	ΔD, Change in Water Level (in.)	Percolation Rate (in/hr)
1	11:10	11:20	10	12.0	7.1	4.9	29.4
2	11:20	11:30	10	12.0	7.7	4.3	25.8
3	11:30	11:40	10	12.0	7.4	4.6	27.6
4	11:40	11:50	10	12.0	7.9	4.1	24.6
5	11:50	12:00	10	12.0	7.6	4.4	26.4
6	12:00	12:10	10	12.0	7.5	4.5	27.0
7							
8							
9							
10							
11							
12							
13							
14							
15							

Comments: Reduction Factor (R_f) = ((2d_1 - Δd) / 13.5) + 1

d_1 = initial water depth (inches)

delta d = water level drop of the stabilized rate (inches)

DIA = diameter of the boring (inches)

Factor of Safety (FS) = 3.0

R_f = ((2*12)-4.5)/13.5)+1

R_f = 2.44

Infiltration rate (Ir) = perc rate / R_f = 27/2.44

Ir = 11.1 inches/hour

Ir_{all} = Ir / FS = 11.1 / 3.0 = 3.7 in/hr

ATTACHMENT D
CEQA GUIDELINES FORM – GEOLOGY AND SOILS

GEOLOGY AND SOILS	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact	Not Applicable
Would the project:					
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:					
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault (refer to CDMG Special Publication 42)?			X		
ii) Strong Seismic ground shaking?		X			
iii) Seismic-related ground failure, including liquefaction?			X		
iv) Landslides?			X		
b) Result in substantial soil erosion or the loss of topsoil?		X			
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?			X		
d) Be located on expansive soil, as identified in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?			X		
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for disposal of waste water?			X		

Appendix H
Paleontological Resources Assessment

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Rincon Consultants, Inc.

Environmental Scientists *Planners* *Engineers*

M E M O R A N D U M

■ **Los Angeles**

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Redlands:	(909) 253 0705	**Ventura:**	(805) 644 4455
Riverside:	(951) 782-0061		

Date:	March 2021
To:	Kern County Planning Department
Project:	Aratina Solar Project
From:	David Daitch, Ph.D., Principal
Subject:	Addendum to Revised November 2020 Paleontological Resources Assessment

64NB 8ME LLC has recently submitted to the Kern County Planning Department a revised project footprint associated with the Conditional Use Permit (CUP) application. This revision to the Aratina Solar Project reduces the project's proposed footprint from approximately 2,700 acres to approximately 2,300 acres. One consequence of the revised footprint is an increased setback from the nearby communities of Boron and Desert Lake. Attached for reference is a figure illustrating the previous and current proposed project footprint.

This Addendum to the Revised November 2020 Paleontological Resources Assessment for the Aratina Solar Project has been prepared to document the above-described change in project footprint and document that the recent change in project footprint does not change the findings of the Revised November 2020 Paleontological Resources Assessment, as described below.

Potential Impacts

The Revised November 2020 Paleontological Resources Assessment found that geologic units within the project area have a high paleontological sensitivity, and that ground disturbance of these units could result in impacts to scientifically important vertebrate fossils.

The 400-acre reduction in footprint associated with the proposed project is associated with Project Sites 1, 2, and 4. The reduced footprint would reduce the total acres of the proposed project that have a paleontological sensitivity of low at ground surface and high below 3 feet. The reduced footprint would not affect areas considered to be of high paleontological sensitivity.

Proposed Mitigation Measures

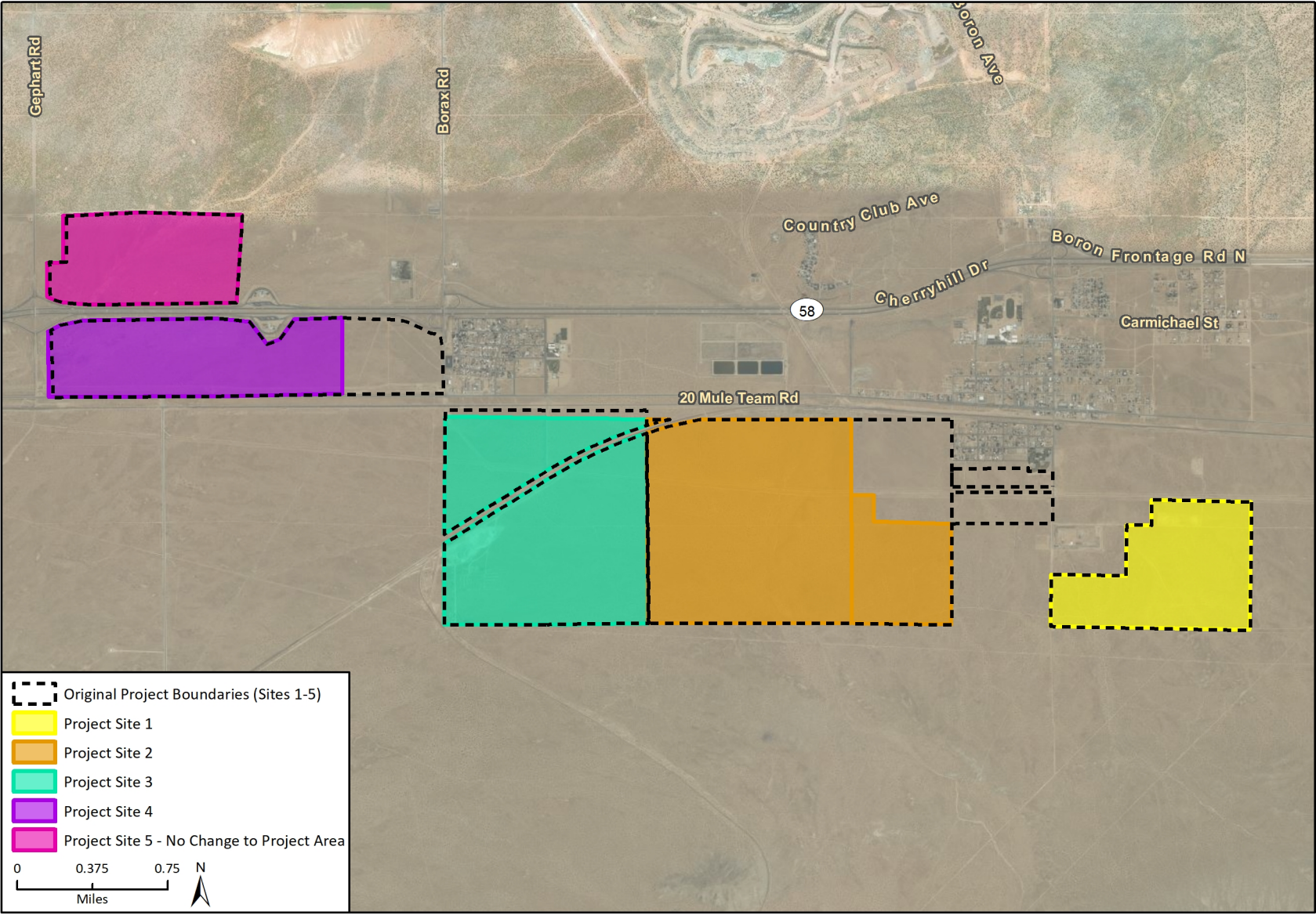
The Revised November 2020 Paleontological Resources Assessment recommended five measures relating to the potential discovery of paleontological resources during project implementation, as identified below:

- Develop a Paleontological Resources Mitigation Plan
- Paleontological Worker Environmental Awareness Program (WEAP)
- Paleontological Monitoring
- Fossil Discovery, Preparation, and Curation
- Final Paleontological Mitigation Report

Implementation of the above recommended mitigation measures would reduce potential project impacts to paleontological resources and would not change as a result of the reduced project footprint.

Conclusion

The revised footprint submitted by 64NB 8ME LLC to the Kern County Planning Department for the Aratina Solar Project would reduce the proposed project footprint by approximately 400 acres, which would shift the project footprint associated with Project Sites 1, 2, 3, and 4 away from the communities of Boron and Desert Lake. The revised footprint does not change the existing conditions, the impacts analysis, or the proposed mitigation in any way. As such, the Revised November 2020 Paleontological Resources Assessment prepared for the Aratina Solar Project represents the worst-case potential impacts related to paleontological resources for the proposed project and no additional analysis is required.



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Aratina Solar Project

Paleontological Resources Assessment

prepared for

64NB 8ME LLC
5455 Wilshire Boulevard, Suite 2010
Los Angeles, California 90036
Contact: Mr. Alexander Sundquist

prepared by

Rincon Consultants, Inc.
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Los Angeles, California 90012

May 2019; Revised November 2020

RINCON CONSULTANTS, INC.
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Please cite this report as follows:

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Executive Summary

Rincon Consultants, Inc. (Rincon) was retained by 64NB 8ME LLC to conduct a paleontological resource assessment for the Aratina Solar Project (project) in the Antelope Valley of Kern County, California. This study has been prepared in conformance with the California Environmental Quality Act (CEQA) and includes a records search, literature review, and paleontological sensitivity assessment consistent with the professional standards of the Society of Vertebrate Paleontology (SVP 2010). The purpose of the literature review and records search was to identify the geologic unit(s) underlying the project and to determine whether previously recorded paleontological localities occur either within the project boundaries or elsewhere in the same geologic unit. Using the results of the literature review and records search, the paleontological resource potential of the project area was determined in accordance with the 2010 SVP guidelines.

Results of Investigation

Published geologic mapping indicates that the project is underlain by Quaternary alluvial gravel and sand, Quaternary windblown sand, and Quaternary older alluvium. A records search for paleontological locality data within the project area and the vicinity was obtained from the Natural History Museum of Los Angeles County and online records were reviewed at the University of California's Museum of Paleontology. According to the record searches, no vertebrate fossil localities have been previously recorded directly in the project boundary; however, multiple vertebrate fossil localities have been previously recorded nearby within deposits of older Quaternary alluvium. These localities yielded scientifically significant fossilized specimens of large terrestrial mammals, rodents, and reptiles. Based on this assessment, the project area is determined to have a high potential for paleontological resources and the likelihood of impacting scientifically significant vertebrate fossils as a result of project construction is high.

Recommendations

Rincon recommends that a qualified paleontologist be retained to develop and implement a Paleontological Resources Mitigation Plan during project construction in areas of high paleontological sensitivity. This plan would include mitigation measures that have been proven to be effective in reducing or eliminating adverse impacts to paleontological resources and would satisfy the requirements of CEQA. The recommended mitigation measures include paleontological monitoring by a qualified paleontologist and preparation of a paleontological monitoring report, which should be submitted to the approved curation facility, accompanied by all significant fossils recovered during construction monitoring.

1 Introduction

Paleontological resources (i.e., fossils) are the remains or traces of prehistoric life. Fossils are typically preserved in layered sedimentary rocks and the distribution of fossils across the landscape is controlled by the distribution and exposure of the fossiliferous sedimentary rock units at and near the surface. Construction related impacts that typically affect or have the potential to affect paleontological resources include mass excavation operations, drilling/borehole excavations, trenching/tunneling, and grading.

This Paleontological Resources Assessment provides a description of the geologic units mapped at the surface within the project area, including types of fossils known to occur within the units (if any), the paleontological sensitivity for each unit, a review of relevant agency regulation, an assessment of potential impacts from project development, and recommended mitigation measures for the protection and recovery of significant fossils that may be impacted. This study has also been conducted in accordance with the requirements of the California Environmental Quality Act (CEQA). The County of Kern (County) is the CEQA Lead Agency for the project.

1.1 Project Location and Description

The Aratina Solar Project ("Aratina" or the "project") is located in the unincorporated area of Kern County, straddling State Route 58, between Gephart Road on the west and the San Bernardino County line on the east. The total project site consist of approximately 2,672.53 acres of PV development areas and several miles of gen-tie alternatives located in the vicinity of the unincorporated communities of Desert Lake and Boron. 64NB 8me LLC (the Applicant) is seeking approval of five separate project sites for the construction of an up to 600 megawatt-alternating current (MW-AC) utility-scale solar farm with energy storage known as Aratina Solar Farm. The Kramer Junction gen-tie alternative was evaluated under a separate NEPA document , as that alternative is located entirely on federal land. The Applicant proposes to construct, own, and operate Aratina. The five project sites are summarized in Table 1. Figure 1 and Figure 2 depict the project location and vicinity.

Table 1 Project Site Summary

Project Site	Gross Acreage
Project Site 1	372.43
Project Site 2	957.29
Project Site 3	646.12
Project Site 4	444.38
Project Site 5	252.31
Total	**2,672.53**

The Applicant proposes to develop a photovoltaic (PV) energy facility with energy storage system (up to 600 MW-AC each of solar PV and energy storage) in the project site. Power generated by Aratina will be delivered from the project site via up to 230 kilovolt overhead and/or underground electrical transmission line(s), originating from one or more on-site substation(s)/switchyard(s), and

terminating at the Southern California Edison (SCE) Holgate substation. Alternatively, Aratina may interconnect at the SCE Kramer substation in San Bernardino County.

Each project site may include operations and maintenance (O&M) buildings, substations, energy storage systems (ESSs), and/or transmission facilities, as necessary, or each project site may share such facilities with each other or with any future energy projects in the area, and/or it may be remotely operated. Any "unused" O&M building, substation, and/or transmission facility areas on-site may be covered by solar panels under such scenarios. Construction of the facility will include site preparation, grading and earthwork, concrete foundations, structural steel work, electrical/instrumentation work, collector line installation, architecture and landscaping. Ground disturbing activities are expected to be limited to the construction of the access roads, any O&M building, any substation, any ESSs, and any storm water protection or storage (detention) facilities.

Figure 1 Project Vicinity Map

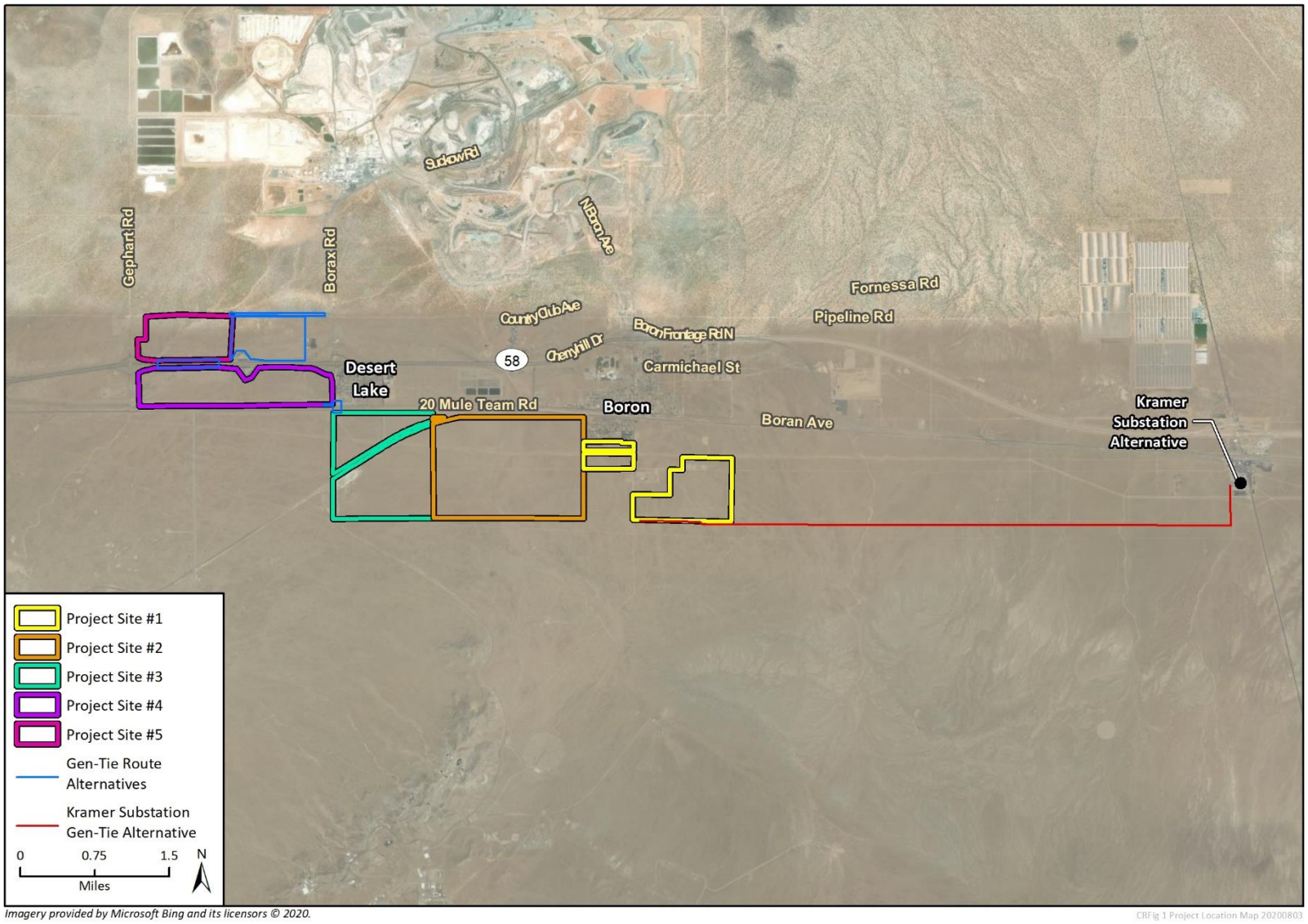
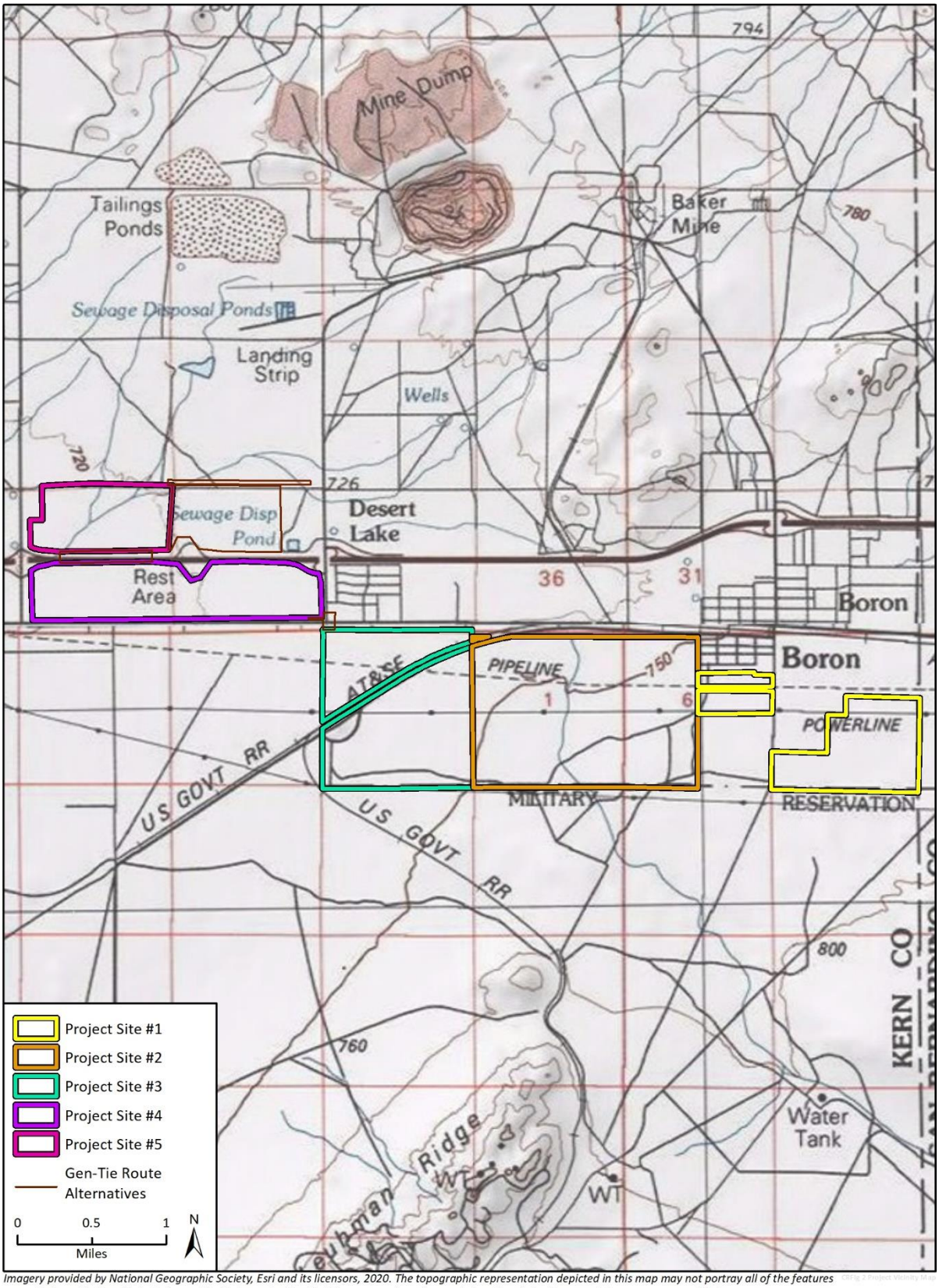


Figure 2 Project Location Map



Imagery provided by National Geographic Society, Esri and its licensors, 2020. The topographic representation depicted in this map may not portray all of the features currently found in the vicinity today and/or features depicted in this map may havechanged since the original topographic map was assembled.

2 Regulatory Setting

Paleontological resources are considered nonrenewable scientific resources because once destroyed, they cannot be replaced. As such, paleontological resources are afforded protection under various federal, state, and local laws, ordinances, regulations, and standards. Regulations applicable to potential paleontological resources on the project site are summarized below.

2.1 State

California Environmental Quality Act

CEQA requires public agencies and private interests to identify the potential environmental consequences of their proposed projects on any object or site considered to be a historical resource of California (California Public Resources Code [PRC], section 21084.1, California Code of Regulations Title 14, section 15064.5). Appendix G of the *State CEQA Guidelines* (California Code of Regulations Title 14, Chapter 3) provides an Environmental Checklist of questions including a single question related to paleontological resources (Section VII.f) as follows: "Would the project directly or indirectly destroy a unique paleontological resource or site…?"

CEQA does not define "a unique paleontological resource or site." However, the Society of Vertebrate Paleontology (SVP) has defined a "significant paleontological resource" in the context of environmental review. The SVP defines a Significant Paleontological Resource as:

> Fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years) [p. 11] (SVP 2010).

The loss of significant paleontological resources would be a significant impact under CEQA. The CEQA lead agency is responsible for ensuring that paleontological resources are protected in compliance with CEQA and other applicable statutes.

2.2 Local

Kern County

Kern County addresses Paleontological Resources within the Kern County General Plan, Section 1.10.3 Archaeological, Paleontological, Cultural, and Historical Preservation, of the Land Use, Open Space, and Conservation Element (Kern Conty 2009). In areas of known paleontological resources, the County is to address the preservation of these resources when feasible.

3 Resource Assessment Guidelines

Paleontological resources are limited, nonrenewable resources of scientific, cultural, and educational value and are afforded protection under CEQA. This assessment satisfies CEQA (13 PRC, 2100 et seq.) and Public Resource Code Section 5097.5 (Stat. 1965, c 1136, p. 2792) requirements, and follows guidelines and significance criteria specified by the SVP *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources* (SVP 2010).

3.1 Paleontological Sensitivity

Paleontological sensitivity refers to the potential for a geologic unit to produce scientifically significant fossils. Direct impacts to paleontological resources occur when earthwork activities, such as grading or trenching, cut into geologic deposits (e.g., formations) within which fossils are buried and physically destroy the fossils. Because fossils are the remains of prehistoric animal and plant life, they are nonrenewable. Such impacts have the potential to be significant and, under CEQA guidelines, may require mitigation.

Significant paleontological resources are fossils or assemblages of fossils that are unique, unusual, rare, diagnostically important, or are common but have the potential to provide valuable scientific information for evaluating evolutionary patterns and processes, or which could improve our understanding of paleochronology, paleoecology, paleophylogeography, or depositional histories. New or unique specimens can provide new insights into evolutionary history; however, additional specimens of even well-represented lineages can be equally important for studying evolutionary pattern and process, evolutionary rates, and paleophylogeography. Even unidentifiable material can provide useful data for dating geologic units if radiocarbon dating is possible. As such, common fossils (especially vertebrates) may be scientifically important, and therefore considered significant.

Paleontological sensitivity is determined by rock type, history of the geologic unit in producing significant fossils, and previously recorded fossil localities from that unit. Paleontological sensitivity is derived from the known fossil data collected from the entire geologic unit, not just from any one specific survey. The SVP system outlined in the SVP *Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources* is the generally accepted paleontological sensitivity classification scheme for projects on non-federal lands in California. Rincon has characterized the paleontological sensitivity for the proposed project according to the SVP procedures, as described below.

The SVP describes sedimentary rock units as having high, low, undetermined, or no potential for containing significant nonrenewable paleontological resources. This criterion is based on rock units within which vertebrate or significant invertebrate fossils have been determined by previous studies to be present or likely to be present. The SVP sensitivity categories are:

I. High Potential. Rock units from which vertebrate or significant invertebrate, plant, or trace fossils have been recovered are considered to have a high potential for containing additional significant paleontological resources. Rocks units classified as having high potential for producing paleontological resources include, but are not limited to, sedimentary formations and some volcaniclastic formations (e. g., ashes or tephras), and some low-grade metamorphic rocks which contain significant paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or

lithologically suitable for the preservation of fossils (e. g., middle Holocene and older, fine-grained fluvial sandstones, argillaceous and carbonate-rich paleosols, cross-bedded point bar sandstones, fine-grained marine sandstones). Paleontological potential consists of both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, plant, or trace fossils and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, paleoecologic, taphonomic, biochronologic, or stratigraphic data. Rock units which contain potentially datable organic remains older than late Holocene, including deposits associated with animal nests or middens, and rock units which may contain new vertebrate deposits, traces, or trackways are also classified as having high potential.

II. **Undetermined Potential.** Rock units for which little information is available concerning their paleontological content, geologic age, and depositional environment are considered to have undetermined potential. Further study is necessary to determine if these rock units have high or low potential to contain significant paleontological resources. A field survey by a qualified professional paleontologist to specifically determine the paleontological resource potential of these rock units is required before a paleontological resource impact mitigation program can be developed. In cases where no subsurface data are available, paleontological potential can sometimes be determined by strategically located excavations into subsurface stratigraphy.

III. **Low Potential.** Reports in the paleontological literature or field surveys by a qualified professional paleontologist may allow determination that some rock units have low potential for yielding significant fossils. Such rock units will be poorly represented by fossil specimens in institutional collections, or based on general scientific consensus only preserve fossils in rare circumstances and the presence of fossils is the exception not the rule, e. g. basalt flows or Recent colluvium. Rock units with low potential typically will not require impact mitigation measures to protect fossils.

IV. **No Potential.** Some rock units have no potential to contain significant paleontological resources, for instance high-grade metamorphic rocks (such as gneisses and schists) and plutonic igneous rocks (such as granites and diorites). Rock units with no potential require no protection or impact mitigation measures relative to paleontological resources.

4 Methods

Paleontological resources are not found in “soil” but are contained within the geologic deposits or bedrock that underlies the soil layer. Therefore, to determine whether a given project site has the potential to contain significant fossil resources at the subsurface, it is necessary to review relevant scientific literature to determine the geology and stratigraphy of the area. For this assessment, published geologic maps, fossil locality data, and literature were reviewed to identify the geologic units present at and below the surface within the project boundary, assess the paleontological sensitivity of the geologic units identified, and to determine the potential impacts to non-renewable paleontological resources from project development.

Based on a review of aerial imagery, the project area is located on a flat (lacking any significant topographic relief), sandy alluvial plain with low to moderate density vegetation consisting primarily of creosote, saltbush, and Joshua trees. Approximately 47 percent of the project area was previously utilized for farming purposes and the remainder has been subject to years of unregulated sheep grazing. No Pleistocene or older sediments are mapped within Project Sites 3, 4, and 5. According to the cultural pedestrian survey, Project Sites 1 and 2 are devoid of any bedrock exposures and have approximately 80 percent ground visibility; therefore, no paleontological field survey was conducted for this analysis.

A formal paleontological locality search was requested at the Natural History Museum of Los Angeles County (NHMLAC) on May 8, 2019. In addition, Rincon reviewed the online paleontological collections database of the University of California Museum of Paleontology (UCMP) to identify known fossil localities in Kern County from geologic formations similar to those identified in the project area.

Following the paleontological inventory and assessment, the paleontological sensitivity ratings of the geological units were assigned based on the findings of the record search and literature review. Based on the paleontological sensitivity findings, the potential impact to nonrenewable paleontological resources from project development was determined in accordance with the professional standards of the SVP (2010).

5 Description of Resources

5.1 Regional Geology

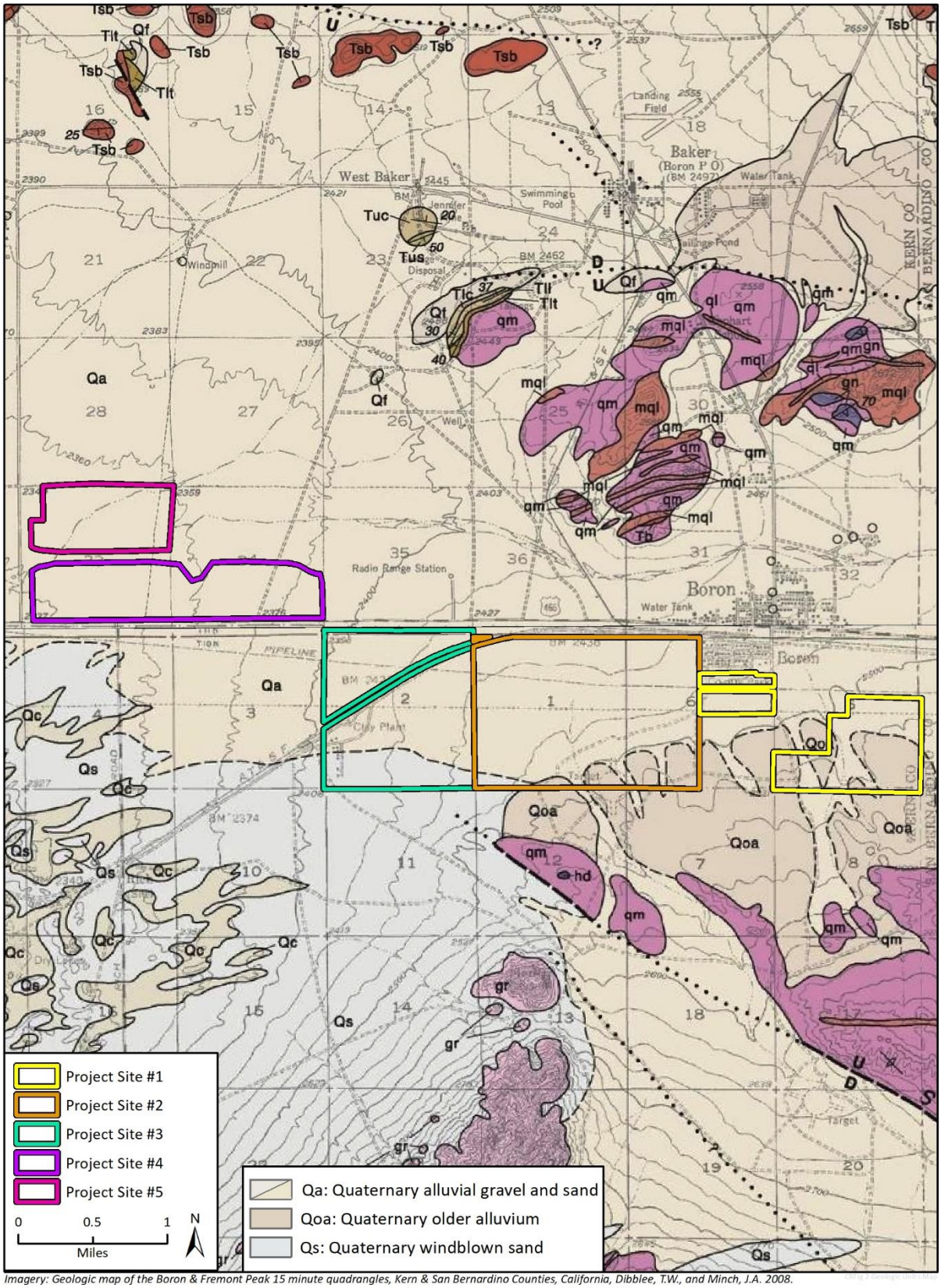
California is divided into 11 geomorphic provinces that are "naturally defined geologic regions that display a distinct landscape or landform" (California Geologic Survey [CGS] 2002). The project area lies within the Antelope Valley region of the Mojave Desert province. The Mojave Desert province is a "broad interior region of isolated mountain ranges separated by expanses of desert plains" (CGS 2002) that is effectively wedged to the west between the Sierra Nevada Range (by the Garlock fault) and the Transverse Range (by the San Andreas fault). The western Mojave Desert acts as a sediment catch from three geomorphic provinces: Basin and Range, Sierra Nevada, and Transverse Ranges. By the early Miocene or late Oligocene an erosional surface rising eastward from the Garlock-San Andreas convergence (at the western end of the Mojave Desert) had developed, and depression of the region began. Depression resulted in the Mojave Desert province becoming an internal drainage area, with deposits of Miocene, Pliocene and Pleistocene sediments accumulating in local basins (Norris and Webb 1990). Miocene sedimentary units deposited during this time contain basalt, volcanic mud flows, and air-fall tuff. Repeated glacial advance and retreat during the Pleistocene created numerous lakes which provided conditions for the preservation of fossils. The area around the project area comprises a thick cover of Holocene to Pleistocene aged alluvium, composed of materials eroded from the surrounding mountains and accumulated during these periods of glacial advance and retreat.

Geology and Paleontology of the Project Site

The project area is mapped at a scale of 1:62,500 by Dibblee and Minch (2008a, b) and includes three geologic units mapped at ground surface: Quaternary alluvial gravel and sand (Qa), Quaternary windblown sand (Qs), and Quaternary older alluvium (Qoa) (Figure 3). Quaternary (Holocene) alluvial sediments, derived from the hills just to the north and south, form an unconsolidated layer of alluvial sand, silt, and gravel across much of the project area and Antelope Valley. Mapped at the surface within the southern portions of Project Sites #2 and #3, the Quaternary (Holocene) aeolian deposits consist of loose, well-sorted, fine-grained sand deposited as dunes or thin veneers on alluvium and clay (Dibblee and Minch 2008). Holocene-aged units are too young to contain scientifically significant paleontological resources and are considered to have low paleontological sensitivity. However, these younger deposits may grade into older Quaternary (Pleistocene) alluvial sediments which may preserve fossil remains.

Quaternary older (Pleistocene) alluvial deposits are exposed within portions of Project Sites #1 and #2 and are composed of loose to weakly consolidated, massive to poorly-bedded, arkosic or granitic sand with clasts of subrounded cobbles and pebbles (Dibblee and Minch 2008). Pleistocene alluvial deposits have proven to yield significant vertebrate fossil localities in Kern County and throughout southern California from the coastal areas to the inland valleys. Localities have produced fossil specimens of terrestrial mammals such as mammoth, horse, elephant, camel, bison, birds, rodents, and reptiles (Jefferson 1991; Springer et al. 2009; UCMP 2019; Paleobiology Database 2019).

Figure 3 Geologic Units in the Project Area



Imagery: Geologic map of the Boron & Fremont Peak 15 minute quadrangles, Kern & San Bernardino Counties, California, Dibblee, T.W., and Minch, J.A. 2008.
Geologic map of the Kramer & Hawes 15 minute quadrangles, Kern, San Bernardino & Los Angeles Counties, California, Dibblee, T.W., and Minch, J.A. 2008.

5.2 Locality Record Search Results

A search of the paleontological locality records at the NHMLAC resulted in no previously recorded fossil localities within the project boundary; however, at least three vertebrate localities (LACM 7786, 7853, 7884) were identified within Quaternary older alluvium in the general vicinity of the project. The closest vertebrate locality, LACM 7786, produced a fossil specimen of meadow vole (*Microtus)* from approximately 30 miles south-southeast of the project between Adelanto and the former George Air Force Base near Victorville. LACM 7853, located approximately 35 miles southwest of the project on the north side of Lancaster near Avenue F and 10th Street, yielded a suite of fossil vertebrates at just three feet below ground surface (bgs) including smelts (Osmeridae), whipsnake (*Masticophis*), leaf-nosed snake (*Phyllorhynchus*), lyre snake (*Trimorphodon biscutatus*), desert iguana (*Dipsosaurus dorsalis*), alligator lizard (*Elgaria*), desert spiny lizard (*Sceloporus magister*), side-blotched lizard (*Uta stansburiana*), horned lizard (Phrynosomatidae), skink (*Plestiodon*), western whiptail (*Aspidoscelis tigris*), desert night lizard (*Xantusia vigilis*), rabbit (*Sylvilagus audubonii*), wood rat (*Neotoma*), deer mouse (*Peromyscus*), pocket gopher (*Thomomys bottae*), kangaroo rat (*Dipodomys*), pocket mouse (*Perognathus*), ground squirrel (*Ammospermophilus leucurus*), and camel (*Camelops*). South of LACM 7853 near Avenue I east of Division Street in Lancaster, LACM 7884 produced a fossil specimen of camel (*Camelops hesternus*) from four feet bgs (McLeod 2019).

A supplemental review of the museum records maintained in the UCMP online collections database was conducted. This database does not contain records for vertebrate fossil localities in the immediate vicinity of the project area. The closest UCMP vertebrate locality on record is UCMP 1041, which yielded an elephant tibia and a camel fossil from Pleistocene sedimentary deposits in an unspecified location in Kern County (UCMP 2019). The results of the museum records search are summarized in Table 2.

Table 2 Museum Records Search Results

Locality No.	Geologic Unit	Age	Taxa
LACM 7786	Qoa	Pleistocene	Meadow vole (*Microtus)*
LACM 7853	Qoa	Pleistocene	Smelts (Osmeridae), whipsnake (*Masticophis*), leaf-nosed snake (*Phyllorhynchus*), lyre snake (*Trimorphodon biscutatus*), desert iguana (*Dipsosaurus dorsalis*), alligator lizard (*Elgaria*), desert spiny lizard (*Sceloporus magister*), side-blotched lizard (*Uta stansburiana*), horned lizard (Phrynosomatidae), skink (*Plestiodon*), western whiptail (*Aspidoscelis tigris*), desert night lizard (*Xantusia vigilis*), rabbit (*Sylvilagus audubonii*), wood rat (*Neotoma*), deer mouse (*Peromyscus*), pocket gopher (*Thomomys bottae*), kangaroo rat (*Dipodomys*), pocket mouse (*Perognathus*), ground squirrel (*Ammospermophilus leucurus*), and camel (*Camelops*)
LACM 7884	Qoa	Pleistocene	Camel (*Camelops hesternus*)
UCMP 1041	Qoa	Pleistocene	Proboscidean (*Elephas*), camel (*Procamelus*)

Sources: McLeod 2019, UCMP 2019

6 Evaluation, Impacts, and Recommendations

6.1 Paleontological Sensitivity Evaluation

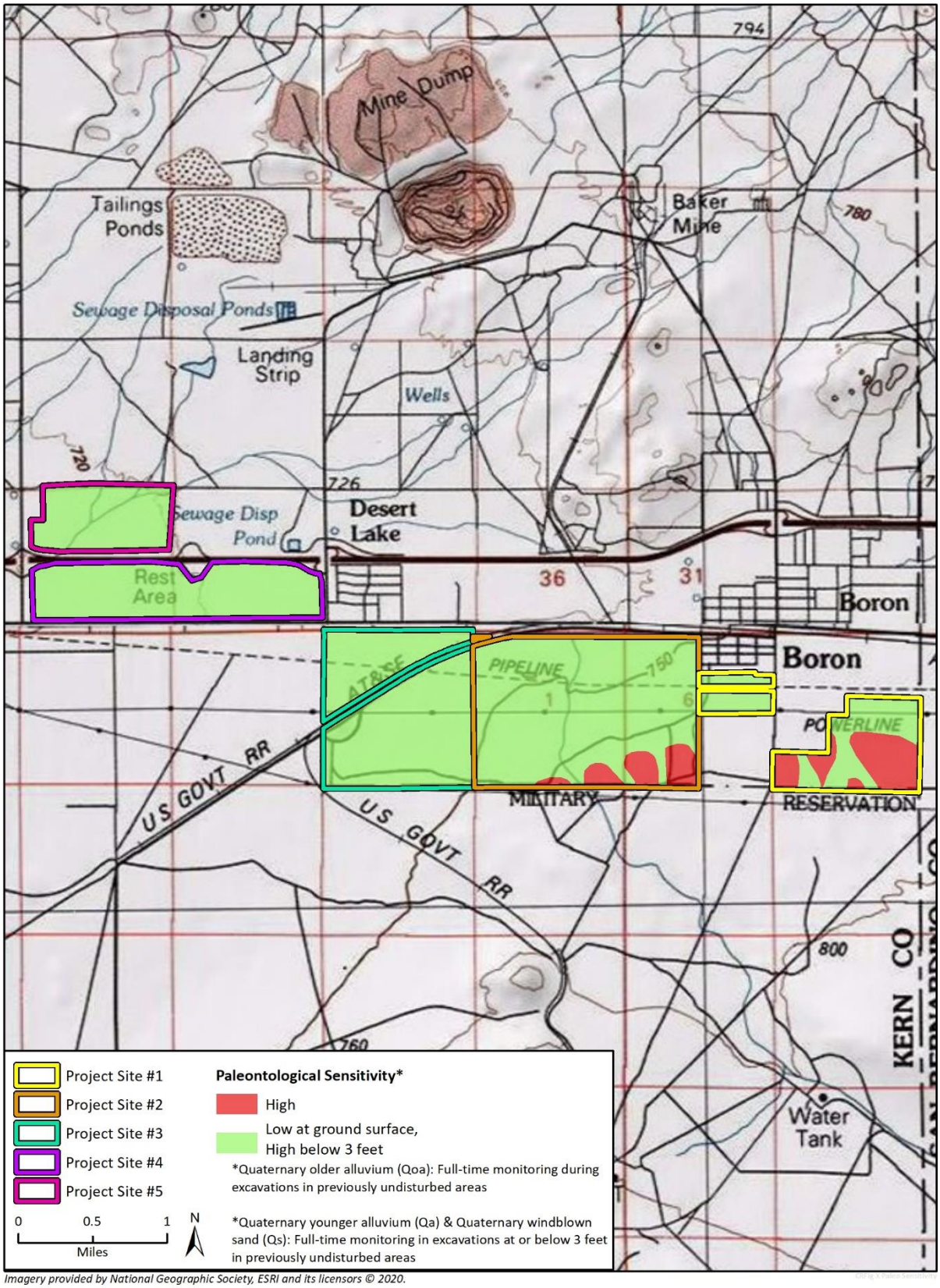
Based on the literature review and records search results, the paleontological sensitivity of the geologic units underlying the project was determined in accordance with criteria set forth by the SVP (2010). Holocene sedimentary deposits, particularly those younger than 5,000 years old, are generally too young to contain fossilized material. Therefore, the Holocene alluvial and aeolian deposits mapped in the project area have been assigned a low paleontological sensitivity. Older Quaternary (Pleistocene) sediments may underlie the Holocene sediments at depths as shallow as three feet bgs in the vicinity of the project (McLeod 2019). The older Quaternary alluvium has a high paleontological sensitivity and a high potential to contain buried intact paleontological resources because the unit has proven to yield significant vertebrate fossils near the project area. The paleontological sensitivity of the geologic units underlying the project area is depicted in Figure 4.

6.2 Impacts

Paleontological resources are nonrenewable and are vulnerable to impacts from development related activities. Fossils provide important information for our understanding of past environments, the history of life, past species diversity, how species respond to climate change, and many other lines of scientific inquiry. Impacts to fossils and fossil localities, and loss of fossils from looting or other destructive activity at fossil sites results in the direct loss of scientific data and directly impacts the ability to conduct scientific research on evolutionary patterns and geological processes. Construction and grading activities associated with any development that will impact previously undisturbed, paleontologically sensitive geologic deposits have the potential for the destruction of significant paleontological resources.

The geologic deposits underlying the project (i.e., Quaternary older alluvium) have a high potential to contain paleontological resources. As such, ground disturbing activities in previously undisturbed portions of the project area could potentially result in significant impacts to paleontological resources under Appendix G of CEQA. Impacts would be significant if construction activities result in the destruction, damage, or loss of scientifically important paleontological resources and associated stratigraphic and paleontological data. Project activities that have the potential to impact paleontological resources include road and site grading, substation and gen-tie excavations, trenching for electrical and communication conduits. Most of the project activities for the installation of the solar panels would generally be less than three feet in depth. However, Project activities that have the potential to impact paleontological resources include road and site grading, substation and gen-tie excavations, and trenching for electrical and communication conduits that may require ground disturbance to a minimum depth of 10 feet.

Figure 4 Paleontological Sensitivity in the Project Area



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6.3 Recommendations

The following recommended mitigation would address the potentially significant impacts relating to the potential discovery of paleontological resources during project implementation. These measures would apply to all phases of project construction and would ensure that any significant fossils present on-site are preserved. Implementation of the following recommended mitigation measures would reduce potential project impacts to paleontological resources to a less-than-significant level pursuant to the requirements of CEQA.

- **Develop a Paleontological Resources Mitigation Plan.** Prior to the commencement of ground disturbing activities, a qualified professional paleontologist shall be retained to prepare and implement a Paleontological Resources Mitigation Plan (PRMP) for the project. A Qualified Paleontologist is an individual who meets the education and professional experience standards as set forth by the SVP (2010), which recommends the paleontologist shall have at least a Master's Degree or equivalent work experience in paleontology, shall have knowledge of the local paleontology, and shall be familiar with paleontological procedures and techniques. The PRMP shall describe mitigation recommendations in detail, including paleontological monitoring procedures; communication protocols to be followed in the event that an unanticipated fossil discovery is made during project development; and preparation, curation, and reporting requirements.
- **Paleontological Worker Environmental Awareness Program (WEAP).** Prior to the start of construction, the Qualified Paleontologist or his or her designee, shall conduct training for construction personnel regarding the appearance of fossils and the procedures for notifying paleontological staff should fossils be discovered by construction staff. The WEAP shall be fulfilled at the time of a preconstruction meeting. In the event a fossil is discovered by construction personnel anywhere in the project area, all work in the immediate vicinity of the find shall cease and a qualified paleontologist shall be contacted to evaluate the find before re-starting work in the area. If it is determined that the fossil(s) is (are) scientifically significant, the qualified paleontologist shall complete the mitigation outlined below to mitigate impacts to significant fossil resources.
- **Paleontological Monitoring.** Initially, full-time monitoring shall be conducted during ground construction activities (i.e., grading, trenching, foundation work, and other excavations) within previously undisturbed Quaternary older alluvium (Qoa) and where ground disturbance exceeds three feet bgs within intact Holocene deposits. Monitoring shall be conducted by a qualified paleontological monitor, who is defined as an individual who meets the minimum qualifications per standards set forth by the SVP (2010), which includes a B.S. or B.A. degree in geology or paleontology with one year of monitoring experience and knowledge of collection and salvage of paleontological resources. The duration and timing of the monitoring shall be determined by the Qualified Paleontologist and the location and extent of proposed ground disturbance. If the Qualified Paleontologist determines that full-time monitoring is no longer warranted, based on the specific geologic conditions at the surface or at depth, the Qualified Paleontologist may recommend that monitoring be reduced to periodic spot-checking or cease entirely.
- **Fossil Discovery, Preparation, and Curation.** If a paleontological resource is discovered, the monitor shall have the authority to temporarily divert the construction equipment around the find until it is assessed for scientific significance and collected. Typically, fossils can be safely salvaged quickly by a single paleontologist and not disrupt construction activity. In some cases, larger fossils (such as complete skeletons or large mammals) require more extensive excavation

and longer salvage periods. In this case, the paleontologist should have the authority to temporarily direct, divert or halt construction activity to ensure that the fossil(s) can be removed in a safe and timely manner.

Once salvaged, significant fossils shall be identified to the lowest possible taxonomic level, prepared to a curation-ready condition and curated in a scientific institution with a permanent paleontological collection (such as the NHMLAC) along with all pertinent field notes, photos, data, and maps. The cost of curation is assessed by the repository and is the responsibility of the project owner.

- **Final Paleontological Mitigation Report.** At the conclusion of laboratory work and museum curation, a final report shall be prepared describing the results of the paleontological mitigation monitoring efforts associated with the project. The report shall include a summary of the field and laboratory methods, an overview of the project geology and paleontology, a list of taxa recovered (if any), an analysis of fossils recovered (if any) and their scientific significance, and recommendations. The final report shall be submitted to the County. If the monitoring efforts produced fossils, then a copy of the report shall also be submitted to the designated museum repository.

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