Draft
Environmental Impact Report

SCH# 2022110504

Volume 4

Appendices E.1 through F.2

BULLHEAD SOLAR PROJECT
by EDF Renewables, LLC *(PP22404)*

GPA No. 8, Map No. 214; CUP No. 48, Map No. 214;
CUP No. 49, Map No. 214; Ag Exclusion Map No. 214;
SPA No. 42, Map No. 231; SPA No. 43, Map 231;
ZCC No. 158, Map No. 231; CUP No. 121, Map No. 231;
CUP No. 122, Map No. 231; Vacation Public Access Easements 03 098 232,
Map No. 232; SPA No. 35, Map No. 232;
SPA No. 36, Map No. 232; ZCC No. 36, Map No. 232;
CUP No. 49, Map No. 232; CUP No. 50, Map No. 232.

Kern County
Planning and Natural Resources Department
Bakersfield, California

November 2023

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Kern County
Planning and Natural Resources Department
Bakersfield, California

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PlaceWorks

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Appendices - Volume 4

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BIOLOGICAL RESOURCES TECHNICAL REPORT

BULLHEAD SOLAR PROJECT

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Acronyms and Abbreviations

°F	degrees Fahrenheit
AC	alternating current
amsl	above mean sea level
APLIC	Avian Power Line Interaction Committee
AVTL	Antelope Valley Transmission Line
BBI	Bloom Biological, Inc.
BESS	battery energy storage system
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practices
BSA	biological study area
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CDNPA	California Desert Native Plants Act
CEC and CDFW Guidance	*Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties*
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFGC	California Fish and Game Code
CFR	Code of Federal Regulations
Citation	CGFC Emergency Statement
CNDDB	California Natural Diversity Data Base
County	Kern County
CRPR	California Rare Plant Rank
CUP	Conditional Use Permit
CWA	Clean Water Act
DC	direct-current
EDFR	EDF Renewables
ESA	environmentally sensitive area
ESA	environmentally sensitive area
FESA	Federal Endangered Species Act
gen-tie	generation-tie
GIS	geographic information system
GPS	global positioning system
HVAC	heating, ventilation, and air conditioning
I	Interstate
kV	kilovolt
LSAA	Lake and Streambed Alteration Agreement
MBTA	Migratory Bird Treaty Act
MGS	Mohave ground squirrel
MGS	Mohave Ground Squirrel
mph	miles per hour
MW	megawatts

NCCP	Natural Community Conservation Planning Act
O&M	operations and maintenance
OHWM	ordinary high-water mark
PCS	power conversion stations
Porter-Cologne	Porter-Cologne Water Quality Control Act
project	Bullhead Solar Project
PV	photovoltaic
quad	quadrangle map
RPSA	rare plant study area
RWQCB	Regional Water Quality Control Board
SCADA	Supervisory Control and Data Acquisition System
SCE	Southern California Edison
SR	State Route
SSC	Species of Special Concern
TRTP	Tehachapi Renewable Transmission Project
U.S.C.	United States Code
USACE	U.S. Army Corp of Engineers
USFWS	U.S. Fish and Wildlife Service
WEAP	Worker Environmental Awareness Program

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Chapter 1
Introduction

1.1 Proposed Project Overview

EDF Renewables (EDFR) proposes the Bullhead Solar Project (project) to develop up to 270 megawatts (MW) (alternating current or "AC") of solar photovoltaic (PV) capacity derived from tracker technology and up to 270 MW of battery storage. The project includes solar development with associated PV panels, inverters, converters, generators, foundations, transformers, and optional generation-tie (gen-tie) routes to the Rosamond and Whirlwind Substations, only one of which would be constructed. The project also includes laydown yards, a meteorological station, a microwave/communication tower, a substation and battery energy storage system. A complete project description is included in the Environmental Impact Report (EIR). Certain components of the project description are described herein as they apply to Biological Resources and analysis of project impacts.

The proposed project encompasses a study area of approximately 1,359.50 acres of private land (Appendix A, Figure 1, *Study Area*). A larger study area has been provided for evaluation to ensure that all lands potentially affected by the proposed project are included in the analysis. Should the Kern County (County) Board of Supervisors approve the project, the County would issue Conditional Use Permits (CUPs) and other required approvals on land proposed for development of the solar facilities. The portion of the project subject to the CUPs is 1,349.50 acres; 10 acres are excluded from the CUP boundary but are included in the Study Area boundary for purposes of environmental analysis.

As shown on Figure 2, Conceptual Site Plan, the project site can be accessed from one primary and one secondary route. The primary access to the project from the regional transportation system would be gained by exiting State Route (SR) 14 (Antelope Valley Freeway) on to Rosamond Boulevard, north on Tehachapi Willow Springs Road, and west on Dawn Road. The secondary access to the Bullhead site is provided via 120th Street West through the approved and adjacent BigBeau Solar Project ("BigBeau"). Approximately 422.4 acres of land permitted in connection with BigBeau will be developed around the same time as the proposed project, and those facilities will use the same interconnection infrastructure as the proposed project. As background, BigBeau called for the development of solar PV and battery storage on approximately 2,285 acres of land. The County Board of Supervisors approved BigBeau and certified an EIR for the project in June 2020. The environmental effects of developing on those lands were evaluated in the BigBeau Solar Project EIR (SCH # 2019071059), which is hereby incorporated by reference. EDFR will comply with all mitigation measures and conditions of approval applicable to BigBeau for any development on those lands.

As shown on Figure 1 and Figure 2(Appendix A), the project's study area consists of a solar array area with three locations under consideration for the development of a substation. CUPs are required for the solar generation facilities (e.g., the panels) and associated generation equipment (i.e., inverters, substation, and batteries), as well as the communications tower. Therefore, these facilities would be located within the CUP boundary (1,349.50 acres). Several other project components do not require CUPs and would extend beyond the CUP boundary (but would be entirely within the study area). These components include access roads and gen-tie power lines (both collection and transmission). Figure 2 shows the project components.

EDFR is committed to creating a state-of-the-art solar energy project that would be constructed in a manner that minimizes environmental impacts to the greatest extent feasible. The proposed project includes four options for gen-tie routes, including two deviations to one option and one deviation to another. Only one route would be constructed. Three project optional gen-tie routes—Rosamond Gen-tie Options 1, 2, and 3, including one deviation identified as Rosamond Gen-tie Option 3.1—would travel south from the project boundary and connect to the Rosamond Switching Station. The Rosamond Switching Station is planned to be constructed by Los Angeles Department of Water and Power (LADWP) by December 2025. One optional project gen-tie route—Whirlwind Gen-tie Option 1,including two deviation routes identified as Whirlwind Gen-tie Option 1.1 and Whirlwind Gen-tie Option 1.2—would cross underneath Southern California Edison's (SCE) Tehachapi Renewable Transmission Project (TRTP) to the east of the project site and connect to the existing Whirlwind Substation. SCE's TRTP 220/500-kilovolt (kV) corridor travels through Whirlwind Gen-tie Option 1 and connects SCE's Vincent Substation with SCE's Windhub Substation to the south and north of the project site, respectively. Many of the lands surrounding the site have either been approved for, or are in the planning stages of, development for solar or wind energy.

1.2 Project Location

The project is generally located in southern Kern County, central California (Appendix A, Figure 3, *Aerial Location Map*). The land is controlled via lease or fee simple ownership (or in final negotiations thereof) by EDFR. The project site is south of the Tehachapi Mountains on lands that gradually slope downward from the northwest to the southeast. It is approximately 52 miles southeast of the city of Bakersfield, 19 miles south of the City of Tehachapi, 8 miles northwest of the community of Rosamond, and 2 miles north of the community of Willow Springs. Other communities in the vicinity of the project site include Mojave in Kern County and the cities of Lancaster, Palmdale, and Neenach in Los Angeles County, which are roughly 12 miles northeast, 17 miles southeast, 24 miles southeast, and 18 miles southwest of the project, respectively. Edwards Air Force Base is 22 miles east of the project's eastern boundary (Appendix A, Figure 4, *Regional Vicinity Map*).

The project site is approximately 12 miles southwest of SR-58 and approximately 34 miles east of Interstate (I) 5. SR-14 (Antelope Valley Freeway) is approximately 7 miles to the east of the site, and SR-138 (West Avenue D) is approximately 9 miles to the south in Los Angeles County. The project site is generally bounded by Favorito Avenue to the south, Champagne Avenue to the north, 110th Street West to the west, and 80th Street West to the east. The project site is bisected by Tehachapi–Willow Springs Road.

The project site and access roads can be found within the Willow Springs, California, U.S. Geological Survey 7.5-minute topographic quadrangle map (quad) (Appendix A, Figure 5, *Topographic Map*). Rosamond Gen-tie Options 1, 2, and 3 are in the Willow Springs and Little Buttes quads and Whirlwind Gen-tie Option 1 is in the Willow Springs and Tylerhorse Canyon quads. Proposed access roads that would be used to access the site fall within the Willow Springs and Little Buttes quads (USGS 2021). This area of the County is recognized by the National Renewable Energy Laboratory as having solar and wind resources that are suitable for renewable energy development. The proposed project is also in an area of low population density and traversed by a network of dirt roads.

1.3 Project Components

Descriptions of the project components applicable to the biological analysis contained in this report are included below. The full Project Description is included in the Project's EIR.

1.3.1 Solar Generator

The proposed project would use up to 270-MW PV system blocks to convert solar energy directly to electrical power for export to the electrical grid.

Solar power is generated through PV modules converting sunlight striking the modules directly to low-voltage direct-current (DC) power, which is subsequently transformed to AC power via an inverter placed onsite. The proposed project site would develop modules using either fixed-tilt or tracker technology. Trackers tilt the panels to follow the course of the sun, optimizing the incident angle of sunlight on their surface. The PV panel modules are mounted on steel support posts pile-driven into the ground. The arrays are typically placed on an aluminum rail such that with a maximum tilt of 60 degrees the top of the array would be a maximum of 15 feet above grade at the tallest point and approximately 2 feet above the grade at the lowest point.

The PV modules are made of semiconductor material encapsulated in glass in which the PV effect converts light (photons) into electrical current. PV is best known as a method for generating electric power by using solar cells to convert energy from the sun into electricity. Energy from the sun is transmitted to Earth as photons, which contain different levels of energy corresponding to different frequencies of the solar spectrum. When a photon is absorbed by a PV cell, the energy of the photon is transferred to an electron in an atom within the PV cell. This added energy allows the electron to escape from the atom to become part of the current in an electrical circuit.

1.3.2 Power Conversion Stations (Inverters)

Within the proposed solar arrays, there would be power conversion stations (PCS), also known as *inverters*, that would contain, at a minimum, one inverter and one transformer. Inverters are usually housed within an enclosed structure, which helps reduce the resulting operational noise levels. PCS would also likely include an exhaust fan, as well as a heating, ventilation, and air conditioning (HVAC) system, which is typically mounted to the exterior of the enclosure. Noise levels generated by PCS would be associated with operation of the inverters, transformer, exhaust fans, and HVAC systems.

1.3.3 Access and Internal Project Roads

The project site can be accessed from one primary and one secondary route (Appendix A, Figure 6, *Project Access Routes*). The primary access to the project from the regional transportation system would be gained by exiting SR 14 (Antelope Valley Freeway) on to Rosamond Boulevard. SR-14 is 7 miles to the east of the project area, and access would be gained by heading west on Rosamond Boulevard, north on Tehachapi Willow Springs Road, and west on Dawn Road. One possible secondary route has been identified from the western side of the project area; however, the Tehachapi Willow Springs Road access would be the primary route. A secondary route to the site is from 120th Street West, heading north from Rosamond Boulevard. In association with other solar projects in the area, 120th Street West is currently graded and recently widened. As seen in Figure 6, 120th Street West connects to the previously permitted BigBeau Solar Project; construction vehicles could use 120th Street West, and then continue through the BigBeau site to access the Bullhead Solar project site. In addition to the primary and secondary routes, access to the Bullhead Solar project site also could be accomplished through other routes from within the adjacent BigBeau Solar Project, to the west of the Bullhead site. As noted in Section 1.1, Proposed Project Overview, the BigBeau Solar Project was previously evaluated pursuant to CEQA and is currently under construction. The EIR for the BigBeau Solar Project evaluated the environmental impacts within that project's footprint, along with its access routes.

If 120th Street West were used as a secondary access route, portions of this road may require additional improvements near Avenue of the Stars; however 120th Street West recently has been graded and widened in association with other nearby solar projects; therefore, substantive improvements are not expected to be needed for the Bullhead Solar Project. If needed, improvement activities may include grading, widening up to 50 feet, compacting, or applying an approved soil stabilizer. In addition, a 20 foot wide-minimum road is required around the perimeter of the solar arrays for the fire department and emergency vehicles. Additional internal maintenance roads would be located throughout the project area. Spacing between each row would depend on final panel type, orientation, and any County regulations. Internal access roads would be up to 20 feet wide and would be cleared and compacted for equipment and emergency vehicle travel and access to the solar blocks. These project site access roads would remain in place for ongoing operations and maintenance (O&M) activities after construction is completed.

Final service road alignments would depend on the final placement of the solar panels and on the results of the environmental report documenting the results of field investigations, including topography and any other site-specific details to be incorporated into the final design. Where access roads are required to cross streambed areas under the jurisdiction of the California Department of Fish and Wildlife (CDFW), EDFR would install appropriate crossings to minimize impacts on these jurisdictional areas and comply with all California Fish and Game Code (CFGC) requirements, including authorization through a Lake and Streambed Alteration Agreement (LSAA), as appropriate. To minimize impacts on jurisdictional streambeds, the proposed project may consider the use of overhead electrical and communication lines to span jurisdictional blue-line streams.

1.3.4 Battery Storage

EDFR proposes to incorporate up to 270 MW of a battery energy storage system (BESS) within the proposed project site. Three alternative locations are depicted on Figure 2 for analysis purposes; however, only one site will be selected for the final design. The proposed project would use a centralized BESS configuration, which would include batteries housed within containers in a centralized location near one of the proposed onsite substation yards..

The BESS would likely consist of containers housing batteries connected in strings and mounted on racks. AC-coupled BESS design standards typically include lighting, monitoring equipment, cooling units, active exhaust venting, multiple fire detection units (e.g., gas/heat/smoke detectors), and fire suppression systems, which adequately address fire risk associated with the unit. AC-coupled BESS units typically require their own inverters on their own skid. However, some BESS equipment (e.g., inverters, auxiliary transformer to control the HVAC system) may be adjacent to the container instead of within the container. The BESS configuration would include up to 270 MW of stored energy with up to 316 battery energy storage containers with associated inverters. Based on consultation with Kern County Fire Department (KCFD) and experience with prior developments, a water storage tank will be installed to provide water supply needed for fire protection and operations. Any additional or revised fire protection measures will be made in consultation with KCFD. The BESS site would include self-contained container units, measuring approximately 70-feet long by 12-feet wide by 13-feet high (including HVAC units; one on each end, depending on container dimensions), situated in a parallel configuration. Each container would have a storage capacity of up to approximately 4 MW-hours. Foundational pads for the BESS containers and inverters would include structural material like crushed aggregate, concrete, or steel. The containers would be non-walk-in type and equipped with doors along the length of the containers, plus one on each end.

AC-coupled BESS would be incorporated and consolidated within or adjacent to the project substation area and would require up to 25 acres within the substation yard to house the BESS containers.

1.3.5 Security Fencing

Security fencing would be installed in accordance with Kern County zoning requirements. Based on current ordinances, the project applicant has the option to fence either the boundaries of the entire proposed project site, each solar panel row independently, or a grouping of solar blocks. At this time, it has not been determined which of these options would be used. A security fence would be installed that would consist of an up to 6-foot chain-link fence with up to three strands of barbed wire, for a total maximum height of 8 feet. Fencing around the panel blocks would be adapted for operations to allow for the movement of wildlife. All fence installation requirements would be evaluated, and the best-fit scenario would be incorporated within the project site based on Kern County's final determination.

Security services would be provided during construction, and any additional security would be provided on an as-needed basis. The security personnel would be responsible for controlling egress and ingress, enforcing safety requirements, and ensuring compliance with all other policies for control of the proposed project site during the construction phase. After construction, these duties would become the responsibility of the O&M provider.

1.3.6 Substation

The proposed project would include construction of one substation facility in one of three potential locations where the BESS would be located (Appendix A, Figure 2). The substation would collect the power generated by the PV solar system blocks, transport the power via the underground/overhead power collection system, and then convert the power for transmission in an overhead 220-kV line to the Rosamond Switching Station or Whirlwind Substation.

Equipment at the project substation would include transformers, bus work, switches, breakers, and all associated equipment required to be compliant with utility-grade interconnection services. The substation facilities would house the power generation control and relaying equipment, station batteries, Supervisory Control and Data Acquisition System (SCADA) and communication systems, and potentially housing with radio or microwave communication mounted on a transmission tower up to 90 feet tall. The project substation would be remotely operated and periodically maintained, but would not be permanently staffed. The substation site would be cleared, graded, and graveled. A security fence would be installed around the perimeter for safety and security purposes. The fence would consist of a chain-link fence up to 6-feet tall with up to three strands of barbed wire for a total maximum height of 8 feet. For safety purposes, this fence would not be adapted for wildlife movement. As described in Section 1.3.4, *Battery Storage*, the BESS would also be co-located within or adjacent to the substation yards. Construction and operation of the project substation and battery storage would affect up to 25 acres.

1.3.7 Gen-tie and Electrical Collection System

The proposed project includes four options for gen-tie routes, including three deviation routes, Rosamond Gen-tie Option 3.1, and Whirlwind Gen-tie Options 1.1 and 1.2, although only one route would be constructed. The selected gen-tie route would be constructed within a 125-foot-wide corridor and would consist of utility poles, trenches, and a corresponding dirt access road. Rosamond Gen-tie Option 1 and Rosamond Gen-tie Option 3 would require a Franchise Agreement with the County and constructed within the Kern County right-of-way on Tehachapi Willow Springs Road and Rosamond Boulevard (Appendix A, Figure 2). Utility trench elements would be incorporated into the shoulder of the roads and would not add to the footprint of the gen-tie road. All utility poles associated with the gen-tie would be erected inside the limits of the corridor. Whirlwind Gen-tie Option 1 is proposed to be partially co-located on existing poles on a previously surveyed corridor (i.e., the Antelope Valley Transmission Line [AVTL]).

The project power generated would be fed to the project substation through a 34.5-kV power collection system. The transmission poles would accommodate the underground feeder splice lines to the overhead lines and would range in height, but would be no taller than 160 feet. The likely materials for the poles would be wood, nonreflective metal, or spun concrete. These overhead lines would be carried via new and existing electrical poles to the Rosamond or Whirlwind Substations. Proposed underground transmission lines (if necessary) and fiber optic lines would be co-located with roads.

Underground collection cables would be installed in conjunction with roads and panel arrays within the proposed project site, connecting each solar panel to a feeder circuit; each feeder circuit would in turn be connected to the substations. Overhead circuits could be used to avoid environmentally sensitive areas (ESAs) or other constraints inherent to the proposed project site. The different solar panel circuits would gather at the substation (or switchyard) and then sent to the overhead electricity lines leading to a grid interconnection point.

1.3.8 Rosamond Gen-tie Option 1

Rosamond Gen-tie Option 1 would exit the southeastern project boundary, heading south along Tehachapi Willow Springs Road for approximately 2.5 miles, and then approximately 1 mile west along Rosamond Boulevard, where it would connect into the LADWP-planned Rosamond Switching Station (Appendix A, Figure 2). EDFR will seek approval of a franchise agreement with the Kern County Board of Supervisors for a portion of this alignment along both Tehachapi–Willow Springs Road and Rosamond Boulevard that would accommodate Rosamond Gen-tie Option 1.

1.3.9 Rosamond Gen-tie Option 2

Rosamond Gen-tie Option 2 would start from the Bullhead Substation at Favorito Avenue and Tehachapi Willow Springs Road and exit the project boundary, heading approximately 1 mile west along Favorito Avenue, and then approximately 2.5 miles south, primarily along 100th Street West, and cutting over to the east, where it would parallel the southeastern side of the LADWP Easement before connecting to the planned Rosamond Switching Station (Appendix A, Figure 2).

1.3.10 Rosamond Gen-tie Option 3

Rosamond Gen-tie Option 3 would exit the southeastern project boundary, similar to Rosamond Gen-tie Option 1, and head south along Tehachapi Willow Springs Road approximately 2.5 miles south, then head approximately 1 mile west at Truman Road, and then 1 mile south on 100th Street West, where it would connect into the LADWP-planned Rosamond Switching Station. Also under consideration is one potential deviation route for Rosamond Gen-tie Option 3, where it heads south, generally along 95th Street West, shown as Rosamond Gen-tie Option 3.1 on Figure 2.

1.3.11 Whirlwind Gen-tie Option 1

The proposed project also includes one primary optional route to deliver electricity to the existing Whirlwind Substation, including two deviations to Whirlwind Gen-tie Option 1. Whirlwind Gen-tie Option 1 would exit the western portion of the project boundary around 105th Street West and Dawn Road, travel approximately 3 miles northwest, and then travel approximately 8 miles southwest to connect to the Whirlwind Substation (Appendix A, Figure 2). The first approximately 3 miles of Whirlwind Gen-tie Option 1 would require new construction until it meets up with EDFR's existing AVTL on the north side of the Los Angeles Aqueduct, where the gen-tie line would then be co-located on the existing AVTL infrastructure for approximately 5.6 miles. Then, where the existing AVTL turns to head south and crosses over the Los Angeles Aqueduct for a second time, Whirlwind Gen-tie Option 1 would require new construction and be located on new poles for approximately 3 miles until ending at the Whirlwind Substation. Also, two potential deviation routes for Whirlwind Gen-tie Option 1 are under consideration, as shown as Whirlwind Gen-tie Option 1.1 and Whirlwind Gen-tie Option 1.2 on Figure 2. Whirlwind Gen-tie Option 1.1 is proposed to primarily travel north on 114th Street West and west on McConnell Avenue. Whirlwind Gen-tie Option 1.2 is proposed to primarily travel north on 110th Street West and west on Billie Avenue.

1.3.12 Microwave/Radio Tower

Supporting the proposed project would be one microwave/communication tower to be located with the substation in one of various potential locations (Appendix A, Figure 2), consisting of up to three 6-foot high-performance microwave dishes fixed to a steel monopole of up to 90 feet in height. An approximately 12-foot by 20-foot equipment shelter would also be included within a fenced area. A separate CUP would be required for the microwave tower. The shelter would have a maximum height of 10 feet.

The proposed project radio equipment would be within the equipment shelter and connected to the microwave dishes via coaxial or fiber optic cables.

If the microwave tower were to be outside the selected substation footprint, fencing would consist of a chain-link fence of up to 6 feet tall with up to three strands of barbed wire (up to 2 feet high), for a total maximum height of 8 feet.

1.3.13 Lighting

Operation of the proposed project would require onsite nighttime lighting for safety and security. The level and intensity of lighting would be the minimum needed per the County's Dark Skies Ordinance (Chapter 19.81 of the Kern County Zoning Ordinance). Lighting at the facility would be restricted to areas required for safety and security. Exterior lights would be hooded, and lights would be directed onsite so that light or glare would be minimized for drivers and pedestrians. Switched lighting would be provided in areas where continuous lighting is not required for normal operation, safety, or security.

1.3.14 Water and Wastewater

The project applicant is pursuing various options for water supply, including purchasing water from a private water truck company with a facility near the unincorporated community of Rosamond or from the Rosamond Community Services District. Water may also be sourced locally by purchasing groundwater rights from existing wells at the project site. Water storage tanks may be installed to provide water supply needed for fire protection and operations. Wastewater service is not anticipated to be required.

The estimated nonpotable water demand for construction and operations would be up to 200 acre-feet and 11 acre-feet per year, respectively. Refer to the Water Supply Assessment (2022) for further information.

1.3.15 Detention/Retention Basin

To meet current Kern County site development requirements, a detention/retention basin or basins may be required, depending on the change in hydrological conditions onsite and, if necessary, based on an engineering-level hydrological assessment for the site at the base of each solar array block for stormwater management. The required storage would be provided via shallow ponding at the downstream limit of the sub-basin(s).

1.3.16 Design Best Management Practices

1.3.16.1 Areas of Limited Impact

As noted above, several project components do not require a CUP from Kern County and therefore would extend beyond the CUP boundary. These components include access roads and power lines (both collection and transmission). Based on preliminary environmental due diligence, several parcels within the proposed project study area are traversed by potential jurisdictional features. Minimizing grading and ground-disturbing activities within the potential jurisdictional features is the best way to preserve vegetation, habitat, and local wildlife. Project features would be designed to limit development to roads, security fences, underground and overhead electrical (including transmission poles), and minor at-grade stream crossings. To the extent feasible, the solar arrays, substation, or other project components that require a CUP would not be placed in these limited impact areas of the project study area. A jurisdictional delineation report has been prepared under separate cover to address impacts on potential jurisdictional features (Heritage Environmental Consultants, LLC 2022).

Construction

The construction of the proposed project would take up to approximately 18 months. Construction would be comparable to that of other renewable energy projects and can be divided into the following components: (1) moving equipment onto the site; (2) site preparation and grading; (3) access road improvements, if needed; (4) gen-tie line construction; (5) internal roads construction; (6) electrical substation and microwave tower construction; (7) solar array structural, underground, and panel installation, and battery storage construction; (8) PV and battery storage commission; and (9) project finalization/commercial operation. The various elements of the proposed project would be constructed concurrently on the property. Construction is anticipated to commence in the third quarter of 2024. Onsite workforce is expected to average 201 workers per day with a peak of up to 627 workers.

Construction employees may be able to carpool from respective population centers such as Tehachapi and Rosamond and report to the designated construction staging yards prior to the beginning of each workday. One or more of the proposed laydown yards may be used as a parking and meeting area for the construction employees and would be reclaimed after substantial completion of the project. It is anticipated that the employees would use Rosamond Boulevard, Tehachapi Willow Springs, and 120th Street West as points of ingress/egress to the property and that, once onsite, they would access various sections via the existing and improved network of dirt roads. Employees may also access the site through the adjacent BigBeau Solar Project, which is owned and operated by EDFR.

Construction would primarily occur during daylight hours, Monday through Friday, between 6:00 a.m. and 6:00 p.m. The proposed project would be constructed by several specialized construction contractors, with construction activities taking place as specified in the County's Code of Ordinances, Chapter 8.36, as required to meet the construction schedule. Construction activities are allowable between the hours of 6:00 a.m. and 9:00 p.m. on weekdays and between the hours of 8:00 a.m. and 9:00 p.m. on weekends.

Construction of the proposed project may include improvements to existing offsite access roads to the proposed project site as required by the County. Internal access roads are described in Section 1.3.3, *Access and Internal Project Roads*. Revegetation of disturbed areas and equipment laydown sites that are not required as part of the ongoing operation of the facility may also be revegetated, as appropriate. Staging areas may be required for material handling, temporary storage, and other staging activities. The duration of each phase of the solar PV construction along with equipment details are provided in the EIR's -Project Description.

Construction activities would be expected to include site preparation, fencing, mowing, excavation, grading, trenching/underground work, pile driving, system installation, testing, and cleanup. Site preparation and construction of the proposed project site would be in accordance with all federal, state, and Kern County zoning codes and requirements. Noise-generating construction activities would be limited to the construction hours noted above. All stationary equipment and machines with the potential to generate a significant increase in noise or vibration levels would be located away from noise receptors to the extent practicable. The contractor would conduct construction activities in such a manner that the maximum noise levels at the affected buildings would not exceed established noise levels.

It is anticipated that the recommended construction period would begin in the third quarter of 2024 to minimize effects on sensitive species and habitats and would be completed approximately 18 months later. As the construction period would continue into the winter season, supplemental erosion measures may need to be implemented.

Construction equipment would be turned off when not in use. The construction contractor would ensure that all construction and grading equipment is properly maintained. All vehicles and compressors would use exhaust mufflers and engine enclosure covers (as designed by the manufacturer) at all times.

During construction, water is anticipated to be supplied by well water purchased from a local supplier or from water rights at the existing wells on site. This local groundwater is suitable as a primary supply for soil compaction and dust control, but may not be suitable for potable use.

Operation and Maintenance

Upon completion of the construction and testing phases, the proposed project would be operated on an unstaffed basis and monitored remotely. Periodically, personnel would visit the site for inspection, security, maintenance, and system monitoring purposes. Approximately up to 15 part-time or full-time staff would operate the facility at the adjacent BigBeau O&M building. The proposed project staff would use the O&M facility west and immediately adjacent to the project site at the BigBeau Solar Project. The nearby BigBeau O&M building would house the proposed project's electronic controls and communications systems, provide storage for tools, maintenance supplies, and spare parts, and provide onsite office, kitchen, and bathroom facilities for operations staff.

The proposed project would be fenced to help prevent access by the public. Gates would be installed at the roads entering the proposed project site. Limiting access to the project site would be necessary both to ensure the safety of the public and protect the equipment from theft and vandalism.

The proposed PV arrays produce electricity passively with minimal maintenance requirements. It is anticipated that panels would be washed once per year, using the same well water source as during the construction phase. This groundwater is suitable as a primary supply for panel washing, but may not be suitable for potable use. The maintenance program would be largely conducted onsite during daytime hours as a safety precaution. Equipment repairs may take place in the early morning or evening, when the plant is producing the least amount of energy.

Seeding and Reclamation

Disturbed areas and equipment laydown sites that are not required for the ongoing operation of the facility may also be revegetated. Staging areas may be required for material handling, temporary storage, and other staging activities. Typical O&M requirements for native landscapes are low once established.

Continued weed management in cleared areas would be maintained through regular monitoring and targeted application of the herbicide to be approved by Kern County or by occasional blading. Additional soil disturbance by regular operations of the plant is not expected. Vegetation would be allowed to regrow within the solar panel field to the extent that it does not interfere with the panels themselves to avoid growing into electrical connections and creating a fire hazard or disrupting the panel's performance. However, this is relatively unlikely given the shading the panels would be providing on the soil. The access roads would be kept clear of vegetation with targeted herbicide spraying, occasional scarifying, or weeding to reduce fire hazard and allow access to the panel arrays.

Decommissioning

The project has an anticipated operational life of up to 35 years, after which the project proponent may choose to update site technology and recommission or decommission the site and remove the systems and their components. All decommissioning activities would adhere to the requirements of the appropriate governing authorities and be in accordance with all applicable federal, state, and County regulations.. Because the PV array supporting equipment would sit on the surface of the land, the land would be largely unaltered from its natural state when the arrays are removed after the proposed project's lifetime. EDFR would work with the County to put an agreement in place to ensure the decommissioning of the proposed project site after its productive lifetime. The proposed project would use best management practices (BMPs) to ensure the collection and recycling of modules and batteries and avoid the potential for modules and batteries to be disposed of as municipal waste.

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Chapter 2
Regulatory Requirements

The following sections summarize the applicable federal, state, and local regulations for protecting biological resources that are pertinent to the proposed project.

2.1 Regulatory Setting

2.1.1 Federal

2.1.1.1 Federal Endangered Species Act of 1973

The Federal Endangered Species Act (FESA) protects plants and wildlife listed as endangered or threatened by the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service. FESA prohibits take of endangered wildlife, with *take* defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct" (16 United States Code [U.S.C.] 1532[19]; see also 16 U.S.C. 1538). For plants, this statute governs removing, possessing, maliciously damaging, or destroying any listed plant on federal land and removing, cutting, digging up, damaging, or destroying any listed plant on non-federal land in knowing violation of any law (16 U.S.C. 1538[a][2][B]).

Under FESA Section 7, federal agencies are required to consult with the USFWS if their actions, including permit approvals or funding, could adversely affect a listed species (including plants) or its critical habitat. Through consultation and the issuance of a biological opinion, the USFWS may issue an incidental take statement, allowing take of the species that is incidental to another authorized activity, provided that the action would not jeopardize the continued existence of the species.

2.1.1.2 Migratory Bird Treaty Act, as Amended (16 U.S.C. 703–711)

The federal Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703[a]), first enacted in 1916, prohibits any person, unless permitted by regulation, to:

> pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport, cause to be transported, carry, or cause to be carried or receive for shipment, transportation, carriage, or export any migratory bird, any part, nest, or egg of any such bird, or any product…composed in whole or part, of any such bird or any part, nest, or egg thereof

The list of migratory birds includes nearly all migratory bird species native to the United States. The Migratory Bird Treaty Reform Act of 2004 further defined species protected under the act and excluded all nonnative species. The statute was extended in 1974 to include parts of birds, as well as eggs and nests.

2.1.1.3 Bald and Golden Eagle Protection Act, as Amended (16 U.S.C. 668–668c)

The Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668) provides protection for both the bald eagle (*Haliaeetus leucocephalus*) and the golden eagle (*Aquila chrysaetos*) by prohibiting the take of either of these species, including their parts, nests, or eggs. The BGEPA defines *take* as to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" any bald or golden eagle. The BGEPA is administered by the USFWS, and limited take authorizations are granted for qualifying activities. Persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner any bald eagle… [or golden eagle], alive or dead, or any part, nest, or egg thereof" without prior approval are subject to criminal penalties.

2.1.1.4 Clean Water Act of 1977 (Public Law 95–217)

The purpose of the Clean Water Act (CWA) is to "restore and maintain the chemical, physical, and biological integrity of the nation's waters" (33 U.S.C. 1251[a]). Section 404 of the CWA prohibits the discharge of dredged or fill material into waters of the United States without a permit from the U.S. Army Corps of Engineers (USACE). The definition of *waters of the United States* includes rivers, streams, estuaries, the territorial seas, ponds, lakes, and wetlands (33 Code of Federal Regulations [CFR] 328.3[a]). *Wetlands* are defined as those areas "that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3[b]). The U.S. Environmental Protection Agency has veto authority over the USACE's administration of the Section 404 program and may override a USACE decision with respect to permitting.

When a project may create impacts on waters of the United States, the project requires a permit or a waiver. Substantial impacts on waters of the United States may require an individual permit. Projects that only minimally affect waters of the United States may meet the conditions of one of the existing nationwide permits, provided the permit's other respective conditions are satisfied. A water quality certification or waiver pursuant to Section 401 of the CWA is required for Section 404 permit actions and any federal action affecting waters. For the proposed project, this certification or waiver would need to be issued by the Lahontan Regional Water Quality Control Board (RWQCB), Region 6.

2.1.2 State

2.1.2.1 California Environmental Quality Act

The California Environmental Quality Act (CEQA) was enacted in 1970 to provide for full disclosure of environmental impacts to the public before issuance of a discretionary permit by a public agency. The CEQA analysis includes review of species that are listed under the FESA or California Endangered Species Act (CESA) or are designated as sensitive. Sensitive species include, but are not limited to, wildlife Species of Special Concern (SSC) listed by CDFW and plant species in the California Rare Plant Rank (CRPR) List 1A (presumed extinct), List 1B (rare, threatened, or endangered in California and elsewhere; eligible for state listing), List 2 (rare, threatened, or endangered in California, but more common elsewhere; eligible for state listing), or List 3 (plants for which more information is needed; many are eligible for state listing).

Appendix G of the CEQA guidelines provides thresholds to evaluate environmental impacts that would normally be considered significant. As described in these guidelines, impacts on biological resources would normally be considered significant if the project:

- Has 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 the CDFW or USFWS
- Has a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations, or by the CDFW or USFWS
- Has a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal) through direct removal, filling, hydrological interruption, or other means
- Interferes substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impedes the use of native wildlife nursery sites
- Conflicts with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance
- Conflicts with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan

A determination of significant impacts on a biological resource must consider both the resource itself and how that resource fits into a regional or local context by evaluating direct, indirect, cumulative, and temporary and permanent impacts.

2.1.2.2 California Endangered Species Act

CESA prohibits take, possession, purchase, sale, and import or export of endangered, threatened, or candidate species, unless otherwise authorized by permit or in the regulations. *Take* is defined in CFGC Section 86 as "to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." CESA allows for take incidental to otherwise lawful projects. CDFW administers CESA and authorizes take through permits issued under CFGC Section 2081 or through a consistency determination issued under Section 2080.1 for projects with federal take authorizations.

2.1.2.3 State Fully Protected Species

CFGC Sections 3511, 4700, 5050, and 5515 designate 37 species of wildlife as Fully Protected in California. Lists of fully protected species were initially developed to provide protection to species that were rare or facing possible extinction/extirpation. Most fully protected species have since been state-listed as threatened or endangered. Fully protected animals may not be taken or possessed at any time.

In September 2011, the Natural Community Conservation Planning Act (NCCP Act) was amended to permit the incidental take of 36 fully protected species, pursuant to the NCCP Act approved by CDFW (CFGC Section 2835). The amendment gives fully protected species the same level of protection as endangered and threatened species under the NCCP Act. The NCCP Act, enacted in the 1990s, authorizes the incidental take of species "whose conservation and management" is provided for in a conservation plan approved by CDFW.

2.1.2.4 California Species of Special Concern

In addition to formal listing under FESA and CESA, certain species receive additional consideration by CDFW and lead agencies during the CEQA process. Species that may be considered for review are included on a list of SSC developed by CDFW. The list tracks species in California whose numbers, reproductive success, or habitat may be in decline.

2.1.2.5 Lake and Streambed Alteration Program

Pursuant to CFGC Sections 1600–1616, CDFW regulates all diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake that supports fish or wildlife. CFGC defines a *stream* (including creeks and rivers) as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation" (14 California Code of Regulations [CCR] 1.72). The commission's definition of *lake* includes "natural lakes or man-made reservoirs" (14 CCR 1.56). CDFW limits of jurisdiction include the maximum extents of the uppermost bank-to-bank distance or riparian vegetation dripline. CDFW jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife.

2.1.2.6 California Fish and Game Code

The State of California has incorporated the protection of birds in CFGC Sections 3503, 3503.5, 3513, and 3800. Section 3503 provides for protection of bird nests and eggs. Section 3513 provides prohibitions against taking of birds protected under the MBTA. Section 3800 makes it unlawful to take any nongame bird except as provided in this code or in accordance with regulations of the commission or, when relating to mining operations, a mitigation plan approved by the department.

2.1.2.7 California Native Plant Protection Act

The California Native Plant Protection Act of 1977 (CFGC Sections 1900–1913) allows CFGC to designate plants as rare or endangered and includes provisions that prohibit take of endangered or rare native plants. Sixty-four species, subspecies, and varieties of plants are protected as rare under NPPA. It prohibits take of rare native plants, but includes some exceptions for agricultural and nursery operations, emergencies, vegetation removal from canals, roads, and other sites (after properly notifying CDFW), changes in land use, and in certain other situations. The regulation of plants as "endangered" has been superseded by the regulations in the CESA and no longer occurs under the NPPA.

Section 1913(b) allows for the incidental removal of rare plant species within a right-of-way to allow a public utility to fulfill its obligation to provide service to the public. CDFW must be given 10 days prior notice to salvage the plants.

2.1.2.8 California Desert Native Plants Act

The California Desert Native Plants Act (CDNPA), which is Division 23 of the California Food and Agriculture Code, was adopted in 1981 to protect California desert native plants from unlawful harvesting on both public and privately owned lands. CDNPA also provides the information necessary to legally harvest native plants. It restricts harvesting of the following plants, except for educational or scientific purposes under a permit issued by the commissioner of the county in which the native plants are growing:

> All species of Burseraceae family, such as elephant tree (*Bursera microphylla*), saguaro cactus (*Carnegiea gigantea*), barrel cactus (*Ferocactus acanthodes*), crucifixion thorn (*Castela emoryi*), panamint dudleya (*Dudleya saxosa*), bristlecone pine (*Pinus longaeva*), and California fan palm (*Washingtonia filifera*).

CDNPA also restricts harvesting of the following species, except under a permit issued by the commissioner or the sheriff of the county in which the native plants are growing:

- All species of the family *Agavaceae* (century plants, nolinas, yuccas)
- All species of the family *Cactaceae* (cacti), except saguaro cactus and barrel cactus, which are protected as described above
- All species of the family *Fouquieriaceae* (ocotillo, candlewood)
- All species of the genus *Prosopis* (mesquites)
- All species of the genus *Cercidium* (palos verdes)
- Catclaw (*Acacia greggii*), desert-holly (*Atriplex hymenelytra*), smoke tree (*Dalea spinosa*), and desert ironwood (*Olneya tesota*)

Because western Joshua tree (*Yucca brevifolia*) is now a candidate species under CESA, no harvest permits may be issued for this species under CDNPA without first obtaining a CFGC Section 2081 Incidental Take Permit. The Fish and Game Commission's vote in June 2022 on whether this species warrants protection under CESA, resulted in a tie, pushing another vote to October 2022.

2.1.2.9 Porter-Cologne Water Quality Control Act of 1966

The Porter-Cologne Water Quality Control Act (Porter-Cologne) (California Water Code Section 13000 *et seq*.) mandates that activities that may affect waters of the state be regulated to attain the highest water quality. The State Water Resources Control Board and the local RWQCB are the relevant permitting agencies. The RWQCB provides regulations for a "non-degradation policy" that are especially protective of waters with high quality. Porter-Cologne reserves the right for the State of California to regulate activities that could affect the quantity or quality of surface or ground waters, including isolated wetlands, within the state. Waters of the state include isolated waters that are no longer regulated by USACE. If the project is proposed to discharge into waters of the state, a waste discharge report must be filed.

2.1.3 Local

2.1.3.1 Kern County General Plan

The Land Use, Open Space, and Conservation Element of the *Kern County General Plan* (2009) provides direction for future growth in the unincorporated areas of Kern County and identifies the federal, state, and local statutes, ordinances, or policies that govern the conservation of biological resources that must be considered by the County during the decision-making process for any project that could affect biological resources. Section 1.10, *General Provisions of the Land Use, Open Space, and Conservation Element*, provides the goals, policies, and implementation measures that typically apply to discretionary projects. These are summarized as follows.

Land Use, Open Space, and Conservation Element

General Provision 1.10.5, Threatened and Endangered Species

- **Policy 27**: Threatened or endangered plant and wildlife species should be protected in accordance with state and federal laws. The County should work closely with state and federal agencies to assure that discretionary projects avoid or minimize impacts on fish, wildlife, and botanical resources.
- **Policy 28**: The County should work closely with state and federal agencies to assure that discretionary projects avoid or minimize impacts on fish, wildlife, and botanical resources.
- **Policy 29**: The County will seek cooperative efforts with local, state, and federal agencies to protect listed threatened and endangered plant and wildlife species through the use of conservation plans and other methods promoting management and conservation of habitat lands.
- **Policy 30**: The County will promote public awareness of endangered species laws to help educate property owners and the development community of local, state, and federal programs concerning endangered species conservation issues.
- **Policy 31**: Under the provisions of CEQA, the County, as lead agency, will solicit comments from CDFW and USFWS when an environmental document (e.g., Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report) is prepared.
- **Policy 32**: Riparian areas will be managed in accordance with USACE and CDFW rules and regulations to enhance the drainage, flood control, biological, recreational, and other beneficial uses while acknowledging existing land use patterns.
- **Implementation Measure Q**: Discretionary projects shall consider effects to biological resources as required by CEQA.
- **Implementation Measure R**: Consult and consider the comments from responsible and trustee wildlife agencies when reviewing a discretionary project subject to CEQA.
- **Implementation Measure S**: Pursue the development and implementation of conservation programs with state and federal wildlife agencies for property owners desiring streamlined endangered species mitigation programs.

Willow Springs Specific Plan

The southern half of the proposed project occurs within the Willow Springs Specific Plan area.

The Willow Springs Specific Plan, adopted in 1992 and amended in 2008, is part of the Land Use, Open Space, and Conservation Element of the *Kern County General Plan*. Its goals, policies, and standards are compatible with those of the General Plan, but are tailored to the particular needs of the expanded Willow Springs area. The purpose of the Willow Springs Specific Plan is to define the planning requirements of a designated area to ensure orderly development (Kern County 2008).

The Willow Springs Specific Plan includes the following policies related to biological resources:

- Where possible, development shall be designed to avoid displacement of sensitive species.
- Focused surveys shall be conducted by a County-approved biologist to establish the presence or absence of sensitive species.

- Initial development within the area covered under the Willow Springs Specific Plan, when possible, will be directed towards previously impacted areas.
- Joshua trees (*Yucca brevifolia*) are designated as sensitive resources under the Willow Springs Specific Plan and must be avoided where possible. Where avoidance is not possible, each parcel containing Joshua trees to be impacted must have a Joshua Tree Preservation or Transportation Plan to be reviewed and approved by the Kern County Agricultural Commissioner's Office prior to grading permit issuance.

Compliance with the policies described in the Willow Springs Specific Plan was considered in the evaluation of the proposed project. Because western Joshua tree is now a candidate species under CESA, compliance with CESA would be required, in addition to the policies detailed in the Willow Springs Specific Plan.

Energy Element

Section 5.4.5 of the General Plan's Energy Element (Chapter 5) encourages the development of commercial solar energy within the county:

- The County shall encourage domestic and commercial solar energy uses to conserve fossil fuel and improve air quality.
- The County should attempt to identify and remove disincentives to domestic and commercial solar energy development.
- 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.
- The County should encourage solar development in the desert and valley regions previously disturbed, and discourage development of energy projects on undisturbed land supporting state or federally protected plant and wildlife species.

Section 5.4.7 of the General Plan's Energy Element (Chapter 5) encourages the development of transmission lines in urban areas to limit impacts and identifies the following policies with respect to transmission line development:

- The County should encourage the development and upgrading of transmission lines and associated facilities (e.g., substations) as needed to serve Kern County's residents and access the County's generating resources, insofar as transmission lines do not create significant environmental or public health and safety hazards.
- The County shall review all proposed transmission lines and their alignments for conformity with the Land Use, Conservation, and Open Space Element of this General Plan.
- In reviewing proposals for new transmission lines or capacity, the County should assert a preference for upgrade of existing lines and use of existing corridors where feasible.
- The County should work with other agencies in establishing routes for proposed transmission lines.
- The County should discourage the siting of above-ground transmission lines in visually sensitive areas.
- The County should encourage new transmission lines to be sited/configured to avoid or minimize collision and electrocution hazards to raptors.

Other Preserve Lands

A review of existing land use plans and maps did not identify any preserve lands in the project area.

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Chapter 3
Methods

3.1 Report Terminology and Project Survey Area

A biological study area (BSA) consists of the area that was surveyed for biological resources within the Bullhead Study Area (i.e., the project limits of disturbance) and a 500-foot buffer. Buffers are used to provide context for the resources identified within the BSA, address potential indirect effects, and allow revisions to the project while maintaining an adequate representation of the biological resources present. The 500-foot BSA was used for vegetation mapping, burrowing owl (*Athene cunicularia*) surveys, desert kit fox (*Vulpes macrotis arsipus*), American badger (*Taxidea taxus*) burrow surveys, and surveys for desert tortoise (*Gopherus agassizii*). Two other biological resource study areas were created based on buffers applied around the limits of disturbance, and are defined as follows: (1) Raptor and Raven Nest Study Area: a 5-mile buffer was used for Swainson's hawk (*Buteo swainsonii*), raptor, and common raven (*Corvus corax*) nest surveys; and (2) Rare Plant Study Area: a 50-foot buffer was used for Joshua tree, protected desert cacti, and special-status plant species mapping (Appendix A, Figure 7, *Project Components & Raptor and Raven Study Area*, and Figure 8, *Project Components & Biological & Rare Plant Study Areas*).

The terms *project*, *proposed project*, *project footprint*, and *project limits of disturbance* in this report are synonymous and represent the area proposed for direct impact from construction of the solar field and gen-tie lines as well as access roads, staging areas, and storage areas. The term *Bullhead Study Area* refers to the main facility area that is proposed for solar development (e.g., solar panels, battery storage, microwave/ communication tower, substation, inverters, converters, generators, foundations, transformers) and excludes the linear stretches of the project (i.e., gen-tie lines and access roads). For this report, *region* is defined as areas depicted on the quad maps that include the Swainson's Hawk Study Area, BSA, or Rare Plant Study Area.

3.2 Literature Review

Prior to conducting field surveys, ICF conducted a literature and records search for information on special-status species occurrences within the BSA. The following databases and resources were reviewed for occurrences within the region:

- California Natural Diversity Database (CNDDB) (CDFW 2021) element occurrences for the Del Sur quad map and surrounding eight quads
- The CDFW Sensitive Natural Communities List (CDFW 2020)
- CNPS Online Inventory of Rare and Endangered Plants, eighth edition (CNPS 2021a), for the Del Sur quad map and surrounding eight quads
- Calflora: Information on California Plants for Conservation, Education, and Research (Calflora 2021)
- USFWS Critical Habitat for Threatened and Endangered Species online mapper (USFWS 2020)

- National Wetlands Inventory database (USFWS 2021b)
- USGS quad maps of the study area and vicinity (USGS 2021)
- U.S. Department of Agriculture, Natural Resources Conservation Service Soil Survey maps (USDA-NRCS 2021)
- The Cornell Lab of Ornithology's eBird database (eBird 2021)
- Consortium of California Herbaria (CCH 2021)
- Biological resource reports for nearby renewable energy projects in Kern County:
  - RE Garland LLC Solar Project (Rincon 2014)
  - Valentine Solar Project (SWCA 2015)
  - Pacific Wind Energy Project (Sapphos 2009)
  - Catalina Renewable Energy Project (Sapphos 2011)
  - RE Kern County Desert Solar Projects (Rincon 2011)
  - Camino Solar Project (SWCA 2018)
  - Rosamond Solar Modification Project (Ecology and Environment, Inc. 2016)
  - Antelope Valley Solar Project (AECOM 2010)
  - Raceway Solar Project (Ecology and Environment, Inc. 2018)
  - EDFR BigBeau Solar Project (ICF 2018).

For the purposes of this report, species are considered to have special status if they meet at least one of the following criteria:

- Species listed or proposed for listing as threatened or endangered under FESA (50 CFR 17.12 [listed plants]; 50 CFR 17.11 [listed animals]) or in various notices of the Federal Register (proposed species), as well as those species that are candidates for possible future listing as threatened or endangered under FESA (79 *Federal Register* 72450, December 5, 2014)
- Species listed or proposed for listing by the State of California as threatened or endangered under CESA (14 CCR 670.5)
- Plant species listed as rare under the California Native Plant Protection Act (CFGC 1900, *et seq*.)
- Species that meet the definitions of rare or endangered under CEQA (§§ 15380 and 15125)
- Wildlife CDFW has designated SSC
- Wildlife species that are fully protected in California (CFGC §§ 3511 [birds], 4700 [mammals], 5050 [amphibians and reptiles], and 5515 [fish])
- Species listed as having a CRPR of 1A (presumed extinct in California), 1B (rare, threatened, and endangered in California and elsewhere), 2 (rare, threatened, or endangered in California, but more common elsewhere), 3 (plants for which more information is needed [a review list]), or 4 (plants of limited distribution [watch list]) (CNPS 2021b). CRPR List 1A, 1B, 2, and 3 species meet the definition of rare or endangered in CEQA Section 15380. Many CRPR 4 species do not meet the same definitions of special-status plants, but are strongly recommended for

consideration under CEQA (CNPS 2021b). This may be particularly appropriate for populations at the periphery of a specie's range, areas where the taxon is especially uncommon, areas where the taxon has suffered heavy losses, and populations exhibiting unusual morphology.

Other sensitive species and conservation lands covered under the following were also considered in this report:

- Native desert plants that are protected under the CDNPA (California Food and Agriculture Code, §§ 80001–80006, Division 23), including all species in the agave and cactus families. This act was taken into consideration in this report because of the presence of cacti that are growing on the project site, in order to provide guidance to the applicant regarding the removal of cacti in support of the project and the potential harvesting of the subject species. Joshua trees are now a candidate for state listing and may not be removed through the CDNPA process.
- Species and open lands that are identified in the *Kern County General Plan* (Kern County 2009) and the Willow Springs Specific Plan (Kern County 2008).

The results of the literature review were compiled into a list of potentially occurring special-status plant and wildlife species, and each species was analyzed for its potential to occur within the BSA. Table 3-1 describes the criteria used for this evaluation; the results of the determinations are provided in Appendix B.

Table 3-1. Criteria for Evaluating Special-Status Species Potential to Occur

Potential	Criteria
Not Expected to Occur	Species is restricted to habitats or environmental conditions that do not occur within the study area, or a plant was not observed during focused rare plant surveys that would have been observed if present in the study area (i.e., a conspicuous perennial, shrub, or tree). This includes species that are considered by experts to have been extirpated in the region.
Low	Records for this species exist within 5 miles of the BSA, but the habitats or environmental conditions needed to support the species do not exist or are very limited, isolated, or highly disturbed within the BSA. Low potential to occur may also be used when species records are very old (pre-1980s), regardless of habitat conditions within the BSA. For special-status plants, low potential may also be used when the plant was not observed during focused rare plant surveys, and its lack of detectability may be due to environmental limitations such as drought or annual variability in germination (e.g., bulbiferous perennials, annuals).
Moderate	The study area is within the range of the species and contains potentially appropriate habitat. Records for this species exist within 1–5 miles of the BSA; however, habitats or environmental conditions needed to support the species are limited within the BSA. Species records indicate few previously documented occurrences within 1 mile of the BSA.
High	The study area is known to be within the range of the species and contains potential habitat with a high likelihood of occupancy. This category includes locally common sensitive animal species known from the region, but not observed during surveys. Depending on regulatory status, local rarity, extent of habitat on the study area, and the nature of potential project impacts, a substantial basis may exist for either conducting focused surveys for the species or for assuming current or future presence. Records for this species exist within 1 mile of the BSA, and habitats or environmental conditions needed to support the species exist within the BSA. Species records indicate previously documented occurrences within 1 mile of the BSA.

Potential	Criteria
Present	Species was detected within or near the BSA during project surveys.

3.3 Survey Methods

The following subsections describe the methodology for the general biological resource surveys, habitat assessments, and focused and protocol surveys. Based on the results from the literature review, protocol surveys were deemed necessary to determine the presence or absence of the following special-status species within the BSA: desert tortoise, Mohave ground squirrel (MGS; *Xerospermophilus mohavensis*), Swainson's hawk, and burrowing owl. In addition, the following were performed: vegetation mapping; Joshua tree, protected cacti, and yucca species inventory; special-status plant species habitat assessment; raptor and raven nest surveys; desert kit fox and American badger burrow mapping, and incidental (not any of the above-listed species) special-status wildlife documentation. Survey dates and personnel are provided below in Table 3-2.

Table 3-2. Biological Survey Personnel and Dates

Survey Type	Survey Dates	Survey Personnel
Vegetation Mapping and Rare Plant Habitat Assessment	4/19–21/2021; 6/8–11/2021	S. Johnston, C. Winchell
Burrowing Owl Survey 1; Desert Tortoise; Desert Kit Fox and American Badger Burrow Mapping; Protected Joshua Tree, Cacti, and Yucca Mapping	2/15–19/2021; 4/2–3/2021; 4/5–9/2021; 4/12–16/2021; 4/19–26/2021	K. Bender, B. Cropper, B. Haley, S. Johnston, K. Klinefelter, W. Kohn, R. Layden, L. Magee, K. Martinusen, M. Paymard, B. Payne, A. Rachman, P. Richards, J. Russell, B. Smith, D. Wong [1]
Burrowing Owl Survey 2	5/9–12/2021	K. Bender, K. Martinusen, N. Sutter
Burrowing Owl Survey 3	6/6–9/2021	M. Gilstrap, K. Martinusen, A. Rachman
Burrowing Owl Survey 4	7/6–9/2021	K. Dix, K. Martinusen, A. Rachman
MGS Trapping (Session 1)	3/25–29/2021; 3/30–4/6/2021; 4/26–30/2021	P. Brylski and C. Randel
MGS Trapping (Session 2) and Camera Study	5/12–29/2021	P. Brylski and C. Randel
MGS Trapping (Session 3)	6/24–28/2021; 7/1–14/2021	P. Brylski and C. Randel
Swainson's Hawk, Raptor and Common Raven Nest Surveys (Survey Period II)	4/5–7/2021; 4/11–13/2021; 4/21–23/2021;	P. Bloom, K. Ross
Swainson's Hawk, Raptor and Common Raven Nest Surveys (Survey Period III)	5/3–5/2021; 5/13–15/2021; 5/23–25/2021;	P. Bloom, K. Ross
Swainson's Hawk, Raptor and Common Raven Nest Surveys (Survey Period IV)	6/7–9/2021; 6/27–29/2021; 7/12–14/2021	P. Bloom, K. Ross

Survey Type	Survey Dates	Survey Personnel
Rare Plant Surveys	3/26-4/1/2022; 5/9-11/2022	S. Johnston, C. Winchell, B. Cropper, A. Fowler

[1] Not all staff were present at all dates shown.

3.3.1 Vegetation Communities and Habitat Assessments

Specific information for the BSA was developed in part through general reconnaissance field evaluations. Habitat evaluations for special-status species and biological resources were conducted by biologists familiar with species habitat requirements. This reconnaissance allowed the biologists to determine which focused evaluations and surveys were required. Surveys were conducted on foot, along with the aid of high-resolution aerial maps (1:200 scale). The BSA for this work was the limits of disturbance and a 500-foot buffer (Appendix A, Figure 8).

Vegetation communities were mapped within the BSA in April and June 2021 and revised in March and May 2022 (Table 3-2). Vegetation community classification followed the *Manual of California Vegetation* (Sawyer et al. 2008); any deviations from standard vegetation classifications were made on best professional judgement when areas did not fit into a specific habitat description that Sawyer et al. (2008) provided. The vegetation communities present within the BSA were mapped using a minimum mapping unit of 0.25 acre. Photos of vegetation communities were taken during field surveys and are provided in Appendix C.

Plants were identified to the lowest taxonomic level for determining whether the plant species observed was invasive, nonnative, native, or special-status. Plants of uncertain identity were subsequently identified from taxonomic keys (Baldwin et al. 2012). Scientific and common species names were recorded according to Baldwin et al. (2012).

All plant and wildlife species observed during field surveys in the BSA were recorded. The presence of a wildlife species was determined through direct observation or wildlife sign (e.g., tracks, burrows, nests, scat, vocalization). Field guides were used to assist with identification of species during surveys and included the *National Geographic Field Guide to the Birds of North America* (National Geographic 2011), *Western Reptiles and Amphibians* (Stebbins 2003), and *A Field Guide to the Mammals of North America* (Reid 2006). All plant and wildlife species observed are included in Appendices D-1 and D-2, respectively.

3.3.2 Special-Status Plant Habitat Assessment and Focused Surveys

A literature review was conducted to evaluate the environmental setting of the rare plant study area (RPSA) prior to conducting the habitat assessment and identify special-status plant species and suitable habitats for special-status plant species that may be found within the RPSA. Suitable habitat was determined by analyzing the relationship between soil types, vegetation communities, and the history of disturbance adjacent to the project. Determinations of the presence of suitable habitat for special-status plants were based on the species' natural life history requirements, which included hydrology, existing habitat, tolerance to disturbance, elevation range, soil types, current land uses, and disturbances.

Focused rare plant surveys were planned in accordance with survey protocols set forth by *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and*

Candidate Plants (USFWS 2000), *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (CDFW 2018and *CNPS Botanical Survey Guidelines* (CNPS 2001). Based on information obtained through the literature review and reconnaissance surveys, surveys for special-status plants were deemed necessary. All suitable habitat within the project limits of disturbance plus a 50-foot buffer (i.e., RPSA) was evaluated (Appendix A, Figure 8). These protocols require that field conditions and prior-winter rainfall to be of average or above-average conditions such that the likelihood of special-status plants being visible to surveyors is high.

Because of drought conditions leading up to the 2021 spring season, focused rare plant surveys were postponed for 2021. Rather, a detailed special-status plant habitat assessment was performed throughout the RPSA in April and June 2021 during typical blooming season for all special-status plant species potentially occurring within the RPSA that require flowers for identification. The assessment was completed through a combination of driving and walking meandering transects throughout suitable habitat, when necessary. Where possible, reference populations were visited for the target species. The surveyors targeted unique portions of the RPSA where microhabitats had an increased potential to support special-status species.

Late-season rains and mild temperatures through March and April 2022 provided suitable conditions to conduct focused, protocol special-status plant surveys within the RPSA. Focused, protocol special-status plant surveys were performed in March and May 2022 in the RPSA. Reference populations were visited for each of the species known from the vicinity of the Project or species determined to have suitable habitat within the RPSA during the 2021 habitat assessment. These species included: alkali mariposa lily (*Calochortus striatus*), Kern County evening primrose (*Camissonia kernensis* ssp. *kernensis*), white pygmy poppy (*Canbya candida*), Mojave paintbrush (*Castilleja plagiotoma*), Mojave spineflower (*Chorizanthe spinosa*), recurved larkspur (*Delphinium recurvatum*), Rosamond eriastrum (*Eriastrum rosamondense*), golden goodmania (*Goodmania luteola*), Latimer's woodland gilia (*Saltugilia latimeri*), and Lemon's syntrichopappus (*Syntrichopappus lemmonii*). The suitable habitat mapping from 2021 was refined during the 2022 focused special-status plant surveys.

The location of special-status plants and suitable habitats were mapped with a hand-held global positioning system (GPS) unit with submeter accuracy. Subsequent to the field survey, data were downloaded from the GPS unit, post-processed, and brought into a geographic information system (GIS) for analysis.

3.3.3 Joshua Tree, Protected Cactus, and Yucca Species Mapping

ICF conducted surveys for plant species protected by CESA (western Joshua tree) and CDNPA (e.g., cactus, yucca) and individually mapped and cataloged all occurrences of these plants within the RPSA to provide the data that would ultimately be used to obtain the Incidental Take Permit (if Joshua tree remains a candidate species or is formally adopted as a threatened species at time of permitting) and Desert Native Harvest Permit. Surveys were conducted concurrently with the desert tortoise and burrowing owl protocol surveys, as shown in Table 3-2. The RPSA for this work was the project limits of disturbance, plus a 50-foot buffer around the permanent impact areas (Appendix A, Figure 8).

The Joshua tree survey methodology was based in part on the BigBeau Solar Project Section 2084 and the CGFC Emergency Statement (EDFR Personal Communication). Joshua trees were categorized by three different size classes (Table 3-3). Other attributes, such as number of trunks, number of branches, number of pups, and overall health, as well as photos (Appendix C), were recorded for each Joshua tree. No Joshua trees, cacti, or yucca species were recorded more than 50 feet from the impact boundaries. No official guidance for conducting Joshua tree surveys for purposes of impact analysis has been provided by CDFW. Therefore, these methods were developed using the best available information at the time of conducting the field surveys (April 2021). Future guidance from CDFW could change what information is collected per tree if the species is formally adopted as a threatened species under CESA or as more information becomes available. Similar information was recorded for protected cacti and yucca species.

Table 3-3. Joshua Tree Height Classes

Joshua Tree Height Classes
0–1 meter (0–3 feet)
1–5 meters (3–16 feet)
>5 meters (>16 feet)

3.3.4 Desert Tortoise Protocol Surveys

Due to the presence of suitable habitat for desert tortoise, presence/absence protocol surveys were conducted in accordance with the *USFWS Preparing for Any Action that May Occur Within the Range of the Mojave Desert Tortoise* (USFWS 2019). Surveys occurred within native habitat areas during periods when tortoises are most active (between either April–May or September–October and when air temperature at 5 centimeters above the ground is below 95 degrees Fahrenheit (°F). USFWS uses the term *action area* to define areas to be affected directly or indirectly by the action (or project) and not merely the immediate area involved in the action. In the case of the gen-tie options and access roads (i.e., linear projects), *action area* is defined as the right-of-way and the adjacent areas on both sides of the right-of-way where tortoises may be moved from harm's way during implementation of the project. The action area for the Bullhead Study Area, gen-tie options, and access roads was determined to be the same as the BSA (i.e., 500-foot buffer around impact boundaries).

Within the Bullhead BSA, transect centerlines were spaced 10 meters apart, thereby obtaining 100 percent survey coverage of the action area in areas of suitable habitat. Using the Linear Project Survey methodology for the linear project components (gen-tie options and access roads), at least one 10-meter wide belt transect was surveyed for every 100 meters of the width of the action area or portion thereof. The action areas for the gen-tie options and access roads were defined as the *permanent impact area* (125 foot [38 meters] for gen-tie options and 50-foot [15 meters] for roads), plus a 500-foot (150-meter) buffer off edge-of-impact boundaries. Therefore, the gen-tie options action areas were 1,125 feet (343 meters) wide, and the access roads proposed for improvement were 1,050 feet (320 meters) wide, both requiring a minimum of four transects in the action area each. Because the desert tortoise surveys were conducted simultaneously with the burrowing owl surveys, which require transects spaced 66 feet (20 meters) apart throughout the BSA, 17 transects for gen-tie options and 16 transects for access roads were surveyed for desert tortoise. Desert tortoise surveys were not conducted for the access roads not proposed for improvement (i.e., 140th Street West and Tehachapi Willow Springs Road) nor for the AVTL section, where no desert tortoise habitat is proposed for potential impacts. During all surveys, biologists qualified to detect and identify desert tortoise sign conducted the surveys (Table 3-4).

A single round of protocol surveys was conducted for the BSA over 17 separate days between April 5 and April 26, 2021 (Table 3-4). Survey personnel walked transects 33 feet (10 meters) apart through the entire Bullhead BSA and spaced 66 feet (20 meters) throughout the gen-tie options and access road BSAs. Portions of the surveyed area were developed and restricted from survey access, including private property such as single-family residences, solar and wind facilities. These areas were surveyed from accessible property boundaries using binoculars to the greatest extent feasible. Air temperature was measured at approximately 5 centimeters from the soil surface in an area of full sun, but in the shade of the observer, per protocol survey guidelines (USFWS 2019). Survey dates, times, and weather conditions during the desert tortoise protocol surveys are shown in Table 3-4.

Table 3-4. Survey Dates, Times, and Conditions for the Desert Tortoise Protocol Surveys

Date	Time	Weather Conditions
4/5/2021	0630–1700	58°F–82°F air, winds 0–12 mph, 0%–25% cloud cover
4/6/2021	0630–1700	53°F–82°F air, winds 0–10 mph, 0% cloud cover
4/7/2021	0630–1700	53°F–86°F air, winds 0–12 mph, 0% cloud cover
4/8/2021	0630–1700	54°F–76°F air, winds 0–14 mph, 15% cloud cover
4/9/2021	0630–1700	56°F–85°F air, winds 0–10 mph, 0% to 8% cloud cover
4/12/2021	0620–1700	44°F–84°F air, winds 0–13 mph, 0–25% cloud cover
4/13/2021	0630–1700	49°F–72°F air, winds 0–12 mph, 0–25% cloud cover
4/14/2021	0700–1830	47°F–63°F air, winds 0–14 mph, 0% cloud cover
4/15/2021	0700–1715	43°F–76°F air, winds 0–13 mph, 0% cloud cover
4/16/2021	0630–1300	42°F–77°F air, winds 0–3 mph, 0% cloud cover
4/19/2021	0600–1500	55°F–83°F air, winds 0–3 mph, 0% cloud cover
4/20/2021	0630–1530	60°F–83°F air, winds 0–14 mph, 2% cloud cover
4/21/2021	0600–1500	62°F–66°F air, winds 10–19 mph, 0–5% cloud cover
4/22/2021	0600–1600	50°F–77°F air, winds 2–5 mph, 1% cloud cover
4/23/2021	0600–1300	52°F–77°F air, winds 0–3 mph, 1% cloud cover
4/25/2021	1545–1730	60°F–65°F air, winds 12 mph, 100% cloud cover
4/26/2021	0600–1500	45°F–63°F air, winds 16–21 mph, 10% cloud cover

mph = miles per hour

3.3.5 Mohave Ground Squirrel Protocol Trapping and Camera Surveys and Nocturnal Small Mammal Trapping

Although the Bullhead Study Area, gen-tie options, and access roads are more than 5 miles west of the currently documented range of the Mohave Ground Squirrel (MGS), and CDFW (2019) stated that the western Antelope Valley is not currently occupied by MGS, there is still suitable habitat present within the BSA. Therefore, a habitat assessment and live-trapping (protocol) surveys, as well as a camera trapping study, were conducted for MGS within the Bullhead Study Area. Aside from trapping beyond the currently documented range of the species, survey methods conformed to guidelines prepared by CDFW (CDFW 2009[1]),). As described in CDFW's *Mohave Ground Squirrel Survey Guidelines* (CDFW 2009; minor process and contact changes in July 2010), for projects larger than 180 acres or linear projects greater than 5 miles in length, CDFW requires special survey protocol(s) to be developed through consultation with either the applicant or the lead agency (i.e., Kern County). ICF prepared and submitted a proposed MGS trapping work plan to CDFW Region 4 representatives via email on March 10, 2021, and requested input. A follow-up notification was made on March 19, 2021, informing CDFW that trapping may begin prior to their review of the trapping work plan. Mr. Craig Bailey acknowledged the notification and offered a meeting with his team on April 13, 2021. During the meeting, CDFW Region 4 representatives Carrie Swanberg and Craig Bailey would neither approve nor deny the contents of the trapping work plan, but additional cameras were requested in areas that did not have a trapping grid in close proximity. ICF subsequently prepared and submitted an MGS camera work plan to CDFW via email on April 16, 2021. A follow-up email was sent on April 21, 2021, informing CDFW that ICF would proceed according to the work plans unless input from CDFW was received by April 23, 2021. That same day, Mr. Bailey responded that CDFW could not make any final comments or confirm they would concur with the results should ICF and EDFR proceed according to the submitted trapping and camera work plans. Documentation of correspondence with CDFW regarding the trapping and camera work plans is provided in Appendix E-1, the MGS trapping work plan in Appendix E-2, and the MGS camera work plan in Appendix E-3.

Nocturnal small mammal trapping was also conducted within the Bullhead Study Area concurrent with MGS trapping and camera efforts in order to inventory nocturnal small mammals present. Concurrent with MGS (diurnal species) trapping, traps were left open between dusk and dawn within the Bullhead Study Area.

3.3.5.1 MGS Habitat Assessment

A habitat assessment for MGS was conducted within the Bullhead Study Area on March 16 and 17, 2021, by MGS biologist Phil Brylski. As part of the habitat assessment, soil, vegetation, topographic, and disturbance features were assessed for the suitability of habitat for MGS. Under the current survey guidelines (CDFW 2012), potential habitat is defined as "land supporting desert shrub vegetation within or adjacent to the geographic range of the species." Based on CDFW guidelines for this species, any open land within the historical range of the species triggers the need for a focused survey. In addition, records examined included the CNDDB (CDFW 2021), range maps for this species, and Dr. Philip Leitner's database of trapping records (both positive and negative; Leitner 2014).

3.3.5.2 MGS Protocol Surveys

Live trapping sessions for MGS were conducted by Dr. Phillip Brylski and C. J. Randel, both of whom possess a Memorandum of Understanding from CDFW to trap and handle MGS. Four 100-trap grids were established within the approximately 844-acre area of suitable habitat in the Bullhead Study Area (Appendix A, Figure 8). Per the CDFW survey protocol (CDFW 2009), three live trapping sessions performed over 5 consecutive days were conducted for each trapping grid (for a total of 12

[1] As of January 1, 2013, the California Department of Fish and Game (DFG or CDFG) became the California Department of Fish and Wildlife (CDFW). Please note that references to CDFG or DFG in previously referenced documents are references to CDFW.

trapping sessions). Trapping was conducted between March 25 and July 14, 2021 (Table 3-2 and Table 3-5). Traps were closed during rain events and whenever the ambient air temperature in the shade 1 foot (0.3 meter) above the ground exceeded 90°F. The *Mohave Ground Squirrel Survey Reports* for the project, including a full description of the methodology and survey conditions, are provided in Appendix E-4 (Grids 1–2) and Appendix E-5 (Grids 3–4).

Table 3-5. Mohave Ground Squirrel Trapping Dates

Grid, Surveyor	Session 1	Session 2	Session 3
Grid 1, C. Randel	3/25–29/2021	5/16–20/2021	7/10-14/2021
Grid 2, C. Randel	3/30–4/3/2021	5/21–25/2021	7/5-9/2021
Grid 3, P. Brylski	4/2–6/2021	5/12–16/2021	7/1–5/2021
Grid 4, P. Brylski	4/26–30/2021	5/25–29/2021	6/24–28/2021

3.3.5.3 MGS Camera Study

At the request of CDFW and to supplement the live trapping being performed at four grids throughout the suitable habitat within the Bullhead Study Area, 15 game cameras were deployed. The game cameras were set up and operated according to a draft document titled *Use of Camera Traps in Mohave Ground Squirrel Studies* (Delaney et al. 2017). These guidelines are still considered draft and have not been formally incorporated into the MGS trapping protocol (CDFG 2012). The MGS trapping work plan submitted on March 10, 2021 (Appendix E-2), included correspondence with Dr. Scott Osborn (CDFW's statewide small mammal coordinator) confirming that the use of game cameras is not required for the 2021 trapping season.

The draft guidelines recommend 10 cameras per 160 acres, spaced 254 meters (833 feet) apart. Given this approach, there could be up to 20 cameras in the western area of Bullhead Study Area. However, due to the irregular shape of the project and presence of unsuitable or disturbed habitat in the center, 12 cameras were deployed in this area (#1–12). An additional three cameras were deployed on the eastern end of the Bullhead Study Area (#13–15). In addition, as part of the Lake and Streambed Alteration Agreement for BigBeau Solar Project, EDFR conducted MGS camera trapping in April 2020 near some of the same areas as #1–12. The camera specifications and operating parameters met those described in the 2017 draft guidelines (provided as an Attachment to Appendix E-3). Specifically, bait was present every day, and the camera was operated between dawn and dusk. The guidelines state to operate the cameras for two 5 full-day sessions between March 15 and May 15. The cameras were installed and or overseen by Dr. Brylski while conducting the live trapping. The cameras were deployed between May 12 and 16 (Session 1) and between May 25 and May 29 (Session 2). Due to the late addition of camera use to the study design, camera work extended until May 29, 2021.

3.3.5.4 Nocturnal Small Mammal Trapping

Live trapping sessions for nocturnal small mammals were conducted by Dr. Phillip Brylski and C. J. Randel. Methods generally follow those described for MGS in Section 3.3.5.2, *MGS Protocol Surveys*. The same traps located within the four established MGS grids were used (Appendix A, Figure 8). There is no established protocol for non-target species-specific nocturnal small mammal trapping. The only difference between trapping methodologies was that the traps were checked and animals released once during each evening, and two live trapping sessions performed over 3 consecutive nights were conducted for each trapping grid (for a total of eight trapping sessions). Trapping was conducted between March 25 and May 29, 2021 (Table 3-2 and Table 3-5). Traps were closed during rain or high-wind events and whenever the ambient air temperature in the shade 1 foot (0.3 meter) above the ground exceeded 90°F. The *Mohave Ground Squirrel Survey Reports* for the project, including a full description of the methodology and survey conditions, are provided in Appendix E-4 (Grids 1–2) and Appendix E-5 (Grids 3–4).

3.3.6 Swainson's Hawk Protocol Surveys

Because of the presence of suitable nesting habitat within 5 miles of the BSA, protocol surveys were conducted for Swainson's hawk, in accordance with the *Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties* (CEC and CDFW Guidance; CEC and CDFW 2010).

Surveys were conducted by Bloom Biological, Inc. (BBI) zoologist Peter H. Bloom and BBI biologist Kerry Ross from April 5, 2021, to July 14, 2021, for a total of 27 person/days of surveys Survey dates for the Swainson's hawk protocol surveys are provided in Table 3-6. As specified by the CEC and CDFW Guidance, surveys were conducted during the minimum three survey periods between April 1 and July 15, with three complete surveys per period, each consisting of 3 person/days. Surveys were completed by driving slowly on roads through suitable habitat in the Study Area, while searching for Swainson's hawks and their nests, using the vehicle as a "blind" to minimize disturbance to any hawks detected. Detailed survey methodology can be found in the *Bullhead Solar Project's Swainson's Hawk, Raptor, and Raven Nest Surveys Final 2021 Survey Report* (Appendix F).

Table 3-6. Swainson's Hawk, Raptor, and Raven Nest Survey Dates

Survey Period II April 1–April 30	Survey Period III May 1–May 30	Survey Period IV June 1–July 15
4/5/2021, 4/6/2021, 4/7/2021	5/3/2021, 5/4/2021, 5/5/2021	6/7/2021, 6/8/2021, 6/9/2021
4/11/2021, 4/12/2021, 4/13/2021	5/13/2021, 5/14/2021, 5/15/2021	6/27/2021, 6/28/2021, 6/29/2021
4/21/2021, 4/22/2021, 4/23/2021	5/23/2021, 5/24/2021, 5/25/2021	7/12/2021, 7/13/2021, 7/14/2021

Swainson's hawk surveys were conducted in accessible suitable habitat inside the Raptor and Raven Nests Study Area, defined as the Bullhead Study Area, gen-tie options, and all areas within 5 miles (Appendix A, Figure 7). Suitable nesting habitat for Swainson's hawks in the Nests Study Area was defined generally as low-growing agricultural areas, fallow agricultural fields, native desert scrub bordered by or containing suitable nesting trees, and Joshua tree woodland. Surveys for all other nesting raptors and ravens were conducted simultaneously, expanding the potential nesting habitat to include all suitable nest trees and structures throughout the Nests Study Area (i.e., utility poles and towers, buildings, rocks, cliffs).

The Raptor and Raven Nests Study Area was divided into six quadrants; biologists systematically surveyed each quadrant, approximately two quadrants per day, before moving on to the next. The intent of this was to ensure full coverage of the Raptor and Raven Nests Study Area. Observers intensively checked suitable arboreal habitat throughout the entire BSA over the first three surveys. Each tree was examined from all available angles for any visible nests, and GPS points were recorded at each nest that was identified, including those that were determined to be possibly occupied or were confirmed to be occupied by other species, such as common raven or other raptors. In addition to searching the Raptor and Raven Nests Study Area for Swainson's hawk nests, historic nest sites from the literature review (i.e., the CNDDB) were also visited and checked for updated conditions and use. Lastly, observers scanned for perched or soaring raptors while driving through the BSA so that they could further understand the locations of Swainson's hawk territories.

3.3.7 Burrowing Owl Protocol Surveys

Because of the presence of suitable habitat within the BSA, a habitat assessment and protocol surveys were conducted for burrowing owls, in accordance with the *CDFG Staff Report on Burrowing Owl Mitigation* (CDFG 2012), with some modifications (see below).

3.3.7.1 Habitat Assessment

An evaluation of the project limits of disturbance, plus a 500-foot buffer, was performed to identify suitable habitat for burrowing owl within the BSA (Appendix A, Figure 8). The habitat assessment is referred to as Survey 1. Portions of the habitat assessment were performed concurrently with desert tortoise surveys (see Table 3-2). In areas where desert tortoise habitat overlapped with burrowing owl habitat within the Bullhead Study Area and 500-foot buffer, transects were spaced 10-meters apart (spacing for desert tortoise transects) to ensure that all burrows were detected. In all other areas of the Bullhead Study Area, linear components (i.e., gen-tie options and access roads), and 500-foot buffer, transects were spaced 20-meters apart (spacing for burrowing owl surveys) to ensure that all burrows were detected. As burrows were encountered, they were inspected for any burrowing owl sign (e.g., tracks, pellets, white-wash, feathers, prey parts). The location of all potential burrows or burrow complexes was recorded and mapped as GPS point locations. Surveys were performed during the timeframes specified in CDFW (2012) (Dawn to 10:00 a.m. or 2 hours before sunset until dusk). While desert tortoise surveys continued after 10:00 a.m., so did burrow mapping. If potential burrows were identified outside of the protocol timeframes, the burrows were revisited during the appropriate timeframes on a subsequent day.

3.3.7.2 Protocol Surveys

Protocol surveys for burrowing owl were then performed in areas determined to be potentially suitable habitat. These protocol surveys are referred to as Surveys 2, 3, and 4. Because burrowing owls require suitable burrows to live in year-round, only those areas with suitable burrows were considered to provide suitable habitat. Areas that did not contain any burrows, or burrows that would be suitable for owls to live in, were excluded from future surveys. Burrows within the BSA that were identified as suitable were each given an individual 500-foot buffer. These suitable burrows and 500-foot buffers comprised the final burrowing owl survey area and were revisited during focused protocol surveys. Transects were walked through all areas within 500 feet of a suitable burrow. Each suitable burrow was also checked during each survey for any sign of burrowing owl use.

CDFW protocol for focused burrowing owl surveys requires that the first of four required site visits occurs between February 15 and April 15 and that the last three site visits occur between April 15 and July 15, with at least one visit between June 15 and July 15 (CDFW 2012). Because of a change in project boundaries, the first site visit extended past the first survey window (February 15 to April 15) until April 26, 2021. All impact areas and 500-foot buffers associated with the Bullhead Study Area were surveyed prior to April 15, 2021. The 500-foot buffers for the gen-tie options and access roads were surveyed between April 15-26, 2021. Surveys 2, 3, and 4 fell within the appropriate survey windows, as identified in the 2012 protocol. Although the first survey was delayed for part of the site, it is not expected that this would have caused a significant change in the results because all four surveys were still completed, and the surveys were conducted during the peak of the breeding season.

The protocol surveys were conducted during weather that was conducive to observing burrowing owls outside burrows and detecting sign. Surveys were not conducted during periods of high winds (i.e., >20 miles per hour [mph]). The surveys were performed in the morning (between 0530 and 1000) or at dusk (between 1745 and 2030). Survey dates, times, and weather conditions during the burrowing owl protocol surveys are provided in Table 3-7.

Table 3-7. Survey Dates, Times, and Conditions for the Burrowing Owl Protocol Surveys

Date	Time	Weather Conditions
Survey 1		
2/15/2021	1600–1830	43°F–63°F air, winds 0–10 mph, 30% cloud cover
2/16/2021	0530–1000 1600–1830	47°F–58°F air, winds 5–18 mph, 3% cloud cover
2/17/2021	0530–1000 1600–1830	30°F–58°F air, winds 2–10 mph, 0% cloud cover
2/18/2021	0600–1000 1600–1830	25°F–58°F air, winds 0 mph, 0% cloud cover
2/19/2021	0600–1000	27°F–47°F air, winds 0–3 mph, 0% cloud cover
4/5/2021	0630–1700	58°F–82°F air, winds 0–12 mph, 0%–25% cloud cover
4/6/2021	0630–1700	53°F–82°F air, winds 0–10 mph, 0% cloud cover
4/7/2021	0630–1700	53°F–86°F air, winds 0–12 mph, 0% cloud cover
4/8/2021	0630–1700	54°F–76°F air, winds 0–14 mph, 15% cloud cover
4/9/2021	0630–1700	56°F–85°F air, winds 0–10 mph, 0% to 8% cloud cover
4/12/2021	0620–1700	44°F–84°F air, winds 0–13 mph, 0–25% cloud cover
4/13/2021	0630–1700	49°F–72°F air, winds 0–12 mph, 0–25% cloud cover
4/14/2021	0700–1830	47°F–63°F air, winds 0–14 mph, 0% cloud cover
4/15/2021	0700–1715	43°F–76°F air, winds 0–13 mph, 0% cloud cover
4/16/2021	0630–1300	42°F–77°F air, winds 0–3 mph, 0% cloud cover
4/19/2021	0600–1500	55°F–83°F air, winds 0–3 mph, 0% cloud cover
4/20/2021	0630–1530	60°F–83°F air, winds 0–14 mph, 2% cloud cover
4/21/2021	0600–1500	62°F–66°F air, winds 10–19 mph, 0–5% cloud cover
4/22/2021	0600–1600	50°F–77°F air, winds 2–5 mph, 1% cloud cover
4/23/2021	0600–1300	52°F–77°F air, winds 0–3 mph, 1% cloud cover
4/25/2021	1545–1730	60°F–65°F air, winds 12 mph, 100% cloud cover
4/26/2021	0600–1500	45°F–63°F air, winds 16–21 mph, 10% cloud cover
Survey 2		
5/9/2021	1745–2015	88°F–90°F air, winds 1–3 mph, 0% cloud cover
5/10/2021	0545–1000 1745–2030	57°F–91°F air, winds 1–4 mph, 0% cloud cover

Date	Time	Weather Conditions
5/11/2021	0545–1000 1745–2000	56°F–91°F air, winds 1–2 mph, 0% cloud cover
5/12/2021	0545–1000	58°F–72°F air, winds 1 mph, 0% cloud cover
Survey 3		
6/6/2021	1730	Winds greater than 20 mph, no survey
6/7/2021	0530–1000 1800	64°F–73°F air, winds 6–19 mph am, over 25 mph in the afternoon. No evening survey, 70–100% cloud cover a.m.
6/8/2021	0530–1100 1800–2015	48°F–72°F air, winds 2–17 mph, 0% cloud cover
6/9/2021	0530–1130	72–80°F air, winds 5–18 mph, 0–5% cloud cover
Survey 4		
7/6/2021	1730–2100	93°F air, winds 8 mph, 0% cloud cover
7/7/2021	0610–1000 1730–2045	71–102°F air, winds 1–18 mph, 0% cloud cover
7/8/2021	0610–1000 1730–2030	73–99°F air, winds 2–3 mph, 0–70% cloud cover
7/9/2021	0610–1000	80°F air, winds 3 mph, 15% cloud cover

mph = miles per hour

3.3.8 Desert Kit Fox and American Badger Burrow Surveys

Because of the presence of suitable habitat within the BSA, burrow surveys for desert kit fox and American badger were determined to be necessary. In February and April 2021, ICF biologists conducted surveys of the BSA for potential desert kit fox and American badger burrows. These surveys were conducted concurrently with desert tortoise and burrowing owl protocol surveys (Table 3-7) by biologists walking survey transects spaced 10–20 meters apart. The biologists surveyed for all potential desert kit fox and American badger burrows/dens, as well as sign such as scat, tracks, fresh dig marks, or prey remains, to help determine if recent desert kit fox or American badger activity had occurred, which would indicate current occupation.

Because the focused burrow surveys were conducted concurrently with desert tortoise and burrowing owl surveys, weather conditions were the same as those provided in Table 3-7, above.

3.3.9 Jurisdictional Delineation Survey

The information in this section is from the *Bullhead Solar Facility and Gen-tie Jurisdictional Waters Report* (Heritage Environmental Consultants, LLC 2022), which is provided in Appendix G.

On November 10–12, 2021, Heritage Environmental Consultants, LLC biologists walked the jurisdictional delineation study area, including the gen-tie and access road options, and collected data on all potential CDFW and RWQCB jurisdictional features. One portion of the northernmost gen-tie line option would be co-located on existing poles along the previously surveyed AVTL. This section was surveyed, but washes in this area were not mapped since the proposed disturbance areas (i.e., pull sites) were already disturbed by the AVTL and the existing access road has been modified along existing washes and will not need to be upgraded. The full methodology for the jurisdictional delineation survey is available in Appendix G.

Some of the features that occur within the western portion of the solar facility area and along portions of several gen-tie options were mapped during surveys for the adjacent Big Beau Solar Project, and this information was used to generate acreage calculations for the jurisdictional delineation report. All of the washes included in the Big Beau Solar Project jurisdictional delineation report were confirmed to be jurisdictional by either or both the CDFW and the Lahontan RWQCB. These washes were checked during field surveys for the Bullhead Project to ensure that no changes had occurred since previous mapping took place. Photographs were taken to document site conditions at most features, regardless of identifiable indicators, and are included as Attachment G.

The boundaries of waters potentially subject to regulation by the CDFW were delineated using agency-issued guidance under the California Fish and Game Code, related CDFW materials, CDFW onsite verbal requests, guidance from site visits at other projects in the vicinity, and standard practices by CDFW personnel and wetland delineation and geomorphology professionals, including *A Review of Stream Processes and Forms in Dryland Watersheds*.

As defined by CDFW, a stream is "a body of water that flows perennially or episodically and that is defined by the area in which water currently flows, or has flowed, over a given course during the historic hydrologic regime, and where the width of its course can reasonably be identified by physical or biological indicators." Because all the features were non-aquatic and ephemeral, and some of them were very small, many lacked obvious banks in some areas. Bank indicators such as slope (first point of inflection), bed erosion or evidence of flow, wrack, and soil sorting (texture and color) were also used to determine the extent of potential jurisdiction. Vegetation is typically another good indicator; however, no riparian vegetation species were observed on site, and vegetation types, including species composition (e.g., creosote bush scrub) and density generally did not differ between surrounding upland areas and channels or flow areas.

CDFW jurisdictional areas were mapped as the top of bank of the feature or to the outer dripline of immediately adjacent vegetation (i.e., where overhanging or included within top of bank). Jurisdictional floodplains were interpreted to be relatively flat areas of land associated with a stream, over which evidence of water and sediment were apparent from a parent stream flow. Floodplains parallel stream channels but may also occur at the terminal end of a stream where the channel joins an axial valley stream, transitions into a playa, or ends, with its flow subsiding into the ground to join the groundwater. Additionally, some of the features mapped within the study area are discontinuous on the landscape. As defined under the Mapping Episodic Stream Activity, discontinuous channels have poorly defined channel form and unconfined or subsurface flow. These features may alternate with well-defined erosional channel segments or terminate in the landscape where flow infiltrates into the streambed. The boundaries for waters of the state, which are subject to regulation by the RWQCB, were delineated as the ordinary high-water mark (OHWM, defined in 33 C.F.R. §328.3 as the line on the shore established by fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, or the presence of litter and debris) of the feature.

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Chapter 4
Existing Conditions

4.1 Biological Resource Setting

The project is located within the Mojave Desert, a region that occurs between the southern, low-elevation, hot Sonoran Desert and the northern, high-elevation, relatively cool Great Basin. The Mojave Desert covers more than 40,000 square miles in California, Arizona, Nevada, and Utah and is characterized by hot summer temperatures and low annual precipitation of less than 5 inches. Daily temperature swings of 40°F can occur, with lows in the winter below or near freezing temperatures. Precipitation extremes are also common, with variations of 80 percent in annual precipitation. Summer thunderstorms can drop more precipitation on a site in one event than the mean yearly precipitation for that location. The project's elevation at approximately 2,600 to 3,100 feet above mean sea level (amsl) means that its temperature regime is somewhat cooler and moister than most areas of the Mojave Desert, with summer high temperatures averaging approximately 95°F and average annual rainfall between 7 and 8 inches. The BSA is situated on the gentle south-facing slopes below the Tehachapi Mountains. This area is geographically defined by the intersection of the San Andreas and Garlock faults and situated east of where the Tehachapi Mountains meet the Transverse Range. Soils in the BSA are all generally loamy sand, slightly to moderately alkaline, coarse, and well drained. Soil series identified in the BSA are listed in Table 4-1 and illustrated on Appendix A, Figure 9, *Soils* (USDA-NRCS 2021). A Jurisdictional Delineation describing the aquatic resources that occur within the BSA, as well as their potential jurisdiction under the USACE, RWQCB, and CDFW, was prepared and is included in Appendix G (Heritage 2022).

Table 4-1. Soil Series Occurring within the BSA

Soil Series
Adelanto coarse sandy loam, 2 to 5 percent slopes
Adelanto loamy sand, 2 to 5 percent slopes
Arizo gravelly loamy sand, 0 to 5 percent slopes
Arizo gravelly loamy sand, 2 to 9 percent slopes
Badland-Orthents complex, 30 to 75 percent slopes
Cajon loamy sand, 0 to 5 percent slopes
Cajon loamy sand, 2 to 9 percent slopes
Cajon sand, 5 to 15 percent slopes
DeStazo sandy loam, 0 to 2 percent slopes
DeStazo sandy loam, 5 to 9 percent slopes, eroded
Hanford coarse sandy loam, 2 to 9 percent slopes
Hesperia fine sandy loam, 0 to 2 percent slopes
Hesperia fine sandy loam, 2 to 5 percent slopes
Mohave coarse sandy loam, 2 to 5 percent slopes
Ramona coarse sandy loam, 2 to 5 percent slopes
Ramona gravelly sandy loam, 2 to 9 percent slopes

Soil Series
Ramona sandy loam, 9 to 30 percent slopes, eroded
Rosamond fine sandy loam
Rosamond loam
Rosamond silty clay loam
Rough broken land
Sunrise sandy loam

The Catalina Renewable Energy Project (Catalina Solar 1), Catalina Solar 2, Pacific Wind Energy, and Manzana Wind Power projects are currently in operation to the north and west of the site. The majority of the land immediately west of the Bullhead Study Area is occupied by solar projects either in operation or under construction. Immediately west of the Bullhead Study Area is the BigBeau Solar Project, as shown in Appendix A, Figure 2. The large tracts of land directly to the south and east of the project remain undeveloped, although some areas have been disturbed by past or current agricultural activities. There has been extensive solar development farther south, between Rosamond Boulevard and SR-138, including the Rosamond Solar Array, Rosamond Solar, Antelope Valley Solar, and RE Astoria Solar projects.

4.2 Vegetation Communities

Sixteen vegetation communities/land cover types were mapped within the BSA, as described in the subsections below. The approximate acreages of each are summarized in Table 4-2 and illustrated on Appendix A, Figure 10, *Vegetation Communities: Study Area & Results*. Locations of representative photographs are shown on this figure and correspond to the photo numbers shown in Appendix C.

Table 4-2. Vegetation Communities Occurring within the BSA

Project Component Impact Type	Bullhead Study Area		Rosamond Gen-tie Option 1		Rosamond Gen-tie Option 2		Rosamond Gen-tie Option 3		Rosamond Gen-tie Option 3.1		Whirlwind Gen-tie Option 1		Whirlwind Gen-tie Option 1.1		Whirlwind Gen-tie Option 1.2		Whirlwind Gen-tie Option 1 co-located with AVTL		120th St. West	
Vegetation Community	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer
Joshua Tree Woodland	–	14.17	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mulefat Thicket	1.84	0.01	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Creosote Bush Scrub	237.90	212.49	–	–	8.18	53.60	–	–	–	–	91.24	707.08	8.01	78.28	21.35	191.46	–	–	–	8.69
Creosote Bush Scrub–Disturbed	141.84	46.87	0.21	8.55	4.97	28.77	3.90	13.87	–	–	–	–	–	–	–	–	–	–	–	0.02
Creosote Bush–White Bursage Scrub	–	–	0.30	49.98	7.14	61.28	0.48	57.60	2.54	9.34	5.00	43.24	–	–	–	–	–	–	14.45	189.92
Scale Broom Scrub	–	–	–	–	–	–	–	–	–	–	1.26	8.46	–	–	–	–	–	–	–	–
Allscale scrub	12.38	6.84	9.82	168.15	3.02	71.13	9.14	123.44	6.59	81.46	–	–	–	–	–	–	–	–	–	–
Allscale Scrub–Disturbed	0.54	0.85	1.47	41.14	7.28	46.24	0.92	29.06	0.04	7.13	–	–	–	–	–	–	–	–	–	–
Cheesebush–Sweet Bush Scrub	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.63	5.75
California Buckwheat Scrub	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.99	21.10
Rubber Rabbitbrush Scrub	42.90	54.56	0.01	11.21	6.31	68.83	1.89	22.20	–	–	–	0.76	–	–	–	–	–	–	–	–
Rubber Rabbitbrush–Disturbed	318.82	77.87	–	0.12	0.03	3.33	–	2.73	–	–	–	–	–	–	–	–	–	–	1.41	16.94
Tamarisk Grove	5.88	1.47	–	–	–	–	0.02	0.21	–	0.12	–	–	–	–	–	–	–	–	–	–
Ruderal Desert Forb Patches	19.40	26.21	1.15	9.77	6.07	24.74	1.15	9.77	–	–	–	–	–	–	–	–	–	–	–	4.30
Snakeweed Scrub	–	–	–	0.44	0.55	20.34	3.51	24.25	–	–	–	–	–	–	–	–	–	–	–	–
Inactive Ag / Fallow Field	538.99	103.04	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Active Agriculture	–	10.59	–	20.25	–	–	–	20.25	–	–	–	–	–	–	–	–	–	–	–	–
Orchard	–	–	–	8.72	–	–	–	8.72	–	–	–	–	–	–	–	–	–	–	–	–
Disturbed	16.16	38.18	1.32	23.12	6.44	56.61	13.74	57.82	0.88	3.87	2.66	33.19	0.16	1.11	1.25	2.88	–	–	3.54	12.28
Developed	22.68	28.77	8.19	51.58	1.47	15.63	2.22	36.46	1.31	4.78	1.87	49.38	0.07	0.97	0.03	0.26	–	–	6.30	59.25
Total	1,359.5	621.92	22.47	393.04	51.46	450.49	36.97	406.38	11.36	106.7	102.04	842.11	8.24	80.36	22.63	194.60	–	–	30.32	318.26

Perm. = permanent

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4.2.1 Allscale Scrub

Allscale scrub is a low-growing, shrub community typically found on fine-textured, poorly drained soils with high alkalinity and dominated (i.e., greater than 50 percent relative cover) by allscale (*Atriplex polycarpa*) (Thomas et al. 2004; CNPS 2021c). The shrub canopy is typically less than 6 feet in height with an open to continuous cover and a variable herbaceous cover that may include seasonal annuals (CNPS 2021c).

Within the BSA, allscale scrub is strongly dominated by allscale with little to no shrub diversity. Associated shrub species when present may include rubber rabbitbrush (*Ericameria nauseosa*), cheesebush (*Ambrosia salsola*), sticky snakeweed (*Gutierrezia microcephala*), wirelettuce (*Stephanomeria pauciflora*), and fourwing saltbush (*Atriplex canescens*). Where this community intergrades with creosote bush scrub, it may be codominant with creosote bush (*Larrea tridentata*), and shrub diversity increases with such species as white bursage (*Ambrosia dumosa*), cheesebush and Nevada ephedra (*Ephedra nevadensis*). The understory was composed primarily of annual nonnative grasses and forbs. Allscale scrub exists in tracts of varying quality and species composition within the BSA. Disturbed allscale scrub is characterized by reduced native shrub cover, with higher cover from ruderal, nonnative annual grasses and forbs, and denoted as "Disturbed" on the vegetation map. Two CRPR plant species were observed in this community within the BSA: alkali mariposa lily (CRPR 1B.2) and Mojave spineflower (CRPR 4.2). The community is a commonly encountered vegetation type located predominantly along the southern portion of the BSA within the proposed Rosamond gen-tie line options and proposed project site.

4.2.2 California Buckwheat Scrub

California buckwheat scrub is typically a disturbance-maintained or successional shrub community dominated or codominated (50 percent or greater relative cover) by California buckwheat (*Eriogonum fasciculatum*) (Sawyer et al. 2009; CNPS 2021c) within the shrub layer. The shrub canopy is open-to-continuous and typically less than 6 feet in height and emergent trees may be present (CNPS 2021c).

Within the BSA, this community is dominated by California buckwheat with associated shrubs, such as rubber rabbitbrush, and sticky snakeweed, creosote bush, cheesebush, and Nevada ephedra commonly present within the shrub layer. The understory was composed of nonnative grasses and ruderal desert forbs. California buckwheat scrub is located within the north end of 120th Street West.

4.2.3 Cheesebush–Sweetbush Scrub

Cheesebush–sweetbush scrub is characterized by the dominance of cheesebush, a low-growing, perennial shrub having greater than 1-percent absolute cover in the shrub canopy; other shrubs, if present, have less than half the cover of cheesebush, except desert lavender (*Hyptis emoryi*) and desert sage (*Salvia dorrii*), which may have higher cover (Thomas et al. 2004). The shrub canopy is typically less than 6 feet in height with an open-to-intermittent cover, and the herbaceous cover is variable and may include seasonal annuals (CNPS 2021c).

Cheesebush–sweetbush scrub within the BSA was typically associated with previous ground disturbance and is strongly dominated by cheesebush. Associated shrub species within this community include California buckwheat, rubber rabbitbrush, sweetbush (*Bebbia juncea*), Nevada ephedra, and Acton encelia (*Encelia actoni*). The herbaceous layer comprises nonnative grasses and ruderal forbs. Cheesebush–sweetbush scrub occurs in one patch along 120th Street West within the BSA.

4.2.4 Creosote Bush Scrub

Creosote bush scrub is typically a widely spaced and often diverse shrub community, with creosote bush characteristically present within the shrub layer, and no shrubs with cover greater than creosote bush except for the following exceptions: rayless goldenhead (*Acamptopappus sphaerocephalus*), sweet bush, green rabbitbrush (*Ericameria teretifolia*), rhatany (*Krameria* spp.) Mormon tea (*Ephedra nevedensis*) or buckhorn cholla (*Cylindropuntia acanthocarpa*), which may have higher cover, but no more than two times the cover of creosote bush (Thomas et al. 2004; CNPS 2021c). This community may support a large diverse herbaceous layer of spring ephemeral flowers and native perennial grasses. Shrub canopy height is typically less than 10 feet, with an open-to-intermittent canopy, and emergent trees may be present at low cover, including honey mesquite (*Prosopis glandulosa*) and Joshua tree (CNPS 2021c).

Creosote bush scrub within the BSA varies from strongly dominated by creosote bush with a relative cover ranging from approximately 60 percent to greater than 90 percent to a highly diverse mix of desert shrub species. Associated shrub species varied widely within this community, from little shrub diversity with an understory composed of ruderal desert forbs to a highly diverse composition of nondominant shrub and perennial grasses, which included species such as Nevada ephedra, California buckwheat, Cooper's box thorn (*Lycium cooperi*), winter fat (*Krascheninnikovia lanata*), Mojave cottonthorn (*Tetradymia stenolepis*), hop sage (*Grayia spinosa*), beavertail cactus (*Opuntia basilaris* var. *basilaris*), cheesebush, Indian rice grass (*Stipa hymenoides*), and one-sided blue grass (*Poa secunda*). In addition, Joshua trees can be widely scattered within this vegetation community. Figure 10 (Appendix A) depicts the distribution of Joshua trees throughout the BSA. Joshua trees, although very conspicuous, negligibly (i.e., less than 1 percent absolute cover) contribute to the overall percent cover, but remain a significant component of this vegetation community because they are the only arborescent species within the over-story. Creosote bush scrub within the BSA exists in tracts of varying quality and species composition due to various past disturbances, including grazing, fire, and mechanical disturbance. Disturbed creosote bush scrub is characterized by reduced native shrub diversity, often limited to just a few associated species, such as Nevada ephedra, California buckwheat, white bursage, and Cooper's box thorn, along with a greater herbaceous cover composed of ruderal desert forbs and nonnative grasses. These disturbed areas are denoted as "Disturbed" on the vegetation map. Creosote Bush Scrub is widespread throughout the BSA, but does not occur within Rosamond Gen-tie Line Option 3.1.

4.2.5 Creosote Bush–White Bursage Scrub

Creosote bush–white bursage scrub is characterized by a codominance of creosote bush and white bursage within the shrub layer. White bursage may be higher in cover than creosote bush, but no other shrubs achieve a greater cover than creosote bush and white bursage, with the following exceptions: rayless goldenhead, sweetbush, buckthorn cholla, Nevada ephedra, green rabbitbrush, or rhatany may have higher cover, but no more than three times the height of creosote bush or white bursage (Thomas et al. 2004). The shrub canopy is typically less than 9 feet tall, with an open-to-intermittent cover; the herbaceous cover is typically composed of abundant seasonal annuals. Emergent trees may be present, but at low cover, including Joshua trees (CNPS 2021c).

Creosote bush–white bursage scrub within the BSA has an open shrub canopy with bare-to-intermittent ground cover composed primarily of nonnative grasses and native forbs. The shrub layer was generally more diverse than creosote bush scrub, with commonly observed species such as Nevada ephedra, California buckwheat, Cooper's box thorn (*Lycium andersonii*), winter fat, Mojave cottonthorn, hop sage, Silver cholla (*Cylindropuntia echinocarpa)*, beavertail cactus, desert beardtongue (*Penstemon fruticiformis*), cheesebush, Indian rice grass, and one-sided blue grass. This vegetation community integrates with both allscale scrub and creosote bush scrub within the BSA. Like creosote bush scrub, Joshua trees can be widely scattered within this vegetation community. Figure 11, *Special-Status Plant, Joshua Tree, and Protected Cacti Inventory Area & Results* (Appendix A), depicts the distribution of Joshua trees throughout the BSA. Joshua trees, although very conspicuous, negligibly (i.e., less than 1 percent absolute cover) contribute to the overall percent cover, but remain a significant component of this vegetation community because they are the only arborescent species within the over-story. Within the BSA, this community is commonly encountered throughout much of the BSA, however does not occur within the proposed project site or Whirlwind Gen-tie Options 1.1 and 1.2.

4.2.6 Joshua Tree Woodland

Joshua tree woodland is characterized by the even distribution of Joshua trees at 1 percent or greater absolute cover within the tree canopy, with other tree species, such as junipers or pines, having less than 1 percent absolute cover. Joshua trees are long-lived, fast-growing trees that are emergent over a shrub or grass layer; tree canopy heights can reach 45 feet, but are typically less than 25 feet, and the shrub and herbaceous layer varies from open to closed (CNPS 2021c).

Joshua tree woodland within the BSA is an open tree and shrub canopy with an intermittent-to-continuous ground cover composed primarily of nonnative grasses, ruderal desert forbs, and sparse native forbs, such as fiddleneck (*Amsinkia* sp.) and angled-stem buckwheat (*Eriogonum angulosum*). Shrub composition is similar to creosote bush scrub, but at lower overall cover, and includes creosote bush, cheesebush, Nevada ephedra, silver cholla, California buckwheat, cooper's lycium, and Acton encelia. Joshua tree woodland does not occur within the project boundary and is restricted to two small areas within northeastern buffer of the proposed project site.

4.2.7 Mulefat Thicket

Mulefat thicket is a dense, riparian shrub community dominated by or codominated by mulefat (*Baccharis salicifolia*). This community may form monotypic stands of mulefat or be composed of a diverse mix of riparian shrubs and emergent trees, which can include willows and other riparian tree species. The shrub cover is variable, typically less than 10 feet tall, with an open-to-intermittent herbaceous layer (CNPS 2021c).

Within the BSA, the shrub canopy varies from intermittent to continuous and is strongly dominated by mulefat, with little shrub diversity. The herbaceous cover was intermittent-to closed and primarily composed of nonnative grasses and ruderal desert forbs. Within the BSA, a mulefat thicket is located within a small area on the northeastern portion of the proposed solar site, where existing farmland runoff contributes to mesic conditions needed for this vegetation community to establish and persist.

4.2.8 Rubber Rabbitbrush Scrub

Rubber rabbitbrush scrub is a disturbance-maintained shrub community dominated (i.e., relative cover of 50 percent or greater) by rubber rabbitbrush, usually with evenly spaced gray shrubs that flower in late summer or fall (Holland 1986; CNPS 2021c). Shrub canopy is open to continuous and typically less than 10 feet tall; emergent trees may be present, including Joshua tree, juniper, and pine (CNPS 2021c).

Rabbitbrush scrub within the BSA is dominated by rubber rabbitbrush with associated shrubs, such as California buckwheat, and sticky snakeweed, creosote bush, cheesebush, and Nevada ephedra commonly found within this community. The understory is composed of nonnative grasses and ruderal desert forbs. Large tracks of rubber rabbitbrush scrub are common throughout the BSA and often occur within previously disturbed areas where ground disturbance, heavy grazing, or fire has occurred, as well as adjacent to roadsides, and are denoted as “Disturbed” on the vegetation map. Disturbed rubber rabbitbrush shrub is characterized by reduced shrub diversity and cover, coupled with an increase in ruderal desert forbs. Rubber rabbitbrush scrub occurs within the proposed solar site, Rosamond Gen-tie Options 1, 2, and 3, and 120th Street West.

4.2.9 Ruderal Desert Forb Patches

Ruderal desert forb patches is a disturbance-maintained herbaceous community dominated by weedy, nonnative annual forbs with little to no native plant cover. Herbaceous cover is continuous to intermittent, typically less than 3 feet tall; shrubs and trees may be present, but at low cover.

Within the BSA, ruderal desert forb patches are dominated or co-dominated by red stemmed filaree (*Erodium cicutarium*) or nonnative mustards (*Sisymbrium* ssp, and *Brassica* spp.). Native shrubs, such as California buckwheat, rabbitbrush, and cheesebush, may be present within this community, but cover is very low and less than 5 percent absolute cover. Ruderal desert forb patches are common throughout the BSA and typically found where ground disturbance has previously occurred, such as areas of heavy grazing, abandoned fields, and waste areas, as well as adjacent to roadsides. Ruderal desert forb patches occurs within the proposed solar site, Rosamond Gen-tie Options 1, 2, and 3, and 120th Street West.

4.2.10 Scale Broom Scrub

Scale broom scrub is typically found within ephemeral washes and on alluvial fans with scale broom (*Lepidospartum squamatum*) characteristically present within the shrub layer (CNPS 2021c). The shrub canopy is typically less than 6 feet tall, with an open-to-continuous cover; the herbaceous cover is variable and may be grassy, and emergent trees may be present, but at low cover (CNPS 2021c).

Scale broom scrub within the BSA has an open shrub canopy with bare-to-intermittent ground cover composed primarily of nonnative grasses and native herbs on sandy soils. Shrub diversity is similar to creosote bush scrub, with species such as Acton encelia, creosote bush, cheesebush, and Nevada ephedra commonly present. Within the BSA, this community occurs within a large wash (Cottonwood Creek) that crosses Whirlwind Gen-tie Option 1within the western portion of the BSA.

4.2.11 Snakeweed Scrub

Snakeweed scrub is typically a disturbance-maintained or successional shrub community that is dominated (i.e., 50 percent or greater relative cover) by sticky snakeweed or broom snakeweed (*Gutierrezia sarothrae*) (CNPS 2021c). The shrub canopy is open to intermittent and typically less than 4 feet tall (CNPS 2021c)

Within the BSA, this community is marked by low shrub cover strongly dominated by sticky snakeweed, with associated shrubs such as rubber rabbitbrush, allscale, and cheesebush scantly scattered throughout this community. The understory is open to intermittent and composed of nonnative grasses and ruderal desert forbs and native herbs, such as turkey-mullein (*Croton setiger)* and angled stem buckwheat. Within the BSA snakeweed scrub is found within Rosamond Gen-tie Options 2 and 3.

4.2.12 Tamarisk Grove

Tamarisk grove is a nonnative woodland community characterized by athel tamarisk (*Tamarisk aphylla*) strongly dominant or codominant within the tree canopy. The tree canopy is open to continuous reaching heights up to 80 feet. The shrub layer, if present, is open to intermittent.

Within the BSA, this community is associated with developments and agricultural lands that provide windbreak, shade, and aesthetics and is entirely composed by athel tree, which reach heights of up to 80 feet. The tree canopy is closed to intermittent, and a shrub layer was not present. The herbaceous layer is open to intermittent and composed of nonnative grasses and desert ruderal forbs. Within the BSA, large linear tracks of tamarisk groves are present surrounding agricultural lands and developed lands within the proposed solar site.

4.2.13 Active Agriculture

Lands that support active agricultural operations may be classified as *active agriculture*. Orchards of artificially irrigated land dominated by one or more tree species are also considered active agriculture. For purposes of habitat evaluations for special-status species, Table 4-2 separates impacts on orchards from other active agriculture. Active agriculture includes planted fields, which are monoculture crops that are usually artificially seeded, irrigated, and maintained. Active agriculture also includes row crops comprised of annual and perennial crops grown in rows with open space between the rows. Within the BSA, active agriculture was not present within the proposed impact areas, rather in areas within 500 feet.

4.2.14 Inactive Agriculture/Fallow Field

Inactive agriculture includes fields that were recently in planted fields or row crops, which are no longer being farmed. These areas are generally low in cover and dominated by nonnative forb species. Within the BSA, inactive agriculture was primarily within the proposed solar site.

4.2.15 Disturbed Habitat

Disturbed habitat consists of areas that have experienced persistent mechanical disturbance, resulting in severely limited native plant growth, and are void of vegetation altogether (i.e., bare ground), or may have a high percentage cover of nonnative weedy broadleaf species (i.e., ruderal) or sparsely distributed native vegetation. Bare ground within the BSA consists of abandoned dirt lots and unpaved roads, off-highway vehicle trails, as well as recently cleared areas that are planned for development or equipment staging.

4.2.16 Urban/Developed

Urban/developed land cover is characterized by areas that have been built on or otherwise physically altered to the extent that native vegetation is no longer supported. *Developed land* is characterized by permanent or semipermanent structures, pavement or hardscape, and landscaped areas that often require irrigation. Areas where no natural land is evident due to a large quantity of debris or other materials being placed on it may also be considered urban/developed (e.g., equipment staging area, quarry). Little to no vegetation occurs in these areas, other than ruderal, disturbance-loving species and a variety of ornamental (usually nonnative) plants.

4.3 Common Plants and Wildlife

Common plant and wildlife species observed during field surveys were typical of the western Mojave Desert. A total of 154 plant species were observed within the BSA and consisted of both herbaceous annual and woody perennial species. A total of 71 species of wildlife were detected, the majority of which were birds, followed in species richness by reptiles and mammals. Appendices D-1 and D-2 contain a complete list of the plant and wildlife species, respectively, detected during the field surveys conducted in 2021 and 2022.

4.4 Special-Status Plants

Based on the literature review and field surveys conducted for the project, 37 special-status plant species were determined to have potential to occur within the region. Of the special-status plants identified, 19 are not expected to occur because of a lack of suitable habitat and or geographical range; additionally, 14 were determined to have low potential based on the presence of marginal habitats or distance from known occurrences. Three special-status plant species were detected within the BSA during the spring 2021 and 2022 surveys: Joshua tree, alkali mariposa lily, and Mojave spineflower (Appendix A, Figure 11). The remaining special-status species recurved larkspur, was determined to have a moderate potential to occur.

Although drought conditions existed in the 2021-2022 winter (discussed further below), late season rainfall coupled with low to moderate temperatures through April, created suitable conditions to justify a 2022 special-status plant survey. Immediately prior to the focused surveys in 2022, reference populations were visited for each species known from the vicinity of the project or species determined to have suitable habitat within the RPSA during the 2021 habitat assessment. Each of the target species reference populations visited were either blooming or in a vegetative state suitable for proper identification, which justified the timing of the 2022 focused survey.

Focused mapping of CDNPA-protected plants, including cacti and Joshua tree, was conducted in 2021. CDNPA-protected cacti beavertail cactus and silver cholla were mapped; no other sensitive cacti species were observed (Appendix A, Figure 11). No additional mapping of CDNPA-protected plants, cacti, or Joshua trees was conducted in 2022.

The Antelope Valley experienced extreme drought conditions between the winter of 2020 through summer of 2021, receiving 1.84 inches of recorded precipitation in Palmdale, California, approximately 25 miles south of the Bullhead Study Area (California Nevada River Forecast Center 2021). The Antelope Valley California Poppy Preserve, located approximately 12 miles south of the Bullhead Study Area, reported similar precipitation amounts (CDPR 2021). During the 2020/2021 rainfall season, the Antelope Valley received just one quarter of the average rainfall amounts for the region. Due to the abnormally arid and dry conditions, many common annual and perennial herbs, including bulbiferous species, were notably absent during the growing season. Because these drought conditions are unfavorable to the germination, emergence, or flowering of sensitive ephemeral annual and herbaceous and bulbiferous perennial herbs, protocol rare plant surveys have been postponed for more favorable conditions. Although focused special-status plant species surveys were not conducted in 2021, a field assessment and analysis of sensitive plant habitat suitability were conducted for both the Bullhead and Gen-tie BSAs. Sensitive plant species that were observed during the assessment or that have a moderate to high potential to occur within the BSA are discussed in the subsections below. Species that are not expected to occur or were determined to have a low potential are addressed in the Potential to Occur Table (Appendix B-1) and not discussed further. The Antelope Valley experienced dry conditions in the fall of 2021, but had wet and cool weather during winter and spring of 2022. Field checks of reference populations during winter/spring of 2022 revealed large emergence of sensitive plant species and therefore this was an appropriate time to conduct focused rare plant surveys.

4.4.1 Listed and Candidate Plant Species

Effective September 22, 2020, western Joshua tree was designated as a candidate species as defined by CFGC Section 2068. As a candidate species, Joshua trees are provided similar protections as a state-listed endangered or threatened species for up to 1 year while CDFW determines whether the petitioned action is warranted. While it has been longer than 1 year, the Fish and Game Commission plans to conduct another vote in October 2022 on whether this species warrants protection under CESA. No other listed or candidate plant species were observed within the BSA or were determined to have a moderate to high potential-to-occur after rare plant surveys were conducted.

4.4.1.1 Western Joshua Tree

Western Joshua tree is a conspicuous, arborescent species iconic to Mojave Desert. Western Joshua tree may define its own vegetation community as Joshua tree woodland when dominant in the tree layer, or it may occur at low cover within other vegetation communities, such as Mojavean desert scrub, pinyon–juniper woodland, and Mojave yucca woodlands. Western Joshua tree is found in Kern, Los Angeles, Mono, Riverside, and San Bernardino counties, as well as counties outside California, and generally grows between 1,300 and 5,900 feet amsl.

Western Joshua tree was found to be abundant, but typically widely scattered throughout portions of the BSA (See Appendix A, Figure 11; Table 4-3); however, large tracts of land were also found to be devoid of the tree. Western Joshua tree was found throughout much of the BSA where suitable Mojavean scrub and woodland habitats occur. Although lower in potential, western Joshua tree was also observed within ruderal and disturbed areas within the BSA. The growth of annual and herbaceous perennials was severely reduced within the region in 2021; however, because of the large and conspicuous growth habit of this species, mature trees were readily observable and recorded within the BSA during the 2021 surveys.

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Table 4-3. Joshua Tree and Cacti Survey Results

Project Component Impact Type	Bullhead Study Area		Rosamond Gen-tie Option 1		Rosamond Gen-tie Option 2		Rosamond Gen-tie Option 3		Rosamond Gen-tie Option 3.1		Whirlwind Gen-tie Option 1		Whirlwind Gen-tie Option 1.1		Whirlwind Gen-tie Option 1.2		Whirlwind Gen-tie Option 1 co-located with AVTL		120th St. West	
Size Class/ Individuals	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer[1]	Perm.	Buffer
Joshua Tree Individuals																				
0-3 feet	1,239	21	–	–	30	20	2	–	4	2	140	55	4	2	8	5	–	–	31	12
3-16 feet	1,050	74	1	–	95	31	4	–	4	–	208	125	16	2	14	25	–	–	45	7
>16 feet	11	2	–	–	1	1	–	–	1	–	1	6	–	–	–	–	–	–	2	–
Total	2,300	97	1	–	126	52	6	–	9	2	349	186	20	4	22	30	–	–	78	19
Protected Cacti Individuals																				
Silver Cholla	14	–	–	–	2	–	–	–	–	–	15	10	–	–	–	1	–	–	–	–
Beavertail Cactus	5	–	–	–	–	–	–	–	–	–	1	–	–	–	1	–	–	–	–	–

[1] A buffer was neither assessed nor surveyed as part of this Project Component.
Perm. = permanent

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4.4.1.2 Bullhead Study Area

Focused surveys for Joshua trees were conducted throughout the Bullhead Study Area and resulted in 2,300 Joshua trees being recorded within the project impact area (Table 4-3; Appendix A, Figure 11). An additional 97 trees were observed within the RPSA buffer around the Bullhead Study Area.

4.4.1.3 Gen-tie Study Area and Access Road

Rosamond Gen-tie Options 1, 2, 3, and 3.1

Western Joshua trees were observed scattered throughout the RPSA of the Gen-tie Options 1, 2, 3, and 3.1 within suitable habitat of creosote bush scrub, cheesebush–sweetbush scrub, and creosote bush–white bursage (Table 4-3; Appendix A, Figure 11). Within the Rosamond Gen-tie Option 1 corridor, one Joshua tree was observed in the permanent impact area and no trees were observed in the buffer. Within the Rosamond Gen-tie Option 2 corridor, 126 Joshua trees were observed in the permanent impact area and 52 trees were observed in the buffer. Within the Rosamond Gen-tie Option 3 corridor, six Joshua trees were observed in the permanent impact area and no trees were observed in the buffer. Within the Rosamond Gen-tie Option 3.1 corridor, nine Joshua trees were observed in the permanent impact area and two trees were observed in the buffer.

Whirlwind Gen-tie Options 1, 1.1, and 1.2

Western Joshua trees were observed scattered throughout the RPSA of the Whirlwind Gen-tie Options 1, 1.1, and 1.2 within suitable habitat of Joshua tree woodland, creosote bush scrub, creosote bush–white bursage scrub, and cheesebush–sweetbush (Table 4-3; Appendix A, Figure 11). Within the Whirlwind Gen-tie Option 1 corridor, 349 Joshua trees were observed in the permanent impact area and 186 trees were observed in the buffer. Within the Whirlwind Gen-tie Option 1.1 corridor, 20 Joshua trees were observed in the permanent impact area and four trees were observed in the buffer. Within the Whirlwind Gen-tie Option 1.2 corridor, 22 Joshua trees were observed in the permanent impact area and 30 trees were observed in the buffer.

Secondary Access Road-120th Street West

Within the 120th Street West RPSA, 78 Joshua trees were observed in the permanent impact area and 19 trees were observed within the buffer. The Joshua trees were found within creosote bush scrub and creosote bush–white bursage scrub, cheesebush–sweetbush scrub, and California buckwheat scrub (Table 4-3; Appendix A, Figure 11).

Whirlwind Gen-tie Option 1 Co-located with AVTL

Although no focused pedestrian surveys were conducted along this corridor, visual (i.e., windshield) surveys were performed along this gen-tie option. No Joshua trees were observed within the permanent impact area of the Whirlwind Gen-tie Option 1 that would be co-located with the AVTL. No additional undisturbed habitat is proposed for impacts along this section of Whirlwind Gen-tie Option 1. The permanent impact areas proposed as part of Whirlwind Gen-tie Option 1 co-located with the AVTL are currently considered permanently impacted as a result of existing infrastructure and roadways. Therefore, windshield surveys were determined to be sufficient for determining presence or absence of Joshua trees.

4.4.2 Non-listed Special-status Plant Species

4.4.2.1 Alkali Mariposa Lily

Alkali mariposa lily, a CRPR 1B.2 species, is a bulbiferous perennial herb found in alkaline and mesic areas within chaparral, chenopod scrub, Mojavean desert scrub, and meadow and seep habitats. It occurs in Inyo, Kern, Los Angeles, San Bernardino, and Tulare counties at elevations ranging from 230 and 5,240 feet amsl and flowers from April through June.

Alkali mariposa lily was observed within the BSA and the RPSA, however not within the proposed impact areas. It was determined to be present within the RPSA buffer and the BSA buffer for Rosamond Gen-tie Option 1 and to have a high potential to occur within other project components in the vicinity of occupied and suitable habitat. Skeletal remains of alkali mariposa lily were observed within a presumed extant CNDDB location (CDFW 2021), approximately 75 feet north of Rosamond Boulevard near the intersection of 95th Street West and Killdeer Street within allscale scrub habitat (Table 4-4; Appendix A, Figure 11) within the BSA, adjacent to the RPSA of Gen-tie Option 1. The detected plant was a single dried stalk and fruit capsule presumed to be remaining intact from a previously season; this observation is consistent with nearby reference population checks where visible dried and dehisced fruiting capsules were spotted, but no living parts were found. This dried capsule observed within the BSA matched the characteristics of alkali mariposa lily. Other than this single location, alkali mariposa was not detected during the rare plant assessment conducted in 2021. Due to extreme drought in 2021 and continued drought in 2022 with late-season rainfall resulting in a compressed blooming season, it is probable that many of the plants within the region remained dormant, or seasonal emergence from bulbs was severely reduced. In some areas of suitable lily habitat, it appeared that between 5 and 10 percent of individuals were emerging, and this was also observed in known reference populations. At the time of the 2022 survey, buds or flowers were not observed, only leaves were visible. In addition, the botanists performing the 2022 surveys also noticed several lily individuals were the subject of herbivory by wildlife (rabbits and or ground squirrels). Because of the compressed blooming season and reduced emergence, the botanists refined the habitat suitability mapping conducted in 2021 based on 2022 observations. Table 4-4 provides the amount observed during focused surveys and the amount of suitable habitat estimated within each project component.

Bullhead Study Area

High potential for alkali mariposa lily exists within the RPSA of the Bullhead BSA for all areas of allscale scrub. Moderate potential for alkali mariposa lily exists in portions of other vegetation communities with suitable alkaline soils, which includes areas of creosote bush scrub, creosote bush–white bursage scrub, and rubber rabbitbrush scrub. Alkali mariposa lily is not expected or has a low potential to occur in other habitat types within the Bullhead BSA.

Gen-tie Study Area and Access Road

Rosamond Gen-tie Options 1, 2, 3, and 3.1

Alkali mariposa lily was determined to be present within the buffer of the RPSA for Rosamond Gen-tie Option 1, with three small populations observed with between 11 and 50 individuals. High potential for alkali mariposa lily exists within the RPSA of remaining areas of Gen-tie Options 1 as well as Options 2, 3, and 3.1 for all areas of allscale scrub (Table 4.4). Moderate potential for alkali mariposa lily exists for portions of other vegetation communities with suitable alkaline soils which includes areas of creosote bush scrub, creosote bush–white bursage scrub, and rubber rabbitbrush scrub. Alkali mariposa lily is not expected or has a low potential to occur in other habitat types within the Gen-tie Options 1, 2, 3, and 3.1.

Whirlwind Gen-tie Options 1, 1.1, and 1.2

No individuals were observed within these project components during focused surveys performed in 2022. Whirlwind Gen-tie Options 1, 1.1, and 1.2 lack suitable habitat and alkaline areas to support alkali mariposa lily, and it is not expected to occur within the RPSA for these areas.

Secondary Access Road-120th Street West

No individuals were observed within this project component during focused surveys performed in 2022. This segment of 120th Street West lacks suitable habitat and alkaline areas to support alkali mariposa lily, and it is not expected to occur within the RPSA for this area.

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Table 4-4. Special-Status Plant Habitat Assessment Results

Project Component Impact Type	Bullhead Study Area		Rosamond Gen-tie Option 1		Rosamond Gen-tie Option 2		Rosamond Gen-tie Option 3		Rosamond Gen-tie Option 3.1		Whirlwind Gen-tie Option 1		Whirlwind Gen-tie Option 1.1		Whirlwind Gen-tie Option 1.2		Whirlwind Gen-tie Option 1 co-located with AVTL		120th Street West	
Plant Species	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer[1]	Perm.	Buffer
Species Observed (Limits of occurrence in 2021 & 2022)																				
Mojave Spineflower	1,600+	–	–	–	5,600+	5,000+	2,100+	1,500	100	1,000	–	–	–	–	–	–	–	–	–	–
Alkali Mariposa Lily	–	–	–	11-50	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Suitable Habitat (acreage)																				
Mojave Spineflower	154.14	8.71	18.73	34.20	23.70	18.6	17.05	26.71	9.35	9.12	–	–	–	–	–	–	–	–	–	–
Alkali Mariposa Lily	154.14	8.71	18.73	34.20	23.70	18.6	17.05	26.71	9.35	9.12	–	–	–	–	–	–	–	–	–	–
Recurved Larkspur	154.14	8.71	18.73	34.20	23.70	18.6	17.05	26.71	9.35	9.12	–	–	–	–	–	–	–	–	–	–

[1] A buffer was neither assessed nor surveyed as part of this Project Component.

Perm. = permanent

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4.4.2.2 Mojave Spineflower

Mojave spineflower, a CRPR 4.2 species, is a small endemic annual herb that occurs in chenopod scrub, Joshua tree woodland, Mojavean desert scrub, and playas. It is often found in alkaline areas and occurs within Kern, Los Angeles, and San Bernardino counties between 20 and 4,265 feet amsl. Its blooming period is from March through July.

Mojave spineflower was found at numerous locations within the Bullhead and Gen-tie Study Area, as well as along the 120th Street West secondary access road. Many populations were identified incidentally during other 2021 wildlife surveys and additional populations were mapped during the 2022 focused surveys; however, nearly all observations were skeletal remains formed during the previous seasons. Due to extreme drought, it is probable that Mojave spineflower remained dormant, or seed germination and growth was severely reduced within the region. Table 4-4 provides the amount observed during focused surveys and the amount of suitable habitat estimated within each project component.

Bullhead Study Area

Mojave spineflower was determined to be present within the Bullhead Study Area and for areas where it was not observed it was assigned a high potential to occur where allscale scrub and vegetation communities with suitable alkaline soils, which includes portions of creosote bush scrub, creosote bush–white bursage scrub, and rubber rabbitbrush scrub (Table 4-4). Mojave spineflower is not expected or has a low potential to occur in other habitat types within the Bullhead Study Area that lack alkaline soils.

Gen-tie Study Area and Access Road

Rosamond Gen-tie Options 1, 2, 3, and 3.1

Mojave spineflower was determined to be present within the RPSA for Gen-tie Options 1, 2, 3, and 3.1 for all areas of allscale scrub and other vegetation communities with suitable alkaline soils, which includes areas of creosote bush scrub, creosote bush–white bursage scrub, snakeweed scrub, and rubber rabbitbrush scrub (Table 4-4). Mojave spineflower is not expected or has a low potential to occur in other habitat types that lack alkaline soils within the Gen-tie Study Area.

Whirlwind Gen-tie Options 1, 1.1, and 1.2

No individuals were observed within these project components during focused surveys performed in 2022. These project components lack suitable habitat and alkaline areas to support Mojave spineflower, and it is not expected to occur within the RPSA for these areas.

Secondary Access Road120th Street West

No individuals were observed within this project component during focused surveys performed in 2022. This project component lacks suitable habitat and alkaline areas to support Mojave spineflower, and it is not expected to occur within the RPSA for this area.

4.4.2.3 Recurved Larkspur

Recurved larkspur (*Delphinium recurvatum*), a CRPR 1B.2 species, is a perennial herb that occurs in alkaline areas within chenopod scrub, cismontane woodland, and valley and foothill grasslands. It is known from Alameda, Contra Costa, Fresno, Glenn, Kings, Kern, Madera, Merced, Monterey, San Joaquin, San Luis Obispo, Solano, Sutter, and Tulare counties at elevations ranging from 5 to 2,590 feet amsl. Recurved larkspur flowers from March through June.

Recurved larkspur was determined to have a moderate potential to occur within the BSA because suitable habitat exists, and several known occurrences of this species are located less than 5 miles away; however, these few local occurrences are restricted to dry lake playas and alkali hummocks and are outlying occurrences from the species' typical geographical range within the San Joaquin Valley. This species was not detected during rare plant assessments in spring 2021 or definitively identified during focused survey in 2022.An unknown species of *Delpinium* was observed during 2022 focused surveys, however, due to herbivory and/or drought conditions, the fruits (the key identification factor between other common species) were not present. It is likely that both in 2021 and 2022 much of the plants within the region remained dormant, or seasonal germination from seed was severely reduced. Table 4-4 provides the amount of suitable habitat estimated within each project component.

Bullhead Study Area

Moderate potential for recurved larkspur exists within the RPSA of the Bullhead Study Area for all areas of allscale scrub and portions other vegetation communities with suitable alkaline soils, which includes areas within creosote bush scrub, creosote bush–white bursage scrub, and rubber rabbitbrush scrub (Table 4-4). Recurved larkspur is not expected or has a low potential to occur in other habitat types within the Bullhead BSA.

Gen-tie Study Area and Access Road

Rosamond Gen-tie Options 1, 2, 3, and 3.1

No individuals were observed within this project component during focused surveys performed in 2022. However, moderate potential for recurved larkspur exists within the RPSA of the Rosamond Gen-tie Options 1, 2, 3, and 3.1 for all areas of allscale scrub and portions of other vegetation communities with suitable alkaline soils, which includes areas within creosote bush scrub, creosote bush–white bursage scrub, snakeweed scrub, and rubber rabbitbrush scrub (Table 4-4). Recurved larkspur is not expected or has a low potential to occur in other habitat types within the Gen-tie Study Area.

Whirlwind Gen-tie Options 1, 1.1, and 1.2

No individuals were observed within these project components during focused surveys performed in 2022. Whirlwind Gen-tie Options 1, 1.1, and 1.2 lack suitable habitat and alkaline areas to support recurved larkspur, and it is not expected to occur within the RPSA for these areas.

Secondary Access Road- 120th Street West

No individuals were observed within this project component during focused surveys performed in 2022. This project component lacks suitable habitat and alkaline areas to support recurved larkspur, and it is not expected to occur within the RPSA for this area.

4.4.2.4 Protected Cactus Species

Native desert plants that are protected under the CDNPA, including all species in the agave and cactus families, were individually mapped and cataloged during field surveys. Two cactus species were detected: beavertail cactus and silver cholla. Silver cholla occurred more frequently than beavertail cactus. Figure 11 (Appendix A) presents the results of the cacti inventory, and Table 4-3 provides a summary of survey results per project component. The growth of annual and herbaceous perennials was severely reduced within the region; however, because of the large and conspicuous growth habit of this species, mature cacti were readily observable and recorded within the BSA during the 2021 surveys. Removal of cacti as a result of project construction and the potential harvesting of the subject species is discussed in Section 5.9, *Protected Cactus and Yucca Species*.

Bullhead Study Area

Focused surveys for agave and cacti were conducted within suitable habitat within the Bullhead Study Area, including Joshua tree woodland, creosote bush scrub, creosote bush–white bursage scrub, California buckwheat scrub, and rubber rabbitbrush scrub. Cacti and agave were not expected to occur in other habitat types within the Bullhead Study Area, but 14 silver cholla and five beavertail cacti were observed in the permanent impact area (Table 4-3; Appendix A, Figure 11). No additional cacti were observed within the RPSA buffer around the Bullhead Study Area.

Gen-tie Study Area and Access Road

Rosamond Gen-tie Options 1, 2, 3, and 3.1

Two silver cholla individuals were observed in the permanent impact area of Rosamond Gen-tie Option 2. No other cacti or protected desert plant were observed in the RPSA of the Gen-tie Options 1, 2, 3, and 3.1 (Table 4-3; Appendix A, Figure 11).

Whirlwind Gen-tie Options 1, 1.1, and 1.2

Fifteen silver chollas and one beavertail cactus were observed in the permanent impact area and 10 silver chollas in the buffer of Whirlwind Gen-tie Option 1. No protected desert plants were observed in Whirlwind Gen-tie Option 1. One beavertail cactus was observed in the permanent impact area, and one silver cholla was observed in the buffer of Whirlwind Gen-tie Option 1.2 (Table 4-3; Appendix A, Figure 11).

Secondary Access Road-120th Street West

No protected desert plants were observed in the permanent impact or buffer areas.

Whirlwind Gen-tie Option 1 Co-located with AVTL

Although no focused pedestrian surveys were conducted along this corridor, visual (i.e., windshield) surveys were performed for this gen-tie option. No protected desert plants were observed within the permanent impact area of the Whirlwind Gen-tie Option 1 co-located with AVTL. No additional undisturbed habitat is proposed for impacts along this section of Whirlwind Gen-tie Option 1.

4.5 Special-Status Wildlife

Special-status wildlife species include those species listed by the USFWS and CDFW as endangered, threatened, proposed, or candidate species and those listed by CDFW as an SSC or California Fully Protected species.

Based on the literature review and field surveys conducted for the project, 23 special-status wildlife species are known from the region. One state-listed threatened species, Swainson's hawk, was observed nesting and foraging within the BSA. Desert tortoise was historically known from the region, but was not observed during focused surveys. Five nonlisted special-status wildlife species were detected within the BSA during the 2021 surveys: burrowing owl, golden eagle, loggerhead shrike (*Lanius ludovicianus*), northern harrier (*Circus hudsonius*), and Vaux's swift (*Chaetura vauxi*). Four other special-status species were identified as having a high potential to occur within the BSA: mountain plover, peregrine falcon (*Falco peregrinus*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), and American badger.

CDFW watch-list species white-face ibis (*Plegadis chihi*), ferruginous hawk (*Buteo regalis*), California horned lark (*Eremophila alpestris*), prairie falcon (*Falco mexicanus*), and Bell's sparrow (*Artemisiospiza belli*) were observed within the BigBeau project BSA in 2018 field surveys and have a high potential to utilize the BSA. Watch-list species are tracked by CNDDB, but do not currently have a special-status, so they are not discussed further in this report.

4.5.1 Listed Wildlife Species

4.5.1.1 Desert Tortoise

CDFW listed desert tortoise as a threatened species in August 1989 (CDFW 2023), and USFWS listed it in April 1990 (USFWS 1990). It inhabits the Mojave, Colorado, and Sonoran deserts in the southwestern United States and northwestern Mexico and occurs west of the Colorado River in southwestern Utah, northwestern Arizona, southern Nevada, and California. In California, the desert tortoise occurs in the southwestern portion of the state, from Inyo County to Imperial County, including eastern Kern, Los Angeles, San Bernardino, Riverside, and San Diego counties (Berry et al. 2002). Critical habitat has been designated for the species, although none occurs within 20 miles of the project.

Desert tortoises are associated primarily with Mojave creosote bush scrub habitat, but have also been found in succulent scrub, cheesebush scrub, blackbush scrub, hopsage scrub, shadscale scrub, microphyll woodland, and Mojave atriplex–allscale vegetation communities (Boarman 2002). This species typically inhabits flats, gently sloping terrain, valleys and bajadas, washes, rocky hillsides, and open, flat desert areas with sandy to sandy-gravel soils that offer suitable substrates for burrowing and nesting (Boarman 2002, USFWS 1994). Desert tortoises are typically found at an elevation range of approximately 1,968 to 3,280 feet amsl, but have occasionally been found above 3,937 feet amsl (Boarman 2002). Desert tortoises can occupy a home range of 0.75 to 1.5 square miles and travel long distances for resource use (USFWS 1994).

The range of desert tortoise has declined due to several factors, including habitat loss due to human-related activities, disease caused by reintroduction efforts and contamination by humans, illegal collection, road kills, habitat degradation by invasive plants, and predation on tortoises by dogs and on juvenile tortoises by ravens (Berry and Medica 1995).

Desert tortoise activity patterns are controlled primarily by ambient temperature and precipitation. In the western Mojave Desert, desert tortoises are generally most active from April to June and September to October, when the herbaceous vegetation they prefer (i.e., grasses and flowers of annual plants) is most abundant. They have also been known to eat other materials, such as insects, lizards, and feces, but these make up a very small proportion of their diets. In periods of harsh or unusually dry conditions, desert tortoises can retreat to burrows, where they lower their metabolism and water intake and consume very little food. During inactive periods, desert tortoises hibernate, aestivate, or rest in subterranean burrows; they spend approximately 98 percent of their time in these cover sites. During active periods, they usually spend nights and the hotter part of the day in their burrow or resting under shrubs (Boarman 2002).

The project occurs on the western edge of the known range of desert tortoise, and observations in the vicinity are generally scarce, despite the numerous surveys that have been conducted in the area. Suitable (i.e., native) habitat for desert tortoise is present throughout the BSA, particularly in the Joshua tree woodland, creosote bush scrub, creosote bush–white bursage scrub, scale broom scrub, allscale scrub, cheesebush-sweet bush scrub, and California buckwheat scrub portions of the BSA. Focused desert tortoise surveys were conducted in native suitable habitat throughout the BSA between April 5 and April 26, 2021(Appendix A, Figure 12, *Desert Tortoise Survey Area & Results*). One very old piece of tortoise shell was detected incidentally during these surveys All other surveys were negative, with no tortoise burrows, live individuals, scat, or other pieces of sign found anywhere in the BSA.

Regarding historic data, a CNDDB literature review (CDFW 2021) indicates that there were sightings of desert tortoise or their sign in the general region, with a sighting falling within a 5-mile radius of the site. Two adult tortoises were reported occurring approximately 2.5 miles north of the Bullhead Study Area, Whirlwind Gen-tie Options 1, 1.1, and 1.2 during desert tortoise protocol surveys conducted in 2009 for Catalina Solar 1 (Sapphos 2011). Also during that survey, a desert tortoise burrow was identified adjacent to Whirlwind Gen-tie option 1. A series of tortoise burrows were found approximately 4 miles north of the Bullhead Study Area and 0.5 mile east of Whirlwind Gen-tie Option 1 near the west side of the AVTL. One piece of desert tortoise scat was detected 0.5 mile east of the 120th Street West Secondary Access Road. Based on these surrounding sightings, the presence of suitable habitat, and the species' known distribution, desert tortoise is considered to have a low potential to occur within the BSA prior to construction.

4.5.1.2 Swainson's Hawk

Swainson's hawk was listed as a threatened species by CDFW in April 1983 (CDFW 2023); it has no federal listing. Swainson's hawk is a medium-sized migratory raptor that prefers open grasslands and agricultural fields for foraging, typically nesting nearby in isolated trees or rows of trees, particularly those near water sources.

Swainson's hawk is relatively common and breeds throughout the western United States (i.e., west of the Great Plains), but has a severely limited population in California, with very few breeding pairs in southern California. Although this species historically bred in small numbers in southern

California, its known breeding population is currently isolated to the Antelope Valley in Los Angeles and Kern Counties. Historic nesting habitat typically encompassed open grasslands and large trees along riparian zones. However, the destruction and conversion of grasslands, denudation of riparian areas, fallowing of active alfalfa fields, pesticide use, shooting, fire, and use of fire suppressants have all contributed to a loss of suitable habitat or a loss of hawks in general.

Swainson's hawk typically arrive in California from southern South America between early March and early May. Site fidelity is high among adults, with many birds returning to the same territory each year (CDFW 2016). In the Antelope Valley region of southern California, nests are typically placed in Joshua trees, roadside trees, and windrow or perimeter trees along agricultural areas (CEC and CDFW 2010). Foraging habitat within the Antelope Valley includes pastures, alfalfa fields, fallow fields, row crops, new orchards, and grain crops. Courtship and nesting begins in April, although eggs may not be laid until May. After an approximately 35-day incubation period and an additional 38- to 46-day nestling period, the young fledge (Bechard et al. 2020); most birds in California have fledged by mid-August. Swainson's hawk begin migrating south in late August and early September and typically arrive at their wintering grounds by November. A total of 12 Swainson's hawk nests were documented during the survey within the Swainson's hawk study area, which was the 5-mile buffer from the Bullhead project and gen-tie options. Of the documented nests, seven were documented as active in 2021, and all failed prior to fledging or egg laying. Five known historical nests were observed within the 5-mile Swainson's hawk study area and determined to be inactive in 2021. One additional historical nest site (SWH-13), at which the nest appears to have been removed since the 2020 breeding season, was previously documented by BBI and reported to the CNDDB as having been active in the last 5 years (CDFW 2021). There are a total of 11 nest sites within the Nest Study Area that have been documented as active within the last 5 years (2017–2021).

The following summarizes the status of documented Swainson's hawk nests active in 2021 within the Nest Study Area:

- Nest-01 – Located south of Willow Springs; active and failed in 2021
- Nest-02 – Located south of Willow Springs; active and failed in 2021
- Nest-03 – Located southwest of Willow Springs; active and failed in 2021
- Nest-04 – Located north of Willow Springs; active and failed in 2021
- Nest-05 – Located north of Willow Springs; active and failed in 2021
- Nest-06 – Located west of Willow Springs; active and failed in 2021
- Nest-07 – Located southwest of Rosamond; active and failed 2021

The following summarizes the status of the known historical Swainson's hawk nests documented as inactive in 2021 within the Nest Study Area:

- Nest-08 – Located south of Willow Springs; known historical nest inactive in 2021
- Nest-09 – Located south of Willow Springs; known historical nest inactive in 2021
- Nest-10 – Located southwest of Willow Springs; known historical nest inactive in 2021
- Nest-11 – Located north of Willow Springs; known historical nest inactive in 2021
- Nest-12 – Located southeast of Willow Springs; known historical nest inactive in 2021

In addition to the nests observed in 2021, there is one known historical Swainson's hawk nest site within the Nest Study Area that has been active within the last 5 years, but at which a nest no longer remains:

- Nest-13 – Located southwest of Willow Springs; known historical nest site where nest was potentially removed between the 2020 and 2021 Swainson's hawk breeding season. This nest removal occurred independent of and without knowledge by the project proponents or BBI.

As a result of water adjudication, the alfalfa fields throughout the Antelope Valley and specifically within the Bullhead Study Area, were fallowed beginning after the 2017 Swainson's hawk nesting season. The fallowing of the alfalfa fields may have led to a reduction in the foraging habitat quality and overall vigor of the Swainson's hawk population or individuals.

Detailed survey results are provided in the *Bullhead Solar Project's Swainson's Hawk, Raptor, and Raven Nest Surveys Final 2021 Survey Report* (Appendix F).

The vegetation communities present within the Bullhead Study Area (Table 4-2) were assigned into three Swainson's hawk foraging habitat categories: primary, secondary, and tertiary, based on their foraging habitat quality, as determined by what is known about Swainson's hawk foraging ecology and what can be surmised based on observations of foraging Swainson's hawk within the Mojave Desert.[2]

Provided below is a summary of the vegetation communities included in each Swainson's hawk foraging habitat category.

- **Primary:** Includes tamarisk thicket, creosote bush scrub, rubber rabbitbrush scrub, creosote bush–white bursage scrub, and Joshua tree woodland (native desert habitat). Although not found in the BSA, active agriculture would also be included in this category.
- **Secondary:** Includes inactive agriculture/fallow fields, allscale scrub, disturbed rubber rabbitbrush scrub, disturbed creosote bush scrub, and mulefat thicket.

  The inactive agriculture/fallow fields on site appear to have been uncultivated since approximately 2017 (Google Earth 2021). Because of the relatively recent conversion from a primary active agriculture foraging habitat (in last 5 years), and the fact that the prey source for Swainson's hawk is still present, although likely in lower numbers, the fallow fields on site are considered secondary foraging habitat.[3]
- **Tertiary:** Includes disturbed allscale scrub, ruderal desert forb patches, and disturbed.

The developed land cover type is not included as a type of foraging habitat.

4.5.1.3 Mohave Ground Squirrel

CDFW listed MGS as a threatened species in June 1971 (CDFW 2023); it has no federal listing. MGS is a small ground squirrel (approximately 9 inches long) and distinguished from the more common

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[2] While there have been no quantitative, robust space and habitat use studies of Swainson's hawk in the Antelope Valley of the Mojave Desert, these categories have been determined based on Dr. Pete Bloom's experience and research with this species in the Antelope Valley since 1979.

[3] It may take a considerable amount of time for these fallow fields to fully transition to native desert habitat and be considered a primary foraging habitat.

sympatric antelope ground squirrel (*Ammospermophilus leucurus*) by the absence of stripes. MGS occurs in the Mojave Desert in parts of Inyo, Kern, Los Angeles, and San Bernardino counties. The historical range of MGS covered approximately 20,000 square kilometers, from Palmdale in the south to Owens Lake in the north and from the eastern edge of the Sierra Nevada to the Mojave River Valley (Gustafson 1993, Leitner 2008).

MGS occur in a range of open desert habitats. They are most common in creosote scrub, but also occur in Joshua tree woodland, desert saltbush scrub, desert sink scrub, desert greasewood scrub, and shadscale scrub (Gustavson 1993). This species typically inhabits areas with open vegetative cover and small bushes (<2 feet in height) spaced approximately 20 to 30 feet apart. MGS consumes leaves, forbs, shrubs, and grasses of several species and genera, including creosote, winter fat, spiny hop-sage, saltbush (*Atriplex* spp.), golden linanthus (*Linanthus aureus*), Mediterranean grass (*Schismus arabicus*), box thorn (*Lycium* spp.), and several other plant species (Best 1995). Winter fat, spiny hop-sage, and saltbush are thought to make up approximately 60 percent of the species' shrub diet, indicating that these are important food sources when forbs are unavailable. It has been suggested that habitats where winter fat and hop-sage are absent may be suboptimal for MGS (MGSWG 2011).

MGS dig burrows in sandy and gravelly soils on flat to moderately sloping terrain. The burrows are used to avoid predators and high temperatures and aestivate in during winter months. MGS are active only during the spring to summer months and spend most of the year (approximately 7 months) below ground.

The MGS protocol (CDFW 2010) states that trapping may be required within 5 miles of the generally accepted boundary for MGS. The BSA is further than 5 miles west of the generally accepted range boundary of MGS, at SR-14, which is described as the western boundary in multiple sources (Gustafson 1993; Leitner 2008, 2014, 2021; CDFW 2019). The eastern boundary of the Bullhead Study Area (i.e., closest part of project to boundary edge) is 6 miles west of SR-14, and the western edge is 10 miles west of SR-14. There are no records of occurrence for this species west of SR-14, between Palmdale and Mojave, or within 15 miles of the project site. The closest MGS records are between the Hyundai Test Track and California City. Leitner (2014) compiled the survey results of protocol MGS trapping surveys between 2008 and 2012 in the Antelope Valley for primarily renewable energy projects. This resulted in over 227 protocol trapping grids conducted in those 5 years. Since then, dozens more protocol trapping and camera surveys have taken place in the Antelope Valley. The results of all trapping grids and camera studies have been negative for MGS. The locations of the trapping grids and camera locations from Leitner (2014) and Heritage Environmental Consultants, LLC (2020) are shown on Figure 14, *MGS Previous Trapping Results in Antelope Valley Bullhead Solar* (Appendix A).

As part of the Bullhead trapping and camera efforts, no MGS were captured, observed, or heard within the BSA during 2021 protocol surveys. Figure 15, *MGS Trapping & Camera Study Areas & Results* (Appendix A) shows the locations of the four MGS grids and 15 camera stations. Given that no MGS were detected within the BSA, the negative results of numerous protocol-level trapping and camera surveys within the vicinity, and the lack of historical records from the area, MGS is not expected to occur and is considered absent from the BSA. Detailed survey results are provided in both of the *Mohave Ground Squirrel Survey Reports* for the project (Appendices E-4 and E-5).

During the course of the three trapping sessions, several changes to the overall project design occurred. Grids 4a and 4b were trapped during Session 1 only. Grid 4c was trapped during Sessions

2 and 3 only. The decision to remove the parcel that Grid 4b was on was not made until April 30, 2021, which is the final day of Session 1 and also on the final day MGS was trapped. Once the parcel on Grid 4b was removed, there was no longer enough suitable habitat to trap in that area. Therefore, Grid 4 was moved to the western side of the Bullhead BSA and trapped for the two remaining sessions (referred to as Grid 4c). In addition, although Figure 15 shows Grids 3 and 4c to be outside of the BSA, the parcels where the MGS trapping grids and cameras were on were removed from the project after Session 3 trapping and camera work were completed.

4.5.2 Non-listed Special-status Wildlife Species Present

4.5.2.1 Burrowing Owl

CDFW lists burrowing owl as an SSC. Burrowing owl is a small owl that is active day and night, nests in underground burrows, and typically nests in small groups. Within the United States, this species winters primarily in the southern portion of the range, including southern California; populations in southern California may also be nonmigratory. Habitat within the breeding range typically includes desert areas and open, treeless areas within grasslands. Burrowing owl is often associated with areas that have high densities of burrowing mammals, such as California ground squirrels (*Otospermophilus beecheyi*). Burrowing owl also regularly occur in open, human-made landscapes, including agricultural fields, golf courses, road or canal berms and shoulders, airports, and vacant urban lots. The presence of nest burrows is a critical requirement for burrowing owls in the western United States. They require burrows from ground squirrels or other fossorial animals with a minimum entrance size of 11 to 15 centimeters. Western burrowing owl can excavate holes where burrowing mammals are absent, but rarely do so (Poulin et al. 2020). Burrowing owls are opportunistic feeders that take primarily insects and small mammals, but will pursue any potential prey they can physically handle. They will often stand on a mound outside of a burrow, but will also perch on elevated structures, including signs and fences.

Typical burrowing owl habitat includes short vegetation and the presence of small mammal burrows. The key characteristics of suitable habitat are moderately low and sparse vegetation, a prey base of small mammals and insects, and burrows or similar sites (e.g., rock piles) for shelter. This species occurs at low densities in the Antelope Valley, where it is present year-round, as recorded in the CNDDB (CDFW 2021) and from surveys conducted in support of adjacent solar projects (e.g., BigBeau Solar and Catalina Solar).

Suitable habitat for burrowing owl is present in the BSA within nearly all vegetation/land cover types, with the exception of developed land and tamarisk groves. Observed burrows with the potential to support burrowing owl were scattered throughout the Bullhead BSA, gen-tie options, and along the access roads (Appendix A, Figure 16, Burrowing Owl Focused Survey Area & Results). Potential suitability of burrows ranged from poor to high. Less-suitable burrows were located within debris piles or had signs of active desert kit fox use. Burrows with inactive desert kit fox use were of moderate quality for burrowing owl. Table 4-5 provides a breakdown of the three types of burrows per Project Component during focused surveys, and Figure 16 (Appendix A) illustrates the results of the focused surveys.

4.5.2.2 Bullhead Study Area

Focused surveys for burrowing owl were conducted within suitable habitat within the Bullhead Study Area, which includes all vegetation and land cover types present, with the exception of developed and tamarisk grove areas, totaling approximately 1,331 acres in the permanent impact area, plus 592 acres in the buffer area that were surveyed (Table 4-5). Although numerous potential burrowing owl burrows and no individual burrowing owls were observed within the Bullhead Study Area, 4 burrows with burrowing owl sign were observed (Table 4-5; Appendix A, Figure 16).

4.5.2.3 Gen-tie Study Area and Access Road

Rosamond Gen-tie Options 1, 2, 3, and 3.1 and Whirlwind Gen-tie Option 1.2

No occupied burrows with either owl or sign were observed or detected in the BSA of the Rosamond Gen-tie Options 1, 2, 3, and 3.1 and Whirlwind Gen-tie Option 1.2 within nearly all of the habitat types (Table 4-5; Appendix A, Figure 16). The amount of potential burrowing owl burrows and suitable foraging habitat for each of these Project Components is shown in Table 4-5 and presented in Figure 16 (Appendix A).

Whirlwind Gen-tie Options 1 and 1.1

One occupied burrow (with owl) and 28 occupied burrows (with sign) were observed in the buffer of Whirlwind Gen-tie Option 1. Four occupied burrows (with sign) were observed in the permanent impact area and 8 in the buffer for Whirlwind Gen-tie Option 1.1. The amount of potential burrowing owl burrows and suitable foraging habitat for each of these project components is shown in Table 4-5 and presented in Figure 16 (Appendix A).

Secondary Access Road-120th Street West

No occupied burrows with either owl or sign were observed or detected in the BSA for the 120th Street West secondary access roads proposed for possible improvement within several habitat types. The amount of potential burrowing owl burrows and suitable foraging habitat for this Project Component is shown in Table 4-5 and presented in Figure 16 (Appendix A).

Whirlwind Gen-tie Option 1 co-located with AVTL

Although no focused pedestrian surveys were conducted along this corridor, visual (i.e., windshield) surveys were performed along this gen-tie option during each of the four focused owl surveys. No potential or occupied burrows were observed within the permanent impact area of the portion of the Whirlwind Gen-tie Option 1 that would be co-located with AVTL. No additional undisturbed habitat is proposed for impacts along this section of Whirlwind Gen-tie Option 1. The permanent impact areas proposed as part of Whirlwind Gen-tie Option 1 co-located with the AVTL are currently considered permanently impacted as a result of existing infrastructure and roadways. Therefore, windshield surveys were determined to be sufficient for determining presence of suitable burrows.

Table 4-5. Burrowing Owl Survey Results

Project Component Impact Type	Bullhead Study Area		Rosamond Gen-tie Option 1		Rosamond Gen-tie Option 2		Rosamond Gen-tie Option 3		Rosamond Gen-tie Option 3.1		Whirlwind Gen-tie Option 1		Whirlwind Gen-tie Option 1.1		Whirlwind Gen-tie Option 1.2		Whirlwind Gen-tie Option 1 co-located with AVTL		120th St. West	
Burrow Type	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer	Perm.	Buffer[5]	Perm.	Buffer
Occupied Burrow (w/ Owl)[1]	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–
Occupied Burrow (w/ Sign)[2]	4	–	–	–	–	–	–	–	–	–	–	28	4	8	–	–	–	–	–	–
Potential BUOW Burrow[3]	191	122	2	10	24	109	2	7	3	–	3	27	–	24	–	30	–	–	2	16
Foraging Habitat[4]	1,330.77	591.68	14.28	341.45	49.98	434.86	34.73	369.71	10.04	101.8	100.16	792.73	8.17	79.39	22.60	194.34	–	–	24.02	259.01

[1] During at least one survey, the burrow was observed to have a burrowing owl present.
[2] During at least one survey, the burrow was observed to have sign indicating burrowing owl occupation.
[3] These burrows appeared to be suitable for burrowing owl occupation, but had neither sign nor owl present during surveys.
[4] Includes all vegetation types except Tamarisk Grove and Developed
[5] A buffer was neither assessed nor surveyed as part of this Project Component.
Perm. = permanent

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4.5.2.4 Golden Eagle

Golden eagle is a California fully protected species; it is also protected under BGEPA and MBTA. Golden eagle is distributed throughout the western half of North America (less commonly in the eastern half) and a year-round resident of most of California (Katzner et al. 2020); California may receive an influx of additional eagles in the winter from more northerly areas. Locally, golden eagle is a fairly common resident of the Tehachapi Mountains and Antelope Valley (eBird 2021). It inhabits a wide variety of areas, typically nesting in open grasslands and oak savannas in California, with oak woodlands and shrublands utilized less commonly. Early successional stages of forests and shrublands may be used (Zeiner et al. 1990). Nests are typically built on cliffs, but may also be built in trees, on the ground, or in human-made structures, such as nesting platforms or transmission towers. In the Mojave Desert, their breeding territory ranges vary from 24 to 1,556 square miles (Katzner et al. 2020). Foraging habitat typically consists of wide-open spaces with abundant mammals as prey; in California, this is often in grasslands.

There is ample foraging habitat for golden eagle in the Antelope Valley. The BSA provides potential for foraging in areas where California ground squirrels or jackrabbits are abundant. Golden eagle were observed foraging in the BSA during surveys in 2021 (Appendix A, Figure 17, *Incidental Special-Status Species Observations*).

Golden eagles are not expected to nest in the BSA at the solar site or any gen-tie option. No golden eagle nests (active or historic) were observed in the BSA during focused surveys in 2021 (Appendix F). Tall electrical transmission towers are present within the BSA, providing potential nesting substrate for golden eagles. No cliffs or other potential nesting substrate are present in the BSA. Golden eagles show strong nest site fidelity, and approximately 90 percent of pairs reuse existing nests (Katzner et al. 2002). With a lack of any historic nests in the BSA, it is expected that any local pairs are nesting in the Tehachapi Mountains or other areas outside BSA and would not be expected to colonize areas within the BSA.

4.5.2.5 Loggerhead Shrike

CDFW lists loggerhead shrike as an SSC. Loggerhead shrike is a small avian predator that hunts from perches and impales its prey on sharp objects, such as thorns and barbed-wire fences. It is a moderately large passerine that occurs in grasslands and other open habitats and feeds on a variety of invertebrate and vertebrate prey. Loggerhead shrike is resident throughout most of the southern part of its range. Breeders usually settle near isolated trees or large shrubs, and nests are typically placed in a hidden location within shrubs, particularly those with thorny branches (Yosef 2020).

Bullhead Study Area

Loggerhead shrike was incidentally observed in numerous locations throughout the BSA during 2021 surveys (Appendix A, Figure 17). All land cover besides Developed is potential foraging habitat for loggerhead shrike. Native shrub communities are potential nesting habitat for this species.

Gen-tie Options

Suitable foraging and nesting habitat for loggerhead shrike is abundant throughout all gen-tie option BSAs.

4.5.2.6 Northern Harrier

CDFW lists northern harrier as an SSC. Northern harrier is a slender, long-winged, low-flying raptor within grasslands, agricultural fields, and marshes. Northern harrier nests on the ground, usually in tall, dense clumps of vegetation. Northern harrier forages on the wing, capturing a large variety of small to medium-sized mammals and birds (Smith et al. 2020).

Bullhead Study Area

Northern harriers were observed foraging within the BSA during the 2021 surveys (Appendix A. Figure 17). The species nests on the ground and could nest within natural vegetation communities within the BSA.

Gen-tie Options

Northern harriers were observed within the BSA during the 2021 surveys. Suitable foraging habitat for northern harrier is abundant throughout the gen-tie options in the BSA. This species could forage within any of the gen-tie routes.

4.5.2.7 Vaux's Swift

CDFW lists Vaux's swift as an SSC. Vaux's swift is a fast-flying neotropical migrant with year-round populations in central America and summer breeding populations in the Pacific Northwest and British Columbia, Canada. Vaux's swift may be observed migrating through southern California in the spring and fall. This species roosts and nests in unlined chimneys and hollow trees and is strongly associated with old-growth forest. This species is almost entirely insectivorous, catching a variety of insects from the air (Schwitters et al. 2020).

This species was observed incidentally flying and foraging over an area outside of the BSA between the project site and the Whirlwind Substation (Appendix A, Figure 17). This species has potential to forage over the Bullhead Study Area and all of the gen-tie options during spring and fall migration. Appropriate nesting habitat for this species does not occur within the BSA.

4.5.2.8 Desert Kit Fox

Desert kit fox is classified as a fur-bearing mammal by CFGC, which sets restrictions on take of this species. In 2013, the Center for Biological Diversity submitted a petition to list desert kit fox pursuant to CESA, but CDFW declined to consider the petition. Desert kit fox occurs throughout much of the Mojave Desert, although its population status and trends are unknown. The species is typically found in desert scrub, washes, and arid grasslands.

Focused burrow surveys for desert kit fox were conducted from early April to mid-May. Suitable burrows to support this species were detected throughout the BSA (Appendix A, Figure 17). In addition, desert kit fox natal den complexes were noted to regularly occur within the BSA in the Bullhead Study Area and along Whirlwind Gen-tie Option 1, Rosamond Gen-tie Options 1, 2, 3, 3.1, and 120th Street West access route.

4.5.3 Non-listed Special-status Wildlife Species with High Potential to Occur

The nocturnal small mammal trapping and camera efforts did not result in capture or detection of non-listed special-status wildlife beyond those discussed in Section 4.5.2, *Non-listed Special-status Wildlife Species Present*.

4.5.3.1 Peregrine Falcon

Peregrine falcon, a California fully protected species, is a large falcon with blue-gray upper parts on adults. Peregrine falcons prey on a large variety of birds, some bats, and a few rodents; most prey is captured from the air. They have traditionally nested on cliffs, but may also use buildings, bridges, or other structures (White et al. 2020).

Peregrine falcon could use the Bullhead Study Area and gen-tie options for foraging. High-voltage transmission line towers are marginal-quality nesting habitat for this species. No nests of this species were observed on towers within the Nest Study Area (Bloom 2021), and no other suitable nesting habitat is present in the BSA.

4.5.3.2 Mountain Plover

Mountain plover (*Charadrius montanus*) is listed by CDFW as an SSC. It breeds in the Great Plains region, primarily in Montana, Wyoming, Colorado, and New Mexico; in California, it is present only as an overwintering species (Knopf and Wunder 2020). Its wintering habitat generally consists of tilled fields, heavily grazed annual grasslands, harvested agricultural fields, and burned fields. It is known to occur in small flocks annually in the Antelope Valley (Shuford and Gardali 2008).

Mountain plover has a high potential to occur within the BSA as a wintering species. Because surveys were generally conducted during the spring and summer, this species would not be expected to have been observed overwintering because it would have already departed the region. However, it could occur in the winter in agricultural fields or in low-growing grasslands within the Bullhead Study Area or the gen-tie options.

4.5.3.3 Yellow-headed Blackbird

CDFW lists yellow-headed blackbird as a California SSC. This species has declined on the coastal slopes of southern California, but persists in the inland desert areas of the region (Shuford and Gardali 2008). This species was reported as breeding in a number of locations in the Antelope Valley during breeding bird atlas surveys conducted from 1995 to 2000. The primary threat to yellow-headed blackbird is habitat loss, particularly the loss of thoroughly deep (ideally 2 to 4 feet) marshes and wetlands, because this species is highly dependent on water depth in its breeding sites, which provides protection from predators. Drawdowns of water at breeding locations may lead to nest abandonment or increased nest predation. If food is abundant inside breeding territories, then yellow-headed blackbirds tend to stay local and feed on insects and seeds. If food is scarce, then they may forage in surrounding cropland and grasslands and may venture out a couple of miles from breeding sites to find food (Twedt and Crawford 1995).

Yellow-headed blackbirds were incidentally observed foraging within the BSA on several occasions during biological surveys conducted in 2021. There is potential foraging habitat for this species in the Bullhead Study Area and the gen-tie options.

4.5.3.4 American Badger

American badger is an uncommon CDFW SSC that ranges throughout the entire state, but is rarely encountered. It is typically found in dry, open areas, including grasslands, shrublands, forests, and herbaceous habitats, where it digs burrows for shelter (Zeiner et al. 1990). In summer, individual badgers may dig new dens each night; otherwise, they readily reuse old burrows. They typically breed in summer and fall and may undergo small periods of torpor during the winter.

Burrow surveys were conducted throughout the BSA from early April to mid-May, and no suitable burrows large enough to support this species were found. Consequently, American badgers are not expected to occur within the BSA. However, this species has been detected in the surrounding area (Rincon 2014, Sapphos 2009) and could move into the BSA prior to construction.

4.6 State Wetlands

The full results of the *Bullhead Solar Facility and Gen-tie Jurisdictional Waters Report* (Heritage Environmental Consultants, LLC 2022) are provided in Appendix G. Below is a brief summary.

The jurisdictional delineation identified 29 features that total 13.87 acres and 19,686 linear feet of potentially jurisdictional waters subject to CDFW jurisdiction within the entirety of the BSA. There are 19 features that total 0.465 acre and 6,152 linear feet of potentially jurisdictional waters subject to RWQCB jurisdiction. The boundaries for waters of the state subject to regulation by the RWQCB were delineated as the OHWM, which is typically smaller than CDFW jurisdictional areas, and not all CDFW jurisdictional areas have OHWM indicators. The larger area of potentially jurisdictional CDFW waters as compared to the smaller area of RWQCB waters is the result of including the area between the OHWM and top-of-bank, and the inclusion of floodplain areas discussed above, under CDFW jurisdiction. The length of potentially jurisdictional CDFW waters is longer than RWQCB waters because of the inclusion of the length of the numerous “fingers” of CDFW waters in floodplain areas that do not exhibit OHWM indicators and the fact that some features only exhibited CDFW jurisdictional top-of-bank characteristics and did not contain OHWM indicators.

There are four features within the solar facility boundary that are likely jurisdictional waters subject to CDFW jurisdiction and/or RWQCB jurisdiction under the Porter-Cologne Water Quality Control Act. There are 22 features along gen-tie routes that are likely jurisdictional waters subject to CDFW jurisdiction and/or RWQCB jurisdiction; one of these 22 features also crosses the proposed access routes outside the solar facility boundary. There are four features along the proposed access routes outside the solar facility boundary that are likely jurisdictional waters subject to CDFW jurisdiction and/or RWQCB jurisdiction; one of these four features also crosses the gen-tie options. The majority of the features subject to CDFW jurisdiction are larger than those subject to RWQCB jurisdiction.

4.7 Wildlife Migration Corridors

Wildlife migration corridors are areas that connect suitable habitat in a region otherwise fragmented by rugged terrain, changes in vegetation, or human disturbance. Natural features (e.g., canyon drainages, ridgelines, or areas with vegetation cover) provide corridors for wildlife travel. Wildlife corridors are important because they provide access to mates, food, and water, allow the dispersal of individuals away from high-population areas, and facilitate genetic diversity. The State CEQA Guidelines require that project proponents disclose effects on wildlife corridors and mitigate for significant impacts.

Disturbance to wildlife corridors, particularly as a result of human disturbance and development, can cause harm to migrating species, cause species to exceed local population thresholds, or prevent healthy gene flow between populations. This section discusses the applicable wildlife corridors that are present or potentially present within the BSA.

The habitat types in the project area are dominated by widely spaced shrubs, which do not pose a physical barrier to the movements of most wildlife species. As a result, wildlife can currently move through most of the proposed project unimpeded, as is generally the case for the Antelope Valley. Scattered washes run generally northwest to southeast, but there is no riparian vegetation to support concentrations of wildlife; all habitats within the project area are xeric and similar to those present in the surrounding areas. The washes are landscape features that are likely to represent wildlife movement corridors locally; however, there is no evidence that they provide avenues for concentrations of wildlife. No known or identified wildlife corridors exist within the proposed project, nor has any part of the proposed project been identified as a wildlife connectivity area as mapped by the *California Essential Habitat Connectivity Project* (Spencer et al. 2010).

In the larger regional context, the project lies near the center of the Antelope Valley, which is relatively flat and has few deep drainages or other well-defined corridor-like topographic features that would channel wildlife movement into specific corridors. Instead, movement of terrestrial animals is very likely diffuse and spread throughout the entire area. Although migratory birds do fly over or through the Antelope Valley, there are no significant stopover sites in the vicinity of the project because there are no riparian habitats or water bodies with abundant resources to attract concentrations of birds. The wind energy projects to the north and west of the proposed project, as well as the areas to the south, which are mainly native plant communities with scattered unpaved roads and residences, provide for largely unrestricted wildlife movement through natural or seminatural habitats. Fenced areas around solar facilities and private and commercial properties in the vicinity of the project have the potential to limit movements of larger wildlife such as desert kit fox, coyote (*Canis latrans*), and bobcat (*Lynx rufus*). However, solar facilities in the vicinity (e.g., BigBeau Solar Project and Valentine Solar Project) were specifically designed to preserve potential wildlife corridors to the maximum extent practicable by avoiding enclosing the washes with fencing.

4.8 USFWS Critical Habitat Areas

USFWS designates critical habitat for endangered and threatened species under FESA (16 U.S.C. 1533 (a)(3)). Critical habitat is designated for the survival and recovery of federally listed endangered or threatened species. Protected habitat includes areas for foraging, breeding, roosting, shelter, and movement or migration. USFWS has not designated any critical habitat within 5 miles of the project, and therefore critical habitat is not discussed further within this document.

Chapter 5
Impact Analysis and Mitigation

5.1 Guidelines for Determination of Significance

CEQA provides definitions of classes of potentially significant effects on biological resources in its Environmental Checklist Form. A project would have a potentially significant effect on biological resources if the project would cause any of the following to occur.

a) 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 or USFWS

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural communities identified in local or regional plans, policies, regulations or by CDFW or USFWS

c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, and coastal) through direct removal, filling, hydrological interruption, or other means

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridor, or impede the use of native wildlife nursery sites

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved state, regional, or local habitat conservation plan.

These significance criteria are discussed in the sections below.

5.2 Impact Summary

The following discussion describes the project's potential to affect special-status biological resources during construction and post-construction operation and maintenance.

The proposed project would operate in compliance with all state and federal laws, regulations, and permit conditions. This includes compliance with CWA, Porter-Cologne, FESA, MBTA, CESA, and CEQA, requirements and protective measures from CDFW and USFWS adopted guidelines and protocols, and the *Kern County General Plan* and Willow Springs Specific Plan. Impacts that would result in irreversible loss of habitat or individuals are considered permanent; impacts that would end with the cessation of construction are considered temporary. Direct and indirect impacts may be either permanent or temporary. These impact categories are defined below.

- **Direct**: *Direct impacts* are caused by the project and occur at the same time and place as the project. Any alteration, disturbance, or destruction of biological resources that would result from project-related activities is considered a direct impact (e.g., grading). Direct impacts would include direct losses to native habitats, potential jurisdictional waters, and special-status species and diverting jurisdictional waters. Direct impacts could include injury, death, or harassment of listed or special-status species. Direct impacts could also include the destruction of habitats necessary for species breeding, feeding, or sheltering. Direct impacts on plants can include removal of adult plants, bulbs, or seeds.

- **Indirect**: As a result of project-related activities, biological resources may also be affected in a manner that is not direct. *Indirect impacts* may occur later in time or at a place that is farther removed from the project than direct impacts, but indirect impacts are still reasonably foreseeable and attributable to project-related activities. Examples include habitat fragmentation, elevated noise, dust, and lighting levels, changes in the level of runoff or sedimentation, soil compaction, increased human activity, and the introduction of invasive wildlife (e.g., domestic cats and dogs) and plants.
- **Permanent**: All impacts that result in the irreversible removal of biological resources are considered *permanent impacts*. For the purposes of this project, impacts are irreversible if filling activities result in an elevation (i.e., gradient) change, habitat conversion, or an impervious surface. Examples include constructing a solar facility or permanent road on an undeveloped area.
- **Temporary**: Any impacts considered to have reversible effects on biological resources can be viewed as *temporary impacts*. For the purpose of this project, if preconstruction contours are generally maintained or if the area can be revegetated in place, then the impact is considered temporary. Examples include temporary construction access routes and laydown areas, underground electric and communication lines, and temporary construction areas associated with constructing overhead transmission lines (but not the pole or new permanent access road). Each of these types of temporary impacts could be restored with native vegetation within the impact area.
- **Cumulative:** According to Section 15355 of the CEQA *Guidelines*, the term cumulative impacts "…refers to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. The individual effects may be changes resulting from a single project or a number of separate projects. The cumulative impact from several projects is the change in the environment, which results from the incremental impact to the project when added to other closely related impacts can result from individually minor but collectively significant projects taking place over a period of time."

  The cumulative projects study area was defined by surrounding areas within 6 miles with similar biological resources. Six projects within those surrounding areas were identified and evaluated to determine the extent of cumulative impacts on biological resources in the cumulative projects study area (Appendix H). Of the six projects, three are solar projects that were either approved and in their construction phase, or soon will be, with the other three consisting of transportation (California High-Speed Rail), housing (Investment Concepts), and energy storage (Hydrostar Gem Energy Storage Center). Additional projects were considered for cumulative impacts but were eliminated from analysis due to the projects never being developed or being of a character and/or scale not to warrant further consideration (e.g., dog kennel, boundary adjustment, single mobile home).

5.3 Construction Impacts

Construction of the project would require vegetation clearing and grading and would result in permanent impacts on biological resources, including native plant communities and special-status plant and wildlife species (see Sections 5.3 through 5.6, below). Permanent impacts on biological resources would result from the installation of permanent structures, which includes solar panel arrays, storage installation, substation, communication tower, electrical transformers, inverters, electrical and communication lines (underground and overhead), and permanent access/maintenance roads and appurtenances.

For the purposes of this report, the entire project footprint, including the proposed project body, substation and storage facility, gen-tie lines, and access roads, is considered a permanent direct impact where vegetation communities are present (Appendix A, Figure 10). Impacts were not included for existing roads or other developed areas.

Certain temporary impacts (e.g., temporary laydown areas and pull sites) have not been identified at this stage of the project design. Areas of the project footprint that are disturbed, but are not required as a part of operation and maintenance, would be revegetated or allowed to naturally revegetate following completion of project construction. Areas to be revegetated would be identified during project development.

Operation and maintenance of the project would consist of regular inspections, maintenance, and repair of the solar and battery facilities and would utilize the constructed access roads.

5.4 Sensitive Natural Communities

Sixteen vegetation communities/land cover types were mapped within the BSA, as described in the Section 4.2, *Vegetation Communities*. Of these, the following three are considered sensitive by CDFW or other federal or state agencies: Joshua tree woodland, scale broom scrub, and snakeweed scrub. Mule-fat thickets is considered a sensitive riparian habitat.

5.4.1 Sensitive Vegetation Communities

5.4.1.1 Direct Impacts

The project would result in permanent direct impacts on mulefat thickets, scale broom scrub, and snakeweed scrub habitats through disturbance or removal of existing vegetation (Table 5-1). Direct impacts may include the removal of existing vegetation and encroachment into the plant communities. Permanent impacts would occur from construction of the proposed solar field, substation and storage facility, gen-tie lines, and access roads. Within the Bullhead Study Area, 1.84 acres of mulefat thickets were observed in the permanent impact area. Mulefat thickets were not observed in any other project component. Within Whirlwind Gen-tie Option 1 corridor, 1.26 acres of scale broom scrub were observed in the permanent impact area. Scale broom scrub was not observed in any other project component study area. Snakeweed scrub was observed in the permanent impact areas of Rosamond Gen-tie Options 2 (0.55 acre) and 3 (3.51 acres). Snakeweed scrub was not observed in any other project component study area.

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Table 5-1. Project Impacts on Sensitive Vegetation Communities (acres)

Vegetation Community	Bullhead Study Area	Rosamond Gen-tie Option 1	Rosamond Gen-tie Option 2	Rosamond Gen-tie Option 3	Rosamond Gen-tie Option 3.1	Whirlwind Gen-tie Option 1	Whirlwind Gen-tie Option 1.1	Whirlwind Gen-tie Option 1.2	Secondary Access Route Proposed for Improvement
Mulefat Thicket	1.84	–	–	–	–	–	–	–	–
Scale Broom Scrub	–	–	–	–	–	1.26	–	–	–
Snakeweed Scrub	–	–	0.55	3.51	–	–	–	–	–
Total	1.84	0	0.55	3.51	0	1.26	0	0	0

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5.4.1.2 Indirect Impacts

Indirect impacts could occur on adjacent native vegetation communities and the sensitive vegetation community Joshua tree woodland as a result of project construction and include those that would result from fugitive dust generated during construction activities, exposure of natural areas to contaminants from equipment maintenance, and the introduction of invasive vegetation. Invasive plant species are opportunistic and often occupy disturbed or exposed soils. Once introduced, these exotic plant species often outcompete natives for resources, resulting in a reduction in growth, future dispersal, recruitment of native species, and the eventual degradation of the vegetation community. Erosion and storm water contaminant runoff from graded or impervious surfaces may also degrade adjacent vegetation communities. Finally, dust deposition on leaf surfaces may result from construction activities and construction-related traffic on dirt roads or lots, thus reducing the photosynthetic vigor of plants comprising native communities. However, indirect impacts on native and sensitive vegetative communities are expected to be greatly reduced with implementation of the avoidance and minimization measures presented below.

5.4.1.3 Cumulative Effects

The proposed project may result in impacts on mulefat scrub, scalebroom scrub, and snakeweed scrub, which will be mitigated to a level below significance through habitat-based mitigation, species-specific mitigation, or preservation. None of the projects within the cumulative project study area documented any expected impacts on mulefat scrub, scalebroom scrub, or snakeweed scrub. None of the other projects would result in impacts on Joshua tree woodland; therefore, there were no unmitigated impacts on Joshua tree woodland. The projects within the cumulative project study area either would not result in impacts on special-status plant communities or will be required to implement or fund their fair share of a mitigation measure or measures designed to alleviate the cumulative impact; therefore, this project will not contribute toward a cumulatively considerable impact.

5.4.1.4 Mitigation Measures

The final project may avoid special-status or sensitive biological resources through design BMPs; therefore, associated mitigation may be reduced. The mitigation measures below represent the maximum impacts and proposed mitigation ratios based on current design.

Bullhead Study Area

If affected by the final project design, **MM-BIO-VEG-1**, below, would be incorporated to reduce effect of loss of mulefat thicket, a riparian vegetation community, to below a level of significance.

MM-BIO-VEG-1. Mitigate Permanent Impacts on Mulefat Thicket.

Direct permanent impacts on up to 1.84 acres of mulefat thicket shall be mitigated at a 2:1 ratio (up to 3.68 acres, depending on final impacts) through one or more of the following as determined through consultation with Kern County: preservation, restoration, enhancement, or establishment/re-establishment.

Gen-tie Options

If Rosamond Gen-tie Option 2 is selected, and if it is affected by the final project design, **MM-BIO-VEG-2**, below, would be incorporated to reduce the effects of loss of snakeweed scrub, a CDFW sensitive vegetation community, to below a level of significance.

MM-BIO-VEG-2. Mitigate Permanent Impacts on Snakeweed Scrub.

Direct permanent impacts on up to 0.55 acre of snakeweed scrub shall be mitigated at a 2:1 ratio (up to 1.10 acres, depending on final impacts) through one or more of the following as determined through consultation with Kern County: preservation, restoration, enhancement, or establishment/re-establishment.

If Rosamond Gen-tie Option 3 is selected, and if it is affected by the final project design, **MM-BIO-VEG-3**, below, would be incorporated to reduce effect of loss of snakeweed scrub, a CDFW sensitive vegetation community, to below a level of significance.

MM-BIO-VEG-3. Mitigate Permanent Impacts on Snakeweed Scrub.

Direct permanent impacts on up to 3.51 acres of snakeweed scrub shall be mitigated at a 2:1 ratio (up to 7.02 acres, depending on final impacts) through one or more of the following as determined through consultation with Kern County: preservation, restoration, enhancement, or establishment/re-establishment.

If Whirlwind Gen-tie Option 1 is selected, and if it is affected by the final project design, **MM-BIO-VEG-4**, below, would be incorporated to reduce effect of loss of scale broom scrub, a riparian-associated and CDFW sensitive vegetation community, to below a level of significance.

MM-BIO-VEG-4. Mitigate Permanent Impacts on Scale Broom Scrub.

Direct permanent impacts on up to 1.26 acres of scale broom scrub shall be mitigated at a 2:1 ratio (up to 2.52 acres, depending on final impacts) through one or more of the following as determined through consultation with Kern County: preservation, restoration, enhancement, or establishment/re-establishment.

5.4.1.5 Avoidance and Minimization Measures

MM-BIO-VEG-5 through **MM-BIO-VEG-9**, below, would be incorporated to avoid and minimize direct and indirect impacts on sensitive native vegetation communities. In addition, avoidance and minimization measures that are nonspecific to biological resources, such as BMPs, a Hazardous Business Materials Plan, and a Stormwater Pollution Prevention Plan, would be included in the Environmental Impact Report for the project. These additional measures, although not specific to biological resources, would help reduce indirect impacts on native vegetation communities and the special-status plant and animal species they support, including dust control, measures to reduce fire risk, erosion and runoff control, pollution prevention, and traffic control.

MM-BIO-VEG-5. Install Temporary Fencing.

Temporary construction fencing or permanent project fencing shall be installed around the project footprint prior to the start of construction. Should project fencing not be installed prior to construction, then highly visible barriers (e.g., orange construction fencing) shall be installed around designated environmentally sensitive areas (ESAs) to be avoided, including any native vegetation communities and special-status plant population boundaries adjacent to the project footprint. All grading or fill activity of any type shall be performed within the limits of the project's study area; no construction work shall be permitted within designated ESAs. All construction equipment shall be operated in a manner to prevent accidental damage to nearby preserved areas. Vehicular traffic to and from the project site shall use designated access roads and existing routes of travel only.

MM-BIO-VEG-6. Minimize the Establishment of Invasive Weed Species.

The project shall implement preventive measures to minimize the potential establishment and spread of invasive weed species during project construction and shall include the following:

- Any exotic species that are removed during construction shall be properly handled to prevent sprouting or regrowth. Trucks carrying loads of vegetation removed from the project footprint shall be covered and disposed of in accordance with applicable laws and regulations.
- Certified weed-free mulch or mulch produced from onsite vegetation shall be used when stabilizing areas of disturbed soil; onsite soil shall be used to the maximum extent practicable for fill, avoiding the top 10 inches of soil used for banking.

MM-BIO-VEG-7. Retain an Authorized Biologist to Monitor Construction.

An authorized biologist shall be present onsite to monitor construction to ensure that the vegetation removal and ground-disturbing activities, environmentally sensitive areas (ESAs), and all avoidance and minimization measures are properly implemented, and to assist with monitoring of stormwater best management practices (BMPs). Prior to and during vegetation removal, the biological monitor shall flush any wildlife species present in the project footprint. No nesting birds shall be evicted during the nesting season (i.e., February 1–August 31). Should any desert tortoise individuals or active burrows be observed, all work in that area shall stop immediately and consultation with USFWS and CDFW shall be required (see **MM-BIO-DT-2**). The biological monitor shall report any noncompliance to the County within 24 hours. The biological monitor shall be retained during construction and decommissioning activities in the event that a special-status species wanders into the project site.

MM-BIO-VEG-8. Conduct Preconstruction Surveys for Special-status Species.

To avoid potential for direct mortality of special-status species that could occupy the site, prior to the commencement of any ground-disturbing activities, preconstruction surveys shall be conducted for special-status species that occur or have a potential to occur within the BSA. Preconstruction desert tortoise (**MM-BIO-DT-1**), nesting bird (**MM-BIO-GEN-4**), burrowing owl (**MM-BIO-OWL-1**), and desert kit fox and American badger den (**MM-BIO-DKF-1**) surveys shall be performed within 14 days prior to ground disturbance. Methodology for preconstruction surveys shall be appropriate for each potentially occurring special-status species and shall follow USFWS or CDFW preconstruction survey guidelines.

MM-BIO-VEG-9. Submit a Landscape Revegetation Plan

Prior to initial ground disturbance, the project operator must submit a landscape revegetation plan to the County for the project site for temporarily disturbed areas. Ground cover shall include native seed mix and shall be spread (after construction of the project) where earthmoving activities have taken place as needed to establish revegetation. The seed mix shall be determined through consultation with local experts and be approved by the Kern County Planning and Natural Resources Department prior to planting. The plan must include the approved native seed mix, a timeline for seeding the site and a percentage of the site to be covered, details of the consultation efforts completed, the methods and schedule for installation of fencing that complies with wildlife agency regulations, and prohibition of the use of toxic rodenticides. The project operator shall continuously maintain ground cover on the site. The revegetation and restoration of the site shall be monitored annually for a 3-year period, and an annual evaluation report shall be submitted to the Kern County Planning and Natural Resources Department for that period. The 3-year monitoring program is intended to ensure the site naturally achieves native plant diversity consistent with conditions prior to implementation of the proposed project. The landscape plan would include adaptive management measures describing what would happen if the success criteria are not met.

5.5 Special-status Plant Species

Three special-status plant species were detected within the BSA: Joshua tree, alkali mariposa lily and Mojave spineflower. Recurved larkspur has a moderate potential to occur within the BSA.

5.5.1 Candidate Plant Species

5.5.1.1 Direct Impacts

Development within the Bullhead Study Area and Gen-tie Study Area would result in direct permanent removal of Joshua trees through brushing and grading of occupied habitat. Clearing and grading activities could disturb and compress soils, potentially destroying seed banks and preventing or reducing future utilization of the area by this species.

Within the Bullhead Study Area, 2,300 Joshua trees were mapped (Table 4-3). Removal of any Joshua trees within the development area would be potentially significant.

Development of the Gen-tie Options would result in direct permanent impacts to Joshua trees. This includes each of the Rosamond Gen-tie Options, Whirlwind Gen-tie Option 1, except the portion that is co-located with AVTL, and the 120th Street West secondary access road proposed for improvement (Table 4-3). Removal of any Joshua trees within the development area would be potentially significant.

5.5.1.2 Indirect Impacts

Temporary indirect impacts on Joshua trees could result from construction-related dust, erosion, runoff, and introduction of invasive species on disturbed soils. Increased dust during construction activities could decrease a plant’s ability to photosynthesize, which could result in diminished vigor. Construction equipment, vehicles, or imported materials could introduce and spread nonnative invasive plant species within the project area, which could increase the likelihood for the propagation of wildfire. However, with the implementation of the avoidance and minimization measures, these impacts are expected to be minor.

5.5.1.3 Cumulative Effects

The proposed project may impact up to 2,300 Joshua tree individuals, which would contribute to the cumulative loss of Joshua tree in the Antelope Valley. These impacts will be mitigated to a level below significance through compensatory mitigation described in mitigation measure **MM-BIO-PLANT-1**. Other projects in the vicinity of the project site would have impacts on Joshua trees. The Big Beau Solar Project documented impacts on 5,281 Joshua trees; the Rosamond Solar Project estimated impacts on 350 Joshua trees; and the Raceway 2.0 Solar Project estimated impacts on one Joshua tree. No biological technical report is available for the 71-acre Gem Energy Storage Center project; the site is primarily vegetated with rubber rabbitbrush scrub but likely contains a few Joshua trees which would be impacted by project construction. All alternatives of the California High-Speed Rail Bakersfield to Palmdale Project Section would impact Joshua trees and Joshua tree woodland. Most of the projects within the cumulative project study area would result in some level of impact on Joshua trees. Each individual project will have a significant effect on Joshua tree and will therefore have to mitigate its portion. These projects will be required to implement or fund their fair share of a mitigation measure or include measures designed to alleviate the cumulative impact; therefore, this project will not contribute toward a cumulatively considerable impact. With the implementation of the mitigation measure, the Bullhead Solar Project will reduce its individual, incremental contribution to below a level of significance, and this project will not contribute toward a cumulatively considerable impact for Joshua tree.

The Big Beau solar project was a covered project under CDFW's 2084 Emergency Incidental Take Permit, and impacts on Joshua trees were mitigated through a compensatory mitigation fund. The remaining cumulative projects would be subject to CDFW 2081 Incidental Take Permits for any loss of Joshua tree individuals, and take permits would require compensatory or habitat based mitigation. The Rosamond Solar Project proposes to prepare a Joshua Tree Preservation Plan or to obtain an Incidental Take Permit if impacts cannot be avoided. The Raceway 2.0 Solar Project proposes to avoid impacts of Joshua tree individuals through implementation of a 290-foot buffer.

5.5.1.4 Mitigation Measures

If Joshua tree remains a candidate species or is designated as threatened or endangered under CESA, the following minimum compensatory mitigation would be provided to reduce impacts to below a level of significance. If the California Fish and Game Commission finds that the species does not warrant protection under CESA prior to the approval of the CUP, then the species would no longer be considered to meet the definition of rare or endangered under CEQA, as Joshua tree was Considered but Rejected for inclusion in the *CNPS Inventory of Rare and Endangered Plants of California* (CNPS 2021a), and the compensatory mitigation in **MM-BIO-PLANT-1** would not be required.

Bullhead Study Area

Depending on the final project design, **MM-BIO-PLANT-1**, below, would be incorporated to reduce permanent direct and indirect impacts on Joshua trees within the Bullhead Study Area, to below a level of significance.

MM-BIO-PLANT-1. Mitigate Impacts on Joshua Tree Individuals

If Joshua tree remains a candidate species or is designated as threatened or endangered under CESA at the time of CUP approval, compensatory mitigation would be provided. The project would obtain an Incidental Take Permit with the CDFW for the impacts on Joshua tree and implement the measures in the permit. The mitigation will be based upon the quality of habitat being impacted and the compensatory mitigation amounts will be based on either a per-tree contribution into the CDFW's National Fish and Wildlife Foundation (NFWF) fund or through compensatory species-specific mitigation, or both.

If Joshua tree is not protected under the CESA at the time of CUP approval, the project will comply with the applicable state and local regulations for the species. These regulations may include the Western Joshua Tree Conservation Act, California Desert Native Plant Act (MM-BIO-PLANT-3), or Willow Springs Specific Plan (MM-BIO-GEN-12). The Willow Springs Specific Plan states that, where avoidance is not possible, each parcel containing Joshua trees to experience impacts must have a Joshua Tree Preservation and/or Transplantation Plan to be reviewed and approved by the Kern County Agricultural Commissioner's Office prior to grading permit issuance.

Gen-tie Options

If affected by the final project design, **MM-BIO-PLANT-1**, above, would be incorporated to reduce the effects of loss of Joshua trees within the selected gen-tie option to below a level of significance.

5.5.1.5 Avoidance and Minimization Measures

MM-BIO-VEG-5 through **MM-BIO-VEG-9**, above, would be incorporated to avoid or minimize direct and indirect impacts on sensitive Joshua trees. These measures would help ensure that the project does not result in a level of take above that anticipated.

5.5.2 Non-listed Special-status Plant Species

5.5.2.1 Direct Impacts

The project would permanently remove suitable habitat for special-status plant species as a result of construction of the proposed project facilities, gen-tie lines, and access roads (see Table 4-4). Exact likely limits of occurrence of sensitive annuals and herbaceous perennials could not be determined in 2021 or fully-determined in 2022 due to the drought and lack of emergence of annual and herbaceous perennial species. Therefore, suitable habitats based on soil type and vegetation community were determined for these three species (Mojave spineflower, alkali mariposa lily, and recurved larkspur). Recurved larkspur (moderate potential to occur) was included in this discussion because of the lack of definitive results from focused rare plant surveys (Un-identifiable *Delphinium* species observed).

Mojave spineflower and alkali mariposa lily were observed within the BSA (Appendix A, Figure 10). Both species have potential to be more widespread within suitable habitat in the BSA. Recurved larkspur, a CRPR 1B.2 species, was determined to have a moderate potential to occur in the RPSA (Section 4.4.2, *Non-listed Special-status Plant Species*, and Appendix B-1). After rare plant surveys were conducted in 2021 and 2022, no other CRPR listed species were determined to have a moderate to high potential to occur in the BSA.

Direct effects on alkali mariposa lily, Mojave spineflower, and recurved larkspur, from project construction could also include direct mortality of individual plants and plant injury as a result of trampling by construction vehicles or personnel. Clearing and grading activities could disturb and compress soils, potentially destroying seed banks and preventing or reducing future utilization of the area by this species. In addition, construction could increase the potential for fire in the area, which could directly and indirectly affect these species. These effects could be both short- and long-term in nature.

Alkali mariposa lily and recurved larkspur are listed as CRPR 1B.2 species and therefore meet the CEQA Section 15380 definition of considered rare or endangered. Direct impacts on Alkali mariposa lily or recurved larkspur would be considered significant.

Mojave spineflower, is listed as CRPR 4.2, which is considered a watch list. Mojave spineflower does not meet the CEQA Section 15380 definition of rare or endangered. Because Mojave spineflower is not considered endangered, if Mojave spineflower were detected within development areas within BSA, the removal of Mojave spineflower would not be a significant impact to special-status plant species.

5.5.2.2 Indirect Impacts

Temporary indirect impacts on special-status plant species could result from construction-related dust, erosion, runoff, and introduction of invasive species on disturbed soils. Increased dust during construction activities could decrease a plant's ability to photosynthesize, which could result in diminished reproduction or loss of individual alkali mariposa lily, Mojave spineflower, and recurved larkspur,. Construction equipment, vehicles, or imported materials could introduce and spread nonnative invasive plant species within the project area, which could outcompete special-status plants for resources such as water and space. In addition, suitable habitat could become monotypic, thereby reducing quality and diversity of native vegetation communities onsite. However, with the implementation of the avoidance and minimization measures, these impacts are expected to be minor.

5.5.2.3 Cumulative Effects

The proposed project may result in impacts on alkali mariposa lily and/or recurved larkspur, which, if found to be present, will be avoided or mitigated to a level below significance through bulb or seed collection or habitat-based mitigation. High Speed Rail had observations of alkali mariposa lily within the project alignment, though it was not reported in the EIR if these populations were anywhere near the project area. High Speed Rail proposes to conduct a salvage, relocation and/or propagation program for special-status plant species, which would reduce their impact to below a level of significance. None of the other projects within the cumulative project study area documented any impacts on alkali mariposa lily or recurved larkspur.. This project provides its fair share of mitigation measures to alleviate its incremental contribution to the cumulative impacts. The project would therefore not have a cumulatively considerable impact on special-status plant species.

5.5.2.4 Mitigation Measures

Direct impacts on individuals or populations of alkali mariposa lily or recurved larkspur would be considered significant. Due to the drought conditions that occurred within the BSA, the distribution of these species within the BSA is not fully known; however, estimates of suitable habitat amounts for these species are provided in Table 4-4. Rare plant surveys would be conducted during the appropriate survey season(s) during a year with average or above-average rainfall to provide information on the distribution of rare plants within the RPSA.

MM-BIO-PLANT-2a. Conduct Focused Rare Plant Surveys.

Contingent on prevailing weather conditions and prior to the initiation of construction, a protocol focused rare plant survey shall be conducted during the appropriate time of year to detect special-status alkali plant species (i.e., alkali mariposa lily and recurved larkspur) within areas of suitable habitat. A letter report documenting the results of the survey shall be provided to Kern County. If these species are not detected within the footprint of the Bullhead Study Area or Gen-tie Study Area/selected Gen-tie route, no further action is necessary as special status plant species shall have been determined to be absent.

MM-BIO-PLANT-2b. Consider Avoidance of Special-Status Plant Species.

If alkali mariposa lily and recurved larkspur species are observed within the footprint of the Bullhead Study Area or Gen-tie Study Area/selected Gen-tie route, the project proponent shall coordinate with Kern County and determine if impacts to these special-status plant species can reasonably be avoided.

MM-BIO-PLANT-2c. Compensatory Mitigation for Impacts to Special-status Plant Species.

If alkali mariposa lily and recurved larkspur are determined to be present within the footprint of the Bullhead Study Area or Gen-tie Study Area/selected Gen-tie route and cannot be avoided, direct permanent impacts to the population shall be mitigated at a 3:1 ratio through one or more of the following as determined through consultation with Kern County: preservation, restoration, enhancement, or establishment/re-establishment. The maximum total impact per gen-tie option is show in Table 4-4.

5.5.2.5 Avoidance and Minimization Measures

Implementation of **MM-BIO-VEG-5** through **MM-BIO-VEG-7** and **MM-BIO-VEG-9**, above, would ensure that direct and indirect impacts on special-status plant species would be reduced to the maximum extent possible and would minimize potential impacts on suitable habitat for special-status plant species adjacent to the project limits of disturbance.

5.6 Special-Status Wildlife Species

5.6.1 Desert Tortoise

5.6.1.1 Direct Impacts

Potential habitat for desert tortoise in the BSA was determined to be unoccupied during focused surveys in 2021. Based on focused surveys, historical data, and a desktop analysis of data from surveys for surrounding projects, the desert tortoise is considered to have a low potential to colonize the BSA prior to construction and direct impacts on desert tortoise are not anticipated.

If desert tortoises moved into the site prior to construction, direct impacts could occur as a result of the grading of the site. If present on the site at the time of construction, it is possible that tortoises could be injured or crushed by onsite equipment or vehicles or could experience dehydration if startled by project personnel (resulting in evacuation of their internal water supply). If any tortoises are in burrows and the burrows go undetected, tortoises or eggs inside could be crushed during grading. Common ravens, a notable predator of juvenile desert tortoises, are common throughout the BSA and could injure or kill juvenile desert tortoise should they be present. The avoidance and minimization measures described below would ensure that direct impacts on desert tortoise are avoided.

5.6.1.2 Indirect Impacts

Noxious weed seeds could be spread during construction activities to offsite habitats that could be utilized by tortoise. If allowed to establish and spread, these weeds could alter the surrounding habitat for this species. Nonnative vegetation often has little to no nutritional value for tortoise. Conversion of native, nutritious vegetation, such as grasses and herbs, to invasive nonnative plant species could result in tortoises being unable to find sufficient amounts of food. Establishment of nonnative plants can also increase the risk of fires, which could harm desert tortoise.

5.6.1.3 Cumulative Effects

The projects within the cumulative project study area obtained negative focused surveys and are not considered occupied by desert tortoise; therefore, no impacts on desert tortoise individuals are expected and no mitigation for suitable desert tortoise habitat was required. Since none of the projects within the cumulative project study area have impacts on desert tortoise, there would be no cumulatively considerable impact on the species from the Bullhead Solar Project.

5.6.1.4 Avoidance and Minimization Measures

MM-BIO-VEG-7, MM-BIO-VEG-9, and MM-BIO-VEG-10, above, would avoid direct mortality or injury of any desert tortoise during construction should the species occupy the site. Implementation of **MM-BIO-GEN-1**through **MM-BIO-GEN-3 and MM-BIO-DT-1** and **MM-BIO-DT-2**, below, would minimize potential impacts on suitable habitat for desert tortoise adjacent to the project limits of disturbance.

MM-BIO-GEN-1. Conduct WEAP Training.

Prior to the initiation of construction and for the duration of project activities that could affect natural habitat, all new personnel shall attend a Worker Environmental Awareness Program (WEAP) developed by a qualified biologist. Any employee responsible for the operation and maintenance of the completed facilities shall also attend the WEAP program. Additional requirements are as follows:

a. The program shall include information on the life history of desert tortoise, burrowing owl, Swainson's hawk and other raptors, American badger, and desert kit fox, as well as other wildlife and plant species that may be encountered during construction and operation and maintenance activities.

b. The program shall discuss each species' legal protection status, the definition of "take" under FESA and CESA, measures the project operator is implementing to protect the species, reporting requirements, specific measures that each worker shall employ to avoid take of wildlife species, and penalties for violation of FESA and CESA.

c. The program shall provide information about how and where to bring injured animals for treatment in the case any animals are injured on the project site and how to document animal mortalities and injuries.

d. An acknowledgement form signed by each worker indicating that environmental training has been completed shall be kept on record.

e. A sticker shall be placed on worker hardhats on the worker's successful environmental training completion. Construction workers shall not be permitted to operate vehicles or equipment within the construction areas unless they have attended the training and are wearing hard hats with the required sticker.

MM-BIO-DT-1. Conduct Preconstruction Surveys.

Within 14 days prior to the commencement of any ground-disturbing activities, the project proponent shall conduct preconstruction surveys for desert tortoise within the Bullhead Study Area. The surveys shall be conducted in accordance with the USFWS protocol (currently USFWS 2019). If no tortoises are discovered during preconstruction surveys, no consultation with USFWS and CDFW is necessary. Should desert tortoise or an active burrow be observed during preconstruction surveys, all work shall be immediately halted within a 500-foot radius of the tortoise or burrow, and consultation with USFWS and CDFW shall be required, which shall include the following:

a. Develop a plan for desert tortoise translocation and monitoring in consultation with USFWS and CDFW prior to project construction. The plan shall provide the framework for implementing clearance surveys and protection measures.

b. Develop a Raven Management Plan for the project site if desert tortoise is found.

MM-BIO-DT-2. Halt Construction if Injured or Deceased Tortoises are Found.

If an injured or dead tortoise is encountered during construction, or if any desert tortoise is injured or killed, all construction activities within 500 feet of the vicinity shall be halted and an authorized biologist immediately contacted. The biologist shall have the responsibility for contacting USFWS and CDFW. If an injured animal recovers, USFWS shall determine the final disposition of the animal because few injured desert tortoises are returned to the wild.

MM-BIO-GEN-2. Limit Vehicular Speeds.

Vehicle speed limits shall not exceed 15 miles per hour during construction and operation of the project. A speed limit sign shall be posted at all project site entry locations.

MM-BIO-GEN-3. Ensure Wildlife is Not Underneath Equipment.

Employees and contractors shall look under vehicles and equipment for the presence of wildlife prior to moving vehicles and equipment. If present, the animal shall be left to move on its own or until it is removed by the biological monitor. No listed species shall be handled without concurrence from USFWS or CDFW, as applicable.

5.6.2 Swainson's Hawk

5.6.2.1 Direct Impacts

Development of the Bullhead Study Area would have the potential to result in direct impacts on occupied nesting and foraging habitat for Swainson's hawk and may directly affect the nesting success of Swainson's hawk in the Antelope Valley. Direct impacts on individual Swainson's hawks, their nesting locations, and their foraging habitat would be considered significant. Swainson's hawk will forage for small mammals and large insects in active and fallow agricultural areas and native desert shrub and grassland communities. Project components could be expected to eliminate most or all foraging potential on the project site. Post-construction, the solar field may still accommodate some foraging, however for the purposes of this evaluation, the solar fields are not expected to provide any potential for foraging. Of note, the Bullhead Study Area does not include active agriculture or Joshua tree woodland, considered to be Primary foraging and nesting habitats for Swainson's hawk (See Section 4.5.1.2 for habitat category definitions). Less than one-third of the Bullhead Study Area will impact other types of Primary foraging habitats, with the majority of impacts occurring within Secondary habitat types, which have a lower habitat value than Primary.

The project's removal of foraging habitat within 5 miles of active nests would reduce the ability of Swainson's hawks to find sufficient prey to support nesting activities, resulting in reduced nesting success through loss or reduced health or vigor of the adults, eggs or young. Development of the Bullhead Study Area would affect two Swainson's hawk nesting territories along 95th Street West, which includes three Swainson's hawk nests. Removal of the trees supporting the nests or physical removal of the nests would be a potentially significant impact (CEC and CDFW 2010); however, as currently designed, the project would not remove the trees hosting the Swainson's hawk nests. The Bullhead Study Area habitat includes some nesting substrates, including Joshua trees over 12 feet tall and 5.89 acres of tamarisk groves supporting athel tamarisk. The CDFW Swainson's hawk protocol surveys conducted within 5 miles of the Bullhead Study Area in 2021 documented a total of 12 Swainson's hawk nests, 11 of which have been active within the last 5 years (2017–2021) (CEC and CDFW 2010). Removal of the foraging habitat within the Bullhead Study Area is considered a significant effect on Swainson's hawks nesting within 5 miles.

Direct impacts may also occur with the development of a gen-tie line. Electrocution of Swainson's hawk can occur from wing contact with two conductors simultaneously due to wingspan, hawk excrement making contact with the conductors, or two birds making contact from two different conductors as a result of perching, landing, or taking off from a utility pole and therefore completing the electrical circuit (APLIC 2012). Avian electrocutions can also occur through simultaneous contact with energized phase conductors and other equipment or by simultaneous contact with an energized wire and a grounded wire. Direct impacts can also occur from collision with power line wires. Direct mortality through electrocution or collision would be a significant potential effect.

No Swainson's hawk nests were observed within 0.5 mile of the Gen-tie options in 2021. Development activities within 0.5 mile of any active Swainson's hawk nest during the breeding season would be a significant potential effect (CEC and CDFW 2010).

The proposed gen-tie line that is selected for the project would result in conversion of narrow strips of desert habitat and fallow agriculture to disturbed habitat (bare ground or ruderal); however, this is not expected to significantly reduce the ability of Swainson's hawk to forage in these areas. Prey species such as ground squirrels, gophers, rats, mice, snakes, lizards, small birds, and grasshoppers move widely throughout undeveloped areas and are not expected to avoid disturbed strips. Swainson's hawks often hunt from perches such as tree limbs, poles, or posts (Bechard 2020). Transmission towers may provide Swainson's hawks with perching opportunities to reduce effort for foraging. Therefore, development of the gen-tie line is not expected to result in a significant negative impact on Swainson's hawk if an appropriate buffer (0.5 mile) is implemented during construction for active nests (CEC and CDFW 2010).

Pending final design and foraging habitat impact amounts, the applicant may need a CDFW Section 2081 Incidental Take Permit because project-related activities may incidentally lead to take of the species (defined by CDFW as *harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct*). This shall include compensatory mitigation to offset the loss of the foraging habitat.

5.6.2.2 Indirect Impacts

Temporary indirect impacts on foraging individuals could occur as a result of construction-related noise and dust. These disturbances may dissuade birds from foraging in the immediate vicinity of the project site. Dust, noise, or other disturbances during project construction could reduce the suitability of foraging habitat in the area or cause nest failure during the breeding season, which would result in a substantial adverse effect on Swainson's hawk. Long-term (i.e., operational) indirect impacts from noise and dust are not anticipated.

5.6.2.3 Cumulative Effects

The proposed project, as described above, would have a significant effect on two Swainson's hawk territories known to occur within 0.5 mile of the Bullhead Study Area. Nine other Swainson's hawk territories are known to be used for nesting and foraging within 5 miles of the Bullhead Study Area. The project proposes a suite of avoidance and mitigation measures to avoid direct impacts on this species and to avoid impacts that could reduce the breeding effectiveness of Swainson's hawk. After implementation of avoidance, minimization, and habitat-based mitigation measures described below, the project impacts on Swainson's hawk would be less than significant with mitigation incorporated. The projects within the cumulative projects study area will result in the removal of approximately 7,150 acres of Swainson's hawk foraging habitat, with the Big Beau Solar Project removing 2,285 acres, Rosamond Solar Modification Project removing 1,360 acres, Raceway Solar

Project removing 1,330 acres, Gem Energy Storage Center removing 71 acres, and removal of approximately 1, 575 acres associated with approximately 13 miles of habitat due to the High-Speed Rail alignment that cuts through the study area. These projects would cumulatively reduce the suitable breeding and foraging habitat for Swainson's hawk in the Antelope Valley. While the cumulative impacts from past, present, and reasonably foreseeable future projects may result in a cumulatively significant impact on this species, this project provides its fair share of mitigation measures to alleviate its incremental contribution to the cumulative impacts. The project would therefore not have a cumulatively considerable impact on Swainson's hawk.

5.6.2.4 Mitigation Measures

MM-BIO-SWHA-1 through **MM-BIO-SWHA-8** and **MM-BIO-GEN-4,** below, would reduce the likelihood of direct and or indirect impacts on any individual Swainson's hawk or active nests that may occur within the Biological Study Area during construction. Implementation of these mitigation measures would reduce the impacts on Swainson's hawk to less than significant with mitigation incorporated.

MM-BIO-SWHA-1: Conduct Swainson's Hawk Nesting Season Surveys

To determine the presence and activity of any known or new nests of Swainson's hawk, a qualified biologist shall conduct nest surveys for Swainson's hawk prior to commencement of construction activities. The surveying biologist must be approved by CDFW and Kern County and be qualified to determine the status and stage of nesting by Swainson's hawk. An initial nesting season survey must be performed no more than 1 year prior to the commencement of construction activities. The surveys shall be conducted during the nesting season for Swainson's hawk (March 1 through September 15) within both the construction footprint and within all accessible areas within a 5-mile buffer around the proposed construction areas. Areas within the 5-mile buffer that are not accessible shall be surveyed by binocular and spotting scope. The surveys can be phased with project build-out. The nesting season surveys shall follow the protocols set out in the CEC and CDFW Guidance (2010).

MM-BIO-SWHA-2: Conduct Swainson's Hawk Pre-Construction Nest Surveys

If construction activities are scheduled to be initiated during the nesting season, a qualified biologist shall conduct a pre-construction survey of all accessible areas within 0.5 mile of the construction site to determine the presence and activity of known or new Swainson's hawk nests. Inaccessible areas shall be surveyed by binocular and spotting scope. The preconstruction survey shall occur within 30 days prior to the start of construction. Depending on project timing, the pre-construction survey may not be necessary if the initial nesting season surveys overlap with the pre-construction survey timing or if construction activities will start outside of the Swainson's hawk nesting season (September 16 to February 28). The pre-construction nest survey shall follow the protocols set out in the CEC and CDFW Guidance (2010).

MM-BIO-SWHA-3: Swainson's Hawk Foraging Habitat Avoidance

To the extent feasible, the project applicant shall design the project site to allow sufficient foraging and fledging area to maintain active Swainson's hawk nests located adjacent to the project site. The solar panels and infrastructure would be set back from Swainson's hawk nests at a distance determined through consultation with Kern County and CDFW. Avoided habitat would not count toward impacts used in determining compensatory mitigation requirements in **MM-BIO-SHWA-5** and may be used to satisfy mitigation requirements if protected by a conservation easement.

MM-BIO-SWHA-4: Swainson's Hawk Nest Avoidance

During the nesting season (March 1 through September 15), ensure no new disturbances, habitat conversions, or other project-related activities that may cause nest abandonment or forced fledging shall occur within 0.5 mile of an active nest. Buffer zones may be adjusted in consultation with CDFW and with the County.

MM-BIO-SWHA-5: Provide Compensatory Mitigation for Loss of Swainson's Hawk Foraging Habitat

a. To compensate for permanent impacts to foraging habitat, the applicant shall provide project-specific compensatory mitigation. Lands proposed as compensatory mitigation for Swainson's hawk shall meet the following minimum criteria:

    i. The final mitigation ratios and calculations will be determined through coordination with Kern County and CDFW, but mitigation ratios for foraging habitat can range from 0.25:1 (for every 1 acre of project impact, provide 0.25 acre of compensatory habitat) to 1:1 (for every 1 acre of project impact, provide 1 acre of compensatory habitat). Replacement land shall be provided based on the quality of the mitigation land relative to the impacted habitat using the foraging habitat type definitions of Primary, Secondary, and Tertiary. The Base Mitigation Ratios and definitions for each foraging habitat type are provided below in Table 1. When using Primary habitat to mitigate the loss of Secondary or Tertiary habitat impacts (Uptier), the amount shall be proportional to the Base Mitigation Ratio (see Table 1) because a higher quality habitat type is replacing a habitat type of lower value. The lands subject to restoration shall be considered as Primary foraging habitat.

    ii. The Compensatory Mitigation and Monitoring Plan (**MM-BIO-SWHA-6**) shall address the responsibility and funding source for the CDFW-approved non-profit third party to implement the restoration efforts for lands surrounding the on-site nests.

Table 1. Foraging Habitat Mitigation Ratios

Foraging Habitat Type	Base Mitigation Ratio	Uptier to Primary	Uptier to Secondary
Primary[1]	1:1	N/A	N/A
Secondary[2]	0.75:1	0.66:1	N/A
Tertiary[3]	0.5:1	0.25:1	0.375:1

[1]Primary: Tamarisk thicket, creosote bush scrub, rubber rabbitbrush scrub, and creosote bush – white bursage scrub, active agriculture, Joshua tree woodland.
[2]Secondary: Inactive agriculture/fallow fields, allscale scrub, disturbed rubber rabbitbrush scrub, disturbed creosote bush scrub, and mulefat thicket.
[3]Tertiary: Disturbed allscale scrub, ruderal desert forb patches, and disturbed.

MM-BIO-SWHA-6: Swainson's Hawk Compensatory Mitigation and Monitoring Plan

To implement the compensatory mitigation described in **MM-BIO-SWHA-5**, the applicant shall prepare a Swainson's Hawk Compensatory Mitigation and Monitoring Plan, as described below:

a. The applicant shall mitigate the loss of Swainson's Hawk foraging and nesting habitat by providing Habitat Management lands within the Antelope Valley Swainson's hawk breeding range, based on the final mitigation calculations and ratios determined in coordination with Kern County and CDFW. Project proponents may delegate responsibilities for acquisition and management of the Habitat Management lands to the CDFW or a third party, such as a nongovernmental organization dedicated to Mojave Desert habitat conservation. The project proponent shall seek approval of such delegation from the CDFW. Approaches for acquisition and management of Habitat Management lands shall be defined in the approved compensatory mitigation plan and shall include the following:

   i. **Habitat Management Land Selection Criteria.** Identify the region within which lands would be acquired, and the type/quality of habitat to be acquired. Foraging habitat quality should be equal to or better than the habitat being affected, with a capacity to improve in quality and value to Swainson's hawks, and must be within the Antelope Valley Swainson's hawk breeding range. Primary foraging habitat with suitable nest trees is preferred.

   ii. **Review and Approval of Habitat Management Lands.** Provide a habitat management lands proposal to CDFW for approval. The proposal should discuss the suitability of those lands by comparing them to the selection criteria in the CEC & CDFW (2010) guidance.

   iii. **Land Acquisition Schedule and Financial Assurances.** Provide an irrevocable letter of credit or other form of security for the compensatory mitigation land acquisition prior to beginning ground-disturbing project activities. Provide financial assurances for dedicating adequate funding for impact avoidance, minimization, and compensation measures required for project approval.

   iv. **Habitat Management Lands Acquisition and Management.** Be prepared to provide a preliminary title report, initial hazardous materials survey report, and biological analysis to CDFW, at a minimum. The information will likely be reviewed by the California Department of General Services, Fish and Game Commission and/or Wildlife Conservation Board. Fee title or conservation easement will likely be transferred to a CDFW-approved non-profit third party and CDFW, or solely to the CDFW. Be prepared to support enhancement and endowment funds for protection and maintenance of acquired lands. The CDFW will approve establishment and management of the funds, ensuring that qualified non-profit organizations or the CDFW will manage the funds in an appropriate manner. Contributed funds and interest generated from the initial capital endowment would support long-term operation, management, maintenance, and protection of the approved Habitat Management lands, including reasonable administrative overhead, biological monitoring, preparation and submittal of annual reports and long-term maintenance and monitoring reports, law enforcement measures, and any other action designed to protect or improve the habitat values of the Habitat Management lands.

MM-BIO-SWHA-7: Swainson's Hawk Compliance Reporting

To document compliance with measures **MM-BIO-SWHA-1** through **MM-BIO-SWHA-6**, the Project Biologist shall submit a memorandum, on a bi-weekly basis or at other appropriate intervals, to the applicant's dedicated Environmental Compliance Manager.

MM-BIO-SWHA-8: Swainson's Hawk Injury Plan

The project applicant shall prepare and implement a Swainson's Hawk Injury Plan that provides for the following in the event an injured Swainson's hawk is found during construction and operations:

a. Immediate relocation of the injured Swainson's hawk to a raptor recovery center approved by CDFW.

b. Costs associated with the care or treatment of such injured Swainson's hawks shall be borne by the project proponent/operator.

c. Include appropriate contact information for immediate notification to CDFW and the County if a hawk injury incident occurs, and establish a procedure to notify CDFW and the County inside of normal business hours. The project applicant shall notify the appropriate personnel via telephone or email, followed by a written incident report. Reports shall include the date, time, location, and circumstance of the incident.

5.6.2.5 Avoidance and Minimization Measures

MM-BIO-GEN-4. Avoid Disturbance of Vegetation During Bird Nesting Season.

To comply with state and federal protections on nesting birds, any clearing, trimming, or grubbing of vegetation shall occur between September 1 and February 14 (i.e., outside of the general bird breeding season), and tree removal shall occur between July 16 and January 14 (outside of the raptor breeding season). If tree or vegetation trimming, clearing, or grubbing cannot feasibly occur outside these breeding seasons, then preconstruction nesting surveys, as described below, shall be conducted by a qualified biologist prior to initiating vegetation trimming, clearing, or grubbing activities.

Preconstruction surveys shall be conducted within potential nesting habitat within the project site for construction activities that are initiated during the breeding season (i.e., February 15–August 31). The nesting bird survey shall include 100 percent coverage of the project site. Surveys shall be conducted no more than 14 days prior to the start of construction activities. Surveys need not be conducted for the entire project site at one time; they may be phased so that surveys occur shortly before a portion of the project site is disturbed. The surveying biologist must be qualified to determine the status and stage of nesting by migratory birds. If active nests are found, a qualified wildlife biologist shall continuously monitor the nest for the first 24 hours prior to starting work activities to establish a behavioral baseline, and a suitable buffer (e.g., 30–50 feet for passerine species; 200–300 feet for common raptors) shall be established around active nests wherein no construction within the buffer shall be allowed until a qualified biologist has determined that the nest is no longer active (i.e., the nestlings have fledged and are no longer reliant on the nest). Once work commences, all nests shall be monitored to detect any behavioral changes as a result of the project. If behavioral changes are observed, all work causing the disturbance shall cease, and CDWF shall be consulted for additional avoidance and minimization measures. Should project activities be delayed or suspended for 10 days or more during the breeding bird season, additional nesting bird surveys shall be conducted within 14 days prior to restarting project activities. For nonlisted species, encroachment into the avoidance buffer may occur at the discretion of a qualified biologist;

however, for state-listed species, consultation with CDFW shall occur prior to encroachment into the aforementioned buffers.

5.6.3 Mohave Ground Squirrel

5.6.3.1 Direct, Indirect, and Cumulative Impacts

Because MGS is considered absent from the BSA, the project is not expected to have a direct, indirect, or cumulative effect this species.

5.6.3.2 Avoidance and Minimization Measures

Because MGS is considered absent from the BSA, no avoidance and minimization efforts are required.

5.6.4 Burrowing Owl

5.6.4.1 Direct Impacts

Development of the BSA would directly affect suitable habitat for burrowing owls. Nesting and foraging habitat that contains suitable burrows for burrowing owl would be permanently removed during site development (see Table 4-5 and Appendix A, Figure 16). Based on focused surveys conducted in 2021, four burrows with burrowing owl sign were observed within the project footprint,. Removal of onsite habitat would also remove the occupied nest sites. Vegetation removal and grading could result in injury or mortality to any birds that are inside burrows and unable to leave (primarily young); it would also crush any active burrows on the site. Birds flying out of burrows to escape could collide with machinery or vehicles. Any burrowing owls currently inhabiting the site would be displaced. **MM-BIO-OWL-1, MM-BIO-GEN-5,** and **MM-BIO-GEN-6** would avoid direct impacts on burrowing owl. Habitat-based mitigation focused on Swainson's hawk (**MM-BIO-SWHA-5** and **MM-BIO-SWHA-6**) would preserve in perpetuity potentially suitable habitat for burrowing owl. Implementation of these measures would reduce the impacts on burrowing owl to less than significant with mitigation incorporated.

5.6.4.2 Indirect Impacts

Potential temporary indirect effects on burrowing owls include those resulting from decreased suitability of habitat in the proposed project vicinity due to various factors, such as increased noise from construction activities and vehicles, vehicle emissions, dust, introduction and spread of invasive plant species, and other human activity. Noise from construction activities can affect avian species in multiple ways, such as depressing breeding success by acoustical masking, interfering with intraspecific communication, and interfering with detection of predators. Construction activities could disrupt breeding and foraging activities and prevent birds from attending to nests or could cause birds to flush from their nests, endangering eggs and chicks. Dust could have an adverse effect on the health of chicks and adults, as well as on the viability and presence of prey insects and on the overall health of vegetation. Displaced birds may undergo increased stress, competition, or predation while attempting to establish new territories in unfamiliar areas. Temporary impacts may also result from unauthorized actions from construction personnel, such as hunting, feeding, or harassment of individual burrowing owl.

5.6.4.3 Cumulative Effects

The proposed project would reduce nesting and foraging habitat for burrowing owl and has potential for significant direct impacts on this species. Mitigation measures were proposed to avoid direct impacts on burrowing owl. Habitat-based mitigation focused on Swainson's hawk (**MM-BIO-SWHA-5** and **MM-BIO-SWHA-6**) would preserve in perpetuity potentially suitable habitat for burrowing owl. Implementation of these measures would reduce the impacts on burrowing owl to less than significant. The Big Beau Solar Project documented impacts to one occupied burrowing owl burrow and included avoidance measures. Raceway Solar Project did not document any burrowing owl presence on site and therefore do not contribute to cumulative impacts on this species. High Speed Rail contains mitigation measures to conduct surveys for burrowing owls and would provide compensatory mitigation for loss of active burrowing owl burrows and habitat. Since this project provides its fair share of mitigation and reduces its incremental contribution to cumulative impacts, it would not have a cumulatively considerable impact on burrowing owl.

5.6.4.4 Avoidance and Minimization Measures

MM-BIO-GEN-1, **MM-BIO-DT-1**, and **MM-BIO-GEN-2**, above, and **MM-BIO-OWL-1, MM-BIO-GEN-5,** and **MM-BIO-GEN-6**, below, would reduce the likelihood of direct or indirect impacts on individual burrowing owl occurring within the BSA during construction. Implementation of **MM-BIO-VEG-5** through **MM-BIO-VEG-9**, above, would minimize potential impacts on suitable habitat for burrowing owl adjacent to the project limits of disturbance.

MM-BIO-OWL-1. Conduct Burrowing Owl Preconstruction Surveys.

Qualified biologists shall conduct a preconstruction burrowing owl survey throughout the BSA within 14 days prior to the start of construction or ground-disturbing activities. Survey methodology shall follow that described in the 2012 CDFW *Staff Report on Burrowing Owl Mitigation* as appropriate for the season in which the preconstruction surveys commence. Owl surveys can be conducted concurrently with preconstruction desert tortoise surveys and desert kit fox and American badger surveys. If no owls are found within the BSA, construction may proceed as planned. Copies of the survey results shall be submitted to the Kern County Planning and Community Development Department.

If burrowing owls are detected on site, no ground-disturbing activities, such as vegetation clearance or grading, shall be permitted within a buffer of no fewer than 330 feet (100 meters) from an occupied burrow during the breeding season (February 1–August 31). During the non-breeding (winter) season (September 1–January 31), ground-disturbing work may proceed near active burrows as long as the work occurs no closer than 165 feet (50 meters) from the burrow. Depending on the level of disturbance, if smaller buffers are set, it shall be per established CDFW protocol.

If active burrows cannot be avoided, a Burrowing Owl Exclusion Plan shall be prepared following established CDFW protocols. The plan shall describe all necessary measures to minimize impacts on burrowing owls during passive relocation, including details on how owls shall be removed and excluded from burrows, the methodology to do so, where the owls shall be moved to, and whether any follow-up monitoring shall be required.

MM-BIO-GEN-5. Cover, Cap, and Inspect Construction Pipes, Culverts, or Similar Structures.

Burrowing owls, mammals, and nesting birds can use construction pipes, culverts, or similar structures for refuge or nesting. Therefore, all construction pipes, culverts, or similar structures with a diameter of 4 inches or more that are stored at a construction site for one or more overnight periods shall be covered or capped while in storage or otherwise be thoroughly inspected for special-status wildlife or nesting birds before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If an animal is discovered inside a pipe, that section of pipe shall not be moved until the biological monitor has been consulted, and the animal has either moved from the structure on its own accord or has been captured and relocated by the biological monitor.

MM-BIO-GEN-6. Prohibit Pets and Wildlife Harassment on the Project Site.

Workers shall be prohibited from bringing pets to the project site and from feeding, harassing, collecting, or otherwise harming wildlife.

5.6.5 Non-listed Special-status and Nesting Bird Species

Proposed construction activities may affect special-status avian species that have either been observed on the site or have a high potential to breed, forage, or winter within the BSA. Five non-listed special-status avian species, including burrowing owl, golden eagle, loggerhead shrike, northern harrier, and Vaux's swift, were observed within or near the BSA. Of these species, burrowing owl, loggerhead shrike, and northern harrier have the potential to nest within the BSA. Burrowing owl is discussed separately in Section 5.6.4, *Burrowing Owl*. Golden eagle is resident to the Antelope Valley and may forage within the BSA, but does not nest within the BSA (Appendix F). Vaux's swift could forage over the site during migration, but does not nest in the region. Three other special-status species were identified as having a high potential to occur within the BSA: mountain plover, peregrine falcon, and yellow-headed blackbird. Of the birds, only peregrine falcon has potential to nest within the BSA (on transmission towers), and this species was determined to be absent as a breeding species in 2021 (Appendix F). Mountain plover could occur as nonbreeding winter residents. Yellow-headed blackbird could forage on or over the BSA. Impacts on these special-status species, and on other nesting birds protected by MBTA and CFGC, may occur as a result of proposed project construction.

5.6.5.1 Direct Impacts

Proposed project activities on native habitat (see Table 4-4) could permanently affect special-status avian species' habitats include the permanent loss of habitat used for foraging, nesting, and wintering by avian species, all of which may provide nesting habitat for a variety of other avian species protected under MBTA that are not considered rare, threatened, or endangered by local, state, or federal laws or regulations. Of the permanently affected vegetation types, creosote bush scrub, rabbitbrush scrub, and desert saltbush scrub may serve as nesting habitat for loggerhead shrike or northern harrier. No nesting habitat would be affected for the following nonlisted sensitive species, but potential foraging habitat would be lost for golden eagle, peregrine falcon, Vaux's swift, or yellow-headed blackbird.

The act of removing habitat may also result in vehicular strikes to birds that are attempting to flee the disturbance, which could cause injuries or mortality. Vehicular collisions would be expected to occur most frequently during the vegetation-clearing stage of construction and would be especially dangerous for eggs, nestlings, and recently fledged young that cannot safely avoid equipment. In addition, electrocution of avian species can occur from wing contact with two conductors because avian species perching, landing, or taking off from a utility pole can complete the electrical circuit. Avian electrocutions can also occur through simultaneous contact with energized phase conductors and other equipment or simultaneous contact with an energized wire and a grounded wire. Electrocution of avian species poses a greater potential hazard to larger birds, such as raptors, because their body sizes and wing spans are large enough to bridge the distance between the conductor wires and, thus, complete the electrical circuit.

5.6.5.2 Indirect Impacts

Potential indirect effects on avian species include impacts resulting from decreased suitability of habitat in the proposed project vicinity resulting from various factors, such as increased noise from construction activities and vehicles, vehicle emissions, dust, and other human activity. Noise from construction activities can affect avian species in multiple ways, such as depressing breeding success by acoustical masking, interfering with intraspecific communication, and interfering with detection of predators. Construction activities could disrupt breeding and foraging activities and prevent birds from attending to nests or could cause birds to flush from their nests, endangering eggs and chicks. Dust could have an adverse effect on the health of chicks and adults, as well as on the viability and presence of prey insects and the overall health of vegetation. Displaced birds may undergo increased stress, competition, or predation while attempting to establish new territories in unfamiliar areas. Night lighting associated with construction activities may also temporarily affect avian species' roosting and foraging behavior, especially for avian species that are active after dark. However, indirect impacts on these species would be minimal with the implementation of avoidance and minimization measures described below.

Post-construction studies at solar facilities in southern California have documented avian mortalities resulting from impact trauma (Kagan et al. 2014). Some have theorized that solar panels can attract species that mistake the panels for bodies of water, potentially leading to increased collision-related fatalities and other risks. For this reason, the phenomenon sometimes colloquially is referred to as the "fake lake effect." Some postulate that this phenomenon could be attracting birds to solar project sites, thereby exposing the birds to greater risk of impacts such as potential collision with project infrastructure, the possibility of being stranded within site fencing once they land, or other forms of distress. It may be that, when viewed from a distance or an elevated position, solar panel arrays appear to be a water body to migrating water birds during daylight hours or on nights when the moon is full; however, this speculation is not supported by empirical research. A report commissioned by the U.S. Department of Energy analyzed available avian mortality data from utility-scale solar energy facilities (ANL-NREL 2015) and concluded that although it is apparent that solar energy facilities may present a risk of fatality for birds, additional standardized and systematic fatality data would be needed to better understand and quantify the risks. It did, however, note that based on available data, there was no consistent pattern to support or refute the hypothesis that water-dependent species were more susceptible to mortality at solar facilities. The causes of avian injuries and fatalities at commercial-scale solar projects continue to be evaluated by USFWS, CDFW, and others. However, as yet, no empirical studies have been conducted at commercial-scale solar projects that establish a clear causal link between such projects and the types of avian mortality and injury documented on existing solar project sites.

5.6.5.3 Cumulative Effects

The proposed project would result in impacts on foraging and breeding habitat for non-listed special-status and nesting birds. Mitigation measures were proposed to avoid direct impacts on non-listed special-status and nesting birds. Habitat-based mitigation focused on Swainson's hawk (**MM-BIO-SWHA-5** and **MM-BIO-SWHA-6**) would preserve in perpetuity potentially suitable habitat for non-listed special-status and nesting birds. Implementation of these measures would reduce the impacts to less than significant. Since this project provides its fair share of mitigation and reduces its contribution to cumulative impacts, it would not have a cumulatively considerable impact on non-listed special-status and nesting birds.

5.6.5.4 Avoidance and Minimization Measures

MM-BIO-GEN-1 through MM-BIO-GEN-3 (Section 5.6.1, *Desert Tortoise*), **MM-BIO-GEN-5** and **MM-BIO-GEN-6** (Section 5.6.4, *Burrowing Owl*), and **MM-BIO-GEN-4**, above, would reduce the likelihood of direct or indirect impacts on special-status and nesting birds in the BSA during construction. Implementation of **MM-BIO-VEG-5, MM-BIO-VEG-7, and MM-BIO-VEG-8** under Section 5.4.1.5 would minimize potential impacts on suitable habitat for special-status and nesting birds adjacent to the project limits of disturbance. This would reduce the impacts to below a level of significance. Implementation of Measures **MM-BIO-GEN-7 through MM-BIO-GEN-9**, below, would further minimize potential impacts on suitable habitat for non-listed special-status and nesting bird species.

MM-BIO-GEN-7. Contain and Remove Garbage.

Trash and food items shall be contained in closed containers and removed on a regular basis to reduce the attractiveness to opportunistic predators, such as common ravens, coyotes, and feral dogs.

MM-BIO-GEN-8. Design and Construct all Planned Transmission Structures to Avian Power Line Interaction Committee Guidelines.

To reduce the risk of avian electrocution or collision with new transmission lines, the project shall design and construct all planned transmission structures to Avian Power Line Interaction Committee (APLIC) guidelines. The design engineer shall certify that the lines have been designed in accordance with APLIC Guidelines and shall submit written documentation illustrating this to the Kern County Planning and Natural Resources Department. Plans shall include designs that shall not only reduce the likelihood of birds being electrocuted, as detailed in *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC 2006), but also reduce the likelihood of birds colliding with structures, conductors, or neutral wires, as detailed in *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* (APLIC 2012).

MM-BIO-GEN-9. Comply with Kern County's "Dark Skies" Ordinance.

The project shall comply with Kern County's outdoor light "dark skies" ordinance (Kern County Zoning Ordinance § 19.81) or apply with the County for an exemption per Section 19.90.080 of the Zoning Ordinance.

5.6.6 Desert Kit Fox and American Badger

5.6.6.1 Direct Impacts

Suitable habitat for desert kit fox and American badger is present in the BSA within native vegetation communities. Desert kit fox and desert kit fox burrows were observed within the BSA in 2021. American badger was not observed but has high potential to utilize the area and could occupy the site prior to construction. Permanent impacts on these species could occur, should they be present within the area during construction. Project construction would result in the permanent loss of suitable habitat, which is the same as burrowing owl suitable habitat (Table 4-4). Direct impacts on individuals could result from adults or young being crushed in dens or from collisions with vehicles, resulting in injury or death. However, because the area being affected by the project is small compared to the regional habitat available for these species, and with the implementation of the avoidance and minimization measures listed below, project impacts on desert kit fox and American badger, should they be present, are expected to be minimal. Within the Bullhead Study Area, approximately 1,330 acres of suitable desert kit fox and American badger habitat are present. Rosamond Gen-tie Options 1, 2, 3, and 3.1 contain approximately 14 acres, 50 acres, 35 acres, and 10 acres, respectively, of suitable desert kit fox and American badger habitat. Whirlwind Gen-tie Options 1, 1.1, and 1.2 contain approximately 100 acres, 8 acres, and 22 acres, respectively, of suitable desert kit fox and American badger habitat. Within the West Mojave Desert, there are approximately 3,501,554 acres of suitable desert kit fox and American badger habitat (DRECP 2015). The permanent impact areas would impact approximately 1,500 acres of suitable habitat, roughly 0.04 percent of the available suitable habitat in the West Mojave Desert. Additionally, habitat-based mitigation focused on Swainson's hawk (**MM-BIO-SHWA-5a or MM-BIO-SHWA-5b**) would preserve in perpetuity potentially suitable habitat for desert kit fox and American badger.

5.6.6.2 Indirect Impacts

Indirect impacts on individual desert kit fox and American badger could occur from construction-related disturbances, including noise, ground vibration, night lighting, and increased human presence. Suitable habitat for these species surrounding the BSA could be degraded as a result of construction activities, including dust, erosion, introduction of invasive plant species, and increased fire risk. However, indirect impacts on these species would be minimal with the implementation of avoidance and minimization measures described below.

5.6.6.3 Cumulative Effects

The potential impacts on habitat for desert kit fox and American badger by the Bullhead Solar Project are limited compared to the regional habitat available for these species. With implementation of the avoidance and minimization measures listed below (**MM-BIO-DKF-1**, **MM-BIO-GEN-10,** and **MM-BIO-GEN-11**), project impacts on desert kit fox and American badger, should they be present, are expected to be minimal. Additionally, habitat-based mitigation focused on Swainson's hawk (**MM-BIO-SWHA-5** and **MM-BIO-SWHA-6**) would preserve in perpetuity potentially suitable habitat for desert kit fox and American badger. Because of habitat-based mitigation, any contribution of the project to the cumulative loss of habitat would be adequately mitigated; therefore, the project would not have a cumulatively significant impact on desert kit fox and American badger.

5.6.6.4 Avoidance and Minimization Measures

Measures **MM-BIO-GEN-1 through MM-BIO-GEN-3** (Section 5.6.1, *Desert Tortoise*); **MM-BIO-GEN-4** (Section 5.6.2, Swainson's Hawk); **MM-BIO-OWL-1**, **MM-BIO-GEN-5,** and **BIO-GEN-6** (Section 5.6.4, *Burrowing Owl*); and **MM-BIO-GEN-7** (*Section 5.6.5, Non-Listed Special-Status and Nesting Bird Species)*, above, and **MM-BIO-DKF-1**, **MM-BIO-GEN-10** and **MM-BIO-GEN-11**, below, would reduce the likelihood of direct mortality of any desert kit fox or American badger occurring within the project footprint during construction. Implementation of **MM-BIO-VEG-5** through **MM-BIO-VEG-9**, above, would minimize potential impacts on suitable habitat for desert kit fox and American badger adjacent to the project limits of disturbance.

MM-BIO-DKF-1. Conduct Preconstruction Surveys for Desert Kit Fox and American Badger Dens.

Preconstruction surveys shall be conducted by a qualified biologist for the presence of desert kit fox or American badger dens within 14 days prior to commencement of construction activities. Should potential burrows of desert kit fox or American badger be identified during preconstruction surveys, the qualified biologist shall follow standard monitoring procedures to determine the occupancy status, species, and type (i.e., potential, active, or natal) of burrows. Surveys need not be conducted for all areas of suitable habitat at one time; they may be phased so that surveys occur within 14 days prior to that portion of the site being disturbed. If no potential desert kit fox or American badger dens are present, no further action is required. If potential dens are observed and avoidance is feasible, the following buffer distances shall be established prior to construction activities, or an appropriate buffer established by the qualified biologist, until absence or presence is verified:

- Desert kit fox or American badger potential den: 30 feet
- Desert kit fox active den: 100 feet
- Desert kit fox natal den: 500 feet

If avoidance of the potential dens is not possible, the following measures are recommended to avoid potential adverse effects on desert kit fox or American badger:

- If the qualified biologist determines that potential dens are inactive, the biologist shall excavate these dens by hand with a shovel to prevent foxes or badgers from reusing them during construction. Identified dens shall be determined to be inactive by installing and operating a camera station at the potential den entrance for 5 consecutive days to determine den use and by what species. An alternative method may be used to determine inactivity if it is acceptable to Kern County.
- If the qualified biologist determines that potential dens may be active during the breeding season (January 1–August 31), the biologist shall notify the Kern County Planning and Natural Resources Department. No destruction of active natal dens is to occur during the

breeding season. An ESA shall be established and a 500-foot corridor left open to allow the foxes or badgers to vacate the site once the rearing has been completed. Once the den no longer contains pups/cubs and is no longer natal in nature, passive relocation can commence. Once individuals have left, the ESA can be taken down and hand-excavation can occur.

- During the non-breeding season, an onsite passive relocation program shall be implemented. This program shall consist of excluding foxes or badgers from occupied burrows by installation of one-way doors at burrow entrances and monitoring of the burrow for 1 week to confirm usage has been discontinued. After the qualified biologist determines that foxes or badgers have stopped using active dens, the dens shall be hand-excavated with a trowel or shovel to prevent reuse during construction.
- Desert kit fox and American badger monitoring reports during construction and decommissioning shall be prepared by the monitoring biologists as needed. If monitoring for desert kit fox or American badger burrows is required, a qualified biologist shall prepare a summary monitoring report separately for the construction phase and the decommissioning phase, documenting the results of pre-activity surveys and monitoring activities for these species. These monitoring reports shall be submitted to the Kern County Planning and Natural Resources Department at the completion of monitoring of any active desert kit fox or American badger burrows.

MM-BIO-GEN-10. Install Wildlife-friendly Fencing.

The project site shall be fenced to keep terrestrial wildlife species from entering the project site during construction, but shall provide openings postconstruction to enable wildlife to move freely through the project site during operation (e.g., create 4- to 7-inch portals or openings in the fence, raising the fence 7 inches above the ground, and knuckling the bottom of the fence [i.e., wrapping the fencing material back to form a smooth edge] to protect wildlife passing underneath). To support safety, the fencing will be maintained around the substation to exclude wildlife species permanently. A desert tortoise exclusion fence is not required unless desert tortoise are found onsite during the preconstruction surveys. This wildlife-friendly fencing shall be constructed of silt fence material, metal flashing, plastic sheeting, or other materials that shall prohibit wildlife from climbing the fence or burrowing beneath it. The fencing shall be buried approximately 12 inches below the ground surface and extend a minimum of 30 inches above grade. Fencing shall be installed prior to issuance of grading or building permits and maintained during all phases of construction and decommissioning. The fencing shall be inspected by a qualified biologist at a regular interval and immediately after all major rainfall events through the duration of construction and decommissioning activities. Any needed repairs to the fence shall be performed on the day of their discovery. Outside temporarily fenced exclusion areas, the project operator shall limit the areas of disturbance. Parking areas, new roads, 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.

MM-BIO-GEN-11. Prevent Inadvertent Wildlife Entrapment.

To prevent inadvertent entrapment of wildlife during construction or decommissioning activities, all excavated, steep-walled holes or trenches more than 2 feet deep shall be covered with plywood or similar materials at the close of each working day or installed with one or more escape ramps constructed of earth fill or secured wooden planks measuring at least 12 inches wide. Larger excavations and trenches measuring 100 feet or larger shall be outfitted with at least two escape ramps and one every 100 feet. All holes and trenches, whether covered or not, shall be inspected for trapped wildlife at the start and end of each workday. Immediately before such holes or trenches are filled, they shall be thoroughly inspected by the biological monitor for trapped wildlife. If trapped animals are observed, escape ramps or structures shall be installed immediately to allow escape. If a listed species is found trapped, all work shall cease immediately in the vicinity of the trapped animal. If the animal is apparently uninjured, then the biological monitor shall directly supervise the provision of escape structures or trench modifications to allow the trapped animal to leave safely. Work shall not resume in the vicinity of the animal, and it shall be allowed to leave the work area and project site on its own. If the listed animal is injured, then the biological monitor shall immediately extricate the animal and bring it to a pre-identified veterinary/rehabilitation facility and notify USFWS or CDFW of the incident.

5.7 State Wetlands

Mulefat thicket present in the Bullhead Study Area is presumed to meet the state wetland definition (SWRCB 2019). Impacts on mulefat thicket, a potential state wetland, would be significant. Impacts on this wetland vegetation community are considered in Section 5.4.1, *Sensitive Vegetation Communities*. Implementation of **MM-BIO-VEG-1** would reduce the impacts from any loss of mulefat thicket to less than significant.

The project would result in both permanent and temporary impacts on non-wetland waters that are potentially under the jurisdiction of RWQCB and streambed resources regulated by CDFW. Distribution of waterways are described in the jurisdictional delineation report (Appendix G). Non-wetland waters are not a resource regulated under CEQA; however, to comply with state regulations protecting waters, non-wetland waters would be avoided to the maximum extent practicable. For unavoidable impacts on non-wetland waters, the following permit and agreements would be obtained, or evidence would be provided from the respective resource agency to Kern County that such an agreement or permit is not required. The jurisdictional delineation identified 29 features that total 13.87 acres and 19,686 linear feet of potentially jurisdictional waters subject to CDFW jurisdiction. There are 19 features that total 0.465 acre and 6,152 linear feet of potentially jurisdictional waters subject to RWQCB jurisdiction.

- A Waste Discharge Requirement issued by the California RWQCB for all project-related disturbances of Waters of the State.
- A Section 1602 Lake or Streambed Alteration Agreement issued by CDFW for all project related disturbances of any streambed or CDFW jurisdictional riparian habitat.

MM-BIO-WATERS-1. Wetland Permits.

Impacts on jurisdictional wetland and waterway resources require permits and authorizations by the Regional Water Quality Control Board and CDFW prior to impacts. The applicant shall provide Kern County with permits and authorizations from each resource agency demonstrating approval of project impacts on aquatic resources, or evidence that such a permit is not required, prior to the approval of the grading or improvement plans.

5.8 Wildlife Migration Corridors

5.8.1.1 Direct Impacts

No regional wildlife linkages or corridors are mapped within the project site. Therefore, the project would not permanently affect existing wildlife movement. Although fencing would be installed around the main solar facility, the access roads and gen-tie lines would not be fenced, and no major barriers would be created that would prevent or impede wildlife movement in the region. Because the area is open and wildlife can move throughout the region unimpeded (see Section 4.6, *Wildlife Migration Corridors*), the project would not pose a physical barrier to large-scale wildlife movement, and no major wildlife passages would be permanently reduced or eliminated by the project.

5.8.1.2 Indirect Impacts

The project could temporarily indirectly affect wildlife movement during construction due to the increased presence of equipment, construction-related disturbances (e.g., noise, nighttime lighting), and construction personnel, which may temporarily deter wildlife movement within the BSA. However, these impacts would be temporary in nature, and wildlife could simply avoid the construction zone and use the surrounding area for movement.

5.8.1.3 Avoidance and Minimization Measures

The project site lacks major wildlife linkages or corridors. Therefore, potential impacts of the proposed project on wildlife movement are expected to be minor, and no avoidance and minimization measures are proposed.

5.9 Protected Cactus and Yucca Species

Beavertail cactus and silver cholla, which are native desert plants protected under the CDNPA, were observed within the study area. The locations of these species were cataloged during the 2021 field surveys (Appendix A, Figure 11, *Special Status Plant, Joshua Tree, and Protected Cacti Inventory Area & Results*). This mapping provides guidance to the project proponent regarding the locations of protected cacti in support of the project and the potential harvesting of the subject species. The project proponent would provide the data to Kern County as a part of the permit application for a Desert Native Harvest Permit (**MM-BIO-PLANT-3**). Acquisition of Desert Native Harvest Permit would ensure compliance with state laws and local implementing regulations and would ensure that the project would not have a significant effect on complying with local regulations. Note that Joshua trees are a state candidate species and the removal of Joshua trees is no longer permitted through a Desert Native Harvest Permit.

MM-BIO-PLANT-3. Acquire a Desert Native Harvest Permit.

Prior to the issuance of a grading permit, the project proponent shall demonstrate compliance with CDNPA by acquiring a Desert Native Harvest Permit from Kern County to harvest protected desert native plants, including paying the appropriate fees based on the total anticipated loss of each species.

5.10 Kern County Compliance

5.10.1 Kern County General Plan

The proposed project falls within the jurisdiction of the *Kern County General Plan*. As a component of the project description, the proposed project would pursue compliance with the goals and implementation policies set forth in the *General Plan Energy Element and the Threatened and Endangered Species* section of the General Provisions, Section 1.10.5 (see Section 2.1.3, *Local*, of this report):

- **Compliance with Policy 27**: No significant impacts on listed species have been identified. The implementation of the avoidance and minimization measures outlined in this BTR would ensure that impacts on listed species, if any, are negligible.
- **Compliance with Policy 28**: There are no fish present within the BSA; therefore, no mitigation measures for fish are warranted. The implementation of the avoidance and minimization measures outlined in this BTR would ensure that impacts on terrestrial wildlife and botanical resources present within the BSA are minor.
- **Compliance with Policy 29**: The proposed project does not occur within the West Mojave Plan or any other preserve lands. The avoidance and minimization measures provided in this BTR would be implemented to reduce any potential impacts on listed species to less-than-significant levels. No additional mitigation measures are required.
- **Compliance with Policy 30**: This BTR provides the requisite substantial evidence to inform the public regarding the applicable federal, state, and local statutes and regulations that would be considered by the Kern County Board of Supervisors and other trustee and responsible agencies in their consideration of the proposed project. No additional mitigation measures are warranted.
- **Compliance with Policy 31**: Kern County would circulate the environmental document with this BTR to CDFW and USFWS for review and comment. No additional mitigation measures are warranted.
- **Compliance with Policy 32**: Riparian areas do not occur within the BSA; therefore, no mitigation measures are required.

5.10.2 Willow Springs Specific Plan

The southern half of the project occurs within the Willow Springs Specific Plan. Under the plan, Joshua trees are designated as sensitive resources. The Willow Springs Specific Plan contains two measures specific to Joshua trees:

(15) Where possible, project development within the Specific Plan Update area shall be designed to avoid displacement or destruction of Joshua tree habitat, to the satisfaction of the Kern County Agricultural Commissioner’s Office. Areas adjacent to the woodland shall have a 50-foot setback from the Joshua tree plants. Within that setback, a native plant cover should be restored to natur4al habitat values to serve as a buffer, if such plant cover is not present.

(23) A Joshua Tree Preservation and Transplantation Plan shall be developed by the applicants of discretionary projects for each parcel where Joshua trees are located on site. The plan hall be submitted to the Kern County Agricultural Commissioner’s Office for review and approval prior to grading permit issuance.

The project proponent would pursue compliance with the policies and measures set forth in the Willow Springs Specific Plan (**MM-BIO-GEN-12**).

MM-BIO-GEN-12. Pursue Compliance with the Willow Springs Specific Plan

If Joshua tree does not remain a candidate for listing or is not listed under the CESA at the time of CUP approval, the project will comply with the applicable state and local regulations for the species, including the Willow Springs Specific Plan.

Where possible, project development within the Specific Plan Update area shall be designed to avoid displacement or destruction of Joshua tree habitat, to the satisfaction of the Kern County Agricultural Commissioner’s Office. Areas adjacent to the woodland shall have a 50-foot setback from the Joshua tree plants. Within that setback, a native plant cover should be restored to natural habitat values to serve as a buffer, if such plant cover is not present.

A Joshua Tree Preservation and/or Transplantation Plan shall be developed by the applicant for each parcel where Joshua trees are located on site. The plan shall be submitted to the Kern County Agricultural Commissioner's Office for review and approval prior to grading permit issuance.

Prior to issuance of any grading permits for individual projects, individual project applicants shall consult with the RWQCB, USFWS and/or CDFW, and the USACE to identify potentially required permits. Compliance with this measure will be confirmed through the submittal of a letter (in conjunction with the submittal of grading permit applications) to the County demonstrating compliance with the above-mentioned agencies.

Chapter 6
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Appendix A
Figures

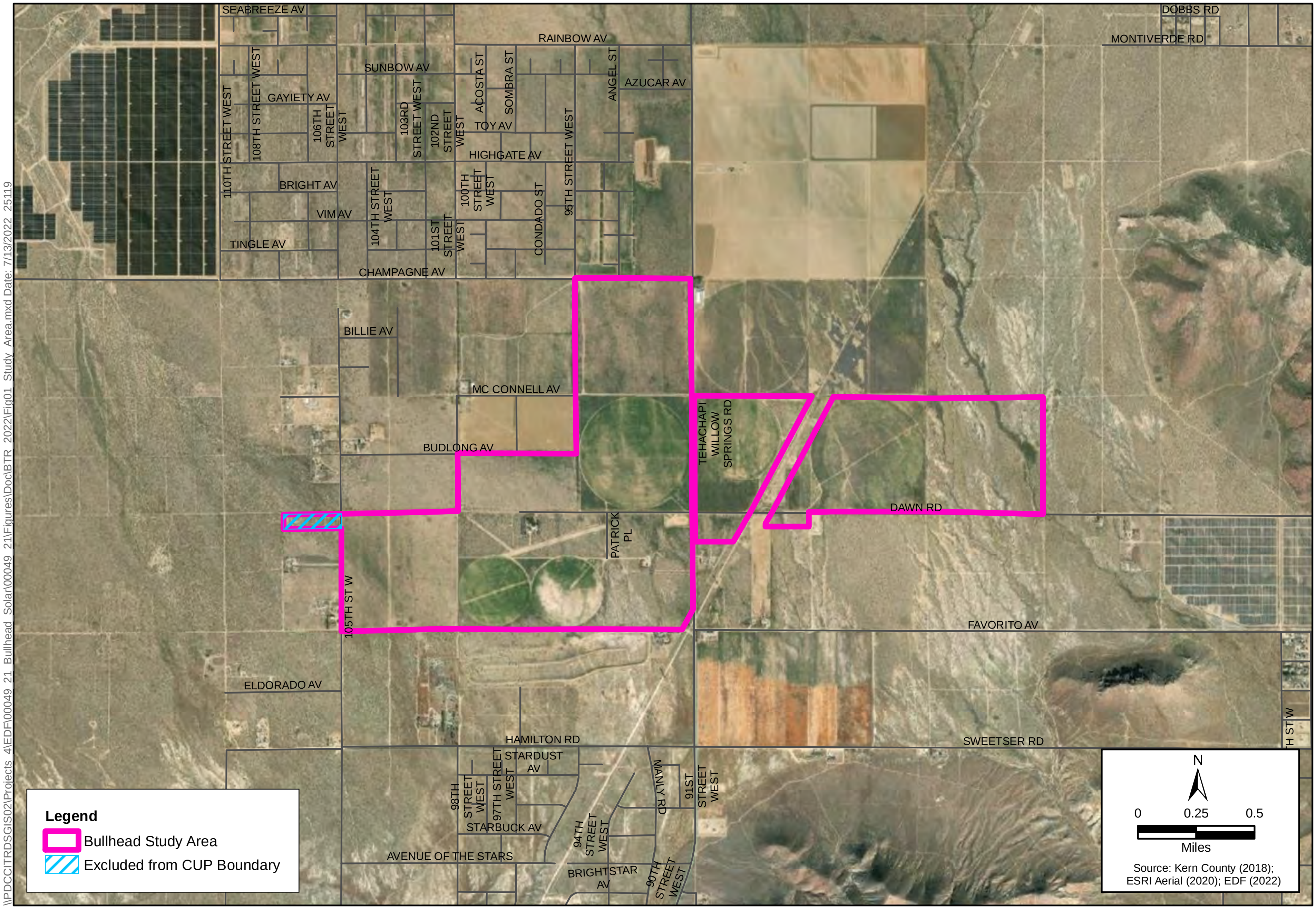

Figure 1
Study Area
Bullhead Solar

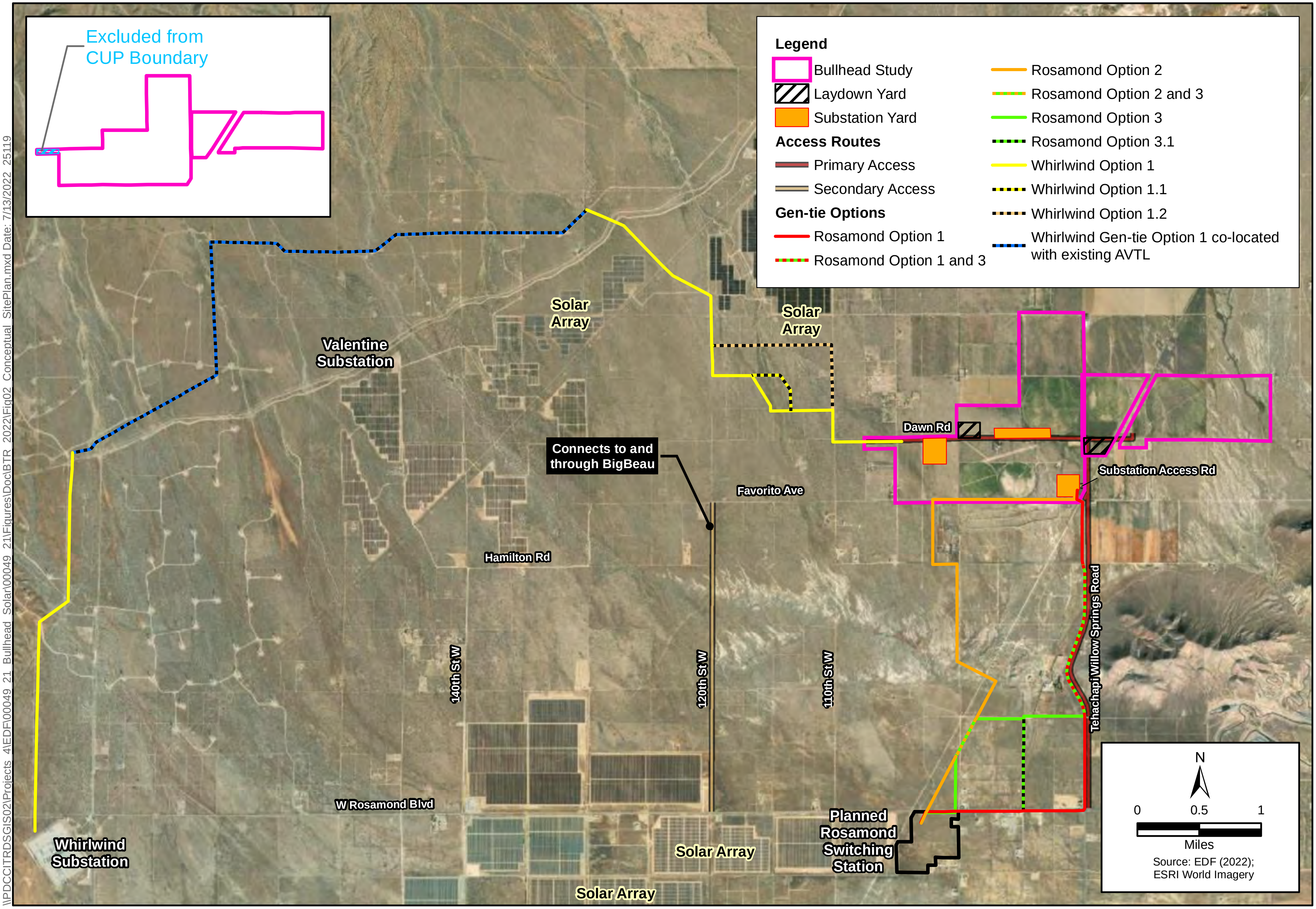

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Figure 2
Conceptual Site Plan
Bullhead Solar

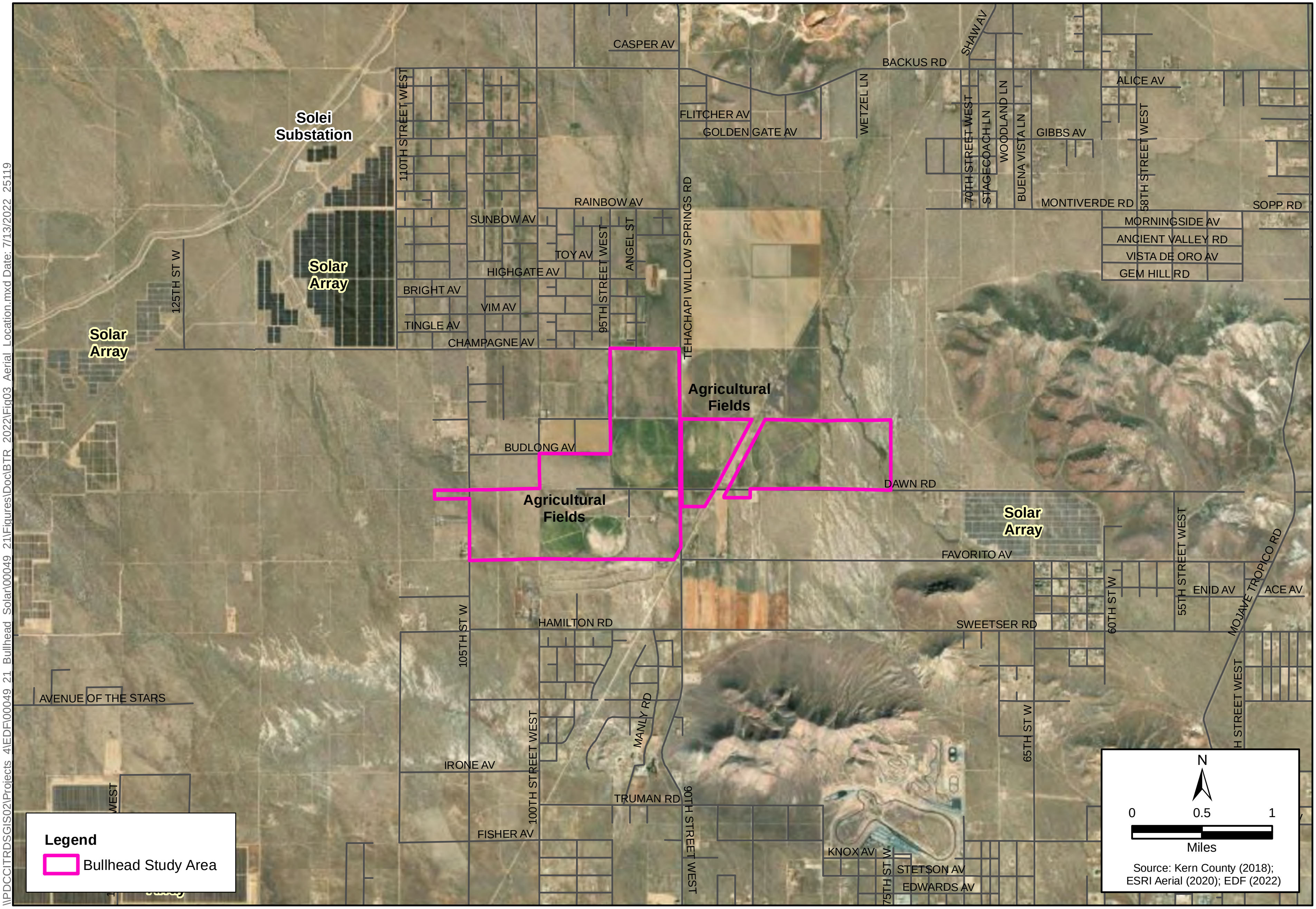

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Figure 3
Aerial Location Map
Bullhead Solar

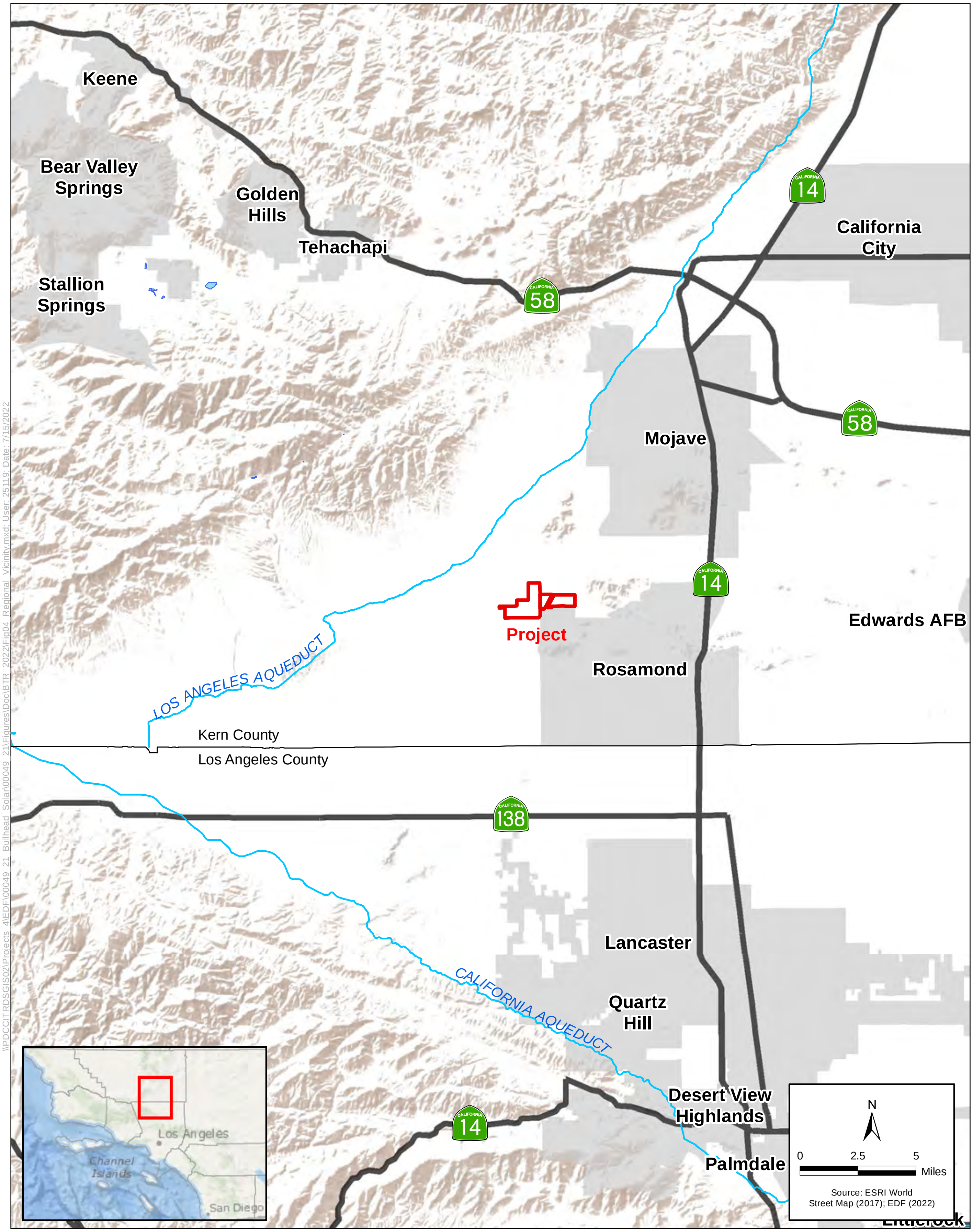

Figure 4
Regional Vicinity Map
Bullhead Solar

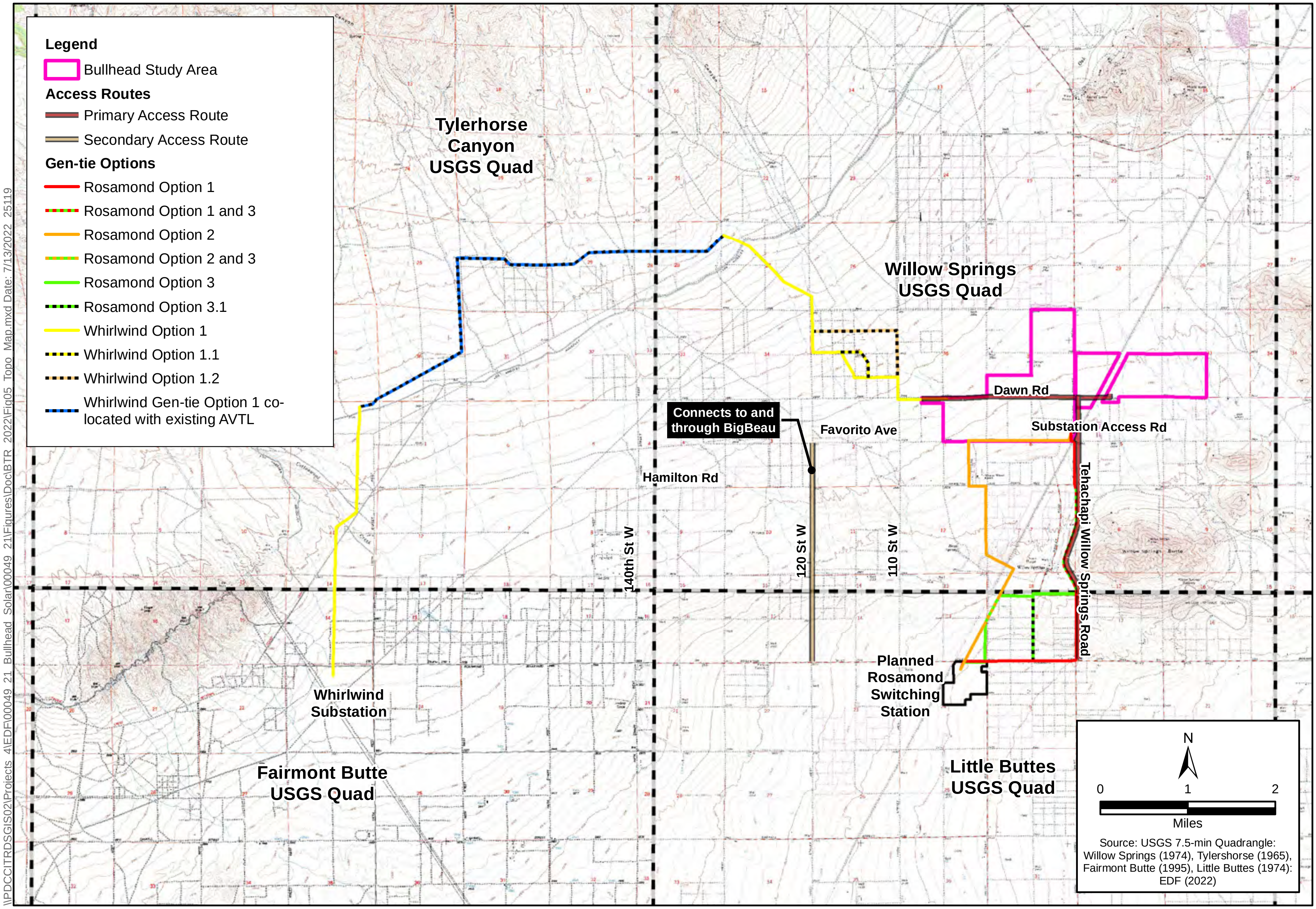

Figure 5
Topographic Map
Bullhead Solar

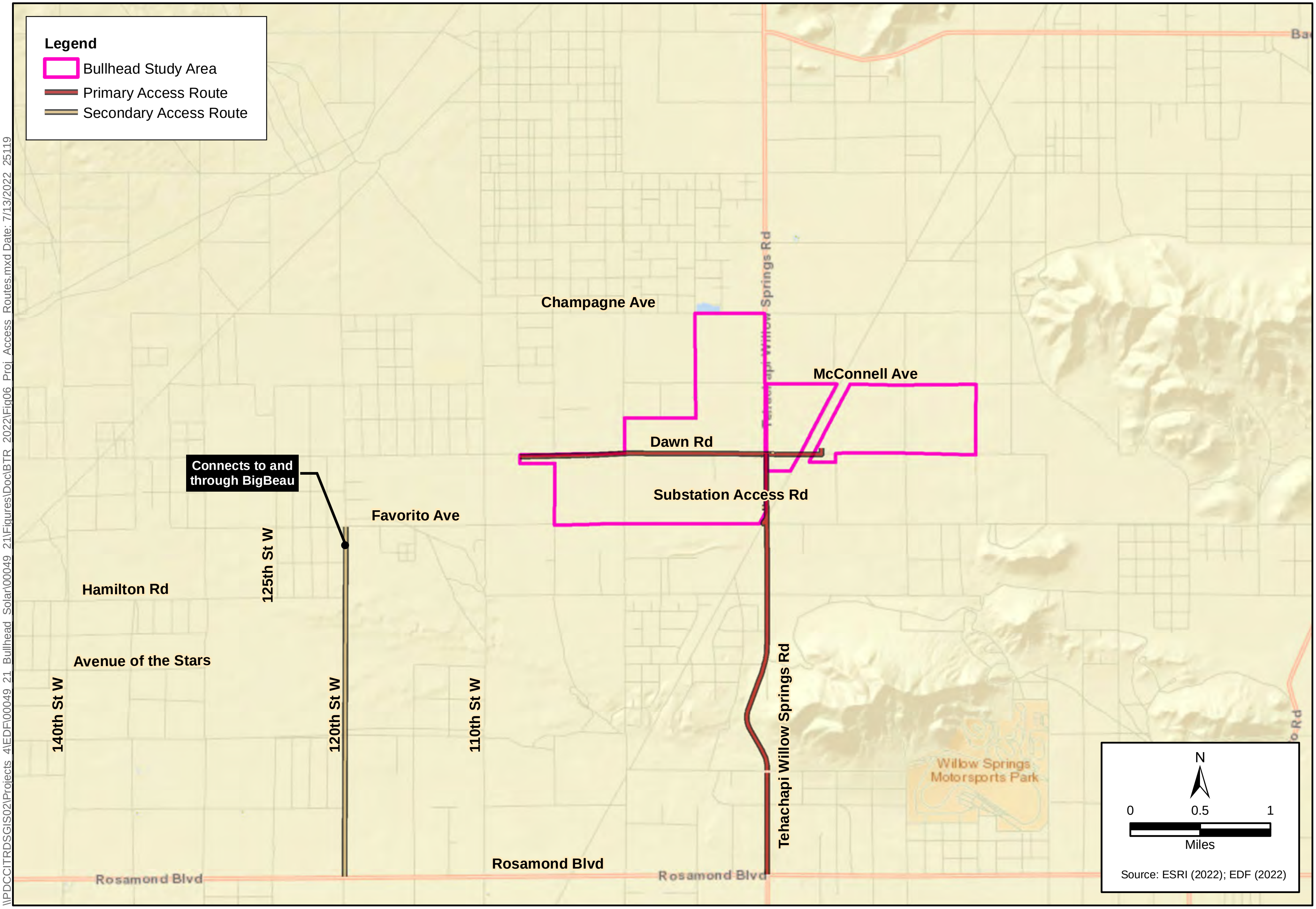

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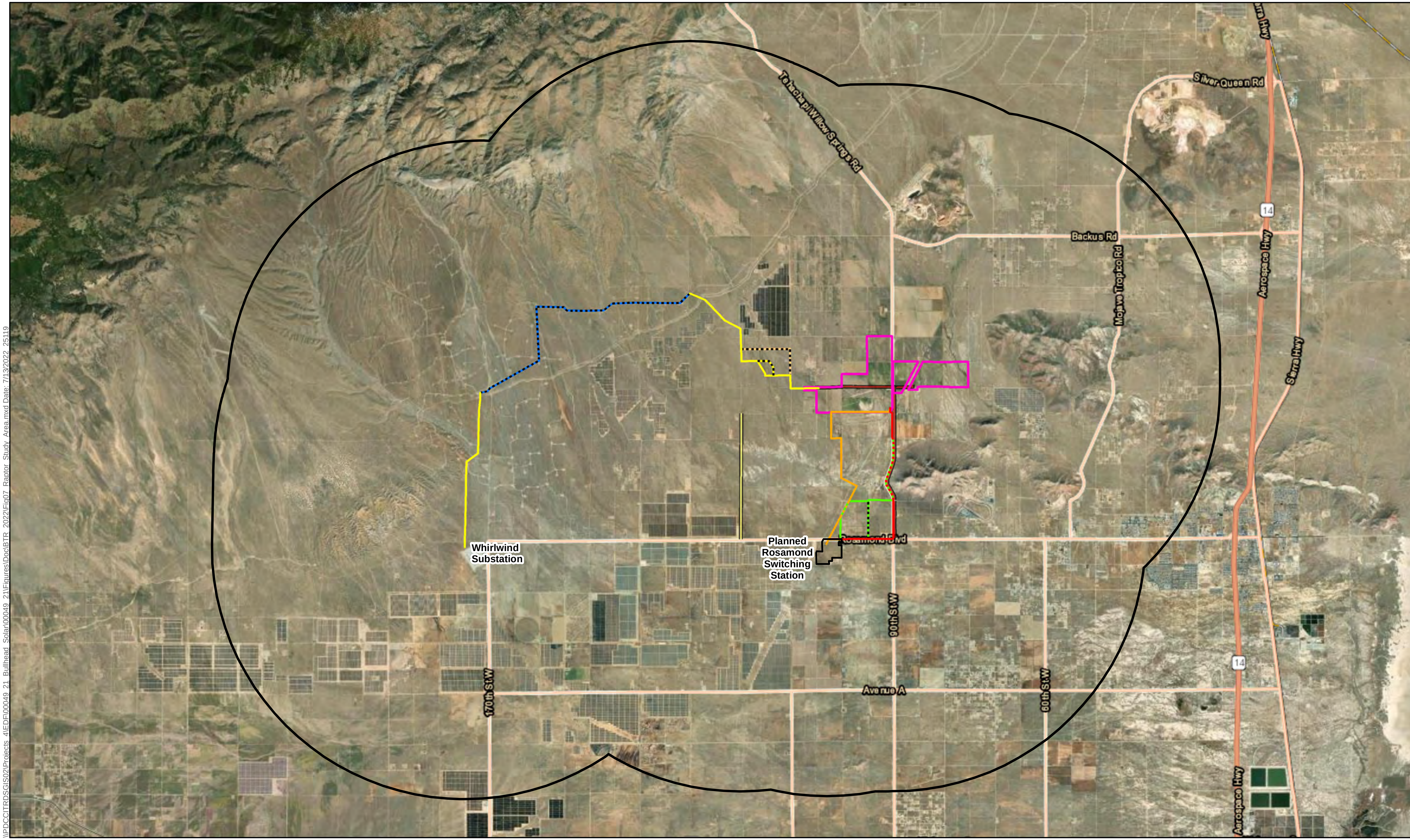
Figure 6
Project Access Routes
Bullhead Solar



Raptor and Raven Study Area Study Area

Bullhead Study Area

Gen-tie Options

Rosamond Option 1

Rosamond Option 1 and 3

Rosamond Option 2

Rosamond Option 2 and 3

Rosamond Option 3

Rosamond Option 3.1

Whirlwind Option 1

Whirlwind Option 1.1

Whirlwind Option 1.2

Whirlwind Gen-tie Option 1 co-located with existing AVTL

Access Routes

Primary Access Route

Secondary Access Route

N

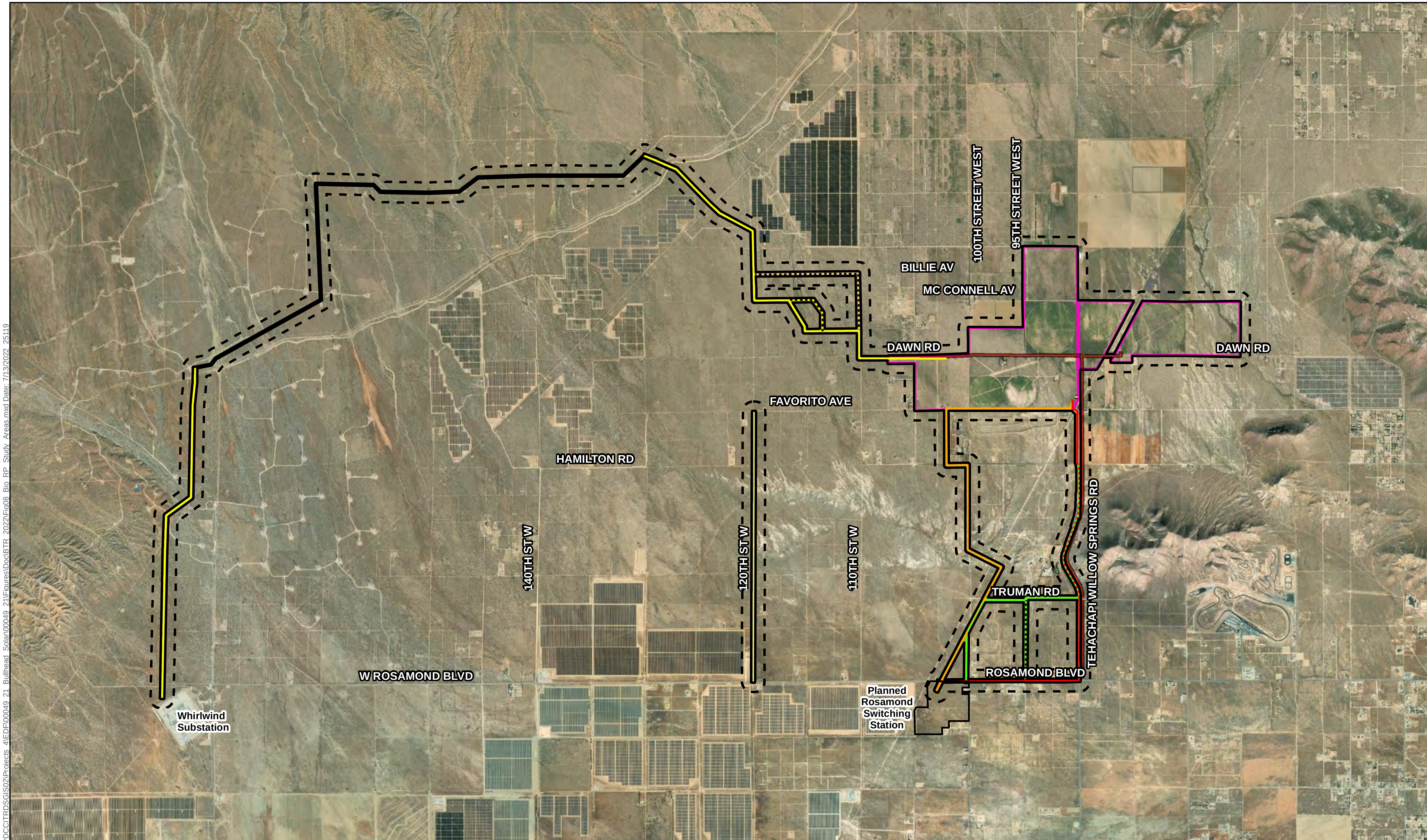
0 1 2

Miles

Figure 7
Project Components &
Raptor and Raven Study Area
Bullhead Solar

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig07_Raptor_Study_Area.mxd Date: 7/13/2022 25119



Biological Study Area
Rare Plant Study Area
Bullhead Study Area
Gen-tie Options
Rosamond Option 1
Rosamond Option 2
Rosamond Option 3
Rosamond Option 3.1
Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2
Whirlwind Option 1 co-located with existing AVTL

Access Routes
Primary Access Route
Secondary Access Route

N
0 0.5 1
Miles

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

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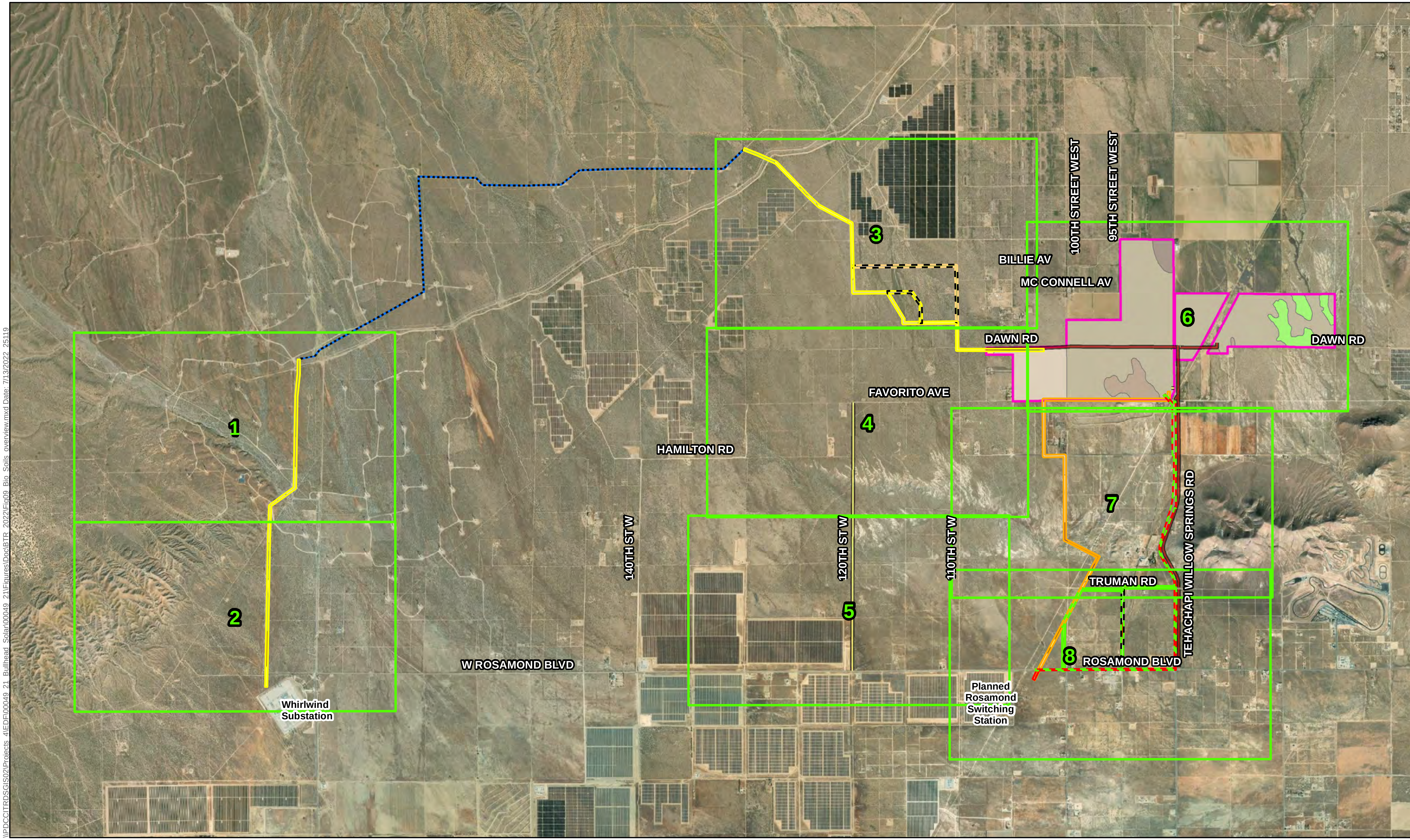
Figure 8
Project Components &
Biological & Rare Plant Study Areas
Bullhead Solar



N

0 0.5 1

Miles

Source: EDF (2022); ESRI Imagery (2020)

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Figure 9 - Overview Soils Bullhead Solar

SSURGO Soils
Arizo gravelly loamy sand, 0 to 5 percent slopes (AsB)
Cajon loamy sand, 2 to 9 percent slopes (CaC)
Ramona coarse sandy loam, 2 to 5 percent slopes (RcB)
Ramona gravelly sandy loam, 2 to 9 percent slopes (ReC)
Ramona sandy loam, 9 to 30 percent slopes, eroded (RdE2)
Not Included in Impacts
Gen-tie Options
Whirlwind Option 1

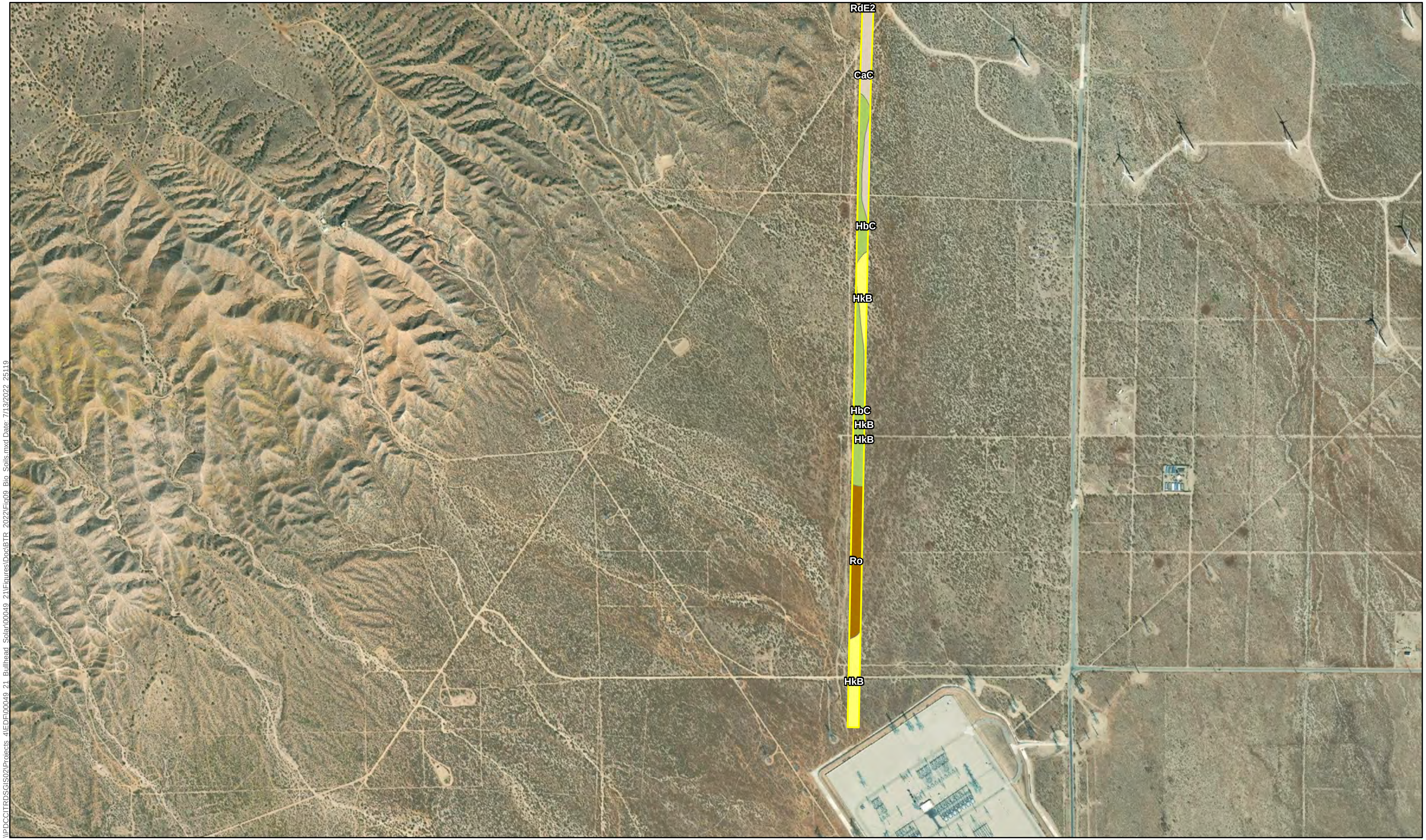
N
0 500 1,000
Feet

ICF

Source: EDF (2022); ESRI Imagery (2020)

Figure 9 - Sheet 1 of 8
Soils
Bullhead Solar

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21\Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig09_Bio_Soils.mxd Date: 7/13/2022 25119



SSURGO Soils
- Cajon loamy sand, 2 to 9 percent slopes (CaC)
- Hanford coarse sandy loam, 2 to 9 percent slopes (HbC)
- Hesperia fine sandy loam, 2 to 5 percent slopes (HkB)
- Ramona sandy loam, 9 to 30 percent slopes, eroded (RdE2)
- Rosamond fine sandy loam (Ro)

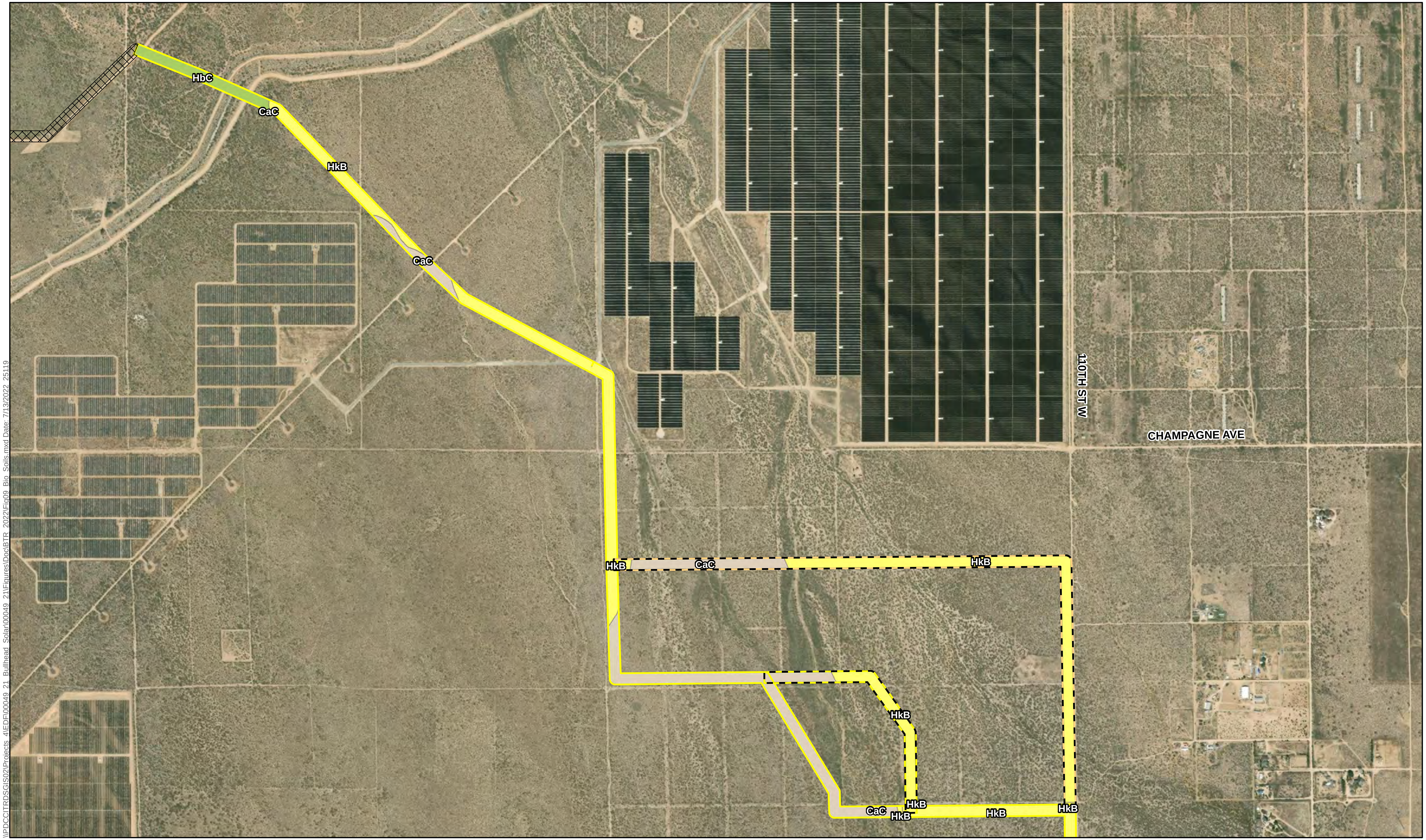
Gen-tie Options
- Whirlwind Option 1

N
0 500 1,000
Feet

Source: EDF (2022); ESRI Imagery (2020)

Figure 9 - Sheet 2 of 8
Soils
Bullhead Solar

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig09_Bio_Soils.mxd Date: 7/13/2022 25119

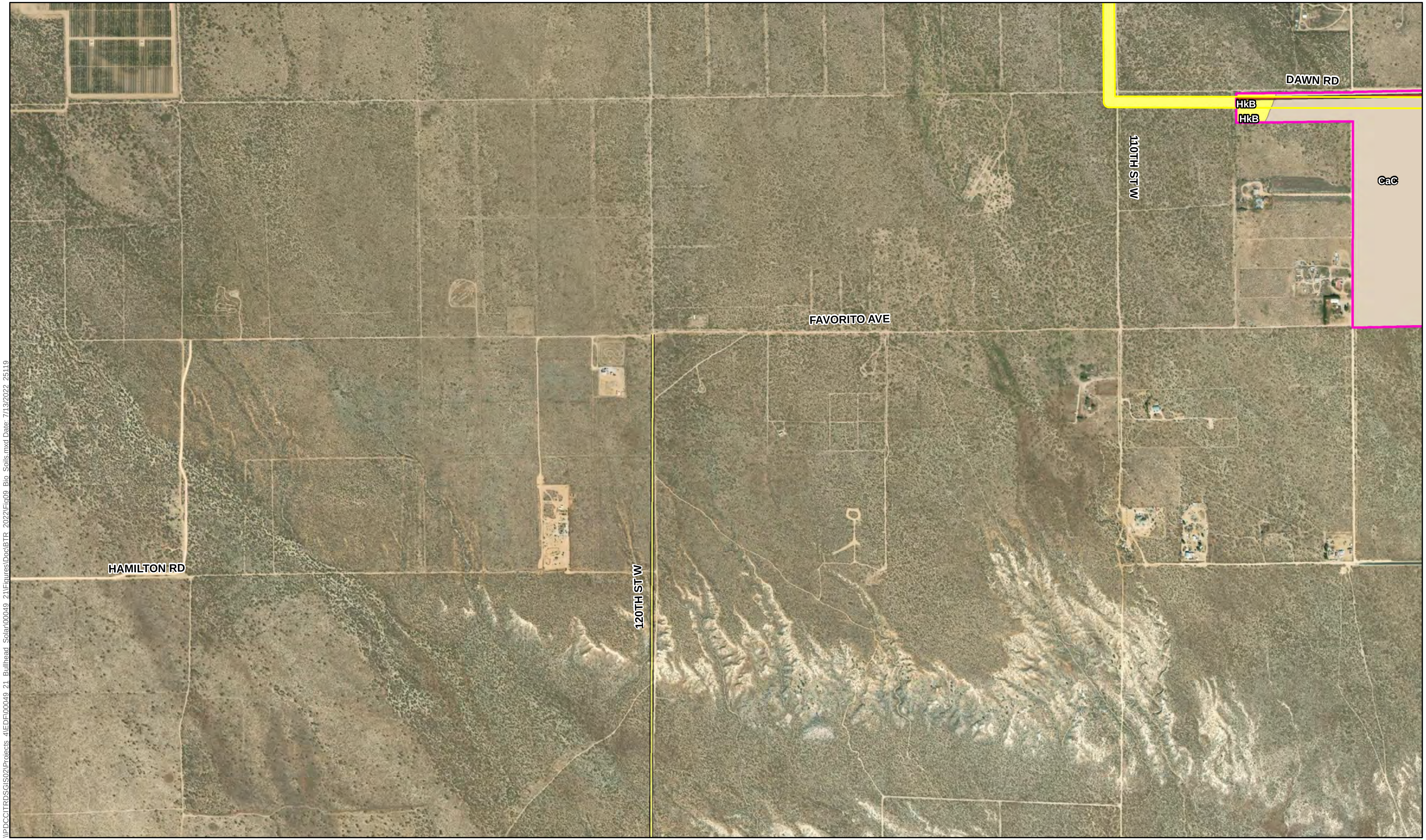


N
0 500 1,000
Feet

SSURGO Soils
Cajon loamy sand, 2 to 9 percent slopes (CaC)
Hanford coarse sandy loam, 2 to 9 percent slopes (HbC)
Hesperia fine sandy loam, 2 to 5 percent slopes (HkB)
Not Included in Impacts
Gen-tie Options
Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2

Source: EDF (2022); ESRI Imagery (2020)

Figure 9 - Sheet 3 of 8
Soils
Bullhead Solar



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N

0 500 1,000

Feet

SSURGO Soils

Cajon loamy sand, 2 to 9 percent slopes (CaC)

Hesperia fine sandy loam, 2 to 5 percent slopes (HkB)

Bullhead Study Area

Access Routes

Primary Access Route

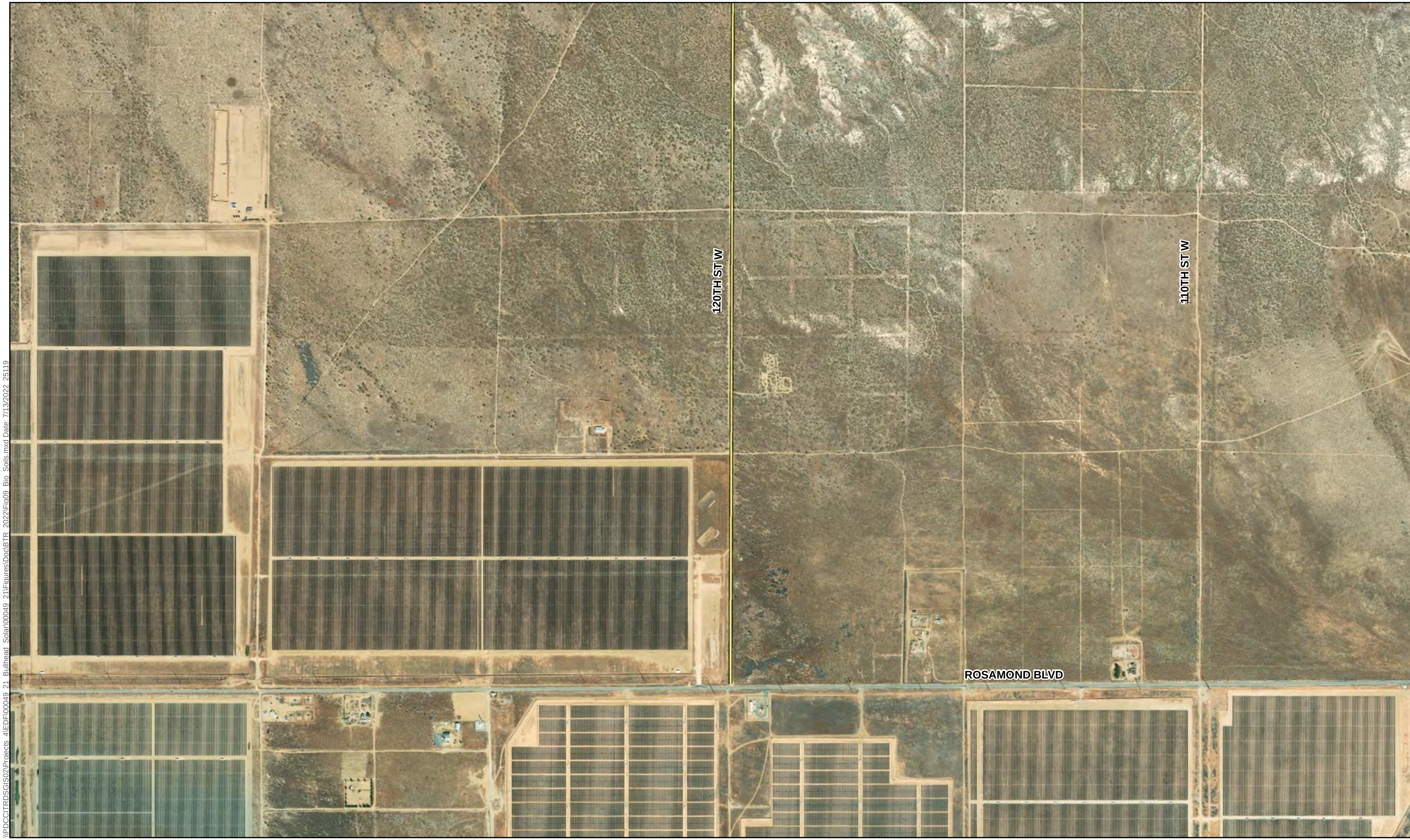
Secondary Access Route

Gen-tie Options

Whirlwind Option 1

Source: EDF (2022); ESRI Imagery (2020)

Figure 9 - Sheet 4 of 8
Soils
Bullhead Solar

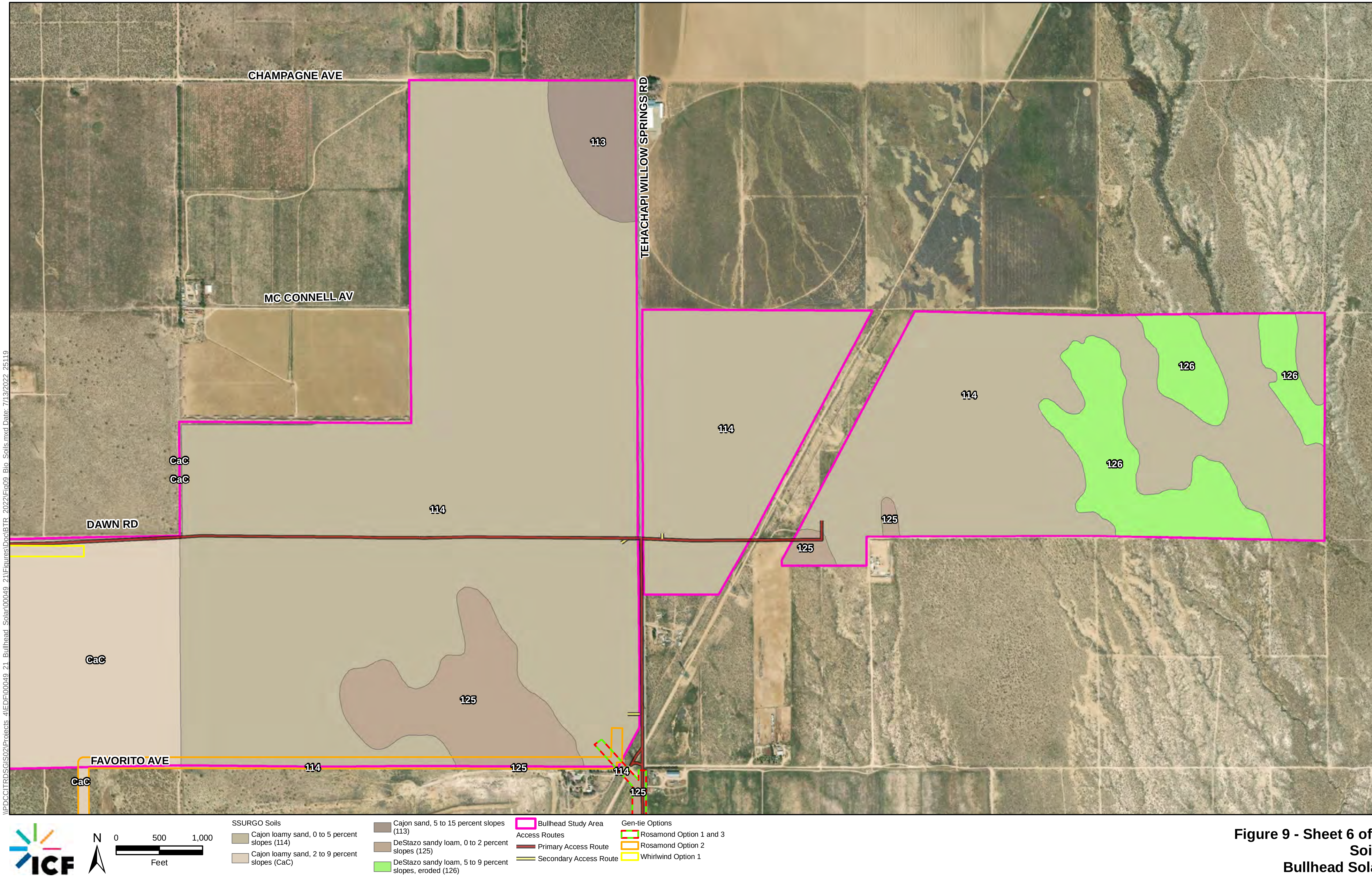


Access Routes
Secondary Access Route

N 0 500 1,000
Feet

Source: EDF (2022); ESRI Imagery (2020)

Figure 9 - Sheet 5 of 8
Soils
Bullhead Solar



Source: EDF (2022); ESRI Imagery (2020)

Figure 9 - Sheet 6 of 8
Soils
Bullhead Solar

SSURGO Soils

- Adelanto loamy sand, 2 to 5 percent slopes (AaB)
- Arizo gravelly loamy sand, 0 to 5 percent slopes (AsB)
- Arizo gravelly loamy sand, 2 to 9 percent slopes (104)
- Badland-Orthents complex, 30 to 75 percent slopes (112)
- Cajon loamy sand, 2 to 9 percent slopes (CaC)
- DeStazo sandy loam, 0 to 2 percent slopes (125)
- DeStazo sandy loam, 5 to 9 percent slopes, eroded (126)
- Hesperia fine sandy loam, 0 to 2 percent slopes (HkA)
- Hesperia fine sandy loam, 2 to 5 percent slopes (HkB)
- Mohave coarse sandy loam, 2 to 5 percent slopes (MzB)
- Rosamond fine sandy loam (Ro)
- Rosamond loam (Rp)
- Rough broken land (RzF)
- Sunrise sandy loam (Sv)

Access Routes

- Primary Access Route

Gen-tie Options

- Rosamond Option 1 and 3
- Rosamond Option 2
- Rosamond Option 2 and 3
- Rosamond Option 3
- Rosamond Option 3.1

N

0 500 1,000

Feet

ICF

Source: EDF (2022); ESRI Imagery (2020)

Figure 9 - Sheet 7 of 8
Soils
Bullhead Solar

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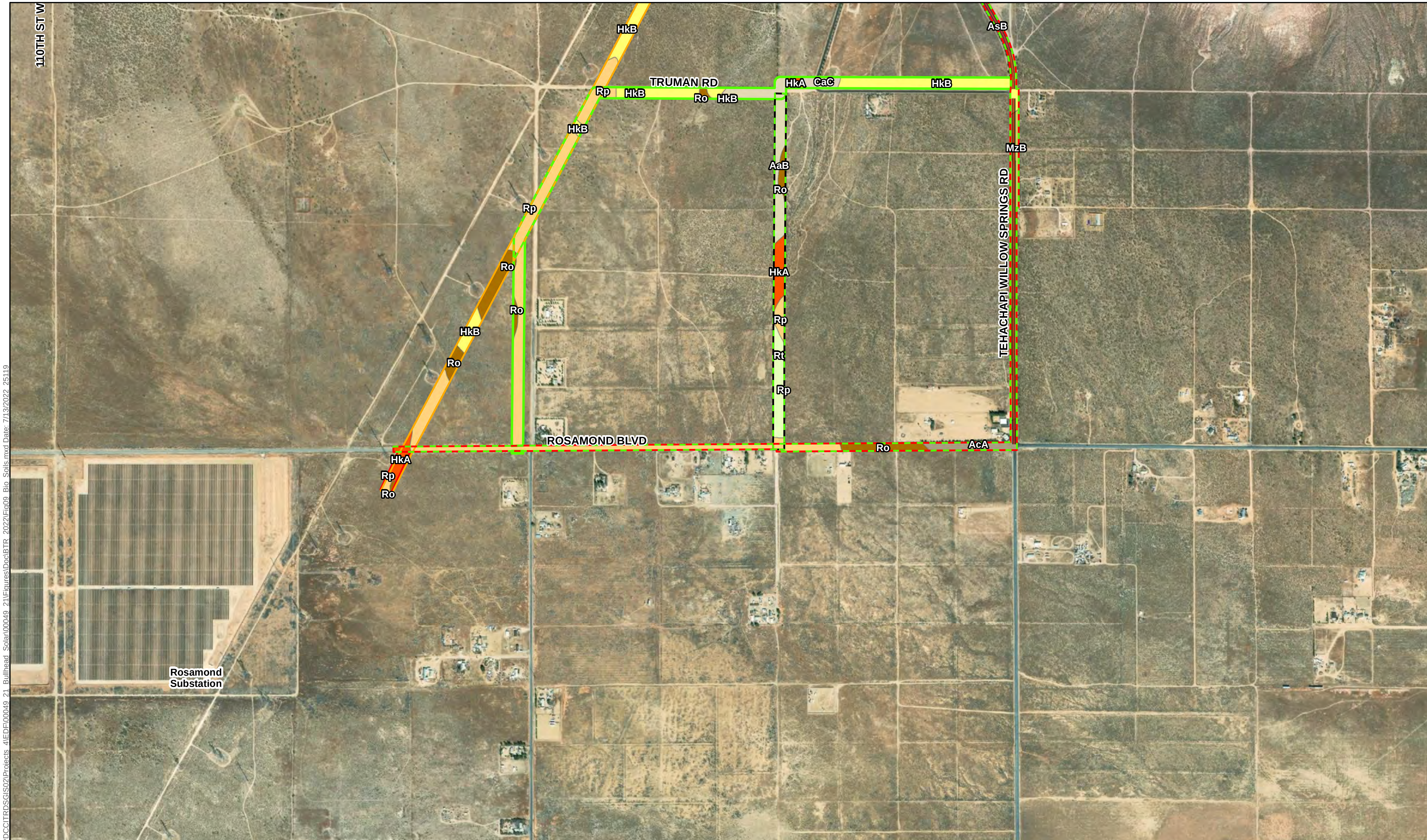

N 0 500 1,000 Feet

SSURGO Soils
- Adelanto coarse sandy loam, 2 to 5 percent slopes (AcA)
- Adelanto loamy sand, 2 to 5 percent slopes (AaB)
- Arizo gravelly loamy sand, 0 to 5 percent slopes (AsB)
- Cajon loamy sand, 2 to 9 percent slopes (CaC)
- Hesperia fine sandy loam, 0 to 2 percent slopes (HkA)
- Hesperia fine sandy loam, 2 to 5 percent slopes (HkB)
- Mohave coarse sandy loam, 2 to 5 percent slopes (MzB)
- Rosamond fine sandy loam (Ro)
- Rosamond loam (Rp)
- Rosamond silty clay loam (Rt)
- Rough broken land (RzF)

Access Routes
- Primary Access Route

Gen-tie Options
- Rosamond Option 1
- Rosamond Option 1 and 3
- Rosamond Option 2
- Rosamond Option 2 and 3
- Rosamond Option 3
- Rosamond Option 3.1

Figure 9 - Sheet 8 of 8
Soils
Bullhead Solar

Source: EDF (2022); ESRI Imagery (2020)

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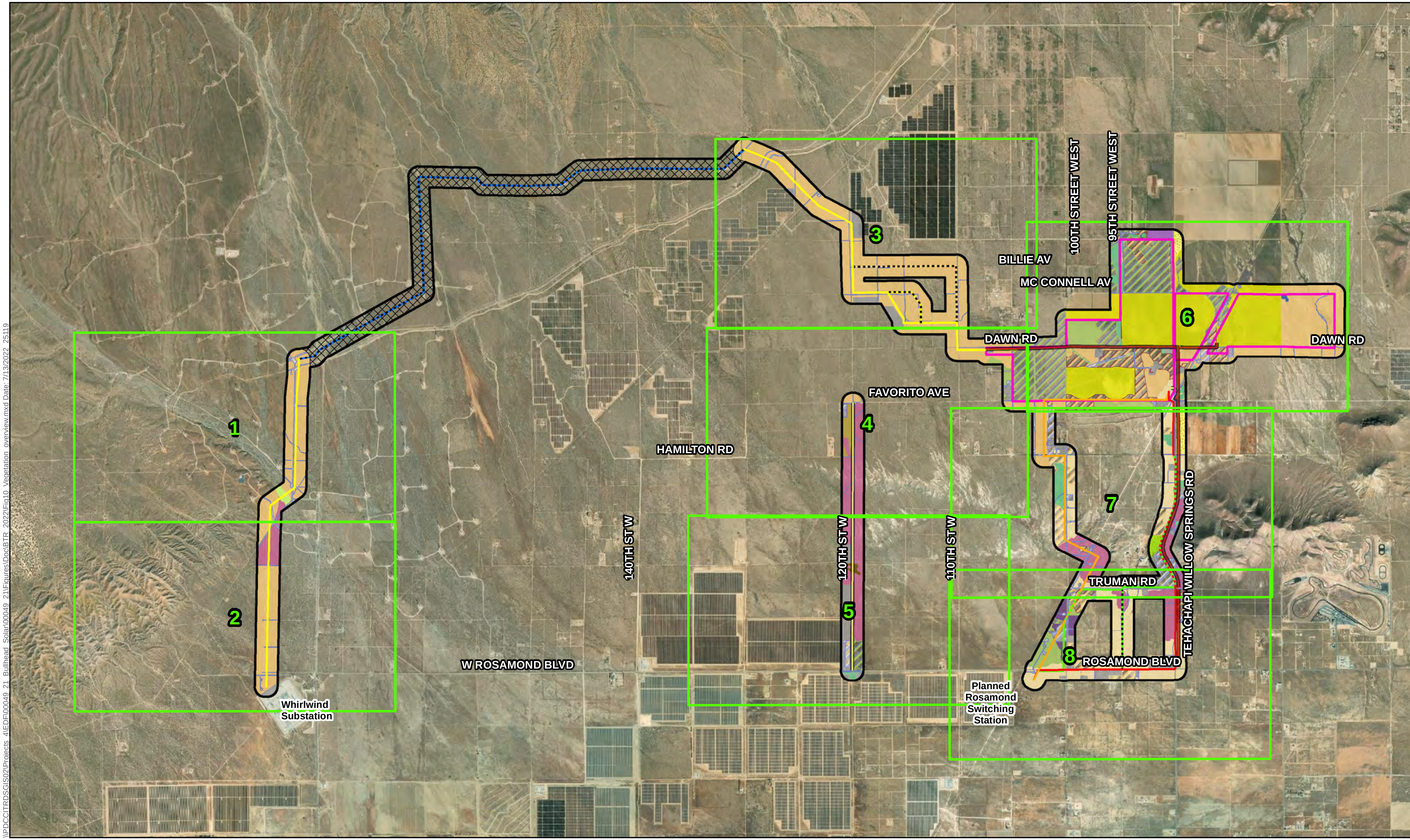

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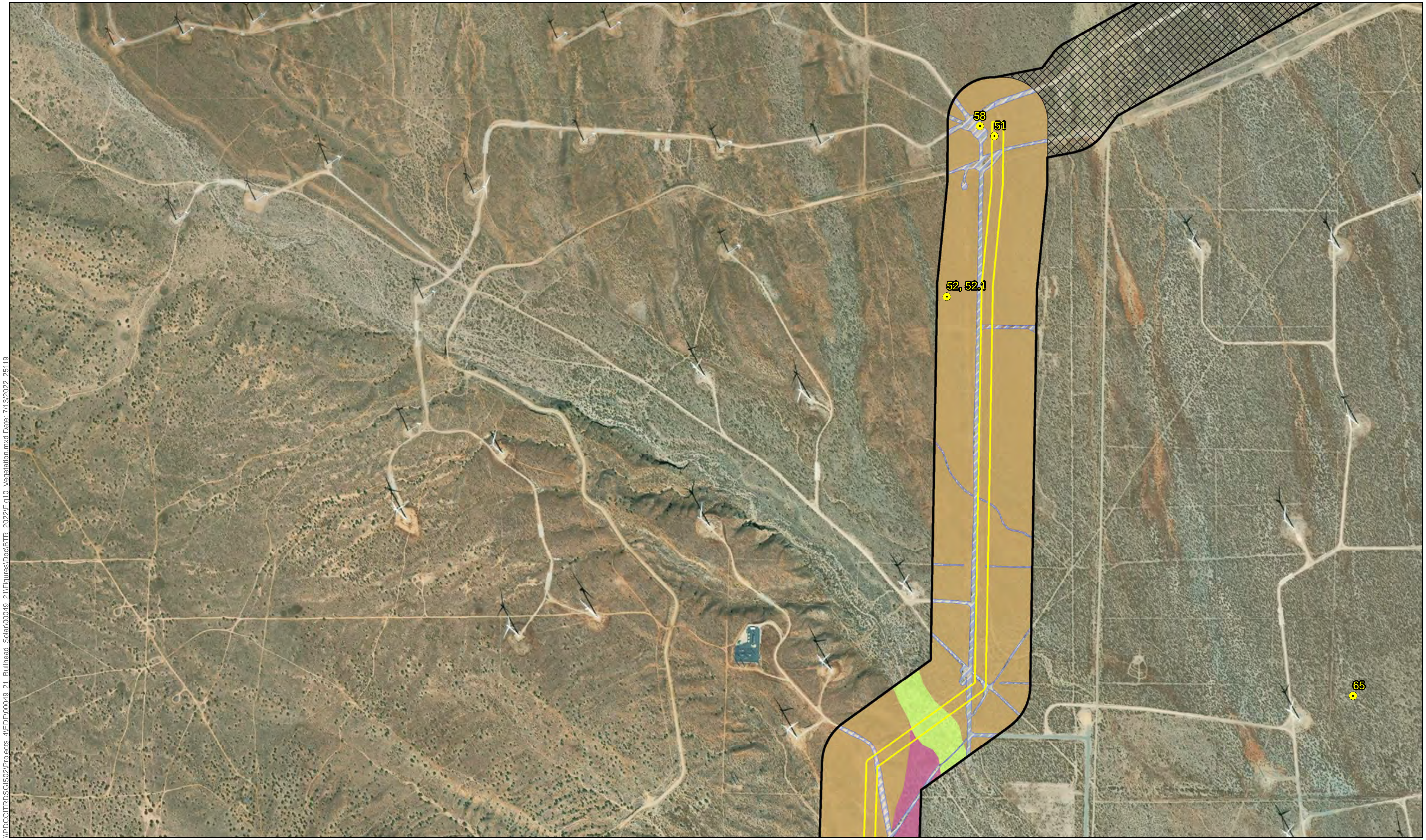
N 0 0.5 1
Miles

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 10 - Overview
Vegetation Communities
Study Area & Results
Bullhead Solar



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N

0 500 1,000

Feet

Photo Points
Biological Study
Not Included in Impacts
Vegetation
Active
Allscale Scrub
Allscale Scrub - Disturbed
California Buckwheat Scrub
Cheesebush - Sweetbush Scrub
Creosote Bush - White Bursage Scrub
Creosote Bush Scrub
Creosote Bush Scrub - Disturbed
Developed
Disturbed
Inactive Agriculture/Fallow Field
Joshua Tree Woodland
Mulefat Thicket
Orchard
Rubber Rabbitbush Scrub
Rubber Rabbitbush Scrub - Disturbed
Ruderal Desert Forb Patches
Scale Broom Scrub
Snakeweed Scrub
Tamarisk Thicket
Bullhead Study Area
Gen-tie Options
Rosamond Option 1
Rosamond Option 1 and 3
Rosamond Option 2
Rosamond Option 2 and 3
Rosamond Option 3
Rosamond Option 3.1
Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2
Access Routes
Primary Access
Secondary Access

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 10 - Sheet 1 of 8
Vegetation Communities
Study Area & Results
Bullhead Solar

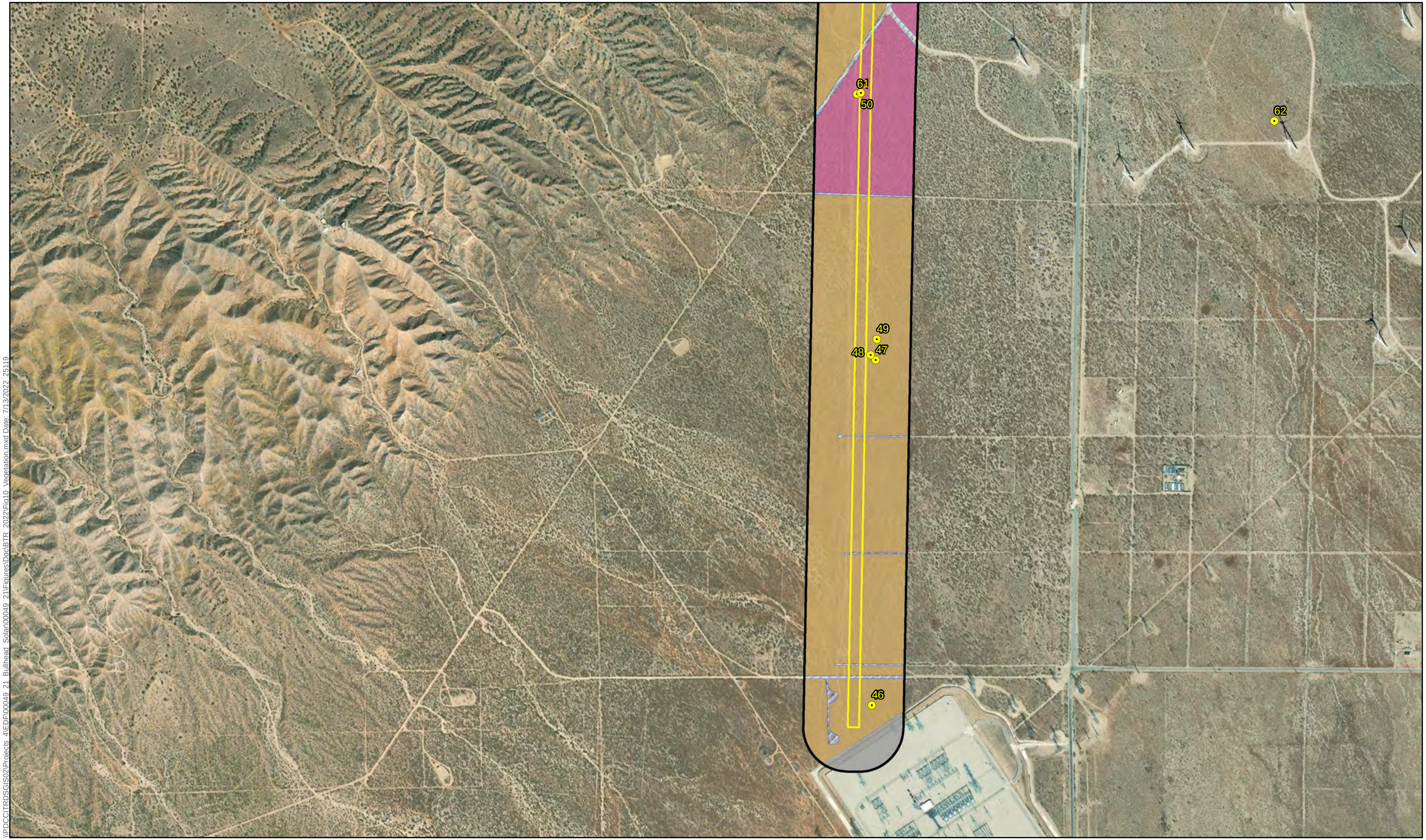

Photo Points
Biological Study
Not Included in Impacts
Vegetation
Active
Allscale Scrub
Allscale Scrub - Disturbed
California Buckwheat Scrub
Cheesebush - Sweetbush Scrub
Creosote Bush - White Bursage Scrub
Creosote Bush Scrub
Creosote Bush Scrub - Disturbed
Developed
Disturbed
Inactive Agriculture/Fallow Field
Joshua Tree Woodland
Mulefat Thicket
Orchard
Rubber Rabbitbush Scrub
Rubber Rabbitbush Scrub - Disturbed
Ruderal Desert Forb Patches
Scale Broom Scrub
Snakeweed Scrub
Tamarisk Thicket
Bullhead Study Area
Gen-tie Options
Rosamond Option 1
Rosamond Option 1 and 3
Rosamond Option 2
Rosamond Option 2 and 3
Rosamond Option 3
Rosamond Option 3.1
Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2
Access Routes
Primary Access
Secondary Access

N

0 500 1,000
Feet

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 10 - Sheet 2 of 8
Vegetation Communities
Study Area & Results
Bullhead Solar

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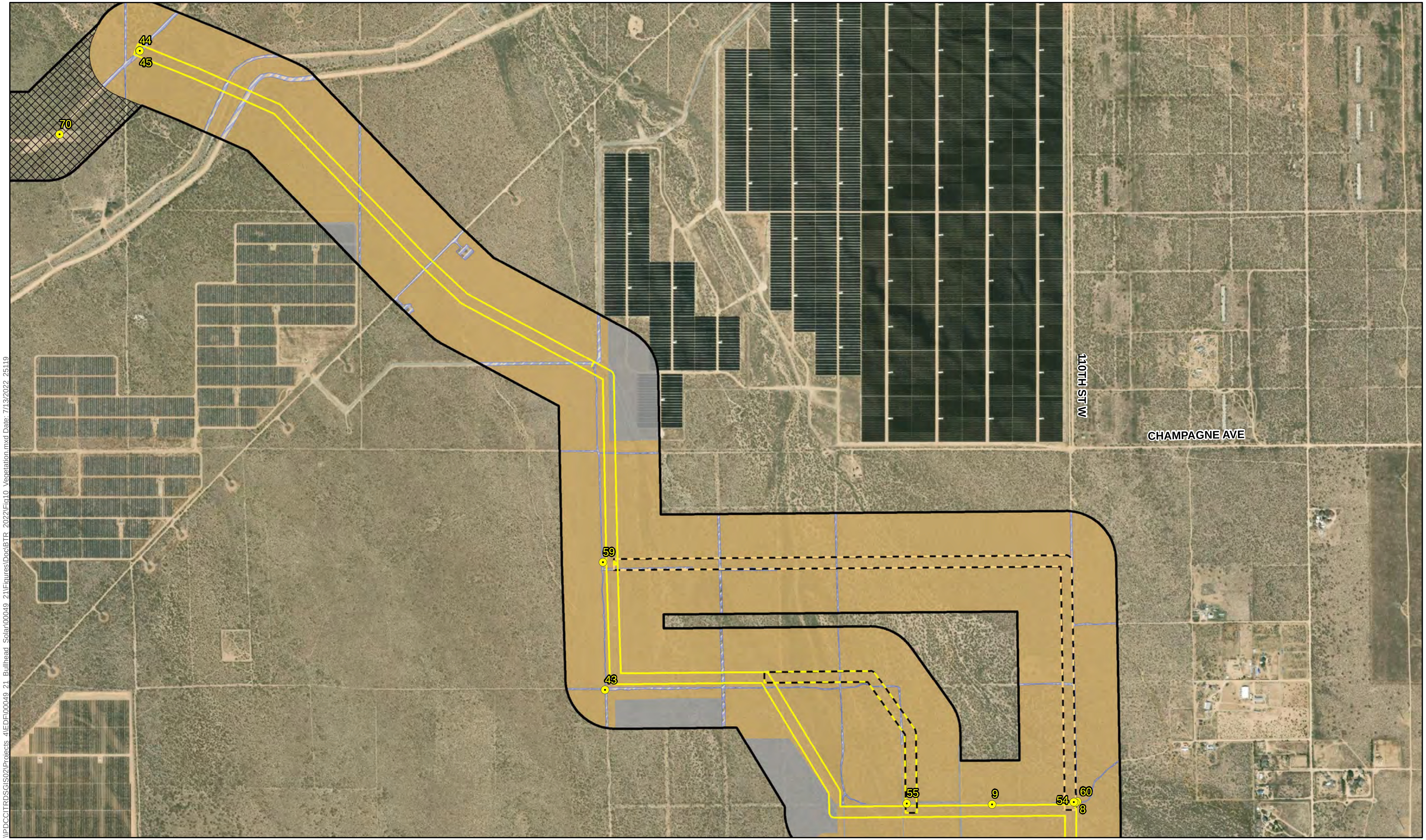
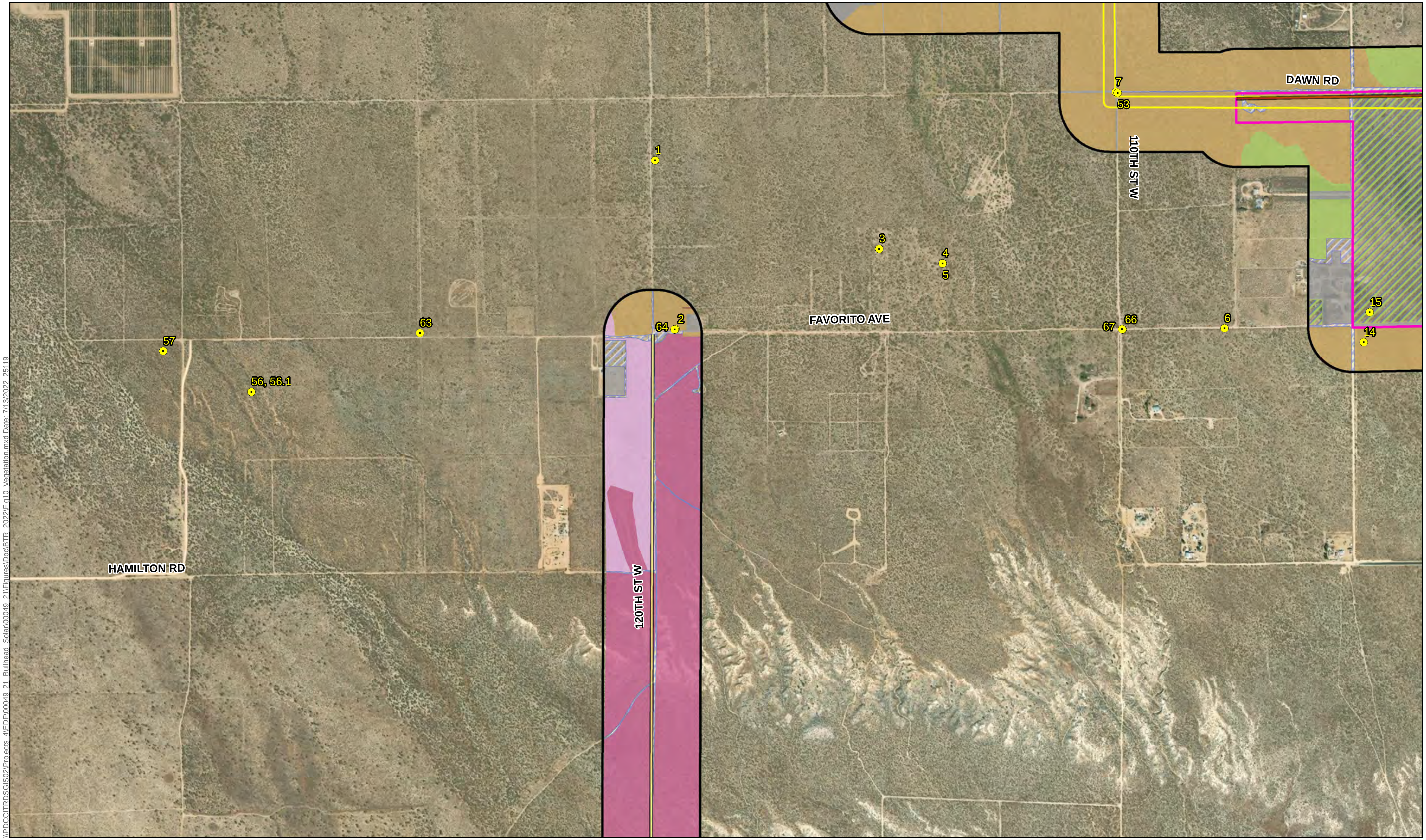


N
0 500 1,000
Feet

Photo Points
Biological Study
Not Included in Impacts
Vegetation
Active
Allscale Scrub
Allscale Scrub - Disturbed
California Buckwheat Scrub
Cheesebush - Sweetbush Scrub
Creosote Bush - White Bursage Scrub
Creosote Bush Scrub
Creosote Bush Scrub - Disturbed
Developed
Disturbed
Inactive Agriculture/Fallow Field
Joshua Tree Woodland
Mulefat Thicket
Orchard
Rubber Rabbitbush Scrub
Rubber Rabbitbush Scrub - Disturbed
Ruderal Desert Forb Patches
Scale Broom Scrub
Snakeweed Scrub
Tamarisk Thicket
Bullhead Study Area
Gen-tie Options
Rosamond Option 1
Rosamond Option 1 and 3
Rosamond Option 2
Rosamond Option 2 and 3
Rosamond Option 3
Rosamond Option 3.1
Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2
Access Routes
Primary Access
Secondary Access

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 10 - Sheet 3 of 8
Vegetation Communities
Study Area & Results
Bullhead Solar



N

0 500 1,000

Feet

- Photo Points
- Biological Study
- Not Included in Impacts

Vegetation

- Active
- Allscale Scrub
- Allscale Scrub - Disturbed
- California Buckwheat Scrub
- Cheesebush - Sweetbush Scrub
- Creosote Bush - White Bursage Scrub
- Creosote Bush Scrub
- Creosote Bush Scrub - Disturbed
- Developed
- Disturbed
- Inactive Agriculture/Fallow Field
- Joshua Tree Woodland
- Mulefat Thicket
- Orchard
- Rubber Rabbitbush Scrub
- Rubber Rabbitbush Scrub - Disturbed
- Ruderal Desert Forb Patches
- Scale Broom Scrub
- Snakeweed Scrub
- Tamarisk Thicket
- Bullhead Study Area

Gen-tie Options

- Rosamond Option 1
- Rosamond Option 1 and 3
- Rosamond Option 2
- Rosamond Option 2 and 3
- Rosamond Option 3
- Rosamond Option 3.1
- Whirlwind Option 1
- Whirlwind Option 1.1
- Whirlwind Option 1.2

Access Routes

- Primary Access
- Secondary Access

ICF

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 10 - Sheet 4 of 8
Vegetation Communities
Study Area & Results
Bullhead Solar

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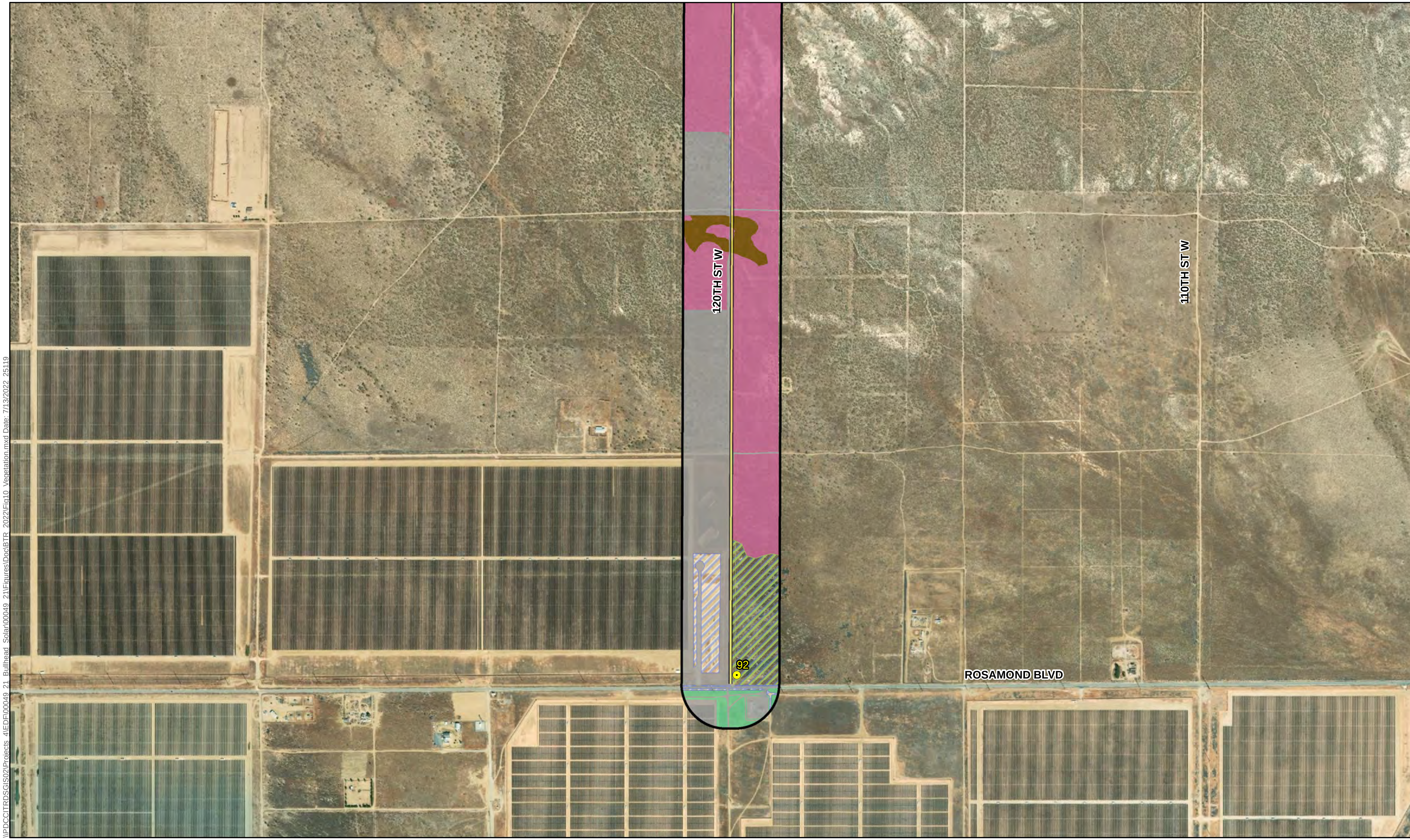


N

0 500 1,000

Feet

- Photo Points
- Biological Study
- Not Included in Impacts

Vegetation

- Active
- Allscale Scrub
- Allscale Scrub - Disturbed
- California Buckwheat Scrub
- Cheesebush - Sweetbush Scrub
- Creosote Bush - White Bursage Scrub
- Creosote Bush Scrub
- Creosote Bush Scrub - Disturbed
- Developed
- Disturbed
- Inactive Agriculture/Fallow Field
- Joshua Tree Woodland
- Mulefat Thicket
- Orchard
- Rubber Rabbitbush Scrub
- Rubber Rabbitbush Scrub - Disturbed
- Ruderal Desert Forb Patches
- Scale Broom Scrub
- Snakeweed Scrub
- Tamarisk Thicket
- Bullhead Study Area

Gen-tie Options

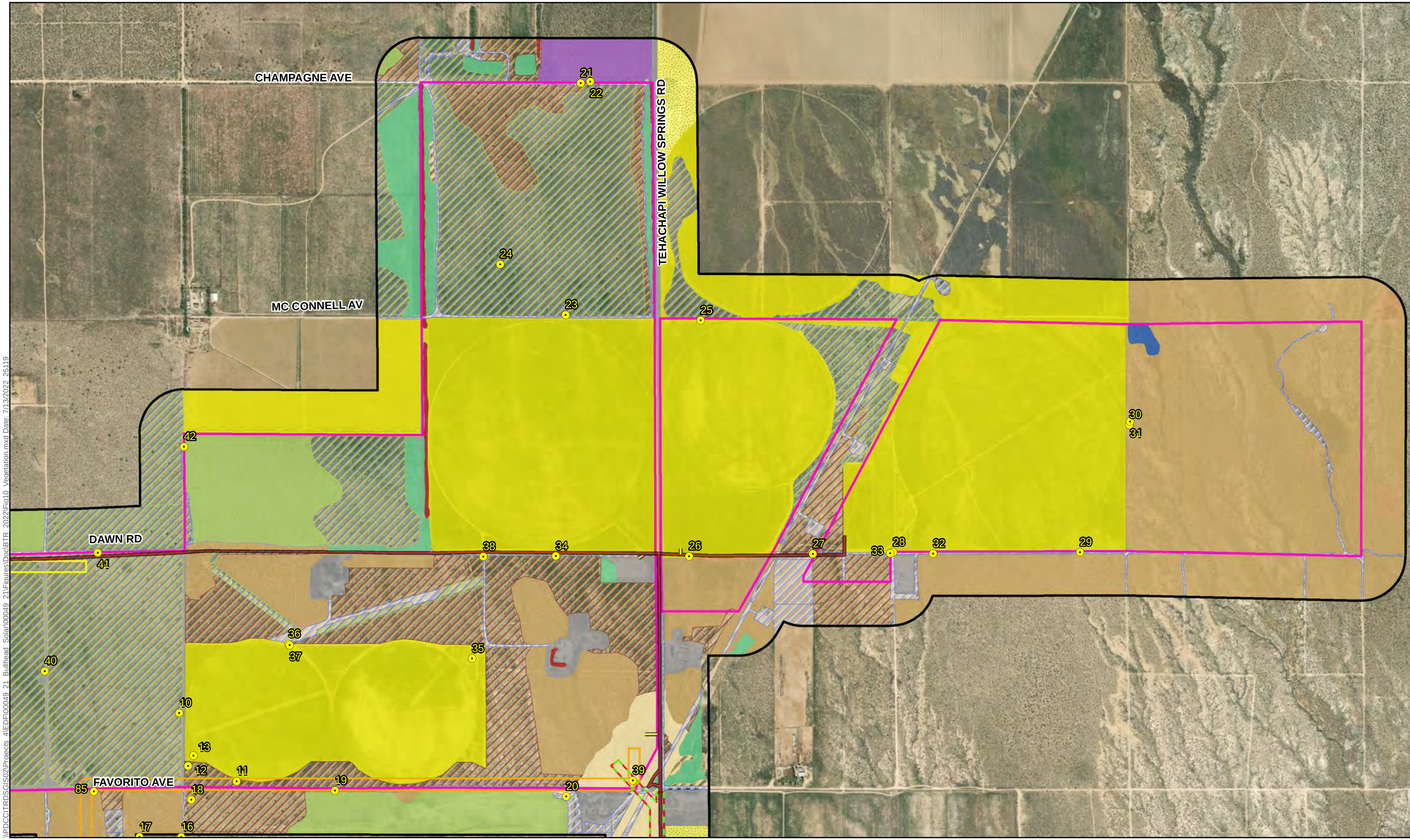
- Rosamond Option 1
- Rosamond Option 1 and 3
- Rosamond Option 2
- Rosamond Option 2 and 3
- Rosamond Option 3
- Rosamond Option 3.1
- Whirlwind Option 1
- Whirlwind Option 1.1
- Whirlwind Option 1.2

Access Routes

- Primary Access
- Secondary Access

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 10 - Sheet 5 of 8
Vegetation Communities
Study Area & Results
Bullhead Solar



\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig10_Vegetation.mxd Date: 7/13/2022 25119

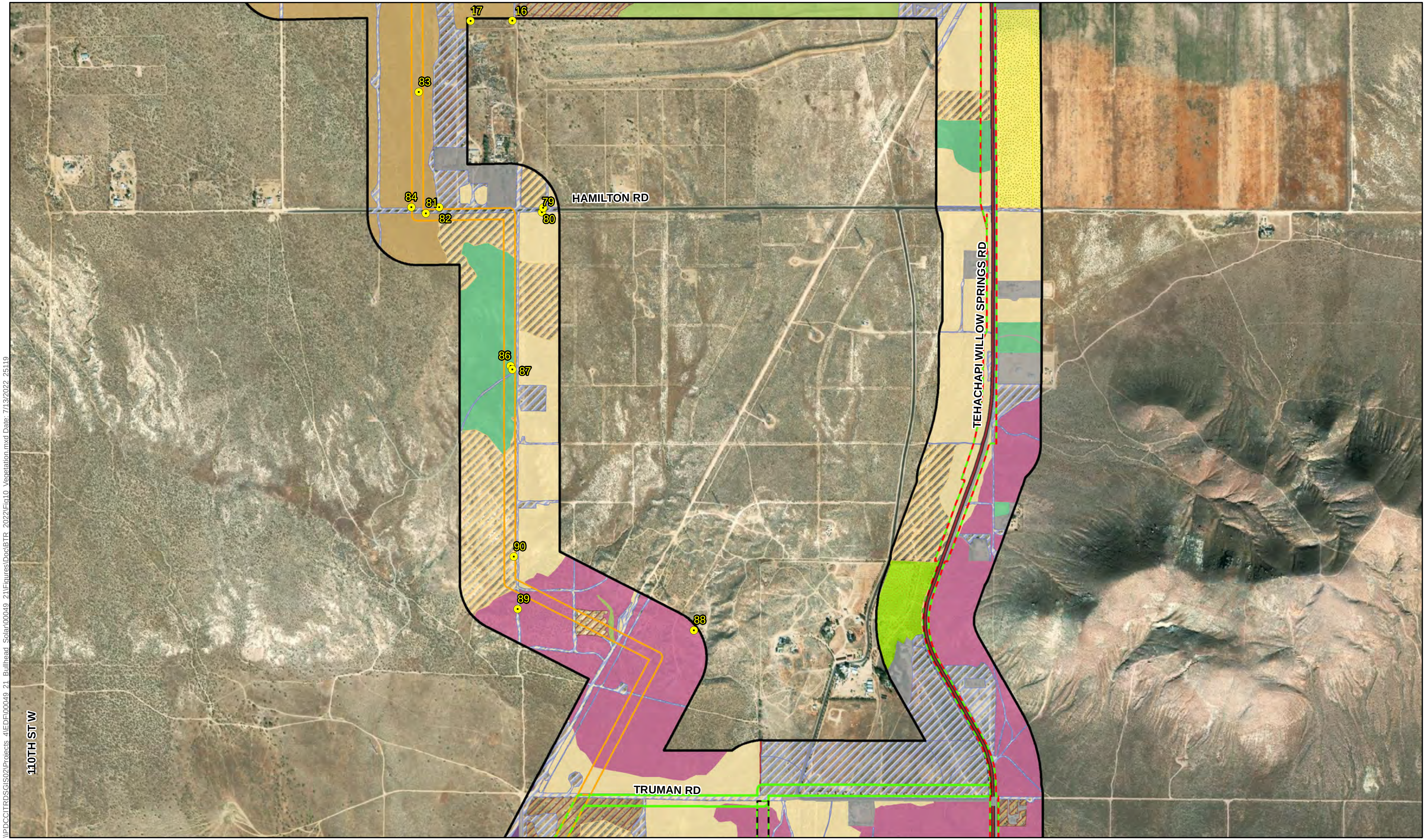
N

0 500 1,000
Feet

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Photo Points
Biological Study
Not Included in Impacts
Vegetation
Active
Allscale Scrub
Allscale Scrub - Disturbed
California Buckwheat Scrub
Cheesebush - Sweetbush Scrub
Creosote Bush - White Bursage Scrub
Creosote Bush Scrub
Creosote Bush Scrub - Disturbed
Developed
Disturbed
Inactive Agriculture/Fallow Field
Joshua Tree Woodland
Mulefat Thicket
Orchard
Rubber Rabbitbush Scrub
Rubber Rabbitbush Scrub - Disturbed
Ruderal Desert Forb Patches
Scale Broom Scrub
Snakeweed Scrub
Tamarisk Thicket
Bullhead Study Area
Gen-tie Options
Rosamond Option 1
Rosamond Option 1 and 3
Rosamond Option 2
Rosamond Option 2 and 3
Rosamond Option 3
Rosamond Option 3.1
Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2
Access Routes
Primary Access
Secondary Access

Figure 10 - Sheet 6 of 8
Vegetation Communities
Study Area & Results
Bullhead Solar



\\PDCCITRDSGIS02\Projects 4\EDF\00049 21 Bullhead Solar\00049 21\Figures\Doc\BTR 2022\Fig10 Vegetation.mxd Date: 7/13/2022 25119

N

0 500 1,000

Feet

Photo Points
Biological Study
Not Included in Impacts

Vegetation
- Active
- Allscale Scrub
- Allscale Scrub - Disturbed
- California Buckwheat Scrub
- Cheesebush - Sweetbush Scrub
- Creosote Bush - White Bursage Scrub
- Creosote Bush Scrub
- Creosote Bush Scrub - Disturbed
- Developed
- Disturbed
- Inactive Agriculture/Fallow Field
- Joshua Tree Woodland
- Mulefat Thicket
- Orchard
- Rubber Rabbitbush Scrub
- Rubber Rabbitbush Scrub - Disturbed
- Ruderal Desert Forb Patches
- Scale Broom Scrub
- Snakeweed Scrub
- Tamarisk Thicket

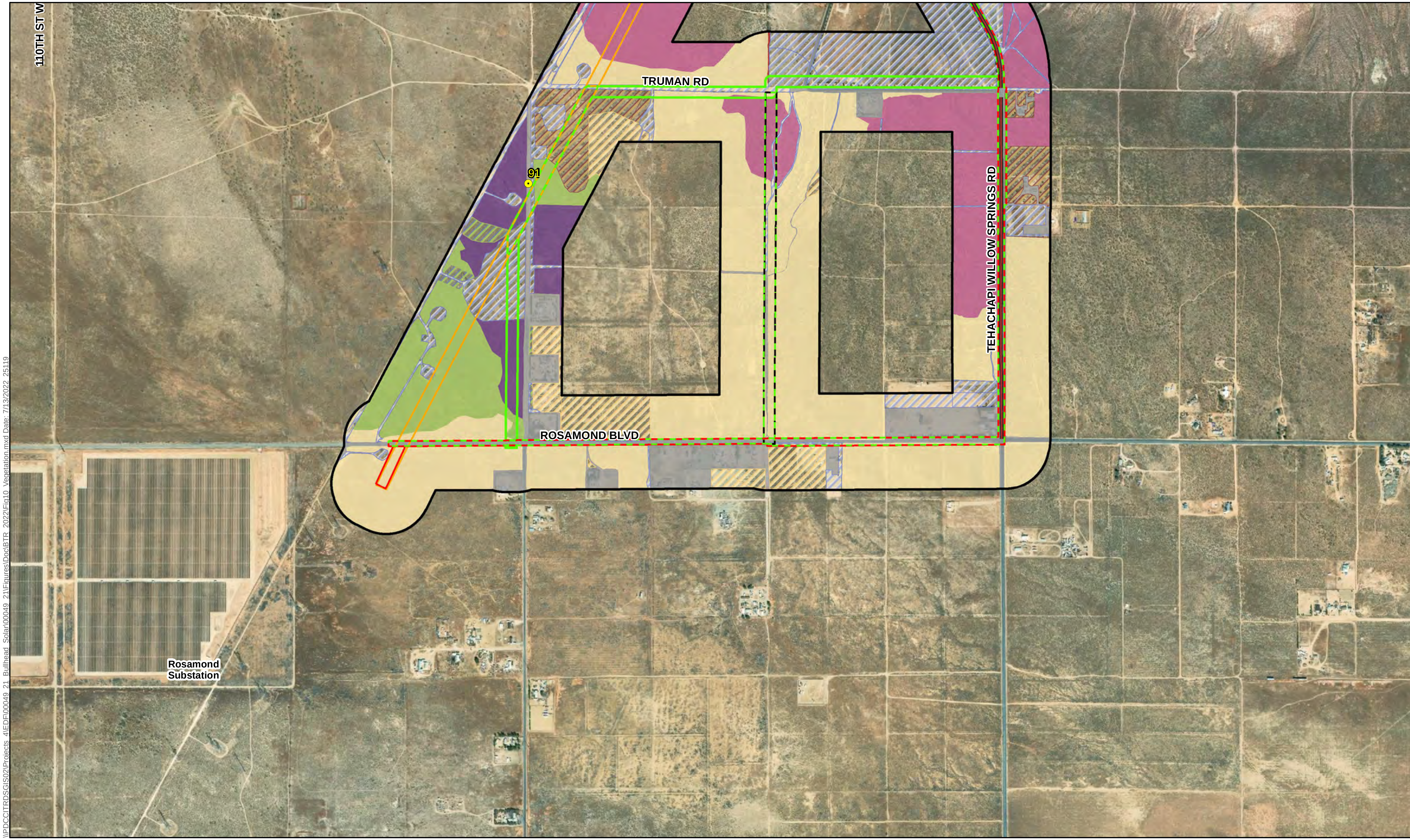
Bullhead Study Area

Gen-tie Options
- Rosamond Option 1
- Rosamond Option 1 and 3
- Rosamond Option 2
- Rosamond Option 2 and 3
- Rosamond Option 3
- Rosamond Option 3.1
- Whirlwind Option 1
- Whirlwind Option 1.1
- Whirlwind Option 1.2

Access Routes
- Primary Access
- Secondary Access

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 10 - Sheet 7 of 8
Vegetation Communities
Study Area & Results
Bullhead Solar



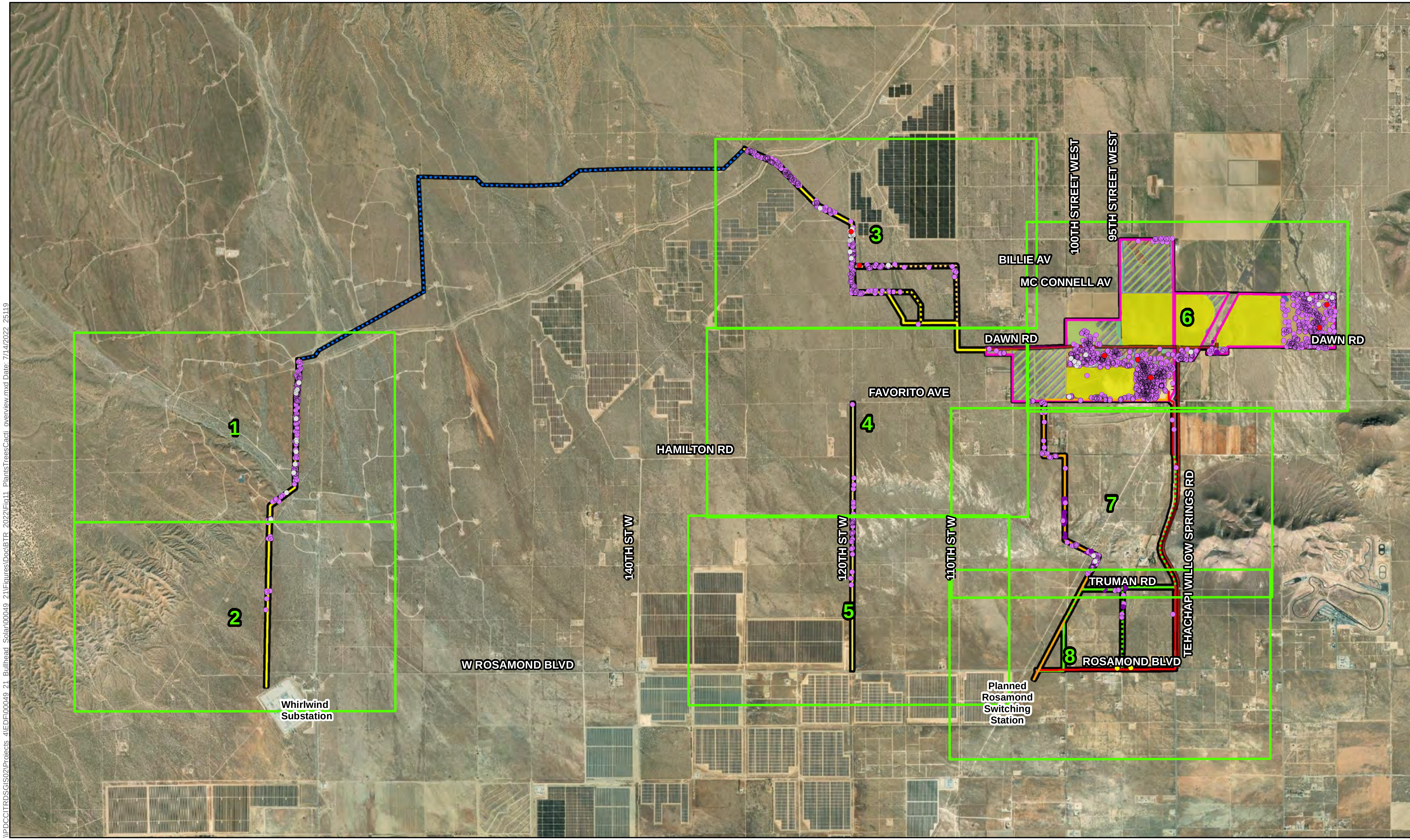
N
0 500 1,000
Feet

Photo Points
Biological Study
Not Included in Impacts
Vegetation
Active
Allscale Scrub
Allscale Scrub - Disturbed
California Buckwheat Scrub
Cheesebush - Sweetbush Scrub
Creosote Bush - White Bursage Scrub
Creosote Bush Scrub
Creosote Bush Scrub - Disturbed
Developed
Disturbed
Inactive Agriculture/Fallow Field
Joshua Tree Woodland
Mulefat Thicket
Orchard
Rubber Rabbitbush Scrub
Rubber Rabbitbush Scrub - Disturbed
Ruderal Desert Forb Patches
Scale Broom Scrub
Snakeweed Scrub
Tamarisk Thicket
Bullhead Study Area
Gen-tie Options
Rosamond Option 1
Rosamond Option 1 and 3
Rosamond Option 2
Rosamond Option 2 and 3
Rosamond Option 3
Rosamond Option 3.1
Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2
Access Routes
Primary Access
Secondary Access

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 10 - Sheet 8 of 8
Vegetation Communities
Study Area & Results
Bullhead Solar

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig10_Vegetation.mxd Date: 7/13/2022 25119

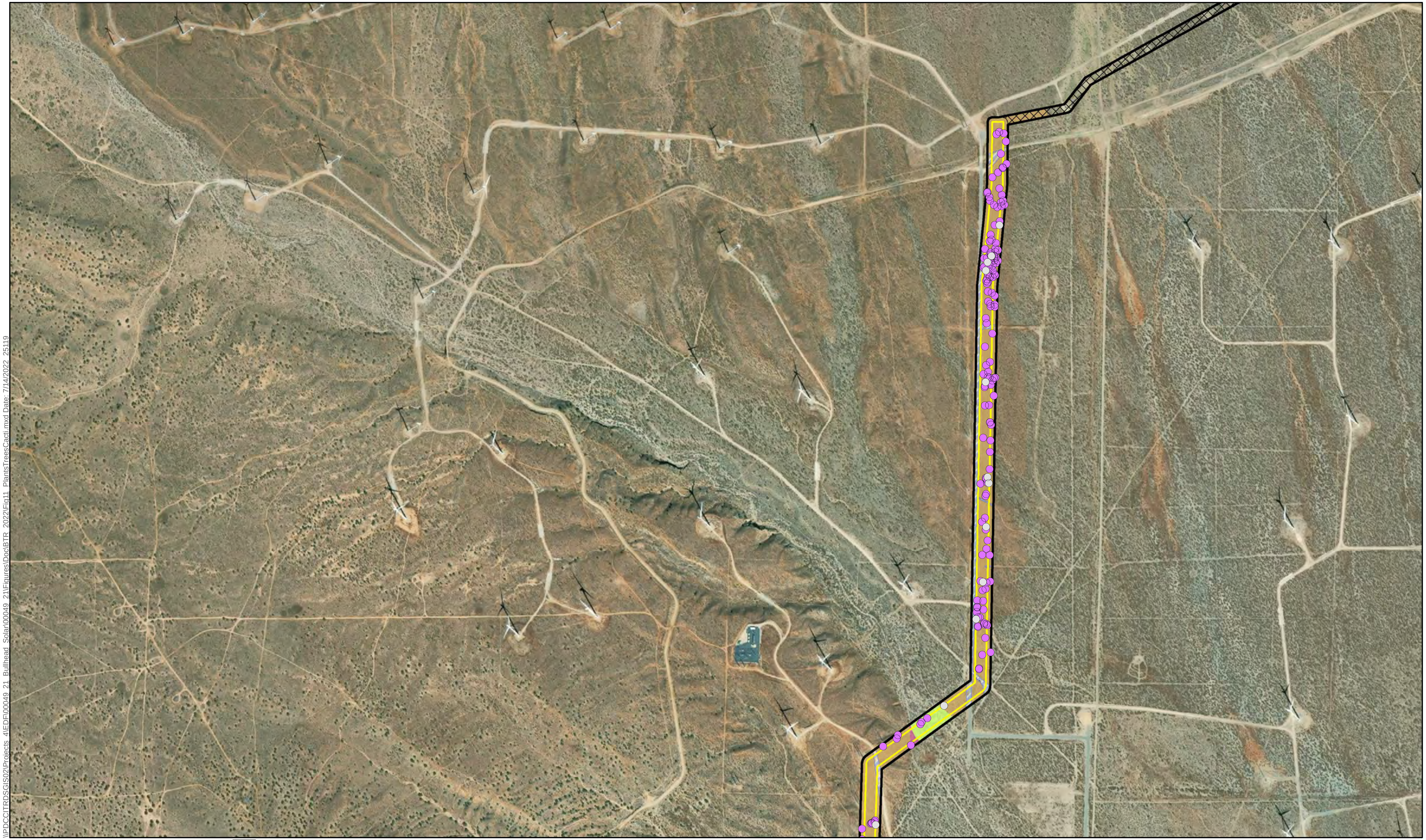


N 0 0.5 1 Miles

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 11 - Overview
Special-Status Plant, Joshua Tree, and Protected Cacti Inventory Area & Results
Bullhead Solar

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig11_PlantsTreesCacti_overview.mxd Date: 7/14/2022 25119



N

0 500 1,000

Feet

- Rare Plant Study Area
- Not Included in Impacts
- Private Property
- Chorizanthe spinosa
- Calochortus striatus
- Beavertail Cactus (*Opuntia basilaris*)
- Joshua Tree (*Yucca brevifolia*)
- Silver Cholla (*Cylindropuntia echinocarpa*)

Vegetation

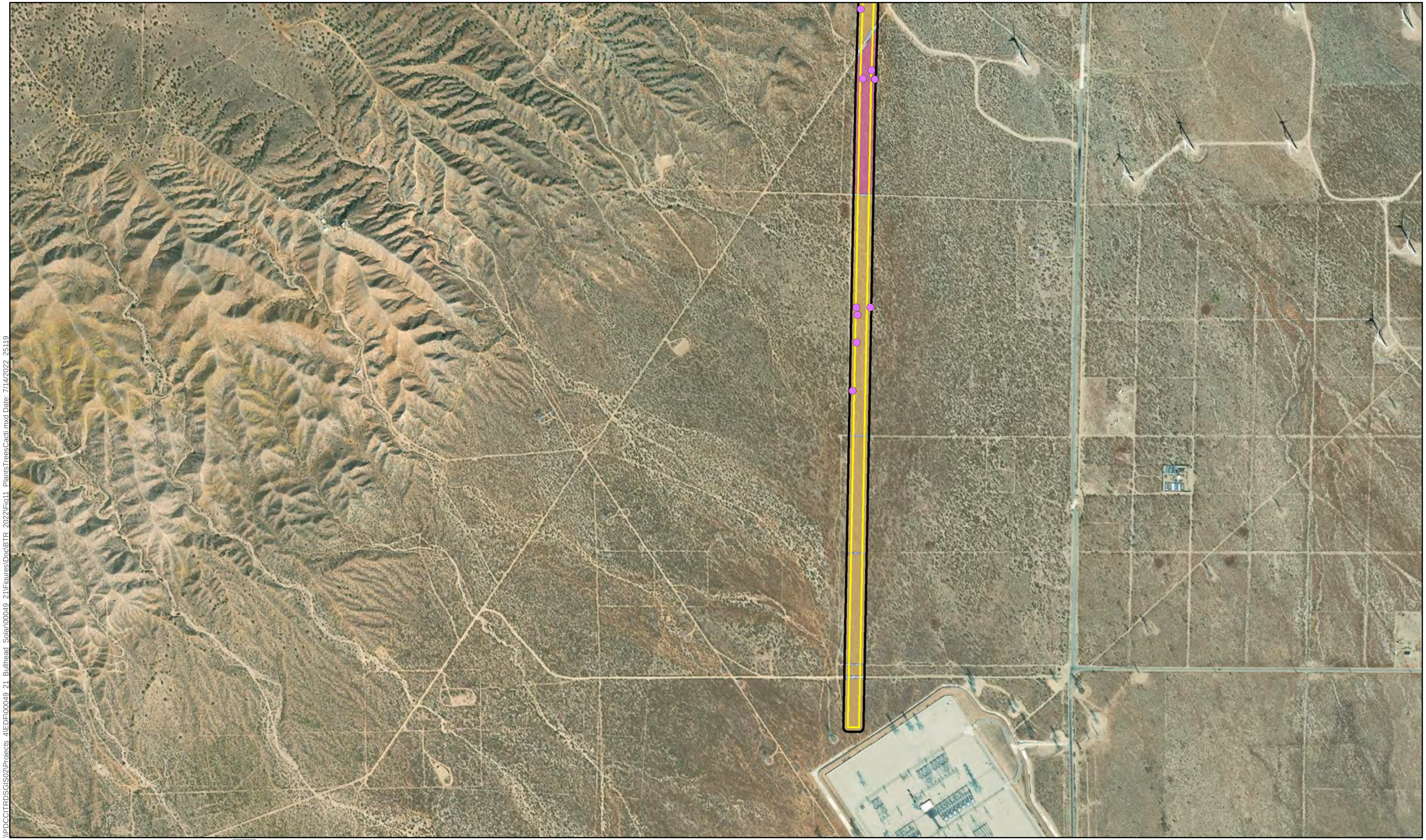
- Creosote Bush - White Bursage Scrub
- Creosote Bush Scrub
- Disturbed
- Scale Broom Scrub

Gen-tie Options

- Whirlwind Option 1

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

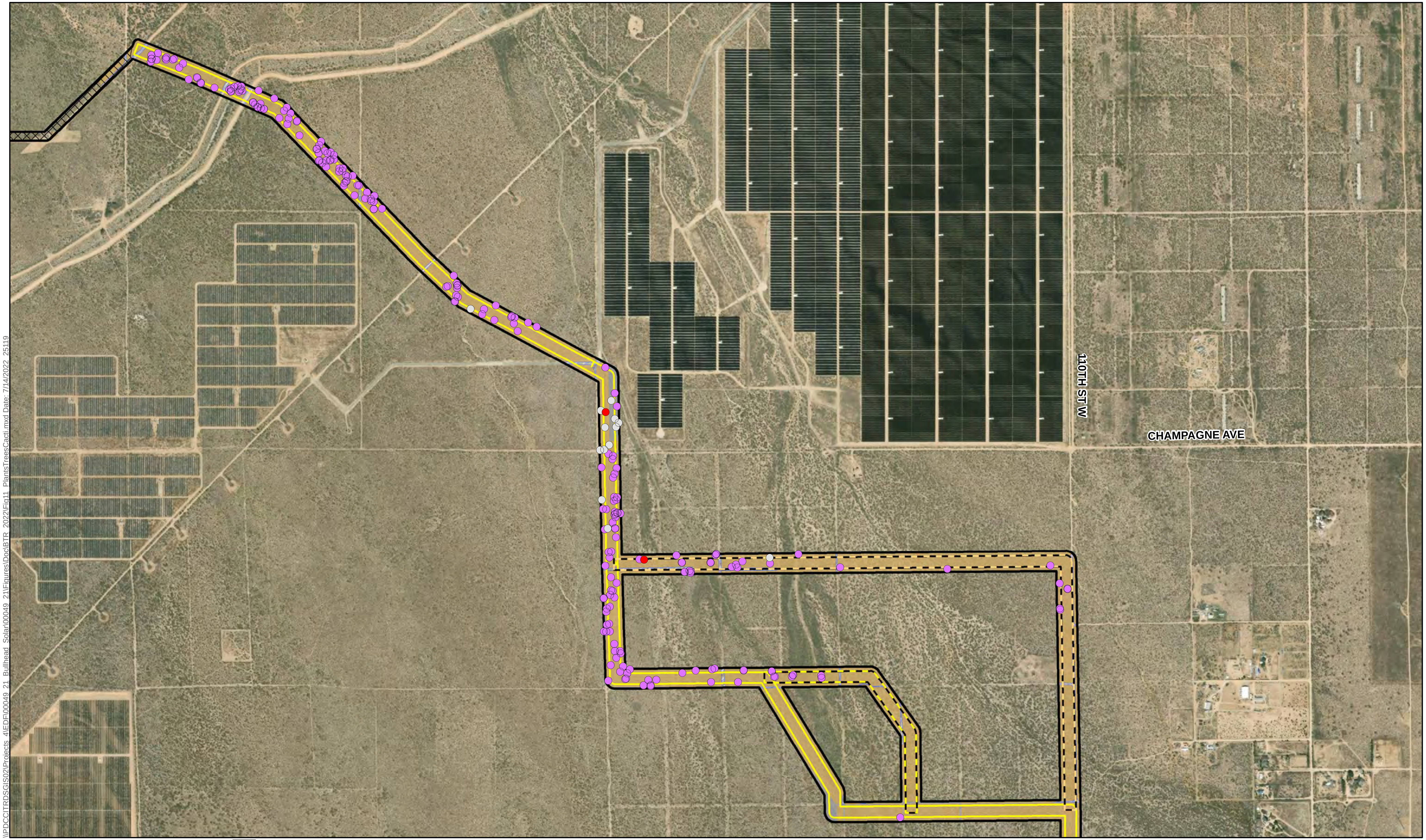
Figure 11 - Sheet 1 of 8
Special-Status Plant, Joshua Tree, and Protected Cacti Inventory Area & Results
Bullhead Solar

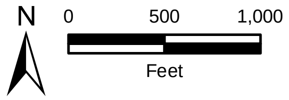


Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 11 - Sheet 2 of 8
Special-Status Plant, Joshua Tree, and Protected Cacti Inventory Area & Results
Bullhead Solar

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig11_PlantsTreesCacti.mxd Date: 7/14/2022 25119



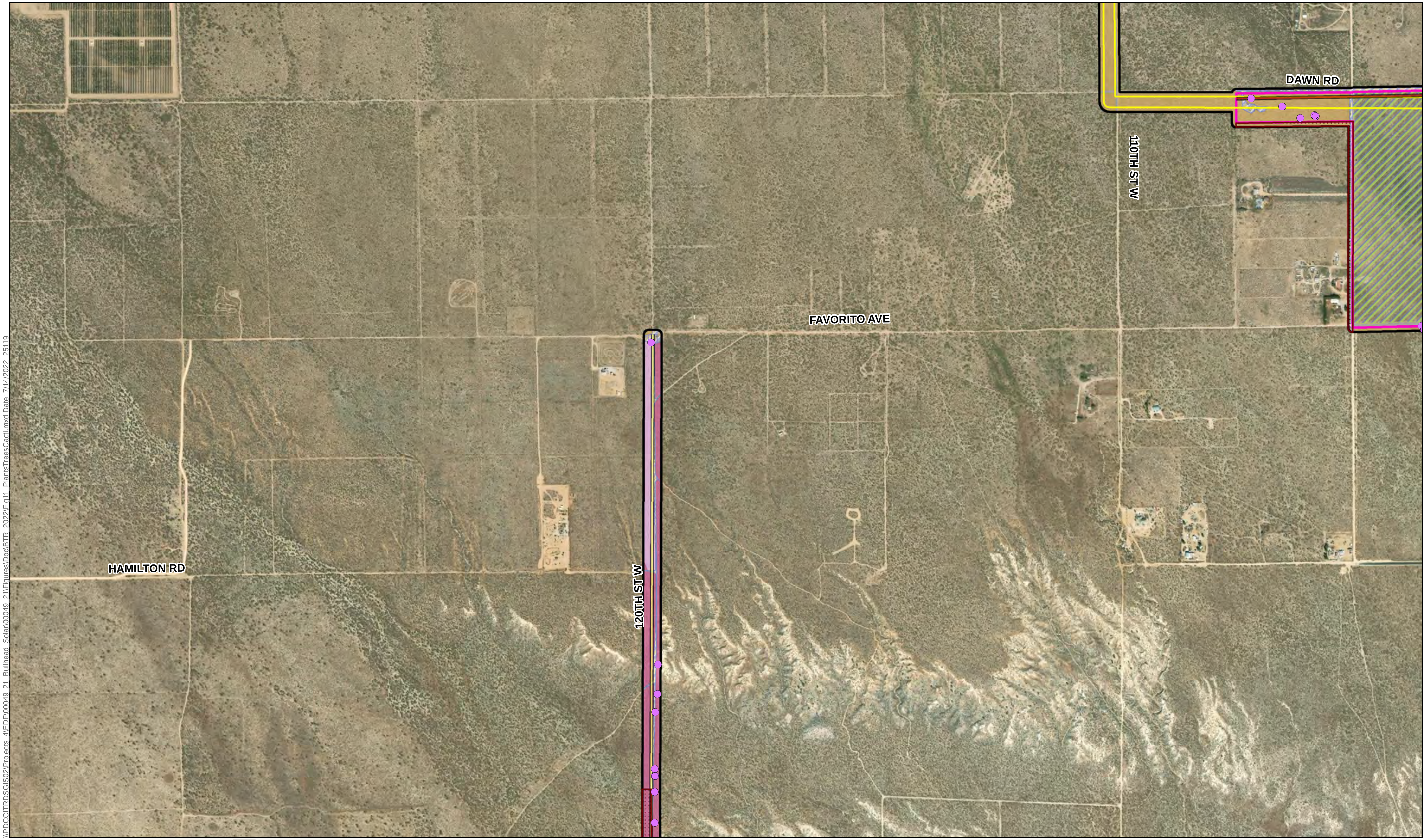


Rare Plant Study Area
Not Included in Impacts
Private Property
Chorizanthe spinosa
Calochortus striatus
Beavertail Cactus (*Opuntia basilaris*)
Joshua Tree (*Yucca brevifolia*)
Silver Cholla (*Cylindropuntia echinocarpa*)
Vegetation
Creosote Bush Scrub
Developed
Disturbed
Gen-tie Options
Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 11 - Sheet 3 of 8
Special-Status Plant, Joshua Tree, and Protected Cacti Inventory Area & Results
Bullhead Solar

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig11_PlantsTreesCacti.mxd Date: 7/14/2022 25119



N

0 500 1,000

Feet

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

- Rare Plant Study Area
- Not Included in Impacts
- Private Property
- Chorizanthe spinosa
- Calochortus striatus
- Beavertail Cactus (*Opuntia basilaris*)
- Joshua Tree (*Yucca brevifolia*)
- Silver Cholla (*Cylindropuntia echinocarpa*)

Vegetation

- California Buckwheat Scrub
- Creosote Bush - White Bursage Scrub
- Creosote Bush Scrub
- Developed
- Disturbed
- Rubber Rabbitbush Scrub
- Rubber Rabbitbush Scrub - Disturbed
- Bullhead Study Area

Gen-tie Options

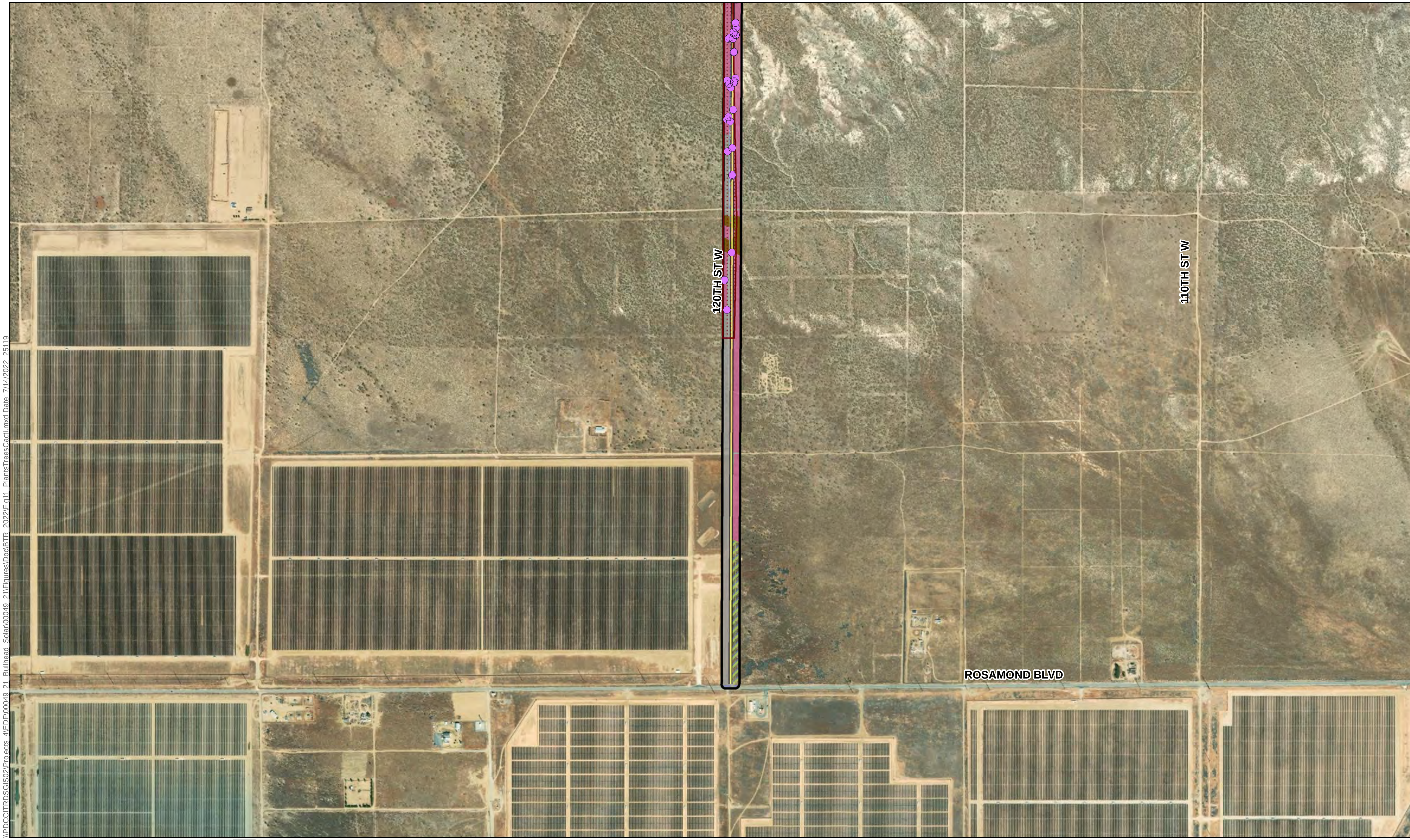
- Whirlwind Option 1

Access Routes

- Primary Access Route
- Secondary Access Route

Figure 11 - Sheet 4 of 8
Special-Status Plant, Joshua Tree, and Protected Cacti Inventory Area & Results
Bullhead Solar

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig11_PlantsTreesCacti.mxd Date: 7/14/2022 25119



N
0 500 1,000
Feet

Rare Plant Study Area
Not Included in Impacts
Private Property
Chorizanthe spinosa
Calochortus striatus

Beavertail Cactus (*Opuntia basilaris*)
Joshua Tree (*Yucca brevifolia*)
Silver Cholla (*Cylindropuntia echinocarpa*)

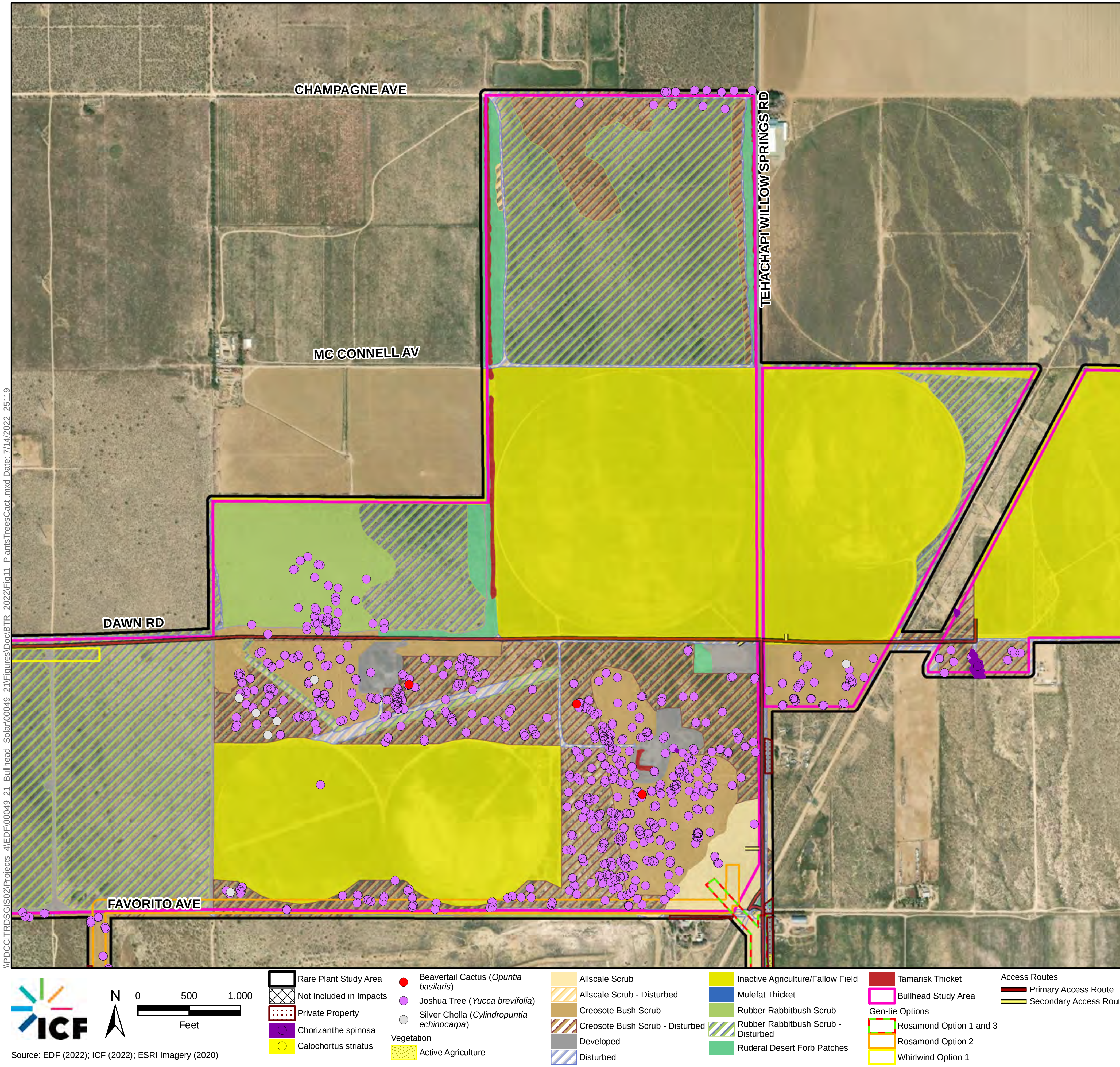
Vegetation
Cheesebush - Sweetbush Scrub
Creosote Bush - White Bursage Scrub
Developed
Disturbed
Rubber Rabbitbush Scrub - Disturbed

Access Routes
Secondary Access Route

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

\\PDCCITRDSGIS02\Projects_4\EDF00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig11_PlantsTreesCacti.mxd Date: 7/14/2022 25119

Figure 11 - Sheet 5 of 8
Special-Status Plant, Joshua Tree, and Protected Cacti Inventory Area & Results
Bullhead Solar



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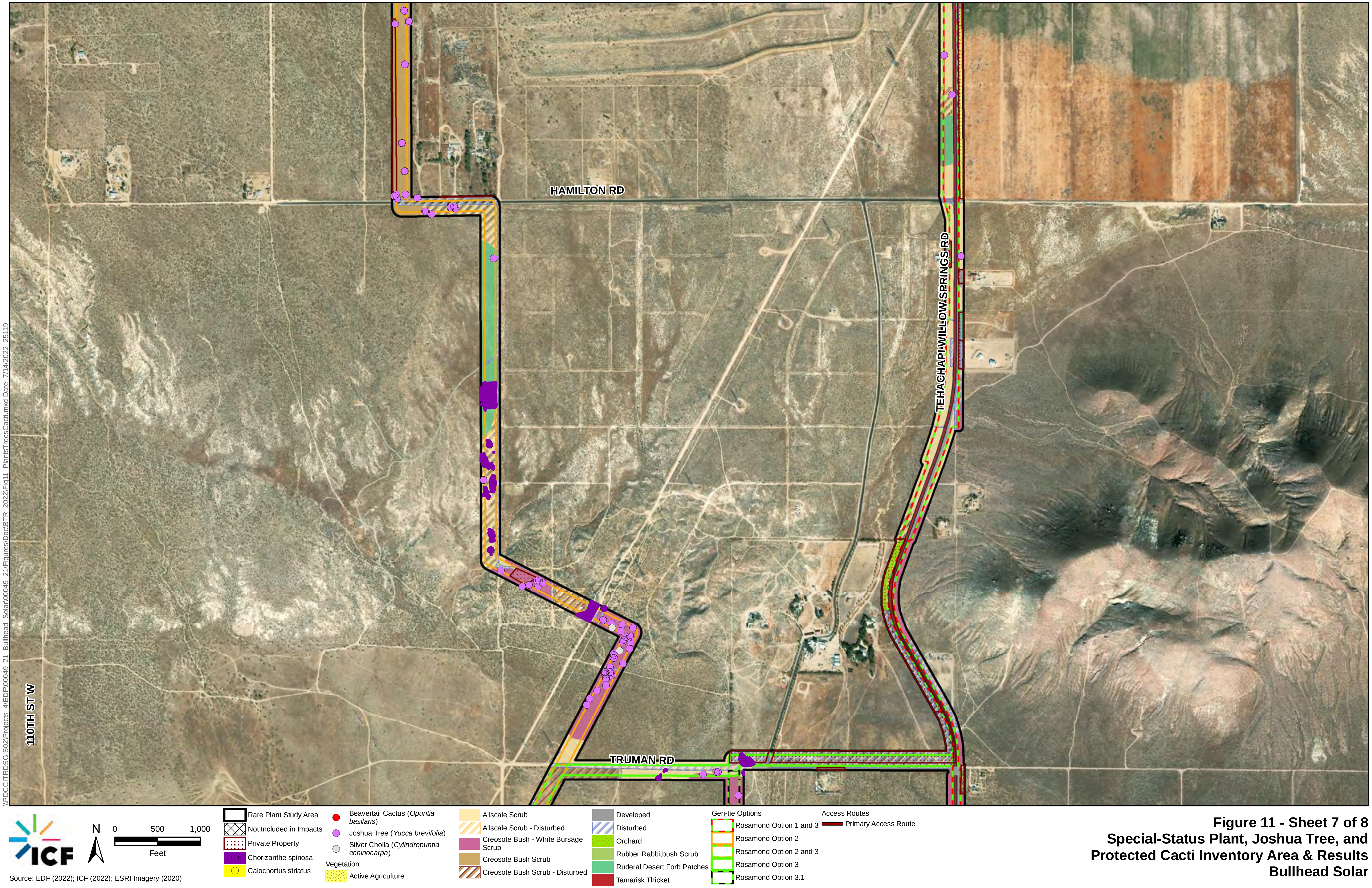
ICF

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

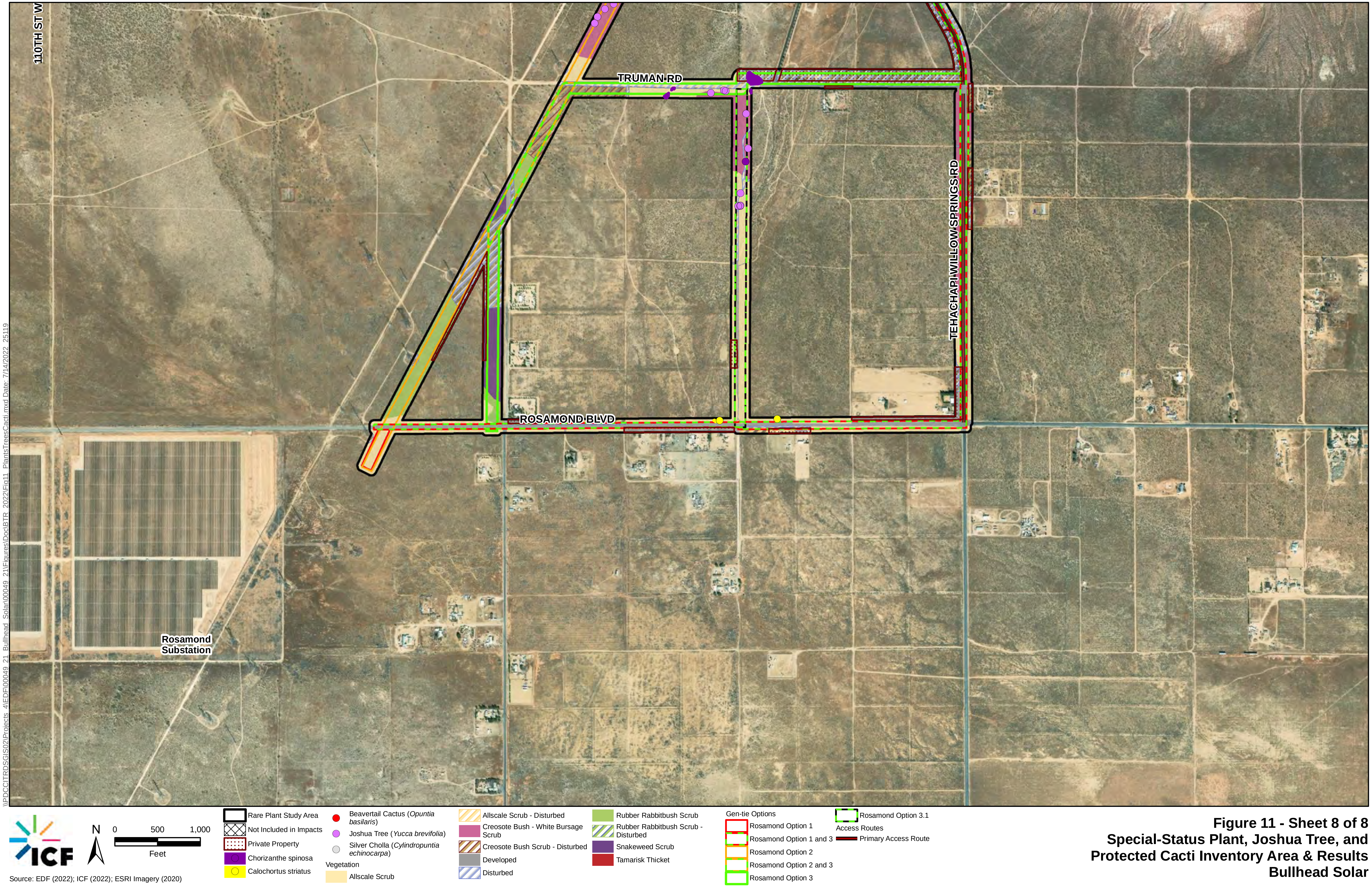
Figure 11 - Sheet 6 of 8
Special-Status Plant, Joshua Tree, and Protected Cacti Inventory Area & Results
Bullhead Solar



Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 11 - Sheet 7 of 8
Special-Status Plant, Joshua Tree, and Protected Cacti Inventory Area & Results
Bullhead Solar

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig11_PlantsTreesCacti.mxd Date: 7/14/2022 25119



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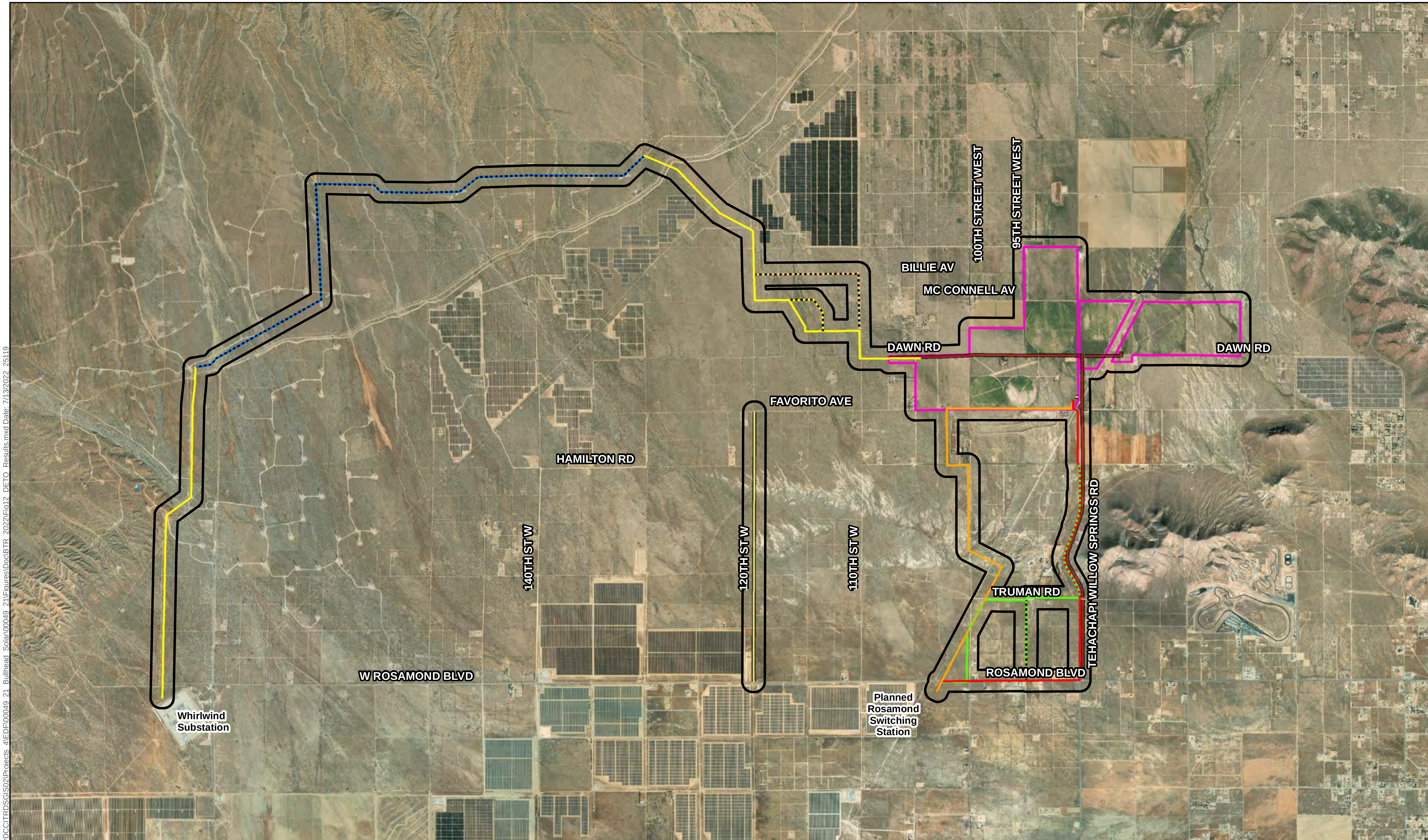
Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 11 - Sheet 8 of 8
Special-Status Plant, Joshua Tree, and Protected Cacti Inventory Area & Results
Bullhead Solar



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ICF

N

0 0.5 1
Miles

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

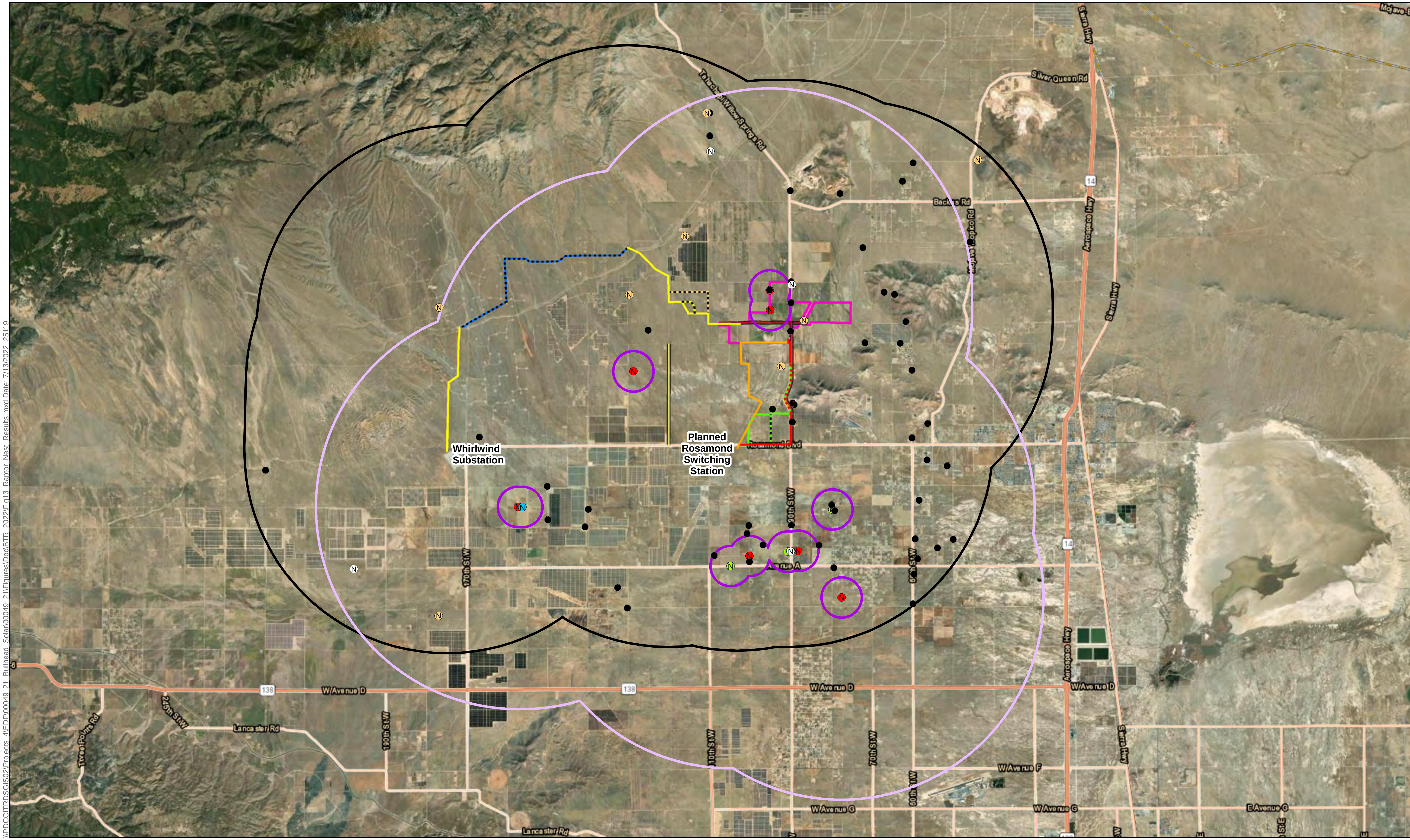
Biological Study

Bullhead Study Area

Gen-tie Options
- Rosamond Option 1
- Rosamond Option 1 and 3
- Rosamond Option 2
- Rosamond Option 2 and 3
- Rosamond Option 3
- Rosamond Option 3.1
- Whirlwind Option 1
- Whirlwind Option 1.1
- Whirlwind Option 1.2
- Whirlwind Gen-tie Option 1 co-located with existing AVTL

Access Routes
- Primary Access
- Secondary Access

Figure 12
Desert Tortoise Survey Area & Results
Bullhead Solar



Raptor and Raven Nests Study Area
Swainson's Hawk (SWHA) Nests Active within Last 5 Years
- Failed 2021
- Last Active 2017
- Last Active 2018

Other Raptor Nests
- Common Raven
- Great Horned Owl
- Red-tailed Hawk

1/2 Mile Buffer of SWHA Nests
5 Mile Buffer of SHWA Nests

Bullhead Study Area

Gen-tie Options
- Rosamond Option 1
- Rosamond Option 1 and 3
- Rosamond Option 2
- Rosamond Option 2 and 3
- Rosamond Option 3
- Rosamond Option 3.1
- Whirlwind Option 1
- Whirlwind Option 1.1
- Whirlwind Option 1.2
- Whirlwind Gen-tie Option 1 co-located with existing AVTL

Access Routes
- Primary Access
- Secondary Access

N

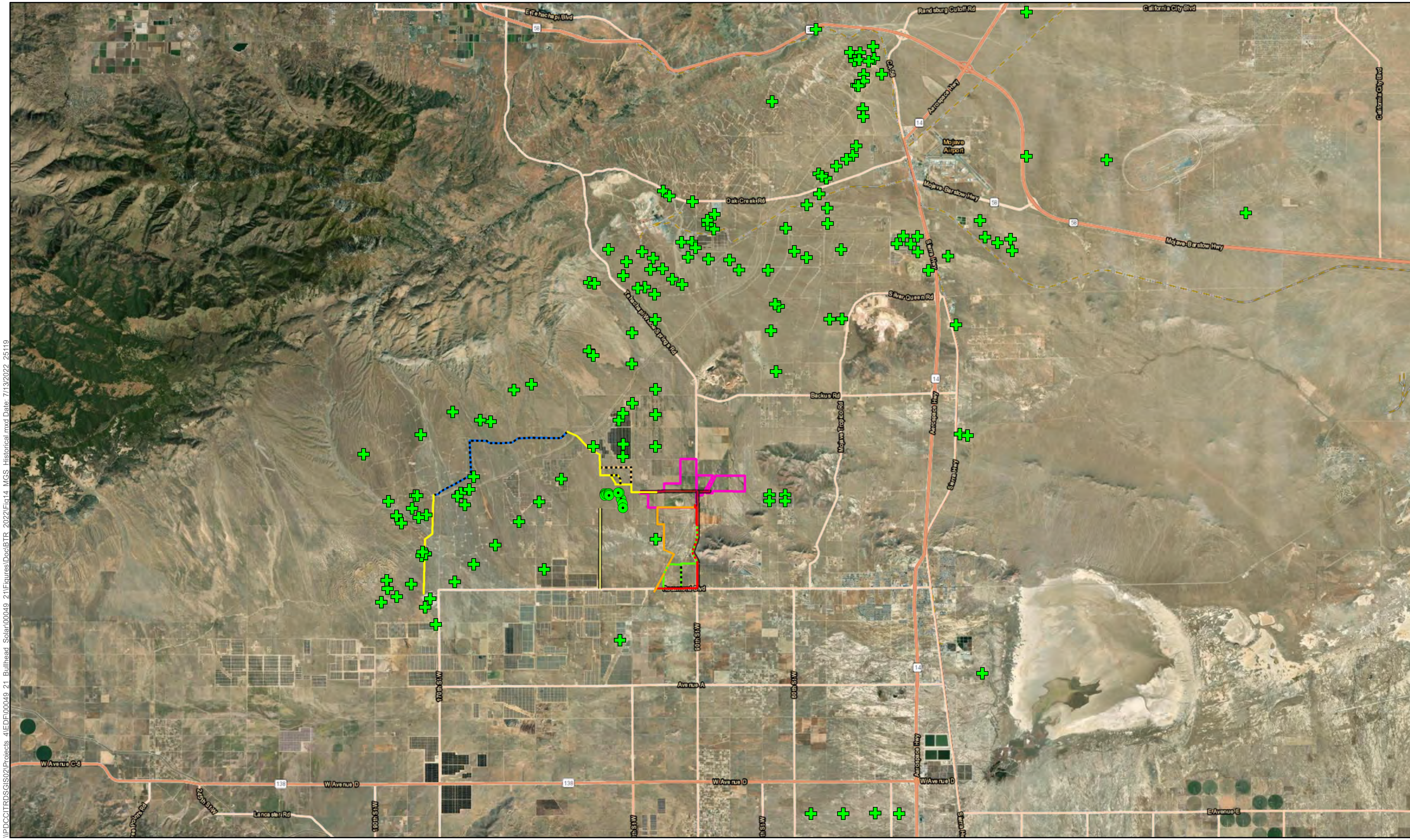
0 1 2
Miles

ICF

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 13
Raptor & Common Raven Nest Survey Area & Results
Bullhead Solar

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig13_Raptor_Nest_Results.mxd Date: 7/13/2022 25119



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ICF

N

0 1.5 3
Miles

Source: EDF (2022); ESRI Imagery (2020)

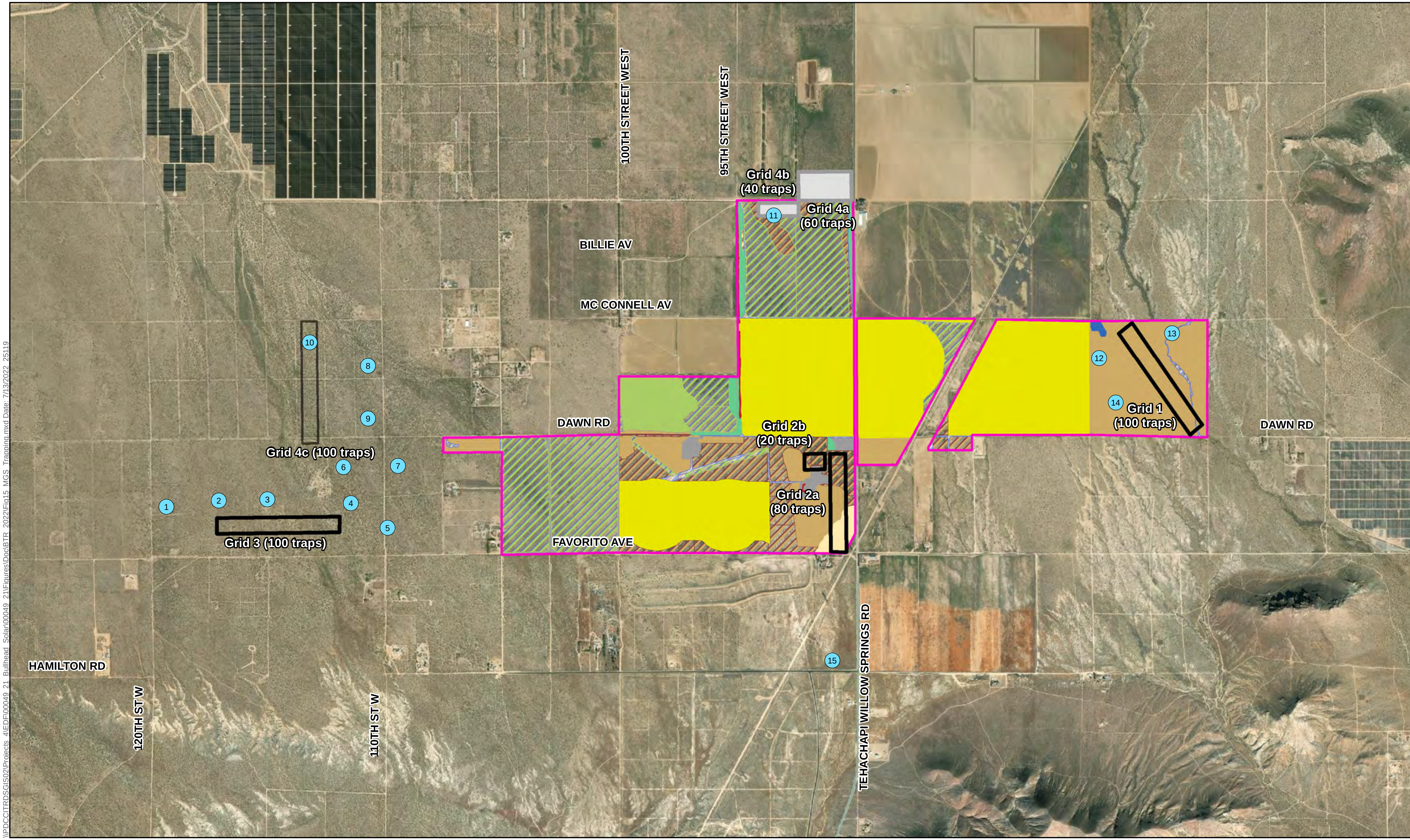
Historical Trapping Grid – MGS Negative
Historical Camera Location – MGS Negative

Bullhead Study Area

Gen-tie Options
Rosamond Option 1
Rosamond Option 1 and 3
Rosamond Option 2
Rosamond Option 2 and 3
Rosamond Option 3
Rosamond Option 3.1
Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2
Whirlwind Gen-tie Option 1 co-located with existing AVTL

Access Routes
Primary Access
Secondary Access

Figure 14
MGS Previous Trapping Results in Antelope Valley
Bullhead Solar



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ICF

N

0 0.25 0.5 Miles

Source: EDF (2022); ESRI Imagery (2020)

- MGS Camera
- MGS Grids 1-4
- MGS Grids 4a and 4b
- Bullhead Study Area

Vegetation

- Allscale Scrub
- Allscale Scrub - Disturbed
- Creosote Bush Scrub
- Creosote Bush Scrub - Disturbed
- Developed
- Disturbed
- Inactive Agriculture/Fallow
- Joshua Tree Woodland
- Mulefat Thicket
- Rubber Rabbitbush Scrub
- Rubber Rabbitbush Scrub - Disturbed
- Ruderal Desert Forb Patches
- Tamarisk Thicket

Figure 15
MGS Trapping & Camera Study Areas & Results
Bullhead Solar

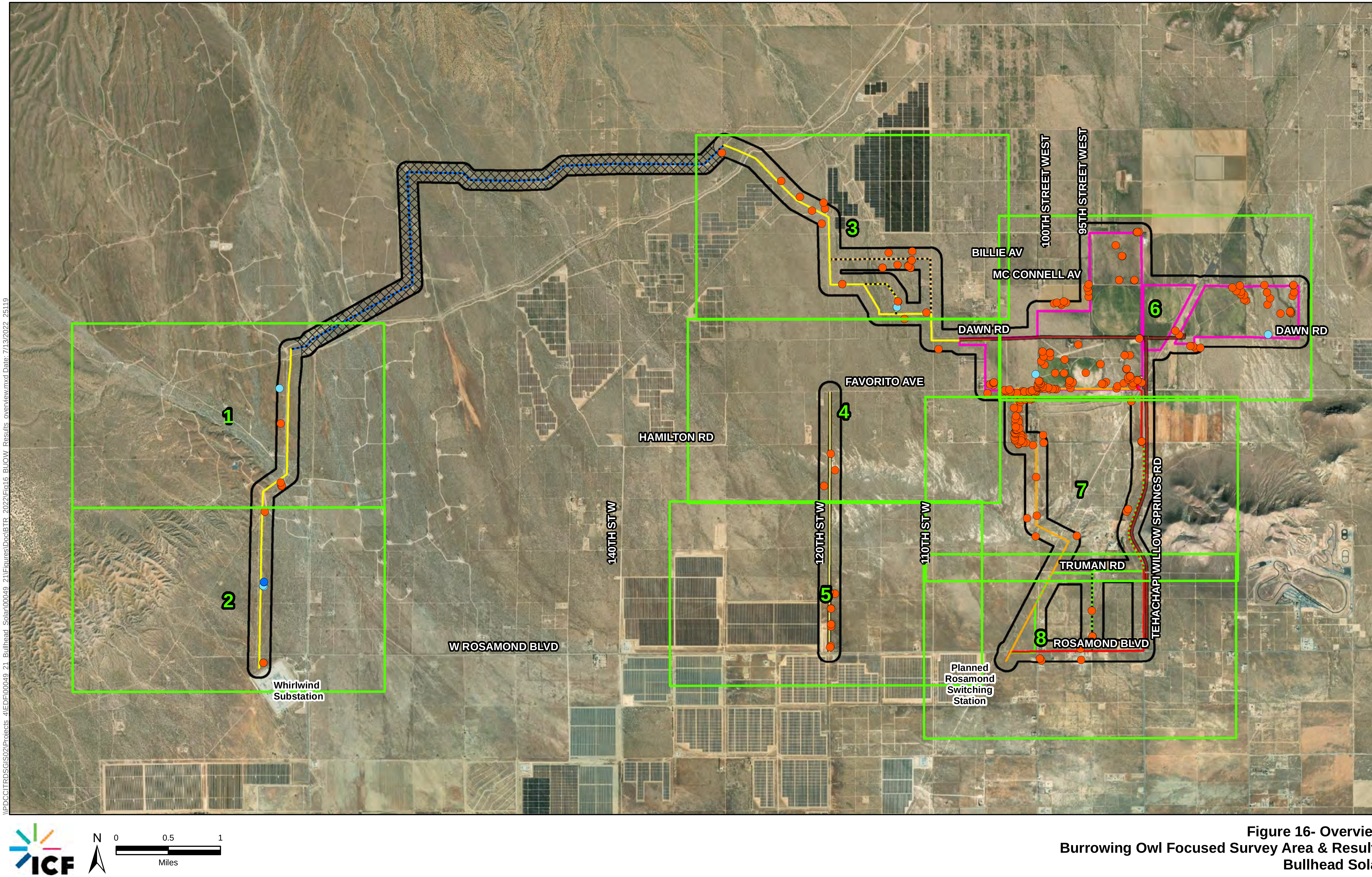

Figure 16- Overview
Burrowing Owl Focused Survey Area & Results
Bullhead Solar

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig16_BUOW_Results_overview.mxd Date: 7/13/2022 25119

Figure 16 - Sheet 1 of 9
Burrowing Owl Focused Survey Area & Results
Bullhead Solar

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

\\PDCCITRDSGIS02\Projects 4\EDF\00049 21 Bullhead Solar\00049 21\Figures\Doc\BTR 2022\Fig16 BUOW Results.mxd Date: 7/13/2022 25119

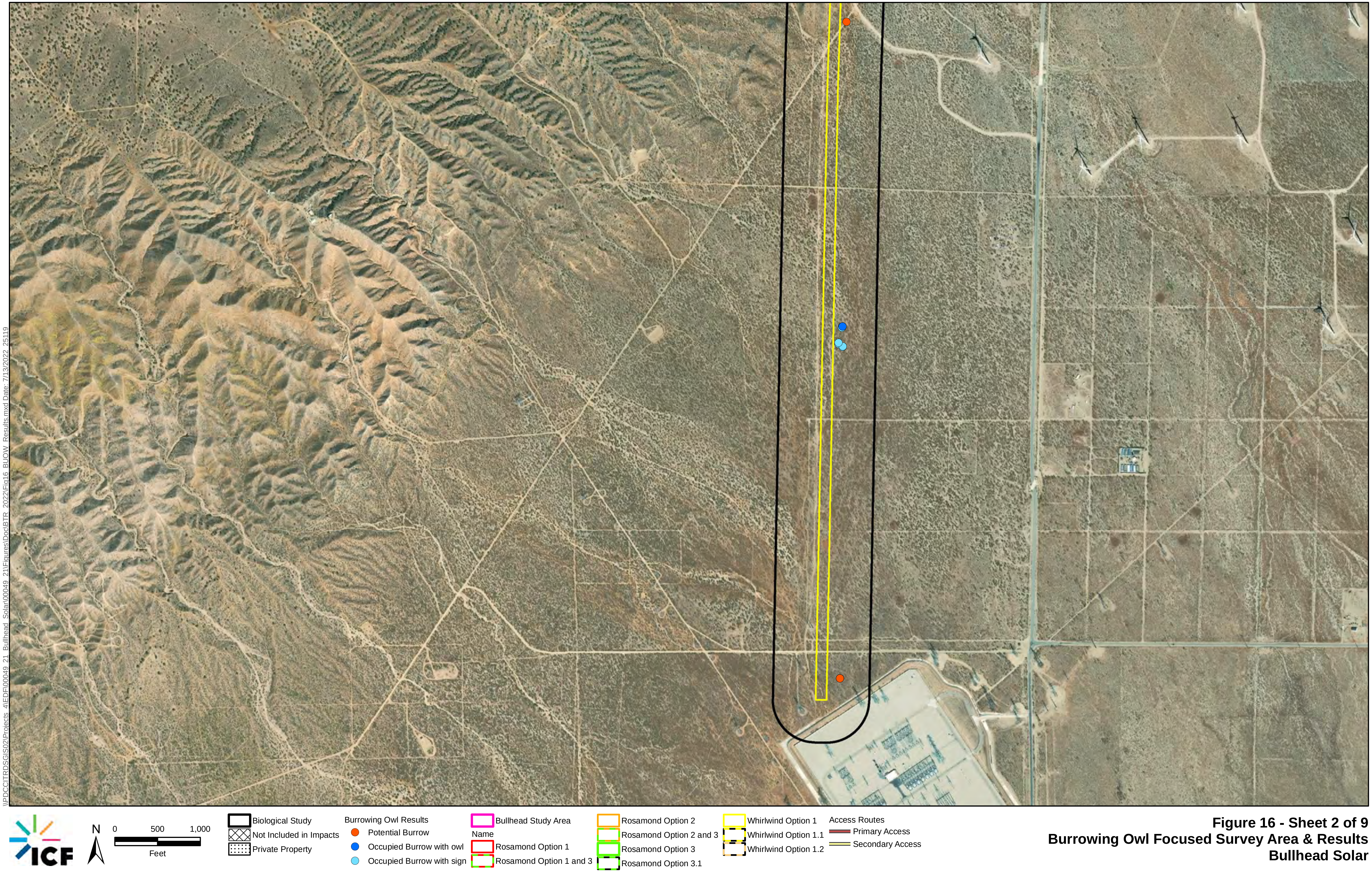

Figure 16 - Sheet 2 of 9
Burrowing Owl Focused Survey Area & Results
Bullhead Solar

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig16_BUOW_Results.mxd Date: 7/13/2022 25119

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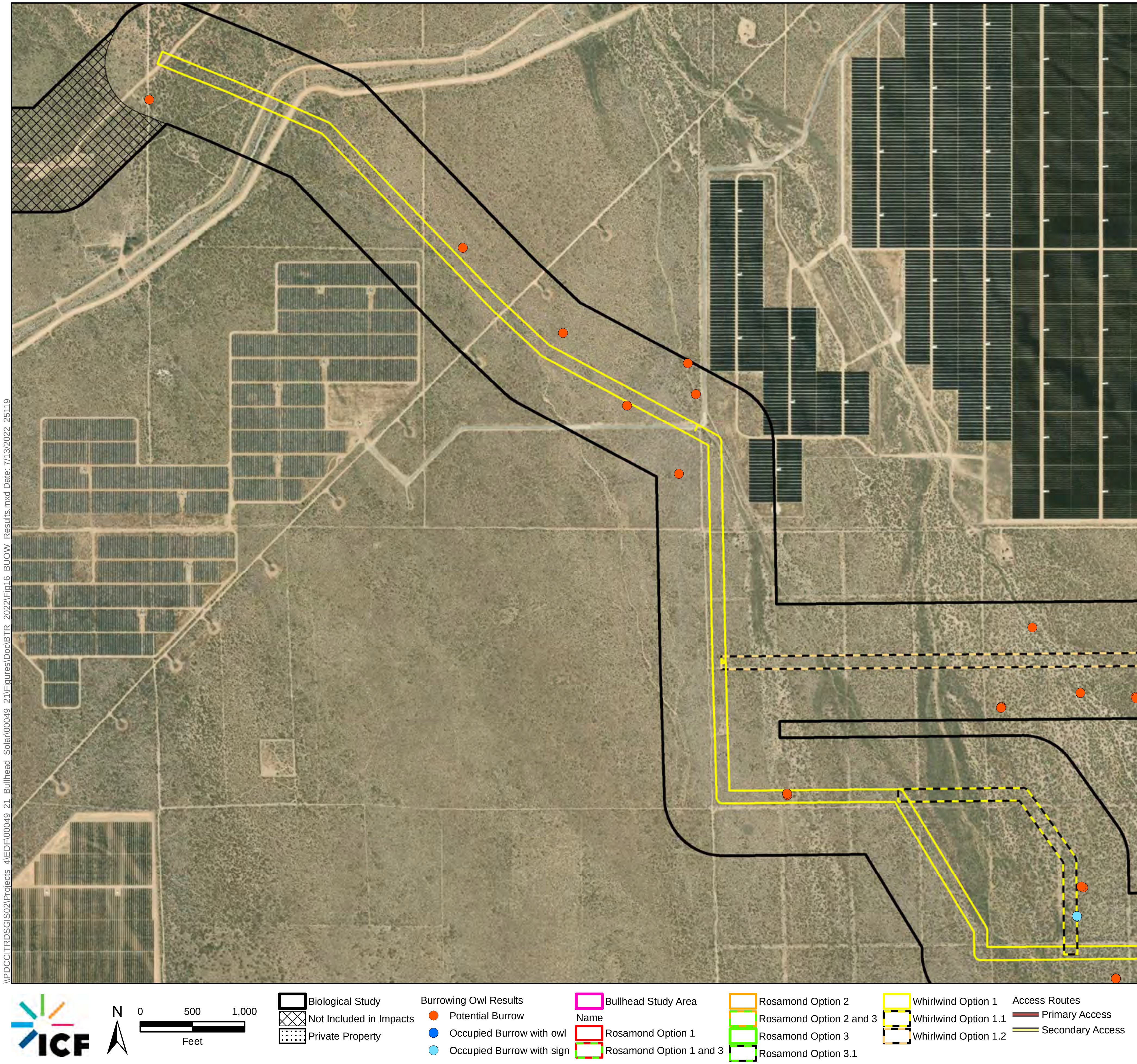
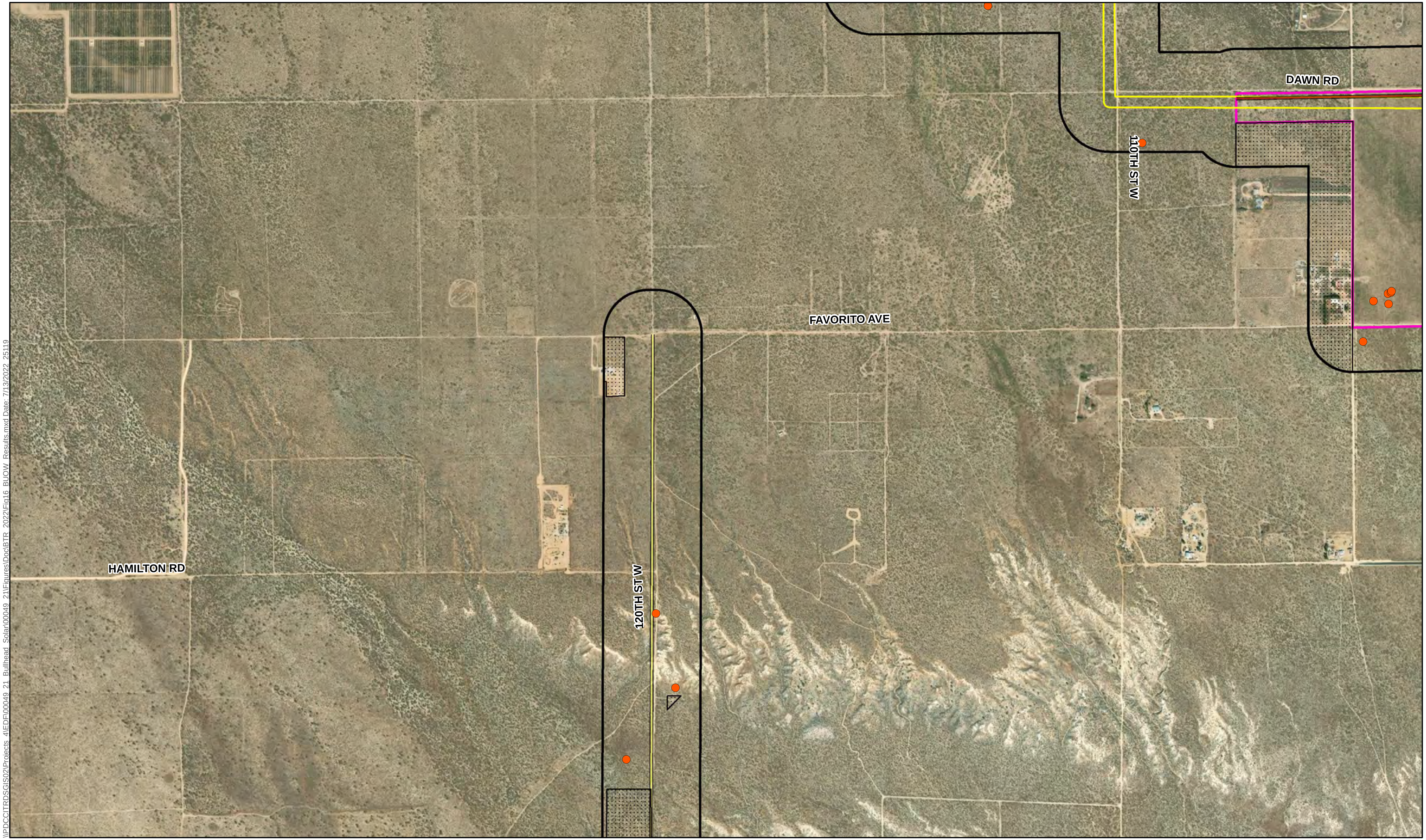


Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 16 - Sheet 3 of 9
Burrowing Owl Focused Survey Area & Results
Bullhead Solar



Biological Study
Not Included in Impacts
Private Property

Burrowing Owl Results
Potential Burrow
Occupied Burrow with owl
Occupied Burrow with sign

Bullhead Study Area
Name
Rosamond Option 1
Rosamond Option 1 and 3

Rosamond Option 2
Rosamond Option 2 and 3
Rosamond Option 3
Rosamond Option 3.1

Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2

Access Routes
Primary Access
Secondary Access

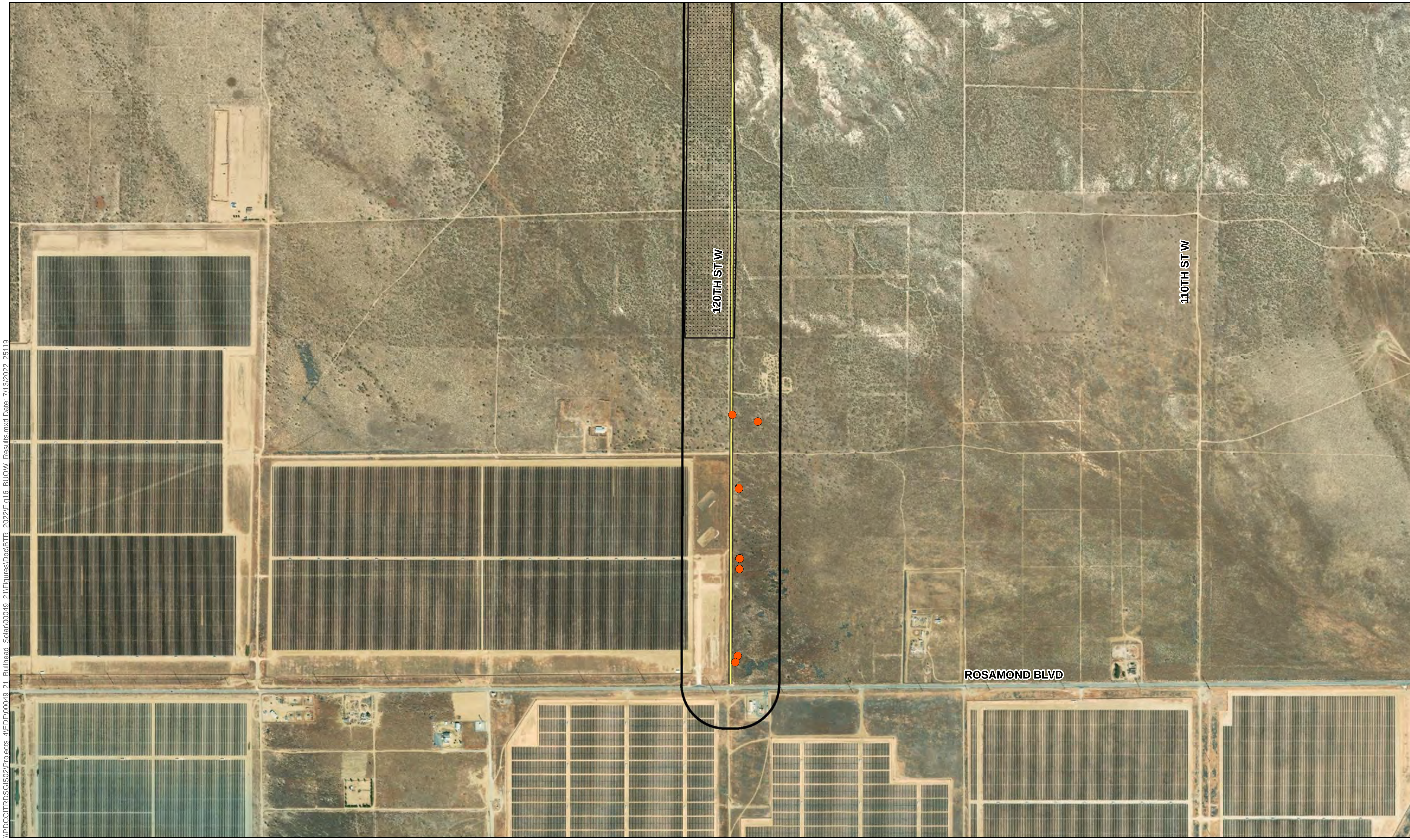
N
0 500 1,000
Feet

ICF

Figure 16 - Sheet 4 of 9
Burrowing Owl Focused Survey Area & Results
Bullhead Solar

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig16_BUOW_Results.mxd Date: 7/13/2022 25119



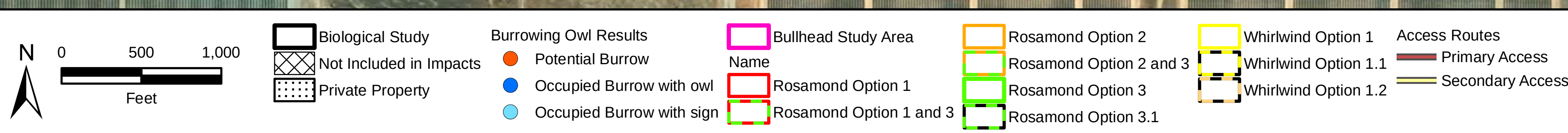
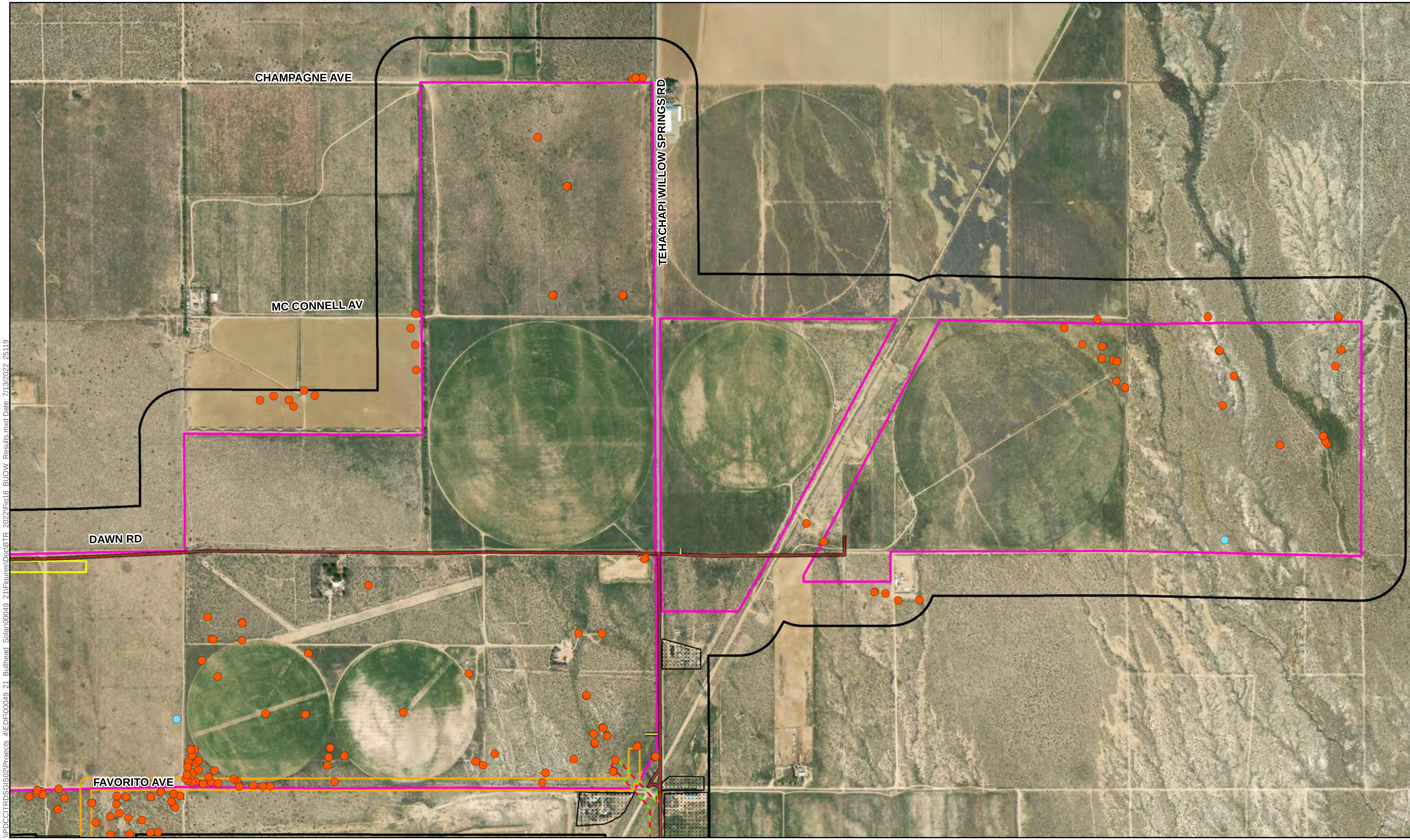


Figure 16 - Sheet 5 of 9
Burrowing Owl Focused Survey Area & Results
Bullhead Solar

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

\\PDCCITRDSGIS02\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Doc\BTR_2022\Fig16_BUOW_Results.mxd Date: 7/13/2022 25119



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ICF

N

0 500 1,000

Feet

Biological Study
Not Included in Impacts
Private Property

Burrowing Owl Results
Potential Burrow
Occupied Burrow with owl
Occupied Burrow with sign

Bullhead Study Area
Name
Rosamond Option 1
Rosamond Option 1 and 3

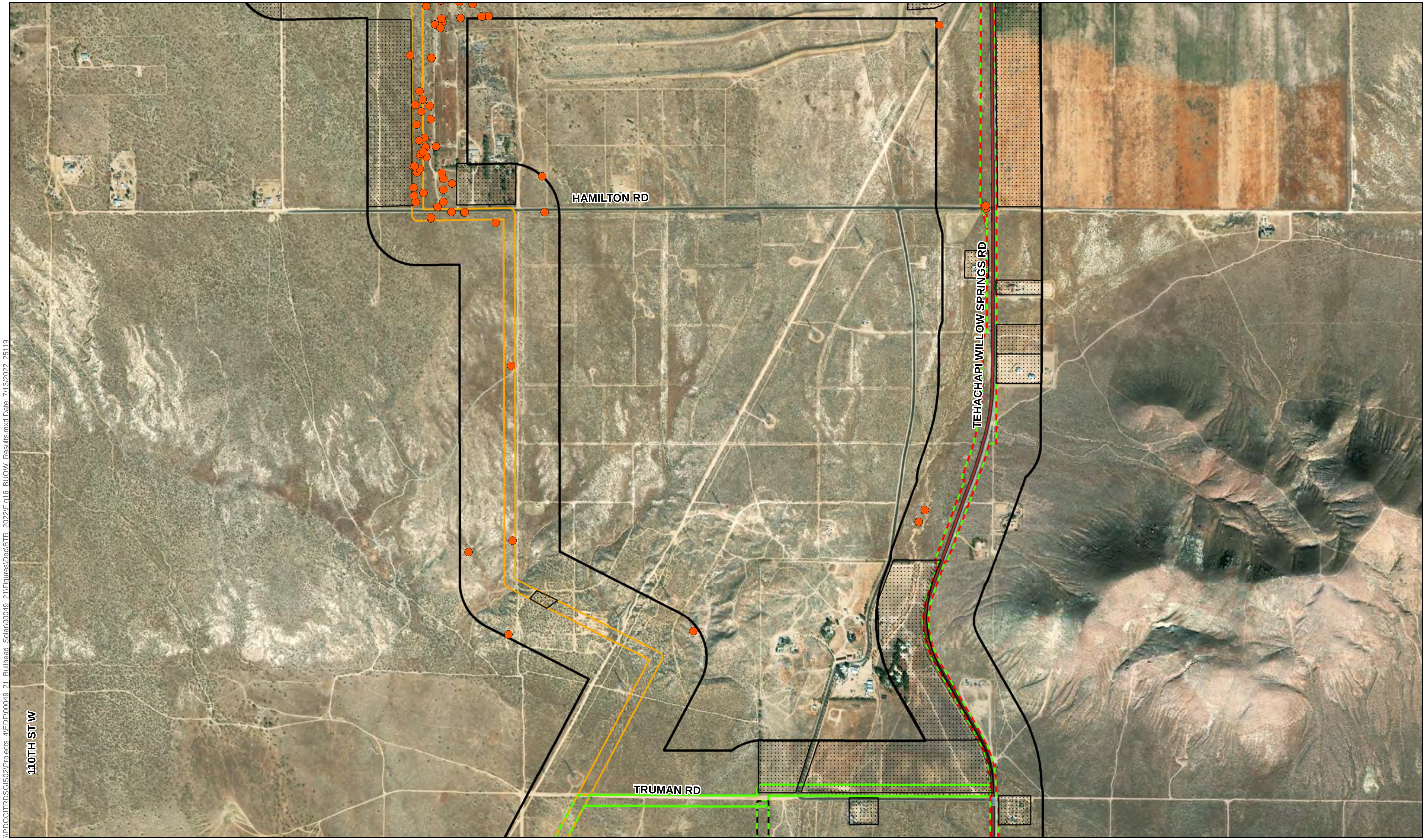
Rosamond Option 2
Rosamond Option 2 and 3
Rosamond Option 3
Rosamond Option 3.1

Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2

Access Routes
Primary Access
Secondary Access

Figure 16 - Sheet 6 of 9
Burrowing Owl Focused Survey Area & Results
Bullhead Solar

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)



ICF

N

0 500 1,000

Feet

Biological Study
Not Included in Impacts
Private Property

Burrowing Owl Results
Potential Burrow
Occupied Burrow with owl
Occupied Burrow with sign

Bullhead Study Area
Name
Rosamond Option 1
Rosamond Option 1 and 3

Rosamond Option 2
Rosamond Option 2 and 3
Rosamond Option 3
Rosamond Option 3.1

Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2

Access Routes
Primary Access
Secondary Access

Figure 16 - Sheet 7 of 9
Burrowing Owl Focused Survey Area & Results
Bullhead Solar

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

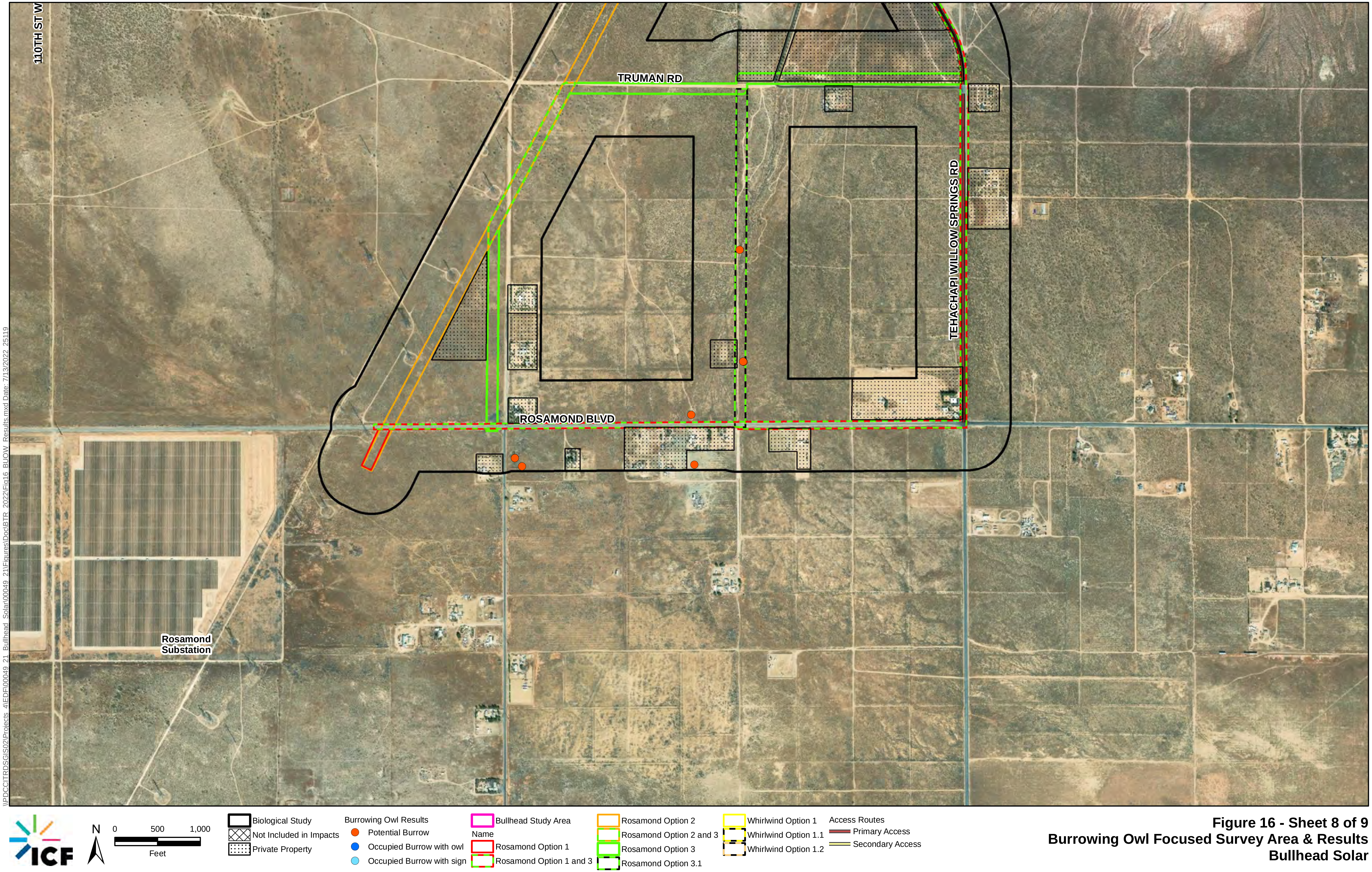
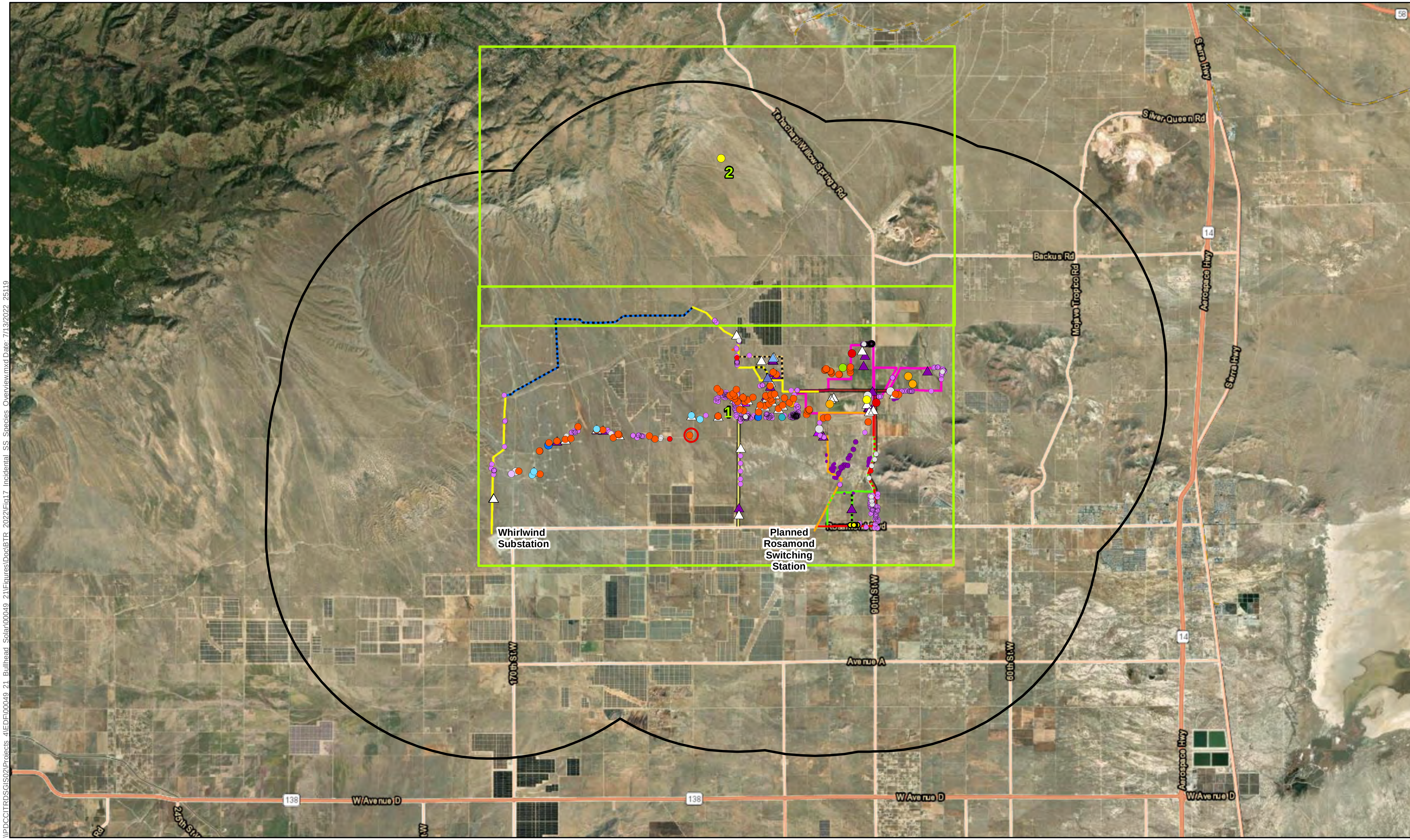


Figure 16 - Sheet 8 of 9
Burrowing Owl Focused Survey Area & Results
Bullhead Solar

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)



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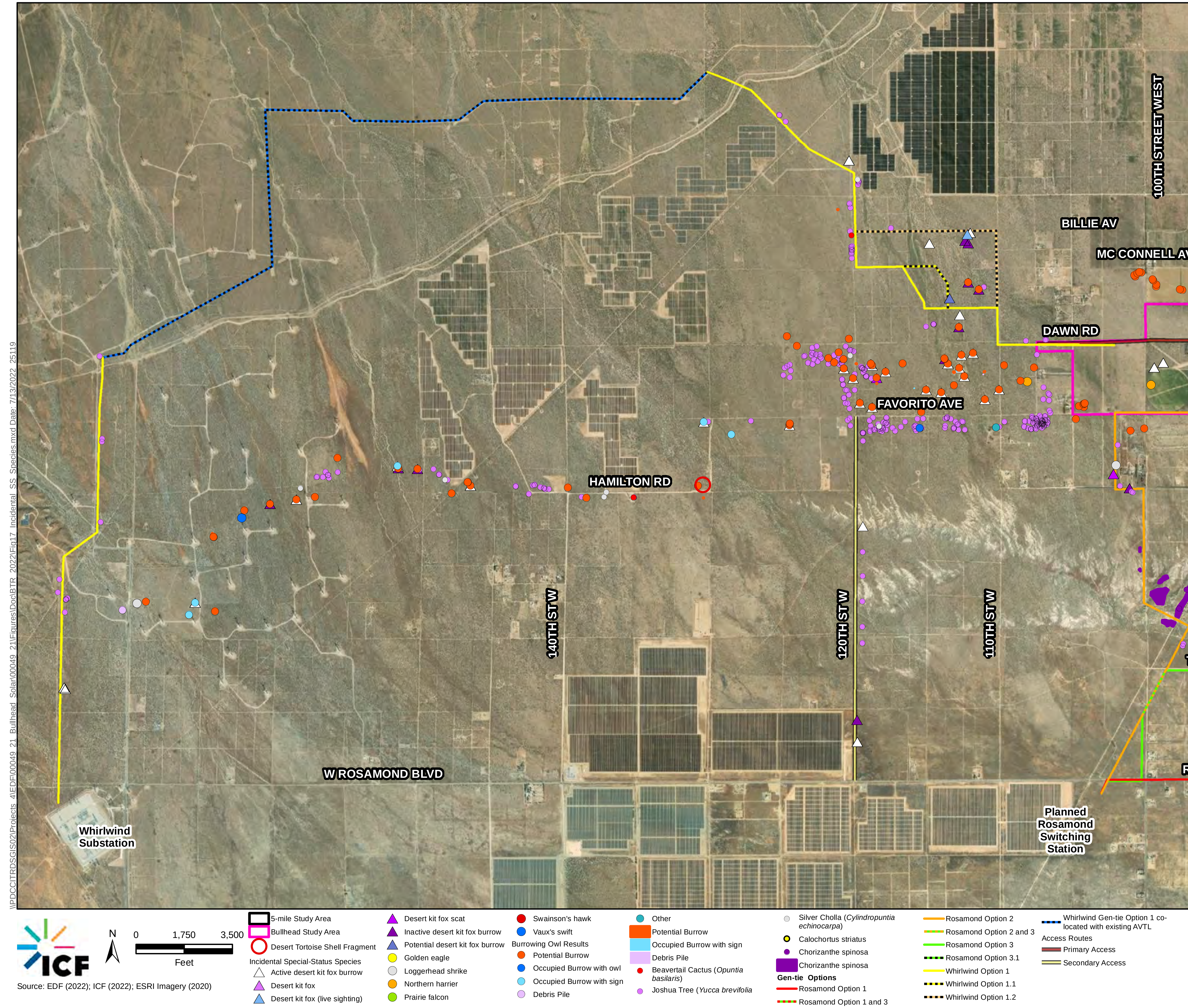
N
0 1 2
Miles

Source: EDF (2021); ICF (2021); ESRI Imagery (2019)

Figure 17 - Overview
Incidental Special-Status Species Observations
Bullhead Solar



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ICF

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

Figure 17, Sheet 1 of 2
Incidental Special-Status Species Observations
Bullhead Solar

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N

0 1,750 3,500
Feet

Source: EDF (2022); ICF (2022); ESRI Imagery (2020)

5-mile Study Area
Bullhead Study Area
Desert Tortoise Shell Fragment
Incidental Special-Status Species
Active desert kit fox burrow
Desert kit fox
Desert kit fox (live sighting)
Desert kit fox scat
Inactive desert kit fox burrow
Potential desert kit fox burrow
Golden eagle
Loggerhead shrike
Northern harrier
Prairie falcon
Swainson's hawk
Vaux's swift
Burrowing Owl Results
Potential Burrow
Occupied Burrow with owl
Occupied Burrow with sign
Debris Pile
Other
Potential Burrow
Occupied Burrow with sign
Debris Pile
Beavertail Cactus (*Opuntia basilaris*)
Joshua Tree (*Yucca brevifolia*
Silver Cholla (*Cylindropuntia echinocarpa*)
Calochortus striatus
Chorizanthe spinosa
Chorizanthe spinosa
Gen-tie Options
Rosamond Option 1
Rosamond Option 1 and 3
Rosamond Option 2
Rosamond Option 2 and 3
Rosamond Option 3
Rosamond Option 3.1
Whirlwind Option 1
Whirlwind Option 1.1
Whirlwind Option 1.2
Whirlwind Gen-tie Option 1 co-located with existing AVTL
Access Routes
Primary Access
Secondary Access

Figure 17, Sheet 2 of 2
Incidental Special-Status Species Observations
Bullhead Solar

Appendix B
Special-Status Species Potential to Occur Table

Appendix B-1

Special-Status Plant Species Potential to Occur Table

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE/ CRPR[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
PLANTS				
Mt. Pinos onion (*Allium howellii* var. *clokeyi*)	-/-/1B.3	This perennial bulbiferous herb is found in great basin scrub, edges of meadows and seeps, and pinyon and juniper woodland. It blooms from April through June at elevations from 4265 feet (ft.) to 6,070 ft. above mean sea level (amsl).	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.
Howell's onion (*Allium howellii* var. *howellii*)	-/-/4.3	This perennial bulbiferous herb is found in valley and foothill grassland, often in clay soils. It blooms from March through April at elevations from 165 feet (ft.) to 6,720 ft. above mean sea level (amsl).	HA	**Not expected to occur.** Suitable habitat does not exist within the rare plant study area (RPSA).
California androsace (*Androsace elongata* ssp. *acuta*)	-/-/4.2	This annual herb is found in a number of habitat types including chaparral, coastal scrub, meadows and seeps, valley and footlhill grassland, cismontane woodland, and pinyon and juniper woodlands. Occurs at elevations from 490 ft. to 4,280 ft. amsl. Blooms from March through June.	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.
Horn's milk-vetch (*Astragalus hornii* var. *hornii*)	-/-/1B.1	This perennial herb is found in alkaline areas within meadows and seeps and playas/lake margins. Occurs at elevations from 195 ft. to 2,790 ft. amsl. Blooms from May through October.	HP	**Low potential.** Marginally suitable habitat for this species (alkali seeps and hummocks) is present in scattered locations throughout the RPSA.
Palmer's mariposa Lily (*Calochortus striatus*)	-/-/1B.2	This perennial bulbiferous herb can be found mesic areas in chaparral, lower montane coniferous forest, meadows and seeps, and valley and foothill grassland between 2330 ft. and 7,840 ft. amsl in elevation. The blooming period is from April through July.	HP	**Low potential.** Marginally suitable habitat (meadows and seeps) is present within the RPSA. The closest record is over 10 miles away.

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE/ CRPR[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
Alkali mariposa lily (*Calochortus striatus*)	-/-/1B.2	This perennial bulbiferous herb can be found chaparral, chenopod scrub, Mojavean desert scrub, meadows and seeps in alkaline and mesic areas between 230 ft. and 5,240 ft. amsl in elevation. The blooming period is from April through June.	**P**	**Present.** Alkali mariposa lily was observed within the biological study area (BSA; 500-ft buffer) and within the 50-ft buffer of the RPSA of Rosamond Gen-Tie Option 1 along Rosamond Blvd. It was not detected within the proposed impact area. It was determined to have a high potential to occur elsewhere based off species abundance within the vicinity of the project and the presence of suitable chenopod scrub (Allscale scrub) habitat in scattered locations throughout the RPSA.
Peirson's morning-glory (*Calystegia peirsonii*)	-/-/4.2	This perennial rhizomatous herb can be found within chaparral, chenopod scrub, cismontane woodland, coastal scrub, lower montane coniferous forest, and valley and foothill grassland. Occurs at an elevation of 95 ft. to 4,920 ft. amsl and blooms between April and June.	HP	**Low.** Suitable habitat is present within the RPSA; however this species is from an isolated location in Kern county, and it’s typically geographical range is from the San Gabriel Mountains. The closest record is over 10 miles away.
Kern County evening-primrose (*Camissonia kernensis* ssp. *kernensis*)	-/-/4.3	This annual herb is known to occur in sandy, gravelly, or granitic areas within chaparral, Joshua tree woodland, and pinyon and juniper woodland habitats. Elevation ranges from 2,590 ft. to 6,990 ft. amsl. Blooms from March through May.	HP	**Low potential.** While records exist within 10 miles of the RPSA and suitable habitat is present, local occurrence of this species is outlying from the typical geographic range. It was not detected during 2022 focused surveys.
White pygmy-poppy (*Canbya candida*)	-/-/4.2	This annual herb is found in gravelly, sandy, and granitic soils within Joshua tree woodland, Mojavean desert scrub, and Pinyon and juniper woodland habitats between 1,968 ft. and 4,790 ft. amsl in elevation. Blooming period is from March through June.	HP	**Low potential.** This species is known from the general vicinity for the project; however, only marginally suitable sandy habitat is present within the RPSA.

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE/ CRPR[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
Mojave paintbrush (*Castilleja plagiotoma*)	-/-/4.3	This perennial herb is known to occur in great basin scrub (alluvial), Joshua tree woodland, lower montane coniferous forest, and pinyon and juniper woodland. It is found at elevations ranging from 985 ft. to 8,205 ft. amsl. The blooming period is from April through June.	HP	**Low potential.** Only marginal and limited suitable habitat is present within the RPSA; however, few records exist within the Antelope Valley region.
Mojave spineflower (*Chorizanthe spinosa*)	-/-/4.2	This annual herb occurs in chenopod scrub, Joshua tree woodland, Mojavean desert scrub, and playas, often in alkaline areas, between 20 ft. and 4,265 ft. amsl in elevation. Blooming period is from March through July.	**P**	**Present.** This species was detected within the RPSA.
Short-bracted bird's-beak (*Cordylanthus rigidus* ssp. *brevibracteatus*)	-/-/4.3	This annual herb is known to occur in chaparral, montane coniferous forest, and pinyon and juniper woodland. It is found at elevations ranging from 2000 ft. to 8,500 ft. amsl. The blooming period is from April through June.	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.
Clokey's cryptantha (*Cryptantha clokeyi*)	-/-/1B.2	This annual herb is found in Mojavean desert scrub on rocky to gravelly slopes, ridge crests, and desert woodland between 2,370 ft. and 4,480 ft. amsl in elevation. This species blooms in April.	HP	**Low potential.** Mojave desert scrub habitat is present within the RPSA but lacks the rocky slopes preferred by this species.
Mt. Pinos larkspur (*Delphinium parryi* ssp. *purpureum*)	-/-/4.3	This perennial herb is known to occur in chaparral, Mojavean desert scrub, and pinyon and juniper habitats. It is found at elevations ranging from 3,280 ft. to 8,530 ft. amsl. The blooming period is from May through June.	HA	**Not expected to occur.** Mojave desert scrub habitat is present within the RPSA but lacks the rocky slopes preferred by this species. In addition, the RPSA is just below the elevation range of this species.

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE/ CRPR[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
Recurved larkspur (*Delphinium recurvatum*)	-/-/1B.2	This perennial herb is known to occur in alkaline areas within chenopod scrub, cismontane woodland, and valley and foothill grasslands. It is found at elevations ranging from 5 ft. to 2,590 ft. amsl and blooms from March through June.	HP	**Moderate potential.** Suitable habitat (chenopod scrub) and alkaline areas are present within the RPSA; however, this species is only locally known from sandy playas surrounding Rosamond dry lake and its range is primarily restricted to the Central Valley.
Calico monkeyflower (*Diplacus pictus*)	-/-/1B.2	This annual herb is known to occur in broadleaf upland forest and cismontane woodland. It is found at elevations ranging from 330 ft. to 4,690 ft. amsl. The blooming period is from March through May.	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.
Limestone dudleya (*Dudleya abramsii*)	-/-/4.3	This perennial herb is known to occur in chaparral and pinyon and juniper woodland. It is found at elevations ranging from 1640 ft. to 8,530 ft. amsl. The blooming period is from April through August.	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.
Rosamond eriastrum (*Eriastrum rosamondense*)	-/-/1B.1	This annual herb is found in the openings of chenopod scrub and along the edges of vernal pools in alkaline hummocks in areas that are often sandy. It occurs at elevations ranging from 2,295 ft. to 2,345 ft. amsl. This species typically blooms from April through May, and occasionally from June to July.	HP	**Low potential.** Only marginal and limited suitable habitat for this species (alkali seeps and hummocks) is present in the RPSA.
Tracy's eriastrum (*Eriastrum tracyi*)	-/-/1B.1	This annual herb is found in chaparral, cismontane woodland, and valley and foothill grassland. It occurs at elevations ranging from 1,035 ft. to 5,840 ft. amsl. This species typically blooms from May through July	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE/ CRPR[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
Sierra monkeyflower (*Erythranthe sierrae*)	-/-/4.2	This annual herb is found in cismontane woodland and lower montane coniferous forest. It occurs at elevations ranging from 1,035 ft. to 5,840 ft. amsl. This species typically blooms from March through July	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.
Pine fritillary (*Fritillaria pinetorum*)	-/-/4.3	This perennial bulbiferous herb is found in chaparral, lower and upper montane coniferous forest, pinyon and juniper woodland, and subalpine coniferous forest. It occurs at elevations ranging from 5,695 ft. to 10,825 ft. amsl. This species typically blooms from May through July	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.
Inland gilia (*Gilia interior*)	-/-/4.3	This annual herb is found in cismontane woodland, Joshua tree woodland, and lower montane coniferous forest. It occurs at elevations ranging from 2,295 ft. to 5,580 ft. amsl. This species typically blooms from March through may	HP	**Low potential.** Suitable habitat is present within the RPSA; however, few records exist within the Antelope Valley region.
Pine gilia (*Gilia leptantha* ssp. *pinetorum*)	-/-/4.3	This annual herb is found in lower montane coniferous forest. It occurs at elevations ranging from 4,920 ft. to 9,185 ft. amsl. This species typically blooms from May through July	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.
Golden goodmania (*Goodmania luteola*)	-/-/4.2	This annual herb is found in alkaline and clay soils within Mojavean desert scrub, meadows and seeps, playas, and valley and foothill grassland habitats. It occurs at elevations between 65 ft. and 7,220 ft. amsl and blooms between April and August.	HP	**Low potential.** Only marginal and limited suitable habitat (alkali seeps and hummocks) is present within RPSA .
Coulter's goldfield's (*Lasthenia glabrata* ssp. *coulteri*)	-/-/1B.1	This annual herb is found in marshes and swamps, playas, and vernal pools. It occurs at elevations between 5 ft. and 4,005 ft. amsl and blooms between February and June.	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE/ CRPR[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
Pale-yellow layia (*Layia heterotricha*)	-/-/1B.1	This annual herb is found in open areas containing alkaline, clay, or loamy soils within cismontane woodland, pinyon-juniper woodland, and valley and foothill grassland habitats. It occurs at elevations ranging from 980 ft. to 5,595 ft. amsl and blooms from March through June.	HP	**Low potential.** Marginally suitable habitat is present within the RPSA.
Sagebrush loeflingia (*Loeflingia squarrosa* var. *artemisiarum*)	-/-/2B.2	This annual herb is found in sandy areas within desert dune, Great Basin scrub, and Sonoran desert scrub habitats. It is known from elevations ranging from 2,295 ft. to 5,300 ft. amsl. Its blooming period ranges from April through May.	HP	**Low potential.** Marginally suitable sandy habitat is present within the RPSA.
Tehachapi monardella (*Monardella linoides* ssp. *oblonga*)	-/-/1B.3	This perennial rhizomatous herb is found in lower montane coniferous forest, pinyon and juniper woodland, and upper montane coniferous forest habitats from about 2,950 ft. to 8,105 ft. amsl in elevation. Its typical blooming period is from June through August, but occasionally begins blooming in May.	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.
Baja navarretia (*Navarretia peninsularis*)	-/-/1B.2	This annual herb occurs in mesic areas in chaparral, lower montane coniferous forest, meadows and seeps, and pinyon and juniper woodland at elevations ranging from 4,920 ft. to 7,545 ft. amsl. It blooms from May through August.	HA	**Not expected to occur.** Suitable habitat and soils do not exist within the RPSA.
Robbin's nemacladus (*Nemacladus secundiflorus* var. *robbinsii*)	-/-/1B.2	This annual herb can be found in chapparal and valley and foothill grassland habitats at elevations ranging from 1,150 ft. to 5,580 ft. amsl. It blooms from April through June.	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE/ CRPR[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
Large-flowered nemacladus (*Nemacladus secundiflorus* var. *secundiflorus*)	-/-/4.3	This annual herb can be found in openings and gravelly areas within chaparral and valley and foothill grassland habitats at elevations ranging from 655 ft. to 6,560 ft. amsl. It blooms from April through June.	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.
Bakersfield cactus (*Opuntia basilaris* var. *treleasei*)	FE/CE/4.3	This perennial succulent can be found in chenopod scrub, cismontane woodland, and foothill grassland habitats at elevations ranging from 330 ft. to 4,755 ft. amsl. It blooms from April through May.	HP	**Not expected to occur.** Not observed during focused cacti surveys and mapping. Marginally suitable habitat is present within the RPSA. Plants within the Antelope Valley region may be hybrids with the more common variety, *O. basilaris* var. *basilaris.*
Adobe yampah (*Perideridia pringlei*)	-/-/4.3	This perennial herb grows along serpentine grassland hillsides, in clay soils, and in seasonally wet sites within chaparral, cismontane woodland, pinyon and juniper woodland, and coastal scrub habitats. It occurs at elevations ranging from 980 ft. to 5,905 ft. amsl. It blooms from April through June, and occasionally into July.	HA	**Not expected to occur.** Suitable habitat and serpentine, clay, and seasonally wet areas do not exist within the RPSA.
Latimer's woodland-gilia (*Saltugilia latimeri*)	-/-/1B.2	This annual herb is found in chaparral, Mojavean desert scrub, and pinyon and juniper woodland habitats in rocky or sandy, often granitic, soils and occasionally washes. It occurs at elevations ranging from 1,310 ft. to 6,235 ft. amsl and blooms from March to June.	HP	**Low potential.** Moderately suitable habitat for this species is present within the RPSA; however, it is known from only one location in the region on a montane limestone outcrop.
Lemmon's syntrichopappus (*Syntrichopappus lemmonii*)	-/-/4.3	This annual herb is found in sandy or gravelly soils within chaparral, Joshua tree woodland, and pinyon-juniper woodland habitats at elevations ranging from 1,640 ft. to 6,005 ft. amsl. It blooms from April through May, and occasionally blooms into June.	HP	**Low potential.** Only marginal and limited Suitable habitat for this species is present within the RPSA.

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE/ CRPR[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
Golden violet (*Viola purpurea* ssp. *aurea*)	-/-/2B.2	This perennial herb is found in meadows and seeps, subalpine coniferous forest, and upper montane coniferous forest habitats at elevations ranging from 4,920 ft. to 11,155 ft. amsl. Its blooming period is from April through July.	HA	**Not expected to occur.** Suitable habitat does not exist within the RPSA.
Joshua tree (*Yucca brevifolia*)	-/SC/-	This tree-like yucca is native to the arid southwest and is found primarily in the Mojave Desert between 1,300 and 5,900 ft. The blooming period is typically February to April.	**P**	**Present.** This species was observed within the RPSA during focused surveys in 2021.

[a] Status Codes

Federal

FE = Federally listed; Endangered

FPE = Proposed Endangered

FT = Federally listed; Threatened

FC = Federal Candidate for Listing

D = Delisted

State

SE = State listed; Endangered

ST = State listed; Threatened

SC = State Candidate for Listing

SSC = Species of Special Concern

California Rare Plant Ranks (CRPR)

1A = Plants presumed extinct in California

1B = Plants rare, threatened, or endangered in California and elsewhere

2B = Plants rare, threatened, or endangered in California, but more common elsewhere

3 = Plants about which we need more information (Review List)

4 = Limited distribution (Watch List)

0.1 = Seriously endangered in California

0.2 = Fairly endangered in California

0.3 = Not very endangered in California

[b] Habitat Presence/Absence Codes

P = The species is present.

HP =Habitat is or may be present. The species may be present.

HA = Habitat is absent and no further work needed.

Appendix B-2
Special-Status Wildlife Species Potential to Occur Table

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
REPTILES				
Northern California Legless Lizard (*Anniella pulchra*)	-/SSC	Occurs in coastal dune, grasslands, chaparral, and coastal scrub habitat types within sandy or loose loamy soils with a high moisture content. Common in Coast Ranges from Antioch/Contra Costa County south to the Mexican border. Elevation from near sea level to about 6,000 ft. amsl. Spotty occurrence in San Joaquin Valley from San Joaquin County south, west slope of the southern Sierra, the Tehachapi Mountains west of the desert, and the mountains of southern California.	HP	**Moderate.** Potentially suitable habitat is present within the BSA.
Desert Tortoise (*Gopherus agassizii*)	FT/ST	Terrestrial tortoise that inhabits burrows on sandy flats, rocky foothills, alluvial fans, canyons, washes and other open areas throughout the Mojave and Sonoran deserts below 3,500 feet in elevation. Species is most active from March through June and from September through October. Populations north and west of the Colorado River are listed as federally threatened. Known to be absent within the Coachella Valley west of the Salton Sea. Additionally, known to be present in the northern, eastern and western rims of the Coachella Valley within the foothills of the Little San Bernardino Mountains, the Painted and Whitewater Hills, and the San Jacinto and northern Santa Rosa Mountains.	A	**Not expected.** Not detected during focused surveys. Site is within the historical range of this species, but desert tortoise is not known to be extant in this area.

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
Coast Horned Lizard (*Phrynosoma blainvillii*)	-/SSC	Found in arid and semi-arid climate conditions in chaparral and coastal sage scrub habitats, primarily below 2,000 ft. amsl in elevation. Critical factors are the presence of loose soils with a high sand fraction; an abundance of native ants or other insects, especially harvester ants (*Pogonomyrmex* spp.); and the availability of both sunny basking spots and dense cover for refuge.	HA	**Not expected.** Suitable habitat does not exist within the BSA. This species occurs in foothills around the Antelope Valley; on the valley floor it is replaced by desert horned lizard (*Phrynosoma platyrhinos*).
BIRDS				
Tricolored Blackbird (*Agelaius tricolor*)	-/ST	Occurs in open country in western Oregon, California, and northwestern Baja California. Breeds near freshwater, preferably in emergent wetland with tall, dense cattails (*Typha* spp.) or tules (*Schoenoplectus* spp.), but also in thickets of willow (*Salix* spp.), blackberry (*Rubus* spp.), and wild rose (*Rosa* spp.). Forages in grassland and cropland habitats. Seeks cover for roosting in emergent wetland vegetation, especially cattails and tules, and also in trees and shrubs.	Nesting: HA Foraging: HP	**High potential for foraging.** This species forages widely in mixed flocks of blackbirds in the Antelope Valley. The BSA contains suitable foraging habitat for this species. The BSA does not support suitable breeding habitat for this species; no potential for this project to impact breeding habitat.
Golden Eagle (*Aquila chrysaetos*)	-/CFP	Forages in grassland, deserts, and open savannah of many types. It tolerates considerable variation in topography and elevation. It prefers to hunt moderate-sized prey, especially California ground squirrels (*Otospermophilus beecheyi*) and rabbits, but will occasionally take larger prey, such as mule deer fawns (*Odocoileus hemionus*). Nests on cliffs of all heights, and occasionally in large trees in open areas, in rugged, open habitats with canyons and escarpments. It is very sensitive to human disturbance, especially near nest sites.	Nesting: A Foraging: HP	**High potential for foraging.** The study aera is open habitat that could serve as foraging habitat for golden eagle. Golden eagles can range widely; individuals from the mountains could fly over the site. High potential that the site could be used at a low intensity. Suitable nesting habitat within the BSA consists of large transmission line towers. No nests present within the BSA (Appendix G). Site is not close to any known nests.

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
Burrowing Owl (*Athene cunicularia*)	-/SSC	Inhabits open, dry grasslands, prairie, desert floor, and open scrub habitats. Commonly found in areas altered by man, including flood control channels and basins, abandoned or open fields, agricultural and livestock areas, and road cuts. In California, commonly uses ground squirrels burrows. Also known to utilize piles of broken concrete, old pipes, and other abandoned structures for burrows.	Nesting: P Foraging: P	**Present**. An occupired burrow was observed within the Bullhead Study Area. Suitable nesting burrows scattered throughout the BSA. Widespread suitable foraging habitat present in the BSA.
Swainson's Hawk (*Buteo swainsoni*)	-/ST	Suitable breeding habitat consists of areas containing Joshua trees, Fremont cottonwoods, or other large trees located adjacent to open fields, including agricultural fields. Forages in open desert, grasslands, agricultural fields, or livestock pastures. In the Antelope Valley, strongly associated with alfalfa fields.	Nesting: P Foraging: P	**Present.** Observed nesting and foraging within the BSA. All habitat within the BSA is within 5 miles of an active nest. Several active Swainson's hawk nests were observed in athel tree (*Tamarisk aphylla*) along 95th Street West in 2021. A total of 12 Swainson's Hawk nests were documented during the survey within the 5-mile Study Area. Of the documented nests, 7 were documented as active in 2021 and all failed prior to fledging or egg laying. Full details are available in Appendix G.
Vaux's swift (*Chaetura vauxi*)	-/SSC/-	Fairly common as a spring and fall migrant in southern California. In winter, occurs rarely and irregularly in the region. Requires trees, snags, chimneys, or smokestacks with large hollows or cavities for nighttime roosting. Roost sites are found in a variety of forested and urban environments.	Nesting: HA Foraging: P	**Migrant.** This species was incidentally observed flying over the BSA during biological surveys conducted in 2021. This species migrates through southern California on its way to breeding grounds in the Pacific Northwest and would not be expected to forage or nest in the BSA

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
Mountain Plover (*Charadrius montanus*)	-/SSC	Occurs in short grasslands, plowed fields with little vegetation, and open sagebrush areas. Nests in short-grass prairies in the western Great Plains and Rocky Mountain states, but winters along the Pacific and Gulf Coasts and in the Southwest. In California, generally winters in the Sacramento, San Joaquin, Panoche, Antelope, and Imperial valleys, with very small numbers occurring in the coastal region.	Nesting: HA Foraging: HP	**High potential for wintering.** This species does not nest in California. However, suitable wintering habitat occurs in the BSA and the species has been documented wintering near the BSA.
Northern Harrier (*Circus hudsonius*)	-/SSC	This is a medium-sized, lightly built bird of prey which hunts low to the ground mostly in open country, nesting on the ground. Prey diversity is high, though small mammals are most commonly taken. This is the only North American hawk that locates much of its prey by hearing as it quarters low over the vegetation. It was formerly a fairly common breeder in much of coastal southern California, but now is nearly extirpated in this role due to loss of native open habitats, especially marshes. It remains fairly common in open country with low human disturbance during migration and in winter.	Nesting: HP Foraging: HP	**Present.** The BSA is suitable breeding and foraging habitat for this species. Northern harrier was observed foraging in the BSA.

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
Willow Flycatcher (*Empidonax traillii*)	FE/SE	A broadly distributed species, breeding interruptedly across much of the United States and Canada. In California it is nearly restricted to the Sierra Nevada Mountains and a few populations scattered through southern California. Several subspecies are recognized. Southern California is within the range of the subspecies *E.t. extimus* (southwestern willow flycatcher). During migration, southern California is host to other subspecies of willow flycatcher passing between breeding areas farther north (Sierra Nevada north to Canada) and their winter range farther south (Central America). These migrants of other subspecies are found in a wide variety of habitats, and are uncommon to fairly common in spring and fall.	Nesting: HA Foraging: HA	**Low Potential.** Low potential to stop within the BSA during migration. No suitable nesting or foraging habitat is present in the BSA.
Peregrine Falcon (*Falco peregrinus*)	-/CFP	Nest on ledges on rocky cliffs or earthen bluffs, or some manmade structures. Prey on birds and bats over a variety of habitat types.	Nesting: A Foraging: HP	**High potential to forage** This species is known to occur in the vicinity. The BSA contains suitable foraging habitat for this species. Electrical transmission towers provide suitable substrate for nesting, but no nests present in the BSA in 2021 (Appendix G).

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
California Condor (*Gymnogyps californianus*)	E/-/-	Occurs in semi-arid mountainous areas in California, including the southern Sierra Nevada, Tehachapi Mountains, Transverse Ranges, and the Coast Ranges from Santa Clara County south to Los Angeles County. Forages in open habitats, including grasslands, foothill chaparral, and savannahs, and feeds solely on carrion. Nests and roosts in cliffs on ledges and cavities and in large trees and snags.	Nesting: HA Foraging: HA	**Not expected to occur.** The BSA is outside of the species' current range and there are no records of occurrence within the project quadrangle or surrounding quadrangles. Suitable habitat is absent from the BSA. Mountainous areas for roosting and large sources of carrion are not found in the BSA. California condor does occur within the nearby Tehachapi Mountains to the north and west, as well as in the San Gabriel and Liebre mountains to the south, but there are no records within the Antelope Valley, which lacks the topography to provide lift for soaring. Although it is possible that an individual could fly over the BSA, it is very unlikely that it would land, as their prey base are absent.
Loggerhead Shrike (*Lanius ludovicianus*)	-/SSC	Found as a common resident and winter visitor throughout California in lowland and foothill habitats, where it frequents open areas with sparse shrubs and trees.	Nesting: HP Foraging: P	**Present.** Observed within the BSA. Suitable breeding and foraging habitat present in the BSA. Widespread in desert and rural areas.
Yellow Warbler (*Setophagia petechia*)	-/SSC	Neotropical migrant occupies riparian vegetation in close proximity to water along streams and in wet meadows, nests in trees. Generalist that is primarily insectivorous in California.	Nesting: HA Foraging: HA	**Low Potential.** Low potential to stop within the BSA during migration. No suitable nesting or foraging habitat is present in the BSA.
Le Conte's Thrasher (San Joaquin population) (*Toxostoma lecontei macmillanorum*)	-/SSC	Year-round resident. Inhabits sparsely vegetated flats, dunes, washes, alluvial fans or gently rolling hills with a high cover of saltbush (*Atriplex* spp.) or prickly pear cactus (*Opuntia* spp.)	Nesting: HP Foraging: HP	**Not expected to occur.** The BSA is approximately 55 miles east northeast of the edge of the population with SSC status. The entire species held SSC status until 2008. Currently, only the San Joaquin population (*T. l. macmillanorum*) is designated as an SSC species, which has no potential to

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
				occur within the BSA. Le Conte's thrasher was observed throughout in the BSA, but was the subspecies *T. l. lecontei* which does not have SSC status.
Least Bell's Vireo (*Vireo bellii pusillus*)	FE/SE	Neotropical migrant occupies riparian thickets either near water or in dry portions of river bottoms; nests along margins of bushes and forages low to the ground; may also be found using mesquite and arrow weed in desert canyons.	Nesting: HA Foraging: HA	**Low Potential.** Low potential to stop within the BSA during migration. No suitable nesting or foraging habitat is present in the BSA.
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)	-/SSC	Most numerous in prairie wetlands, is a conspicuous breeding bird in deep-water, emergent wetlands throughout non-forested regions of western North America. Highly social, these large-bodied blackbirds are polygynous, nesting on grouped territories. Postbreeding birds eat mostly grains, often forming large flocks that forage in uplands and roost in wetlands. Flocks migrate to the southern United States and Mexico for the winter.	Nesting: HA Foraging: HP	**High Potential for foraging.** This species is known to forage in the vicinity. The BSA contains suitable foraging habitat for this species. The BSA does not support suitable breeding habitat for this species.
MAMMALS				
Townsend's Big-eared Bat (*Corynorhinus townsendii*)	-/SSC	This species generally roost in caves, mines, and buildings. It forages in a variety of habitats including, mixed desert scrub, primarily in riparian corridors, closely following creeks or streams, and edge habitats eating insect prey.	Roosting: HA Foraging: HA	**Low Potential.** Suitable roosting habitat and foraging habitat is not present within the BSA, but does occur within the surrounding terrain. Suitable foraging habitat exists throughout the BSA.
Tulare Grasshopper Mouse (*Onychomys torridus tularensis*)	-/SSC	Low open scrub and desert scrub. Historic range extended along foothills and floor of southern San Joaquin Valley from western Merced and eastern San Benito counties, east to Madera	A	**Not Expected to Occur.** Species not detected during nocturnal small mammal trapping conducted.

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE
		County, and south to the foothills of the Tehachapi and San Emigdio mountains.		
Tehachapi Pocket Mouse (*Perognathus alticolus inexpectatus*)	-/SSC	Habitat not well defined; generally found in grasslands, desert scrub, pine woodlands, and fallow fields. Burrows for cover and nesting. From Tehachapi Pass, west to Mount Pinos, and south to Elizabeth and Quail Lakes, at elevations from 3,379 ft. to 6,000 ft. amsl.	A	**Not Expected to Occur**. Species not detected during nocturnal small mammal trapping conducted. Outside of the known range of the species.
American Badger (*Taxidea taxus*)	-/SSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	HP	**High Potential.** Suitable habitat occurs within the BSA.
Desert Kit Fox (*Vulpes macrotis arsipus*)	-/FBM	Open desert on creosote bush flats, desert scrub, chaparral, and grasslands. Kit fox can also be found in urban and agricultural areas.	HP	**Present.** Suitable habitat occurs within the BSA. Den complexes were observed within the BSA.
Mohave Ground Squirrel (*Xerospermophilus mohavensis*)	-/ST	Land supporting desert shrub vegetation within the geographic range of the species. It is restricted to the Mojave Desert in San Bernardino, Los Angeles, Kern, and Inyo counties and is rare throughout its range. Populations in southwestern San Bernardino County appear to be extirpated.	A	**Not expected to occur.** Species not detected during nocturnal small mammal trapping conducted. The BSA is outside of the generally accepted current range of this species. In addition, there are no records of occurrence for this species west of State Route 14 between Palmdale and Mojave.

COMMON NAME/ SCIENTIFIC NAME	STATUS FEDERAL/ STATE[a]	SPECIES REQUIREMENTS	SPECIFIC HABITAT PRESENT/ ABSENT[b]	RATIONALE

[a] Status Codes

Federal

FE = Federally listed; Endangered

PE = Proposed Endangered

FT = Federally listed; Threatened

FC = Federal Candidate for Listing

D = Delisted

State

SE = State listed; Endangered

ST = State listed; Threatened

SC = State Candidate for Listing

SSC = Species of Special Concern

CFP = California Fully Protected Species

FBM = Fur-bearing Mammal

[b] Habitat Presence/Absence Codes

P = The species is present.

HP =Habitat is or may be present. The species may be present.

HA = Habitat is absent and no further work needed.

A = This species/habitat was determined to be absent by focused surveys.

Appendix C
Photo Log

Representative Site Photographs

	
Photo 1 **Bullhead Study Area: Looking east.**	**Photo 2** **Bullhead Study Area: Looking north.**

	
Photo 3 **Bullhead Study Area: Looking west.**	**Photo 4** **Bullhead Study Area: Looking north.**

	
Photo 5 **Bullhead Study Area: Looking south.**	**Photo 6** **Bullhead Study Area: Looking north**

	
Photo 7 **Bullhead Study Area: Looking north**	**Photo 8** **Bullhead Study Area: Looking south.**

	
Photo 9 **Bullhead Study Area: Looking south.**	**Photo 10** **Bullhead Study Area: Looking northwest.**

	
Photo 11 **Bullhead Study Area: Looking north.**	**Photo 12** **Bullhead Study Area: Looking east.**

	
Photo 13 **Bullhead Study Area: Looking east.**	**Photo 14** **Bullhead Study Area: Looking east.**

	
Photo 15 **Bullhead Study Area: Looking southeast.**	**Photo 16** **Bullhead Study Area: Looking west.**

	
Photo 17 **Bullhead Study Area: Looking southwest.**	**Photo 18** **Bullhead Study Area: Looking southeast.**

	
Photo 19 **Bullhead Study Area: Looking south.**	**Photo 20** **Bullhead Study Area: Looking west.**

	
Photo 21 **Bullhead Study Area: Looking south.**	**Photo 22** **Bullhead Study Area: Looking north.**

	
Photo 23 **Bullhead Study Area: Looking southwest.**	**Photo 24** **Bullhead Study Area: Looking east.**

	
Photo 25 **Bullhead Study Area: Looking east.**	**Photo 26** **Bullhead Study Area: Looking northeast.**

Photo 27 **Bullhead Study Area: Looking north.**	**Photo 28** **Bullhead Study Area: Looking north.**

	
Photo 29 **Bullhead Study Area: Looking northwest.**	**Photo 30** **Bullhead Study Area: Looking northwest.**

	
Photo 31 **Bullhead Study Area: Looking south.**	**Photo 32** **Bullhead Study Area: Looking south.**

Photo 33

Bullhead Study Area: Looking southwest.

Photo 34

Bullhead Study Area: Looking southwest.

	
Photo 35 **Bullhead Study Area: Looking southeast.**	**Photo 36** **Bullhead Study Area: Looking northeast.**

	
Photo 37 **Bullhead Study Area: Looking southeast.**	**Photo 38** **Bullhead Study Area: Looking northeast.**

	
Photo 39 **Bullhead Study Area: Looking northwest.**	**Photo 40** **Bullhead Study Area: Looking west.**

	
Photo 41 **Bullhead Study Area: Looking south.**	**Photo 42** **Bullhead Study Area: Looking east.**

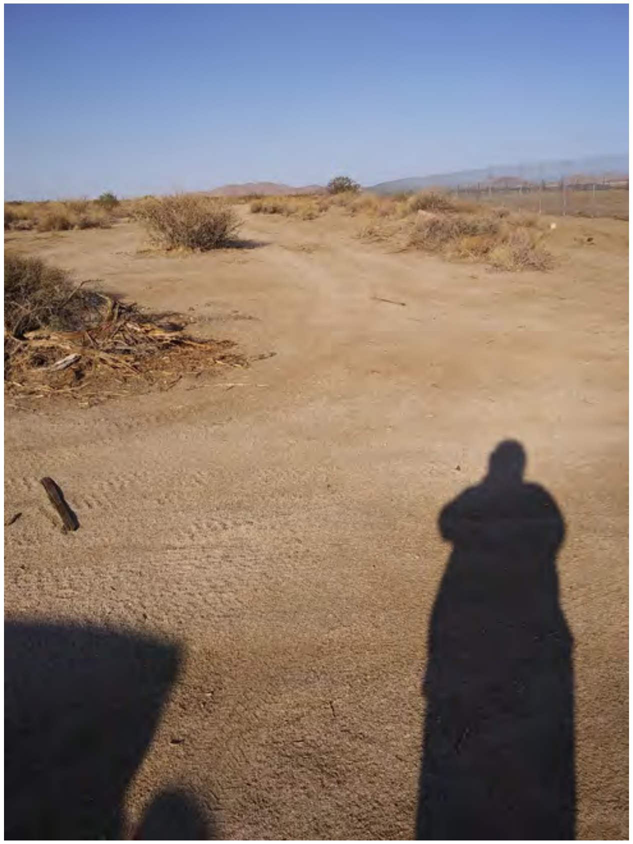	
Photo 43 **Whirlwind Gen-tie Option 1: Looking east.**	**Photo 44** **Whirlwind Gen-tie Option 1: Looking southeast.**

	
Photo 45 **Whirlwind Gen-tie Option 1: Looking southwest.**	**Photo 46** **Whirlwind Gen-tie Option 1: Looking north**

Photo 47 **Whirlwind Gen-tie 0ption 1: Looking at active BUOW burrow.**	**Photo 48** **Whirlwind Gen-tie 0ption 1: Looking at active BUOW burrow.**

	
Photo 49 **Whirlwind Gen-tie Option 1: Looking at active BUOW burrow.**	**Photo 50** **Whirlwind Gen-tie Option 1: Looking north.**

Photo 51 **Whirlwind Gen-tie Option 1: Looking south.**	**Photo 52** **Whirlwind Gen-tie Option 1: Looking at active BUOW burrow.**

	
Photo 52.1 **Whirlwind Gen-tie 0ption 1: Looking at active BUOW burrow.**	**Photo 53** **Whirlwind Gen-tie 0ption 1: Looking east.**

	
Photo 54 **Whirlwind Gen-tie 0ption 1: Looking west.**	**Photo 55** **Whirlwind Gen-tie 0ption 1: Looking north.**

Photo 56 **Whirlwind Gen-tie 0ption 1: Looking at active BUOW burrow.**	**Photo 56.1** **Whirlwind Gen-tie 0ption 1: Looking at active BUOW burrow.**

Photo 57

Whirlwind Gen-tie Option 1: Looking at active BUOW burrow.

Photo 58

Whirlwind Gen-tie Option 1: Looking east.

	
Photo 59 **Whirlwind Gen-tie Option 1.2: Looking east.**	**Photo 60** **Whirlwind Gen-tie Option 1.2: Looking north.**

Photo 61 **Whirlwind Gen-tie Option 2: Looking east.**	**Photo 61.1** **Whirlwind Gen-tie Option 2: Looking west.**

	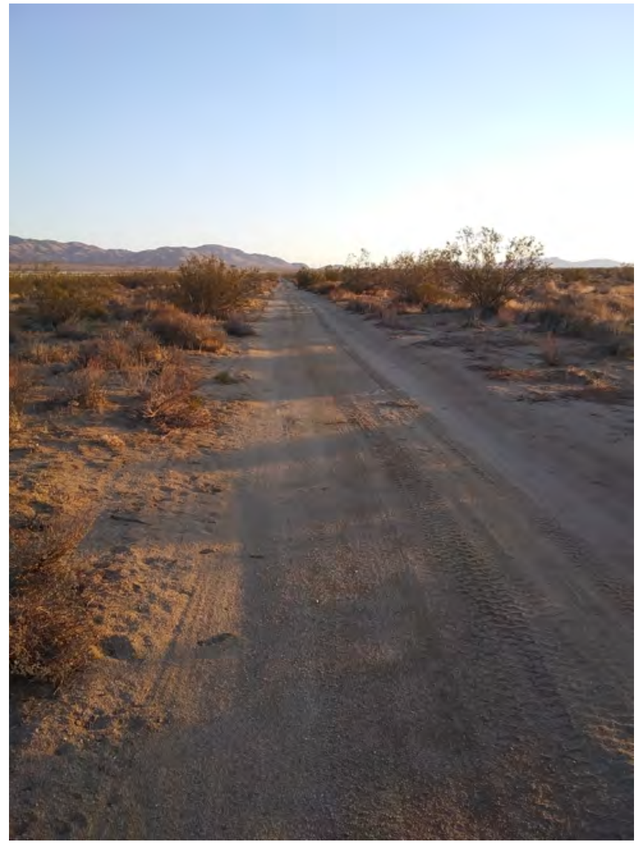
Photo 62 **Whirlwind Gen-tie 0ption 2: Looking at active BUOW burrow.**	**Photo 63** **Whirlwind Gen-tie 0ption 2: Looking southwest.**

	
Photo 64 **Whirlwind Gen-tie Option 2: Looking east.**	**Photo 65** **Whirlwind Gen-tie Option 2: Looking at active BUOW burrow.**

Photo 66 **Whirlwind Gen-tie Option 2: Looking west.**	**Photo 67** **Whirlwind Gen-tie Option 2: Looking north.**

Photo 68

Whirlwind Gen-tie Option 2: Looking west.

Photo 69

Whirlwind Gen-tie Option 2: Looking at active BUOW burrow.

Photo 69.1 **Whirlwind Gen-tie 0ption 2: Looking at active BUOW burrow.**	**Photo 69.2** **Whirlwind Gen-tie 0ption 2: Looking at active BUOW burrow.**

	
Photo 69.3 **Whirlwind Gen-tie 0ption 2: Looking at active BUOW burrow.**	**Photo 70** **Whirlwind Gen-tie 0ption 1 co-located with existing AVTL: Looking east.**

	
Photo 71 **Whirlwind Gen-tie 0ption 1 co-located with existing AVTL: Looking west.**	**Photo 72** **Whirlwind Gen-tie 0ption 1 co-located with existing AVTL: Looking east.**

<table>
<tr><td></td><td></td></tr>
<tr><td>Photo 73
Whirlwind Gen-tie 0ption 1 co-located with existing AVTL: Looking east.</td><td>Photo 74
Whirlwind Gen-tie 0ption 1 co-located with existing AVTL: Looking north.</td></tr>
</table>

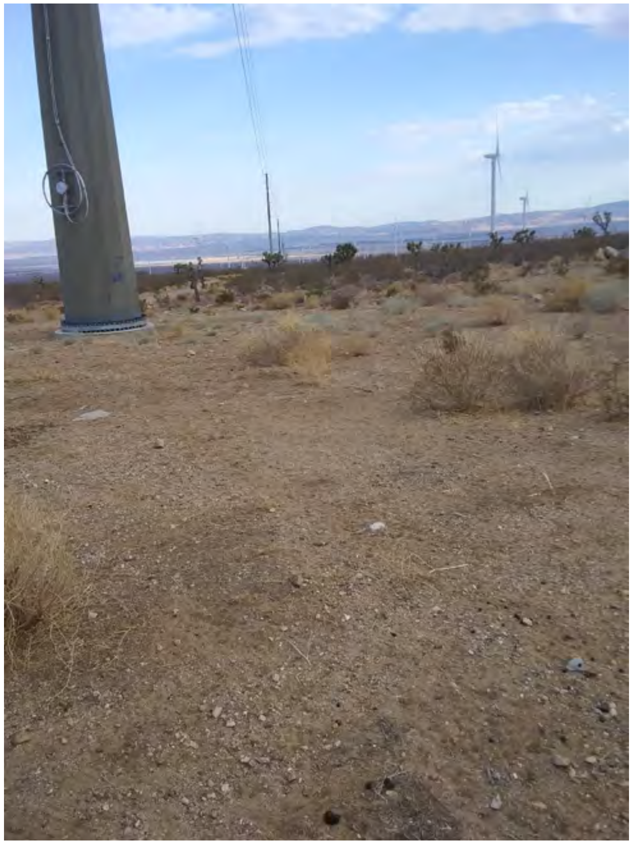

Photo 75 **Whirlwind Gen-tie 0ption 1 co-located with existing AVTL: Looking south.**	**Photo 76** **Whirlwind Gen-tie 0ption 1 co-located with existing AVTL: Looking south.**

	
Photo 77 **Whirlwind Gen-tie 0ption 1 co-located with existing AVTL: Looking north.**	**Photo 78** **Whirlwind Gen-tie 0ption 1 co-located with existing AVTL: Looking west.**

	
Photo 79 **Rosamond Gen-tie option 2: Looking west.**	**Photo 80** **Rosamond Gen-tie option 2: Looking north.**

	
Photo 81 **Rosamond Gen-tie option 2: Looking southeast.**	**Photo 82** **Rosamond Gen-tie option 2: Looking north.**

	
Photo 83 **Rosamond Gen-tie option 2: Looking south.**	**Photo 84** **Rosamond Gen-tie option 2: Looking north.**

Photo 85 **Rosamond Gen-tie option 2: Looking south.**	**Photo 86** **Rosamond Gen-tie option 2: Looking northwest.**

Photo 87 **Rosamond Gen-tie option 2: Looking south.**	**Photo 88** **Rosamond Gen-tie option 2: Looking west.**

Photo 89

Rosamond Gen-tie option 2: Looking southwest.

Photo 90

Rosamond Gen-tie option 2: Looking north.

	
Photo 91 **Rosamond Gen-tie option 2: Looking southeast.**	**Photo 92** **120th Street West: Looking north from Rosamond Blvd.**

Appendix D
Plant and Wildlife Species Observed

Appendix D-1
Plant Species Observed

Table for Report

Scientific Name	Common Name	Special Status
Ambrosia deltoides	Triangle leaf bur sage	
Pectocarya anisocarpa	Pectocarya	
Tropidocarpum gracile	Dobie pod	
GYMNOSPERMS		
Cupressaceae - Cypress family		
Juniperus californica	California juniper	
Ephedraceae - Ephedra family		
Ephedra nevadensis	Nevada ephedra	
Ephedra viridis	Green ephedra	
EUDICOTS		
Amaranthaceae - Amaranth family		
* *Amaranthus albus*	Tumbleweed	
Apiaceae - Carrot family		
* *Daucus carota*	Carrot	
Lomatium nevadense	Nevada lomatium	
Asteraceae - Sunflower family		
Acamptopappus sphaerocephalus	Rayless goldenhead	
* *Acroptilon repens*	Russian knapweed	
Ambrosia acanthicarpa	Annual bur-sage	
Ambrosia dumosa	White bur-sage	
Ambrosia salsola	Cheesebush	
Anisocoma acaulis	Scalebud	
Artemisia dracunculus	Tarragon sagebrush	
Artemisia spinescens	Spiny sagebrush	
Baccharis salicifolia ssp. salicifolia	Mule fat	
Calycoseris parryi	Yellow tack-stem	
* *Centaurea solstitialis*	Yellow starthistle	
Chaenactis fremontii	Fremont's pincushion	
Chaenactis xantiana	Fleshy pincushion	
Encelia actoni	Acton's encelia	
Ericameria cooperi var. cooperi	Cooper's goldenbush	
Ericameria linearifolia	Interior goldenbush	

Scientific Name	Common Name	Special Status
Ericameria nauseosa	Rubber rabbitbrush	
Eriophyllum pringlei	Pringle's woolly sunflower	
Gutierrezia microcephala	Sticky snakeweed	
Helianthus annuus	Annual sunflower	
Lasthenia gracilis	Common goldfields	
Layia glandulosa var. glandulosa	White tidy-tips	
Lepidospartum latisquamum	Nevada broomsage	
Leptosyne bigelovii	Bigelow's tickseed	
Leptosyne calliopsidea	Leafstem tickseed	
Lessingia glandulifera var. glandulifera	Valley lessingia	
Malacothrix coulteri	Coulter's desert dandelion	
Malacothrix glabrata	Smooth desert dandelion	
Monolopia lanceolata	Lance leaf woollythreads	
Stephanomeria exigua	Small wire-lettuce	
Stephanomeria pauciflora	Few flower wire-lettuce	
Syntrichopappus fremontii	Fremont's syntrichopappus	
Tetradymia axillaris var. longispina	Long spine horsebrush	
Uropappus lindleyi	Silver puffs	
Xylorhiza tortifolia var. tortifolia	Mojave-aster	
Boraginaceae - Borage family		
Amsinckia intermedia	Common fiddleneck	
Amsinckia tessellata	Bristly fiddleneck	
Cryptantha circumscissa	Cushion cryptantha	
Cryptantha decipiens	Gravel cryptantha	
Cryptantha micrantha	Redroot cryptantha	
Cryptantha pterocarya	Wingnut cryptantha	
Heliotropium curassavicum var. oculatum	Alkali heliotrope	
Pectocarya penicillata	Northern pectocarya	
Pectocarya setosa	Round-nut pectocarya	
Phacelia fremontii	Fremont's phacelia	
Phacelia tanacetifolia	Lacy phacelia	
Plagiobothrys arizonicus	Arizona popcornflower	
Brassicaceae - Mustard family		
Caulanthus lasiophyllus	Woolly leaf jewelflower	

Scientific Name	Common Name	Special Status
* *Descurainia sophia*	Wise tansymustard	
* *Hirschfeldia incana*	Shortpod mustard	
Lepidium flavum	Yellow pepper-grass	
Lepidium fremontii	Desert pepper-grass	
* *Sisymbrium altissimum*	Tumble mustard	
* *Sisymbrium irio*	London rocket	
Stanleya pinnata var. pinnata	Desert prince's plume	
Cactaceae - Cactus family		
Cylindropuntia echinocarpa	Silver cholla	
Opuntia basilaris var. basilaris	Beavertail cactus	
Chenopodiaceae - Goosefoot family		
Atriplex argentea var. expansa	Silverscale saltbush	
Atriplex canescens	Four-wing saltbush	
Atriplex polycarpa	Allscale saltbush	
Atriplex spinifera	Spiny saltbush	
Chenopodium californicum	California goosefoot	
Grayia spinosa	Spiny hopsage	
Krascheninnikovia lanata	Winter fat	
* *Salsola tragus*	Prickly russian thistle	
Cleomaceae - Spiderflower family		
Cleomella obtusifolia	Mojave stinkweed	
Convolvulaceae - Morning-glory family		
* *Convolvulus arvensis*	Bindweed, orchard morning-glory	
Cuscuta denticulata	Small-tooth dodder	
Cucurbitaceae - Gourd family		
Cucurbita palmata	Coyote melon	
Marah fabacea	Pea like wild cucumber	
Euphorbiaceae - Spurge family		
Croton setigerus	Doveweed	
Euphorbia albomarginata	White margin spurge	
Fabaceae - Legume family		
Acmispon strigosus	Strigose lotus	
Astragalus acutirostris	Sharpkeel milkvetch	
Astragalus didymocarpus var. dispermus	Two seeded dwarf milkvetch	
Astragalus lentiginosus var. variabilis	Variable freckled milkvetch	

Scientific Name	Common Name	Special Status
Lupinus microcarpus	Chick lupine	
Geraniaceae - Geranium family		
* *Erodium cicutarium*	Redstem filaree	
Lamiaceae - Mint family		
* *Marrubium vulgare*	Horehound	
Salvia carduacea	Thistle sage	
Salvia columbariae	Chia	
Salvia dorrii	Blue sage	
Loasaceae - Loasa family		
Mentzelia albicaulis	White stem blazing star	
Malvaceae - Mallow family		
Eremalche exilis	White mallow	
Montiaceae - Purslane family		
Calyptridium monandrum	Common pussypaws	
Nyctaginaceae - Four O'clock family		
Mirabilis laevis	Wishbone plant	
Onagraceae - Evening Primrose family		
Camissonia campestris ssp. campestris	Mojave suncup	
Camissonia strigulosa	Sandysoil suncup	
Camissoniopsis pallida	Paleyellow suncup	
Chylismia claviformis	Cutleaf suncup	
Eremothera boothii ssp. desertorum	Desert evening-primrose	
Tetrapteron palmeri	Palmer's sun cup	
Orobanchaceae - Broom-rape family		
Castilleja chromosa	Desert paintbrush	
Papaveraceae - Poppy family		
Eschscholzia californica	California poppy	
Platystemon californicus	Cream cups	
Plantaginaceae - Plantain family		
Penstemon incertus	Mojave beardtongue	
Polemoniaceae - Phlox family		
Eriastrum densifolium ssp. mohavense	Mojave woollystar	
Eriastrum sapphirinum	Sapphire woollystar	
Gilia latiflora	Broad flowered gilia	
Gilia minor	Little gilia	
Leptosiphon aureus	Golden leptosiphon	

Scientific Name	Common Name	Special Status
Linanthus parryae	Parry's linanthus	
Loeseliastrum schottii	Schott's calico	
Polygonaceae - Buckwheat family		
Centrostegia thurberi	Red triangles	
Chorizanthe brevicornu var. brevicornu	Brittle spineflower	
Chorizanthe rigida	Rigid spineflower	
Chorizanthe spinosa	Mojave spineflower	CRPR 4.2
Chorizanthe watsonii	Watson's spineflower	
Eriogonum baileyi var. baileyi	Bailey's buckwheat	
Eriogonum brachyanthum	Short-flower buckwheat	
Eriogonum fasciculatum var. polifolium	Mojave desert California buckwheat	
Eriogonum gracillimum	Rose-and-white buckwheat	
Eriogonum inflatum	Desert Trumpet	
Eriogonum mohavense	Western Mojave buckwheat	
Eriogonum trichopes	Little desert trumpet	
Eriogonum viridescens	Greenish buckwheat	
Mucronea perfoliata	Perfoliate spineflower	
Oxytheca perfoliata	Round-leaf puncturebract	
Rumex hymenosepalus	Fleshy dock	
Ranunculaceae - Buttercup family		
Delphinium parishii	Parish's larkspur	
Salicaceae - Willow family		
Populus fremontii ssp. fremontii	Fremont cottonwood	
Solanaceae - Nightshade family		
Lycium andersonii	Anderson's box-thorn	
Lycium cooperi	Cooper's box-thorn	
Tamaricaceae - Tamarisk family		
* *Tamarix aphylla*	Athel tamarix	
* *Tamarix ramosissima*	Hairy tamarix	
Zygophyllaceae - Caltrop family		
Larrea tridentata	Creosote bush	
MONOCOTS		
Agavaceae - Century Plant family		
Yucca brevifolia	Joshua tree	ST (Candidate)

Scientific Name	Common Name	Special Status
Liliaceae - Lily family		
Calochortus kennedyi var. kennedyi	Desert mariposa lily	
Calochortus striatus	Alkali mariposa lily	CRPR 1B.2
Poaceae - Grass family		
Avena sp.	Oat	
Bromus berteroanus	Chilean brome	
* *Bromus diandrus*	Ripgut brome	
* *Bromus madritensis*	Compact brome	
* *Bromus tectorum*	Cheat grass	
* *Cynodon dactylon*	Bermuda grass	
Elymus elymoides	Squirreltail wildrye	
Festuca microstachys	Pacific fescue	
* *Hordeum murinum ssp. leporinum*	Hare barley	
* *Hordeum vulgare*	Commercial barley	
Poa secunda	One-sided blue grass	
* *Schismus barbatus*	Mediterranean schismus	
Stipa hymenoides	Indian rice grass	
Stipa speciosa	Desert needle grass	
Themidaceae - Brodiaea family		
Dichelostemma capitatum	Blue dicks	
Muilla maritima	Common muilla	

Scientific Name	Common Name	Special Status

Legend

*= Non-native or invasive species

Special Status:

Federal:
FE = Endangered
FT = Threatened

State:
SE = Endangered
ST =Threatened

CRPR – California Rare Plant Rank
1A. Presumed extinct in California and elsewhere
1B. Rare or Endangered in California and elsewhere
2A. Presumed extinct in California, more common elsewhere
2B. Rare or Endangered in California, more common elsewhere
3. Plants for which we need more information - Review list
4. Plants of limited distribution - Watch list

Threat Ranks
.1 - Seriously endangered in California
.2 – Fairly endangered in California
.3 – Not very endangered in California

Appendix D-2
Wildlife Species Observed

Scientific Name	Common Name	Special Status
VERTEBRATES		
Reptiles		
Aspidoscelis tigris	Tiger Whiptail	
Gambelia wislizenii	Long-nosed Leopard Lizard	
Sceloporus magister	Desert Spiny Lizard	
Uta stansburiana elegans	Western Side-blotched Lizard	
Xantusia vigilis	Desert Night Lizard	
Coluber flagellum piceus	Red Racer	
Crotalus scutalatus	Mojave Green Rattlesnake	
Pituophis catenifer	Gophersnake	
Rhinocheilus lecontei	Long-nosed Snake	
Birds		
Callipepla californica	California Quail	
Phalacrocorax auritus	Double-crested Cormorant	
Cathartes aura	Turkey Vulture	
Pandion haliaetus	Osprey	
Buteo swainsoni	Swainson's Hawk	ST
Buteo jamaicensis	Red-tailed Hawk	
Aquila chrysaetos	Golden Eagle	BEPA, CFP
Charadrius vociferus	Killdeer	
**Columba livia*	Rock Pigeon	
**Streptopelia decaocto*	Eurasian Collared-Dove	
Zenaida macroura	Mourning Dove	
Geococcyx californianus	Greater Roadrunner	
Tyto alba	Barn Owl	
Bubo virginianus	Great Horned Owl	
Athene cunicularia	Burrowing Owl	CSC
Chordeiles acutipennis	Lesser Nighthawk	
Phalaenoptilus nuttallii	Common Poorwill	
Chaetura vauxi	Vaux's Swift	CSC
Aeronautes saxatalis	White-throated Swift	
Falco sparverius	American Kestrel	

Scientific Name	Common Name	Special Status
Falco mexicanus	Prairie Falcon	
Sayornis nigricans	Black Phoebe	
Sayornis saya	Say's Phoebe	
Myiarchus cinerascens	Ash-throated Flycatcher	
Tyrannus verticalis	Western Kingbird	
Lanius ludovicianus	Loggerhead Shrike	CSC
Corvus corax	Common Raven	
Eremophila alpestris	Horned Lark	
Tachycineta thalassina	Violet-green Swallow	
Petrochelidon pyrrhonota	Cliff Swallow	
Hirundo rustica	Barn Swallow	
Auriparus flaviceps	Verdin	
Campylorhynchus brunneicapillus	Cactus Wren	
Polioptila caerulea	Blue-gray Gnatcatcher	
Toxostoma lecontei	Le Conte’s Thrasher	
Oreoscoptes montanus	Sage Thrasher	
Mimus polyglottos	Northern Mockingbird	
**Sturnus vulgaris*	European Starling	
Geothlypis trichas	Common Yellowthroat	
Setophaga coronata	Yellow-rumped Warbler	
Pipilo maculatus	Spotted Towhee	
Spizella breweri	Brewer's Sparrow	
Chondestes grammacus	Lark Sparrow	
Artemisiospiza belli belli	Bell's Sage Sparrow	
Passerculus sandwichensis	Savannah Sparrow	
Zonotrichia leucophrys	White-crowned Sparrow	
Pheucticus melanocephalus	Black-headed Grosbeak	
Sturnella neglecta	Western Meadowlark	
Icterus bullockii	Bullock’s Oriole	
Haemorhous mexicanus	House Finch	
Carduelis psaltria	Lesser Goldfinch	
**Passer domesticus*	House Sparrow	
Mammals		

Scientific Name	Common Name	Special Status
Sylvilagus audubonii	Desert Cottontail	
Lepus californicus	Black-tailed Jackrabbit	
Ammospermophilus leucurus	White-tailed Antelope Ground Squirrel	
Ostospermophilus beecheyi	California Ground Squirrel	
Perognathus inornatus	San Joaquin Pocket Mouse	
Dipodomys merriami	Merriam's Kangaroo Rat	
Dipodomys deserti	Desert Kangaroo Rat	
Canis latrans	Coyote	
Vulpes macrotis	Desert Kit Fox	FP
Taxidea taxus	American Badger	CSC

Legend

*= Non-native or invasive species

Special Status:

Federal:
FE = Endangered
FT = Threatened

State:
SE = Endangered
ST =Threatened
CSC = California Species of Special Concern
CFP = California Fully Protected Species

Appendix E

Mohave Ground Squirrel Agency Correspondence, Work Plans, and Survey Reports

Appendix E-1
Mohave Ground Squirrel Agency Correspondence

From:	Bailey, Craig@Wildlife
To:	Haley, Brad; Robison, Renee@Wildlife; Marquez, Jaime@Wildlife; Swanberg, Carrie@Wildlife
Cc:	Scott Kuhlke; Christa Hudson (Consultant); Devon Muto; Miille, Ellen; Jones, Tanya; Ferranti, Annee@Wildlife
Subject:	RE: EDF Bullhead CDFW MGS Work Plan discussion
Date:	Wednesday, April 21, 2021 12:11:38 PM
Attachments:	image001.png

Good afternoon Brad,

First, thanks for following up and checking in. As we discussed on our phone call, our unit has a lot of staffing constraints right now, and we wanted to have some internal discussions before making any final comments about your plan. Unfortunately, everyone is not always available as anticipated.

In regard to your current proposed plan, we can't confirm we'll concur with the results at this time. I hope to get back to you soon.

Craig

From: Haley, Brad <Brad.Haley@icf.com>
Sent: Wednesday, April 21, 2021 11:53 AM
To: Robison, Renee@Wildlife <Renee.Robison@Wildlife.ca.gov>; Bailey, Craig@Wildlife <Craig.Bailey@wildlife.ca.gov>; Marquez, Jaime@Wildlife <Jaime.Marquez@Wildlife.ca.gov>; Swanberg, Carrie@Wildlife <Carrie.Swanberg@wildlife.ca.gov>
Cc: Scott Kuhlke <scott.kuhlke@edf-re.com>; Christa Hudson (Consultant) <christa.hudson.consultant@edf-re.com>; Devon Muto <Devon.Muto@edf-re.com>; Miille, Ellen <Ellen.Miille@icf.com>; Jones, Tanya <Tanya.Jones@icf.com>
Subject: RE: EDF Bullhead CDFW MGS Work Plan discussion

WARNING: This message is from an external source. Verify the sender and exercise caution when clicking links or opening attachments.

Good morning,

Our team needed to check in with Staff on the Bullhead Solar Project. Per our discussion on April 13th, the Department agreed to provide all comments on the MGS trapping and camera survey plan by close of business on April 19 (Monday). Firming up our approach to MGS is a really important step for us as our biologists are rapidly approaching some important MGS milestones (end of Session 1 and camera trapping windows).

At this point, we will proceed with our approaches described in the MGS trapping work plan (submitted on March 10, 2021) and the MGS camera trapping work plan (submitted April 16, 2021). As of next week, we will have completed Session 1 trapping for 4 grids. Also, starting the week of May 3rd, we will begin the first of two 5-day camera sessions.

Please provide an update as soon as you can or by Friday, April 23rd. Please feel free to call me at 619-633-6439 with any questions.

Thank you,
Brad Haley
C: 619.633.6439

From: Haley, Brad
Sent: Friday, April 16, 2021 10:58 AM
To: Robison, Renee@Wildlife <Renee.Robison@Wildlife.ca.gov>; Bailey, Craig@Wildlife <Craig.Bailey@wildlife.ca.gov>; Marquez, Jaime@Wildlife <Jaime.Marquez@Wildlife.ca.gov>; Swanberg, Carrie@Wildlife <Carrie.Swanberg@wildlife.ca.gov>
Cc: Scott Kuhlke <Scott.Kuhlke@edf-re.com>; Christa Hudson (Consultant) <christa.hudson.consultant@edf-re.com>; Devon Muto <Devon.Muto@edf-re.com>; Miille, Ellen <Ellen.Miille@icf.com>; Jones, Tanya <Tanya.Jones@icf.com>
Subject: RE: EDF Bullhead CDFW MGS Work Plan discussion

Good morning, Carrie, Renee, Craig, and Jaime.
As discussed during our call on April 13, please find attached our proposed work plan for conducting supplemental camera studies at the proposed Bullhead Solar Project.

One additional note not stated during call: As part of the BigBeau LSAA, camera trapping was conducted in 2020 north of our western-most grid. Included in the attached work plan is a compilation of maps showing locations of previous MGS trapping and camera studies in the vicinity of the Bullhead site, including the camera station locations from BigBeau.

Please let me know if you have any questions and we look forward to hearing from you on Monday regarding your review of the attached work plan and other action items from the call.

Thank you,
Brad Haley | Senior Biologist & Project Manager | +1.858.444.3974 direct | brad.haley@icf.com| icf.com
ICF | 525 B Street, Suite 1700, San Diego, CA 92101 USA | +1.619.633.6439 mobile
Twitter | LinkedIn
ICF50 YEARS 1969 – 2019

From: Robison, Renee@Wildlife <Renee.Robison@Wildlife.ca.gov>
Sent: Tuesday, April 13, 2021 12:21 PM
To: Jones, Tanya <Tanya.Jones@icf.com>; Haley, Brad <Brad.Haley@icf.com>; Haley, Brad <Brad.Haley@icf.com>; Bailey, Craig@Wildlife <Craig.Bailey@wildlife.ca.gov>; Marquez, Jaime@Wildlife <Jaime.Marquez@Wildlife.ca.gov>; Swanberg, Carrie@Wildlife <Carrie.Swanberg@wildlife.ca.gov>
Cc: Scott Kuhlke <Scott.Kuhlke@edf-re.com>; Christa Hudson (Consultant) <christa.hudson.consultant@edf-re.com>; Devon Muto <Devon.Muto@edf-re.com>; Miille, Ellen <Ellen.Miille@icf.com>
Subject: RE: EDF Bullhead CDFW MGS Work Plan discussion

Hello Tanya,

Thank you for the agenda and the map excerpt. We've received it and look forward to speaking with you and your project team this afternoon.

Renee Robison
Senior Environmental Scientist (Specialist)
California Department of Fish and Wildlife
Central Region
1234 E. Shaw Ave, Fresno, CA 93710

From: Jones, Tanya <Tanya.Jones@icf.com>
Sent: Tuesday, April 13, 2021 11:06 AM
To: Haley, Brad <Brad.Haley@icf.com>; Haley, Brad <Brad.Haley@icf.com>; Robison, Renee@Wildlife <Renee.Robison@Wildlife.ca.gov>; Bailey, Craig@Wildlife <Craig.Bailey@wildlife.ca.gov>; Marquez, Jaime@Wildlife <Jaime.Marquez@Wildlife.ca.gov>
Cc: Scott Kuhlke <Scott.Kuhlke@edf-re.com>; Christa Hudson (Consultant) <christa.hudson.consultant@edf-re.com>; Devon Muto <Devon.Muto@edf-re.com>; Miille, Ellen <Ellen.Miille@icf.com>
Subject: RE: EDF Bullhead CDFW MGS Work Plan discussion

Good Morning Craig, Renee & Jaime,

Please find attached the Agenda and Veg Map for our call this afternoon.

Thank you.
-Tanya

TANYA JONES | Manager & Irvine Team Lead, Environmental Planning |
+1.949.333.6642 (direct) | tanya.jones@icf.com | icf.com
ICF | 49 Discovery, Suite 250, Irvine, CA 92618 USA | +1.949.565.1690 (fax)|

-----Original Appointment-----
From: Haley, Brad <Brad.Haley@icf.com>
Sent: Monday, April 5, 2021 4:34 PM
To: Haley, Brad; Robison, Renee@Wildlife; Bailey, Craig@Wildlife; Marquez, Jaime@Wildlife
Cc: Jones, Tanya; Scott Kuhlke; Christa Hudson (Consultant); Devon Muto; Miille, Ellen
Subject: EDF Bullhead CDFW MGS Work Plan discussion
When: Tuesday, April 13, 2021 3:00 PM-4:30 PM (UTC-08:00) Pacific Time (US & Canada).
Where: Microsoft Teams Meeting

We will discuss the EDF Bullhead MGS Work Plan.

Thank you
Brad Haley

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting

Or call in (audio only)
+1 213-493-7443,,732375932#   United States, Los Angeles
Phone Conference ID: 732 375 932#
Find a local number | Reset PIN

Learn More | Meeting options | Legal

From:	Robison, Renee@Wildlife
To:	Haley, Brad; Bailey, Craig@Wildlife
Cc:	Marquez, Jaime@Wildlife
Subject:	RE: CDFW point of contact & MGS Protocol Deviation Request for EDFR Bullhead solar project in Kern County
Date:	Monday, April 5, 2021 4:09:13 PM
Attachments:	image001.png

Hi Brad,

Thank you for reaching out and following up. Do either of the following dates or times work for you?

Tuesday April 13th: 3pm – 4:30pm

Thursday April 15th: 9:30am-10:30am

Renee Robison
Senior Environmental Scientist (Specialist)
California Department of Fish and Wildlife
Central Region
1234 E. Shaw Ave, Fresno, CA 93710

From: Haley, Brad <Brad.Haley@icf.com>
Sent: Friday, April 2, 2021 6:19 AM
To: Bailey, Craig@Wildlife <Craig.Bailey@wildlife.ca.gov>
Cc: Robison, Renee@Wildlife <Renee.Robison@Wildlife.ca.gov>; Marquez, Jaime@Wildlife <Jaime.Marquez@Wildlife.ca.gov>
Subject: RE: CDFW point of contact & MGS Protocol Deviation Request for EDFR Bullhead solar project in Kern County

Good morning, Craig, Jaime, and Renee:
Following up again about proposed meeting times to go over the MGS work plan for the proposed Bullhead Solar Project in Rosamond. Please let me know when you can.

Thank you,

Brad Haley
C: 619.633.6439

From: Haley, Brad
Sent: Friday, March 26, 2021 12:27 PM
To: Bailey, Craig@Wildlife <Craig.Bailey@wildlife.ca.gov>
Cc: Robison, Renee@Wildlife <Renee.Robison@Wildlife.ca.gov>; Marquez, Jaime@Wildlife

<Jaime.Marquez@Wildlife.ca.gov>
Subject: RE: CDFW point of contact & MGS Protocol Deviation Request for EDFR Bullhead solar project in Kern County

Hi Craig, Jaime, and Renee:
I wanted to follow up about proposed meeting times to go over the MGS work plan for the proposed Bullhead Solar Project in Rosamond. I believe we were supposed to get a date on the calendar this week. Please let me know when you can.
Thank you and have a good weekend.

Thank you,
Brad Haley
C: 619.633.6439

From: Haley, Brad
Sent: Friday, March 19, 2021 12:33 PM
To: Bailey, Craig@Wildlife <Craig.Bailey@wildlife.ca.gov>
Cc: Robison, Renee@Wildlife <Renee.Robison@Wildlife.ca.gov>; Marquez, Jaime@Wildlife <Jaime.Marquez@Wildlife.ca.gov>
Subject: RE: CDFW point of contact & MGS Protocol Deviation Request for EDFR Bullhead solar project in Kern County

Thanks Craig. I appreciate the info and will be on the lookout for the meeting options.

Thank you,
Brad Haley
C: 619.633.6439

From: Bailey, Craig@Wildlife <Craig.Bailey@wildlife.ca.gov>
Sent: Friday, March 19, 2021 12:21 PM
To: Haley, Brad <Brad.Haley@icf.com>
Cc: Robison, Renee@Wildlife <Renee.Robison@Wildlife.ca.gov>; Marquez, Jaime@Wildlife <Jaime.Marquez@Wildlife.ca.gov>
Subject: RE: CDFW point of contact & MGS Protocol Deviation Request for EDFR Bullhead solar project in Kern County

Good afternoon Brad,

Unfortunately, this week and next week are heavily impacted with various deadlines. Two of my staff are also working on MGS for the area. One of us will reach sometime next week with some proposed meeting dates and times, likely to follow within the next two weeks after that. In regard to initial trapping efforts planned for next week, thank you for the heads up. I don't have any feedback at this time.

Craig

From: Haley, Brad <Brad.Haley@icf.com>
Sent: Friday, March 19, 2021 10:00 AM
To: Bailey, Craig@Wildlife <Craig.Bailey@wildlife.ca.gov>
Subject: RE: CDFW point of contact & MGS Protocol Deviation Request for EDFR Bullhead solar project in Kern County

WARNING: This email originated from outside of CDFW and should be treated with extra caution.

Good morning, Craig.
Are you available today or on Monday for a 5-10 minute call to discuss our plan for MGS trapping? I understand you need until the end of the month to provide a formal response, but we do plan to initiate trapping next week just to get a few grids under our belt for Session 1. I wanted you to be aware of that.

If you are available, please call my cell phone at 619-633-6439.

Thank you,
Brad Haley
C: 619.633.6439

From: Bailey, Craig@Wildlife <Craig.Bailey@wildlife.ca.gov>
Sent: Thursday, March 11, 2021 10:34 AM
To: Haley, Brad <Brad.Haley@icf.com>
Cc: Robison, Renee@Wildlife <Renee.Robison@Wildlife.ca.gov>; Rodriguez, Heather@Wildlife <Heather.Rodriguez@wildlife.ca.gov>; Marquez, Jaime@Wildlife <Jaime.Marquez@Wildlife.ca.gov>; Ferranti, Annee@Wildlife <Annee.Ferranti@wildlife.ca.gov>; Christa Hudson (Consultant) <christa.hudson.consultant@edf-re.com>; Scott.Kuhlke@edf-re.com
Subject: RE: CDFW point of contact & MGS Protocol Deviation Request for EDFR Bullhead solar project in Kern County

Good morning Brad,

Heather Rodriguez forwarded your request to my unit for review. We're covering renewable energy projects in Kern County until Carrie Swanberg returns from leave. Please note given our current workload, this review may take until the end of the month until we're able to respond. In the meantime, please feel free to reach out with any questions or concerns.

Craig Bailey
Senior Environmental Scientist (Supervisor)
California Department of Fish and Wildlife
1234 East Shaw Avenue
Fresno, California 93710
(559) 243-4014 ext. 227
Pronouns: he, him, his

From: Haley, Brad <Brad.Haley@icf.com>
Sent: Wednesday, March 10, 2021 4:58 PM
To: Rodriguez, Heather@Wildlife <Heather.Rodriguez@wildlife.ca.gov>
Cc: Ferranti, Annee@Wildlife <Annee.Ferranti@wildlife.ca.gov>; Wildlife R4 Manager Assistant <reg4assistant@wildlife.ca.gov>; Jones, Tanya <Tanya.Jones@icf.com>; Christa Hudson (Consultant) <christa.hudson.consultant@edf-re.com>; Vance, Julie@Wildlife <Julie.Vance@wildlife.ca.gov>; Scott Kuhlke <Scott.Kuhlke@edf-re.com>
Subject: RE: CDFW point of contact & MGS Protocol Deviation Request for EDFR Bullhead solar project in Kern County
Importance: High

Good afternoon Heather,

EDF Renewables (EDFR) is in the process of conducting environmental technical studies to support the potential development of a solar generation project, the proposed Bullhead Solar Project (proposed project). The proposed project is located in southwestern Kern County, California, approximately 6 miles northwest of the community of Rosamond and SR-14, in north-central Antelope Valley (Figure 1). ICF has been retained on behalf of EDFR to conduct field surveys for biological resources. As part of these surveys, ICF plans to conduct trapping for the Mohave ground squirrel [MGS] (*Xerospermophilus mohavensis*) at the proposed project site in 2021. Because of the large size of the project (>2000 acres), the project proposes a deviation from the trapping protocol. Details of the project and request for protocol deviation are included in the attached work plan for your review.

I should have clarified in my earlier email that the focused technical studies are to support the project's CEQA document that will be prepared by Kern County.

I would like to send a hard copy of this plan to you as well, but I was not sure if you are working in the office. We would be happy to send a hard copy, but please let us know if that is possible and/or necessary.

Please let me know if you have any questions.

Thank you,
Brad Haley | Senior Biologist & Project Manager | +1.858.444.3974 direct | brad.haley@icf.com| icf.com
ICF | 525 B Street, Suite 1700, San Diego, CA 92101 USA | +1.619.633.6439 mobile
Twitter | LinkedIn
ICF50 YEARS 1969 - 2019

From: Rodriguez, Heather@Wildlife <Heather.Rodriguez@wildlife.ca.gov>
Sent: Tuesday, March 2, 2021 9:53 AM
To: Haley, Brad <Brad.Haley@icf.com>
Cc: Wildlife R4 Manager Assistant <reg4assistant@wildlife.ca.gov>; Jones, Tanya

<Tanya.Jones@icf.com>; Christa Hudson (Consultant) <christa.hudson.consultant@edf-re.com>
Subject: RE: CDFW point of contact for EDF Bullhead solar project in Kern County

Good Morning Brad,

I am your CDFW R4 representative for reviewing items associated with any Solar related Lake or Streambed Alteration Agreement. When submitting any requests, I recommend including your R4LSA email as indicated in your Agreement as well.

If you are trying to reach staff for review and approval regarding items associated with an Incidental Take Permit, your contact would be Craig Bailey and/or potentially his staff Renee Robinson. I recommend sending an email to our R4CESA email referenced in your ITP and they can see about directing your request to the appropriate staff.

Thank you,
Heather

From: Haley, Brad <Brad.Haley@icf.com>
Sent: Tuesday, March 2, 2021 9:39 AM
To: Rodriguez, Heather@Wildlife <Heather.Rodriguez@wildlife.ca.gov>
Cc: Wildlife R4 Manager Assistant <reg4assistant@wildlife.ca.gov>; annee.frranti@wildlife.ca.gov; Jones, Tanya <Tanya.Jones@icf.com>; Christa Hudson (Consultant) <christa.hudson.consultant@edf-re.com>
Subject: RE: CDFW point of contact for EDF Bullhead solar project in Kern County
Importance: High

Warning: This email originated from outside of CDFW and should be treated with extra caution.

Good morning, Heather.
My name is Brad Haley with ICF and I am the biological project manager for EDF's Bullhead Solar Project in southern Kern County (near Rosamond). This is adjacent to EDF's Big Beau Solar Project. We are planning to conduct focused biological surveys for MGS, tortoise, burrowing owl, etc. during this 2021 season.

Who will be CDFW's region 4 representative for this project?

As you can see from the email chain below from Feb 9, I was unsuccessful in reaching out to the email address and phone numbers provided on Region 4's main webpage, so trying this more direct approach. Please let me know as soon as you can so we can begin the coordination.

Thank you,
Brad Haley | Senior Biologist & Project Manager | +1.858.444.3974 direct | brad.haley@icf.com| icf.com
ICF | 525 B Street, Suite 1700, San Diego, CA 92101 USA | +1.619.633.6439 mobile

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From: Haley, Brad
Sent: Monday, March 1, 2021 1:38 PM
To: reg4sec@wildlife.ca.gov
Subject: RE: CDFW point of contact for new solar project in Kern County

Following up on this email request. I just left a voicemail at the 559-243-4005 (ext 151) number listed on website.

Thank you,
Brad Haley
C: 619.633.6439

From: Haley, Brad
Sent: Tuesday, February 9, 2021 10:24 AM
To: reg4sec@wildlife.ca.gov
Subject: CDFW point of contact for new solar project in Kern County

Hello. I have a project in southern Kern County (near Rosamond) that I plan to conduct biological surveys (MGS, tortoise, buow, etc.) for this 2021 season. Who will be my region 4 representative?

Thank you,
Brad Haley | Senior Biologist & Project Manager | +1.858.444.3974 direct | brad.haley@icf.com| icf.com
ICF | 525 B Street, Suite 1700, San Diego, CA 92101 USA | +1.619.633.6439 mobile
Twitter | LinkedIn

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Appendix E-2
MGS Trapping Work Plan

March 10, 2021

Habitat Conservation Planning
San Joaquin Valley and Southern Sierra Region
California Department of Fish and Wildlife, Region 4
1234 E. Shaw Avenue
Fresno, California 93710

To whom it may concern,

EDF Renewables (EDFR) is in the process of conducting environmental technical studies to support the potential development of a solar generation project, the proposed Bullhead Solar Project (proposed project). The proposed project is located in southwestern Kern County, California, approximately 6 miles northwest of the community of Rosamond and SR-14, in north-central Antelope Valley (Figures 1 and 2). ICF has been retained on behalf of EDFR to conduct field surveys for biological resources. As part of these surveys, ICF plans to conduct trapping for the Mohave ground squirrel [MGS] (*Xerospermophilus mohavensis*) at the proposed project site in 2021.

This memorandum has been prepared to present ICF's work plan for the MGS based on the California Department of Fish and Wildlife's (CDFW) current survey protocol (CDFW 2010). Based on prior projects in the vicinity, and no records of the species having occurred in the area for any protocol survey, it is assumed that visual surveys for Mohave Ground Squirrel will be negative; therefore, trapping will be needed to determine presence/absence at the proposed project. For non-linear projects smaller than 180 acres, the protocol requires one grid of 100 traps placed per 80 acres of proposed project area. With approximately 2,400 acres in the main project area (which includes 530 acres under Option for purchase), plus access roads and generation tie-line alternatives, the proposed project is substantially larger than this threshold, and therefore, according to CDFW's protocol, modifications are required and survey protocol(s) must be developed through consultation between CDFW and either the project proponent or the local lead agency (if appropriate) or both entities. This memorandum has been prepared to initiate this consultation.

A Conservation Strategy for the Mohave Ground Squirrel (CDFW 2019) defined the western boundary of the geographical range of MGS as a roughly north-south line near SR-14 from Mojave south to Palmdale. CDFW (2019) conducted an exhaustive review of MGS records and trapping efforts and found that MGS have never been reported or detected in the western Antelope Valley (defined as areas west of SR-14). In addition to this review, adjacent solar projects to this proposed project which also had negative trapping results included: Catalina Solar 2/ BAR 13 project in 2012, Valentine Solar project in 2015, and the BigBeau (Tropico) Solar project in 2018, to name a few. CDFW (2019) stated the lack of any positive records of the species in the area supports the conclusion that the western Antelope Valley is not currently occupied by MGS. The MGS protocol (CDFW 2010) states that protocol-trapping may be required in areas up to five miles from the currently documented range. The eastern limit of the proposed project is six miles west of SR-14, which is the currently defined geographical boundary of the species (CDFW 2019).

Preliminary vegetation mapping was conducted for the proposed solar footprint on February 15, 2021. Utilizing the preliminary vegetation map, Dr. Phillip Brylski, who holds a CDFW MGS Memorandum of Understanding (MOU), conducted an MGS habitat assessment on March 7, 2021 of the proposed solar footprint. Based on preliminary vegetation mapping and the habitat assessment, approximately 845 acres (35 percent) of the proposed project area contains potentially suitable MGS habitat (Creosote Bush Scrub, Allscale Scrub, Joshua Tree Woodland, California Joint Fir Scrub, and disturbed variations of each). Of this, over 400 acres were classified as disturbed Creosote Bush Scrub with evidence of past disturbances and understory of non-native vegetation. The remaining 1,020 acres plus 530 acres of Optioned Parcels (65 percent) is Active Agriculture, Redstem Filaree Ruderal Forb Patches, Wild Oats and Annual Brome Grasslands, Annual Grassland, Rubber Rabbitbrush Scrub, Mulefat Thicket, Tamarisk Thicket, disturbed, or developed and does not represent suitable MGS habitat. These vegetation communities within the solar footprint and Optioned Parcels are presented in the attached Figures.

Given the information presented herein, we do not believe that MGS trapping is warranted for this proposed project. However, to determine absence of the MGS and support the CEQA document, we propose to conduct protocol-level trapping for four (4) grids of 100 traps each at the proposed project in spring and summer of this year (2021). In coordination with Dr. Brylski, Brad Haley, who also holds an MGS MOU, determined the approximate grid locations, which are shown in the attached vegetation map and are subject to change based on discretion of trapping biologist (Figures 3 and 4). The grid sizes are to scale with the protocol spacing of 35 meters in between traps. Grids 1 and 3 are 4 lines of 25 traps each, Grid 2 is 10 lines of 10 traps each, and Grid 4 is split with Grid 4a having 4 lines of 20 traps (80 traps) and Grid 4b having 4 lines of 5 traps (20 traps). These grids were positioned in this way based on the vegetation types in those areas and in order to sample the highest quality habitat in each of the proposed project areas. The trapping will be conducted in accordance with the 2010 CDFW protocol guidelines, but with a modified number of trapping grids per unit area due to the project size. The trapping will be performed by qualified, permitted biologists holding a valid MOU.

In addition, we understand there is a draft revision to the trapping protocol to incorporate using camera traps in MGS trapping studies. On February 9, 2021, Mr. Haley corresponded with Dr. Scott Osborn to verify if the revised protocol would be adopted for the 2021 trapping season. Dr. Osborn confirmed that the 2010 version of the protocol would remain in effect for the 2021 trapping season and that camera trapping was not a requirement but recommended (see enclosed email correspondence).

Should CDFW have any comments on this work plan, or recommendations on additional or alternative survey methods that may be required to determine MGS presence or absence at the proposed project, please contact Brad Haley at (619) 633-6439 or brad.haley@icf.com . If no response is received, the surveys will proceed as outlined in the above modified protocol.

Sincerely,

Brad Haley | Senior Biologist & Project Manager | +1.858.444.3974 direct | brad.haley@icf.com| icf.com
ICF | 525 B Street, Suite 1700, San Diego, CA 92101 USA | +1.619.633.6439 mobile

Enclosures:
Figures
CDFW Correspondence RE: MGS Camera Trapping

CC:
Ms. Julie Vance
Ms. Annee Ferranti

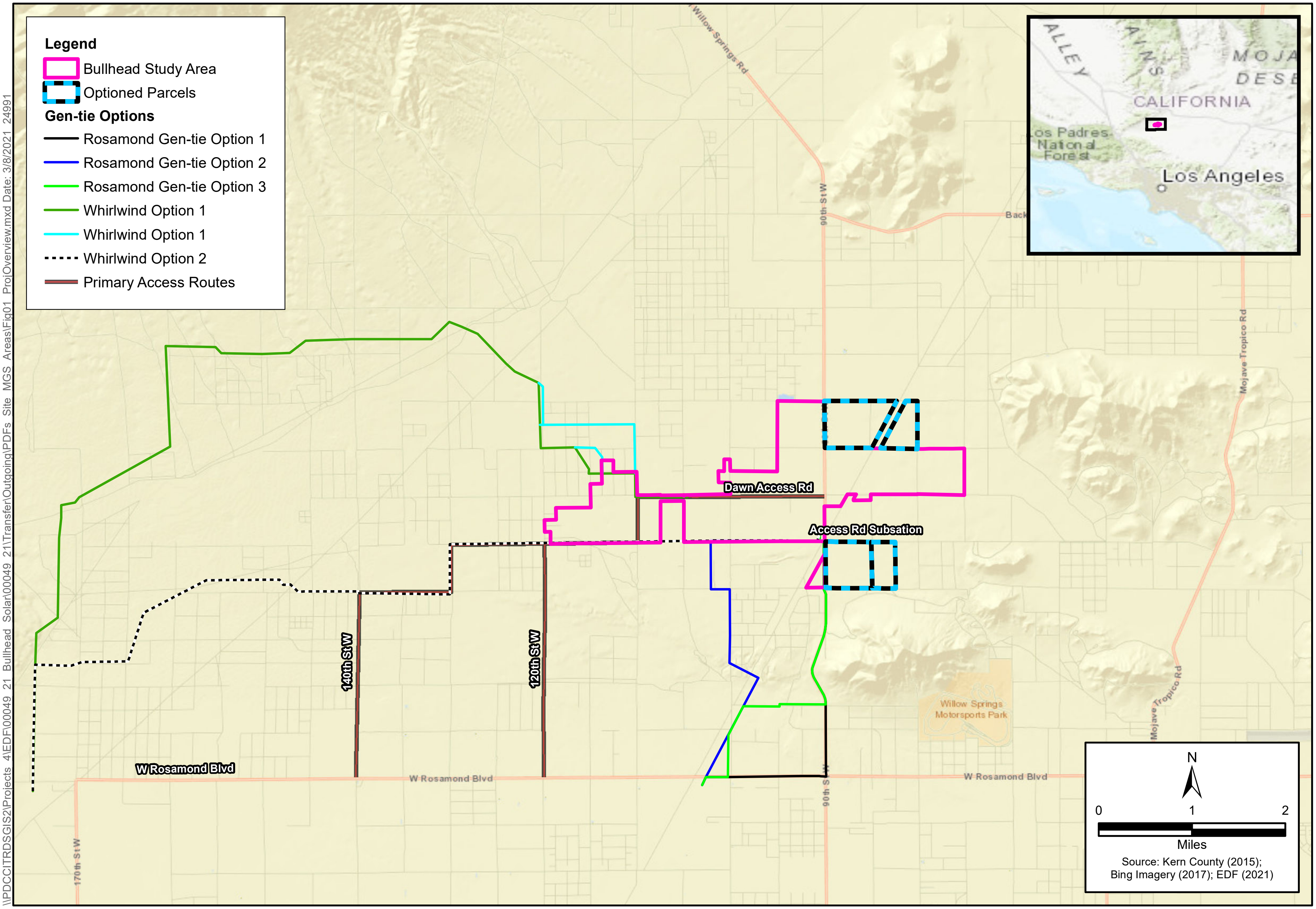

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Figure 1
Project Overview
Bullhead Solar

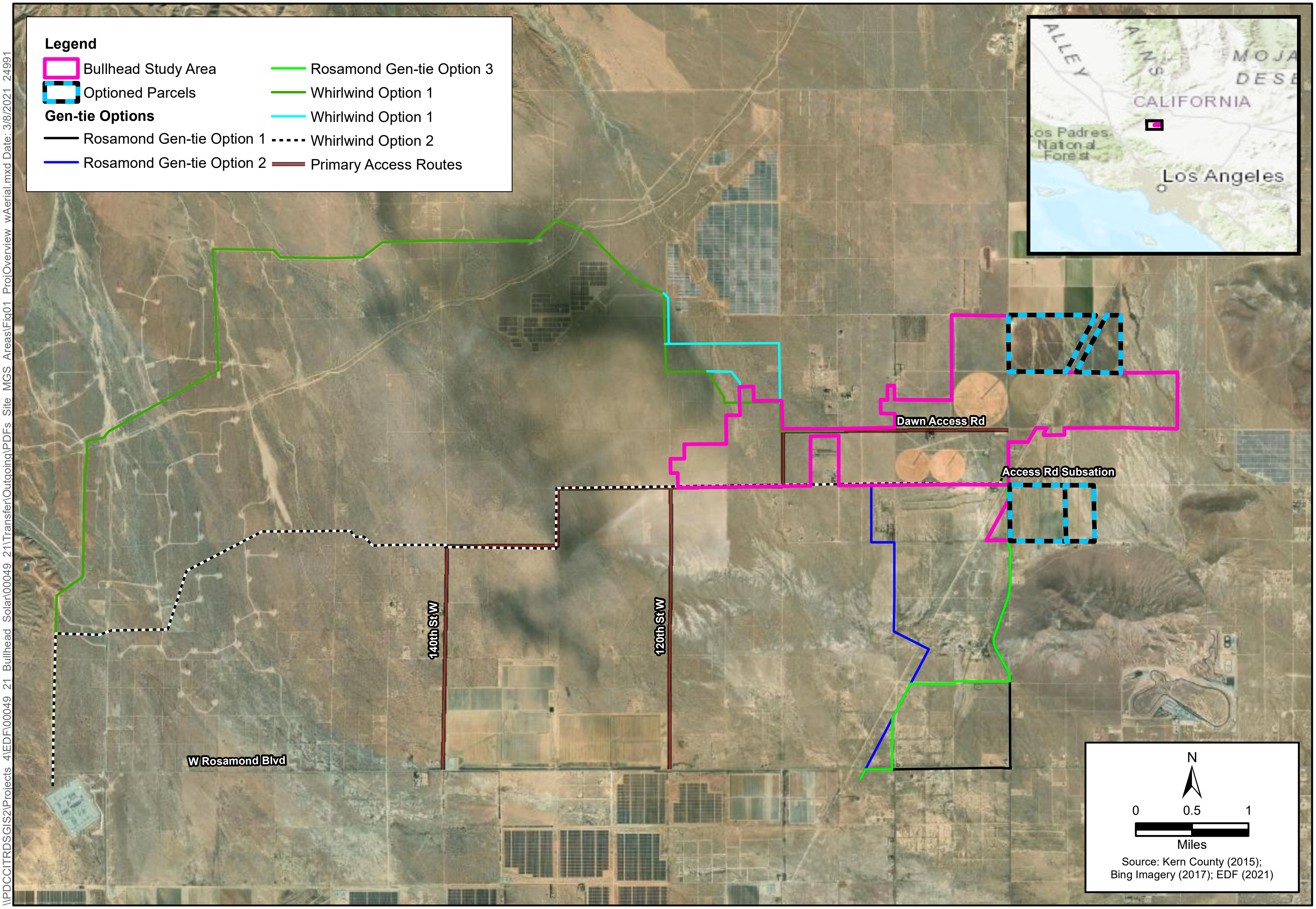

Figure 2
Project Overview
Bullhead Solar

\\PDCCITRDSGIS2\Projects 4\EDF\00049 21 Bullhead Solar\00049 21\Transfer\Outgoing\PDFs Site MGS Areas\Fig01 ProjOverview wAerial.mxd Date: 3/8/2021 24991

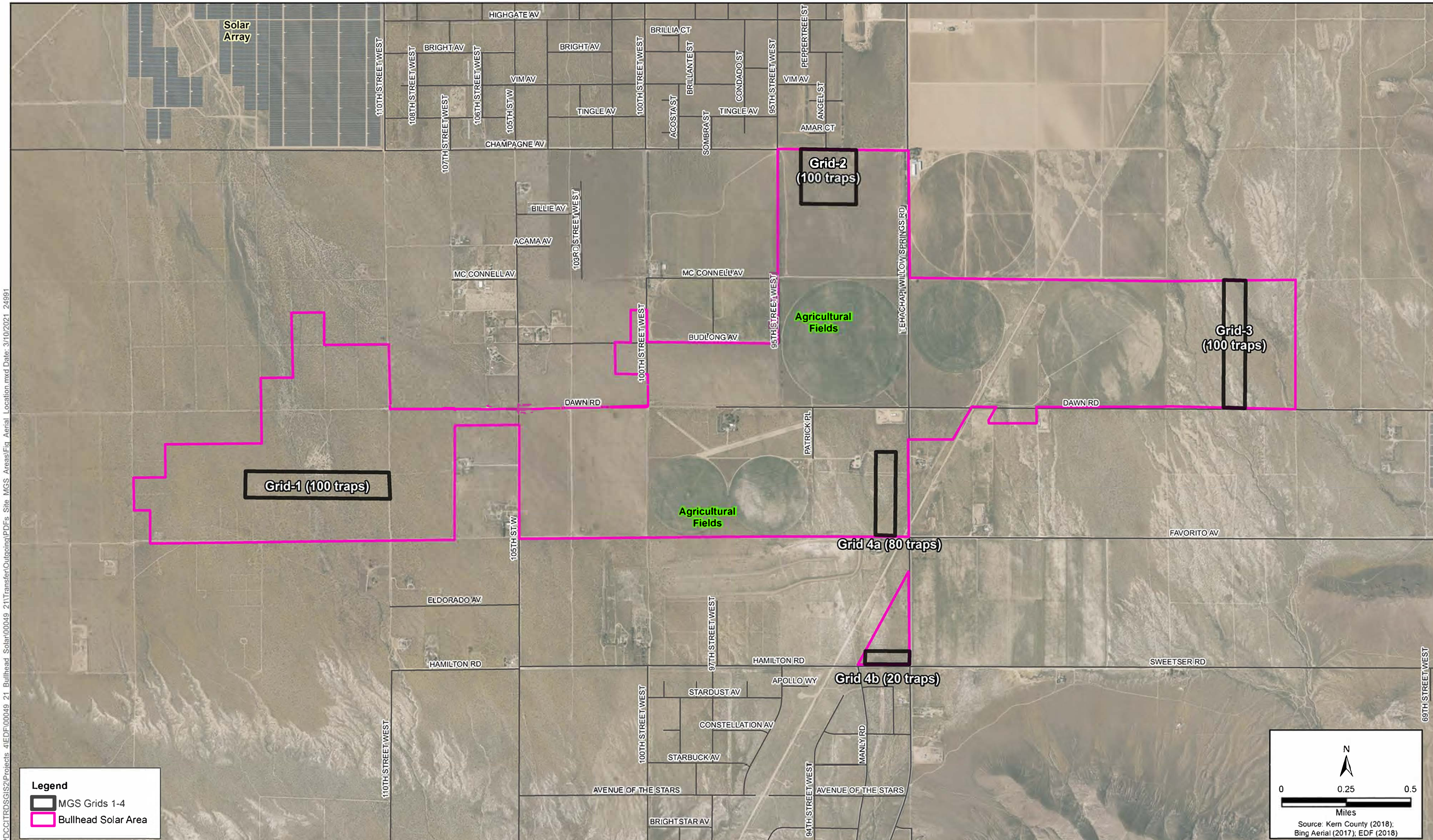

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Figure 3
Aerial Location Map
Bullhead Solar

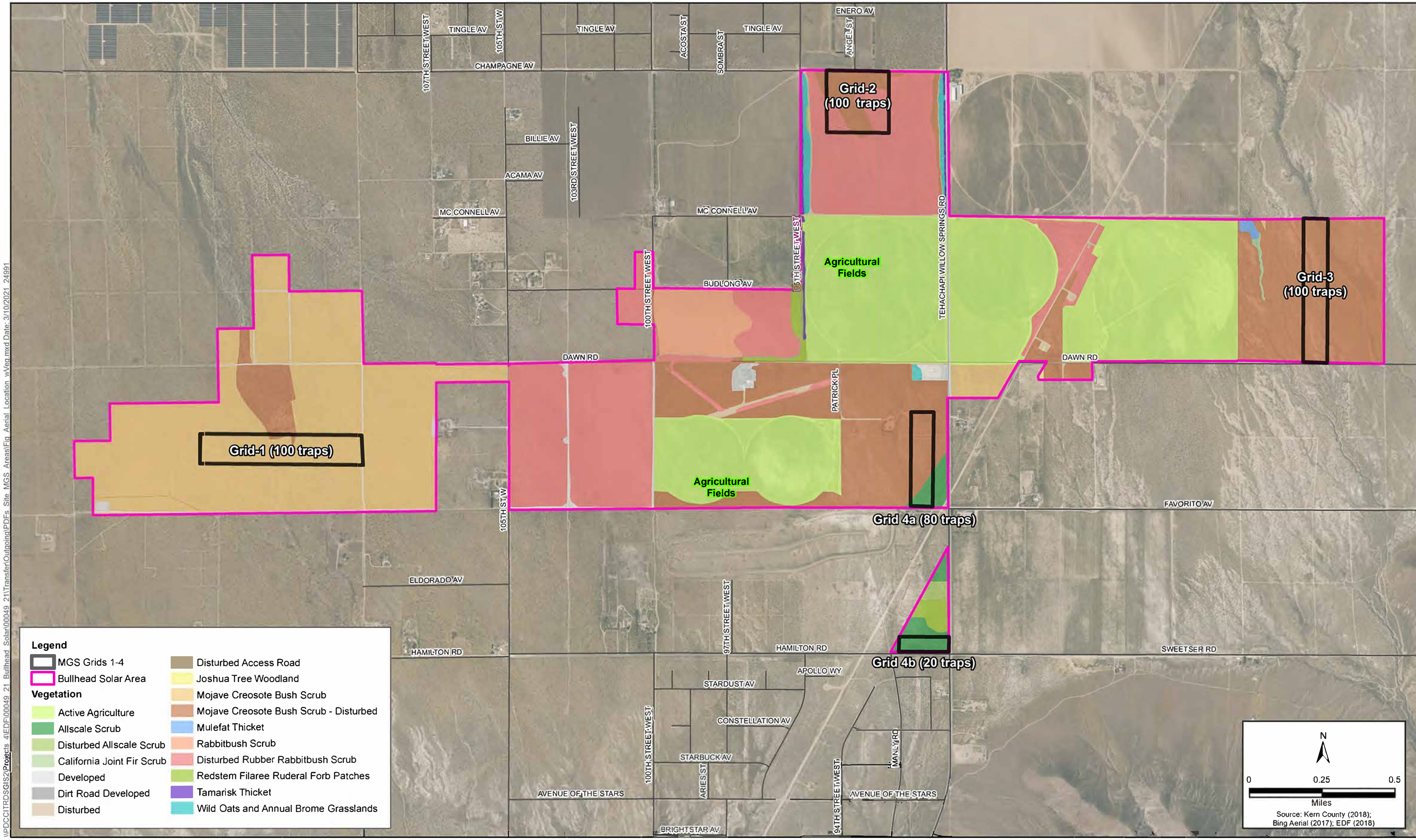

Figure 4
Aerial Location Map with Vegetation
Bullhead Solar

From:	Osborn, Scott@Wildlife
To:	Haley, Brad
Subject:	RE: Camera trapping requirement for 2021 studies?
Date:	Thursday, February 11, 2021 8:01:58 AM
Attachments:	image001.png

Hi Brad – Thanks for getting in touch about this. Given I haven't been able to finalize the revised trapping protocol yet, the old version of the protocol will remain in effect for the 2021 survey season. I would encourage trappers to include some camera traps in or near their live trip grid, so we can accumulate additional data on the relative effectiveness of the two techniques in detecting MGS. But it is not a requirement.

I'll send an email to the entire TAG about this. Thanks again for prompting me on it!

Scott

From: Haley, Brad <Brad.Haley@icf.com>
Sent: Tuesday, February 9, 2021 10:31 AM
To: Osborn, Scott@Wildlife <Scott.Osborn@wildlife.ca.gov>
Subject: Camera trapping requirement for 2021 studies?

Hi Scott – I'm wondering if the requirement for use of game cameras in conjunction with live trapping will be required this 2021 trapping season? I just need to know because that will dictate if me or my subs purchase additional cameras or not.

Thank you,
Brad Haley | Senior Biologist & Project Manager | +1.858.444.3974 direct | brad.haley@icf.com| icf.com
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Twitter | LinkedIn

Appendix E-3
MGS Camera Work Plan

April 16, 2021

Habitat Conservation Planning
San Joaquin Valley and Southern Sierra Region
California Department of Fish and Wildlife, Region 4
1234 E. Shaw Avenue
Fresno, California 93710

Dear Ms. Swanberg,

In response to our discussion on April 13, 2021 regarding our MGS trapping design and protocol deviation request, we propose a camera study to supplement the live trapping effort (described in our March 10, 2021 submittal) being performed at the proposed Bullhead Solar Project (proposed project). The implementation of our live-trapping study along with a camera study (described below), should be adequate to determine Mohave ground squirrel [MGS] (*Xerospermophilus mohavensis*) presence or absence at the proposed project and support the project's CEQA document.

During our call, it was suggested that we conduct additional detection efforts (use of game cameras) in the western component, north of Grid 3, to supplement the live trapping being performed at four grids throughout the proposed project. The live-trapping grid locations and the vegetation communities in the proposed project site are shown in Figure 1 (provided previously). Using the protocol baseline of what one trapping grid covers, we assume that Grid 3 coves 80 acres of the approximate 460 acres in the western project area. With approximately 40 acres of disturbed areas, this leaves approximately 340 acres of suitable MGS habitat. It should be noted that 2 to 3 cameras will be deployed during each session trapped for the four grids. To determine the number of cameras to deploy in this area, we used the following draft document, which is attached for reference: <u>Use of Camera Traps in Mohave Ground Squirrel Studies</u> (D. Delaney, P. Leitner, and D. Hacker, 2017). These guidelines are still considered draft and have not been formally incorporated into the MGS trapping protocol. Our work plan submitted on March 10, 2021 included correspondence with Dr. Scott Osborn confirming this for the 2021 trapping season.

The draft guidelines recommend 10 cameras per 160 acres, spaced 254 meters (833 feet) apart. Given this approach, there could be up to 20 cameras in this western area. However, due to the irregular shape of the project and presence of unsuitable or disturbed habitat in the center, not to mention being nine miles west of the range boundary, we propose deploying 12 cameras in this area (Figure 2; #1-12). The proposed camera locations are shown in Figure 2. In addition, as part of the LSAA permit for BigBeau Solar Project, EDFR conducted MGS camera trapping in April 2020 near some of the same areas. Grids that were trapped in 2018 as part of BigBeau and camera stations that were conducted in 2020 as part of BigBeau are shown in Figure 3. South of Grid 2, there is a small triangle of MGS habitat (9 acres). Having disturbed habitats to the north and west, and agriculture and Tehachapi Willow Springs Road to the east, this area was too small to trap and although “habitat” is present, it is unlikely to support the animal. We will attempt to put one camera in this area (Figure 2; #13), but we may decide to discontinue use if there is concern over security of the camera. Near Grid 1, we propose the use of two additional cameras (Figure 2; #14 and 15).

The camera specifications and operating parameters will meet those described in the 2017 draft guidelines (Attachment 1). Specifically, bait will be present every day and be operated 24 hours per day. For schedule, we propose operating the cameras for two 5 full-day sessions between April 16 and May 31. The cameras will be installed or overseen by the biologists who are conducting the live trapping. The guidelines state March 15-May 15, however due to the late addition of camera use to our study design, we may not be able to fit the two sessions into that timeframe. The results of the camera trapping and live trapping will be incorporated into the MGS section of our Biological Resources Technical Report.

It is worth noting that the proposed project site is greater than 5 miles west of the currently-documented range of the species, which is the limit in which the 2010 MGS protocol requires trapping. In addition, A Conservation Strategy for the Mohave Ground Squirrel (CDFW 2019) stated the lack of any positive records of the species in the area supports the conclusion that the western Antelope Valley is not currently occupied by MGS. Attachment 2 provides a compilation of maps from available literature and previous MGS technical studies conducted in vicinity of the Bullhead Solar Project. With each map shown, the location of the proposed project is identified for context. As stated previously, we do not believe that MGS trapping or camera studies are warranted for this proposed project. However, to determine absence of the MGS and support the CEQA document, we propose to conduct protocol-level trapping for four (4) grids of 100 traps each and install no more than 15 game cameras at the proposed project in spring and summer of this year (2021). The camera locations are subject to change based on discretion of the biologist.

We look forward to receiving your input on our MGS trapping work plan and this camera study design by Monday April 19, 2021. Regarding these MGS work plans, please feel free to contact Brad Haley at (619) 633-6439 or brad.haley@icf.com.

Sincerely,

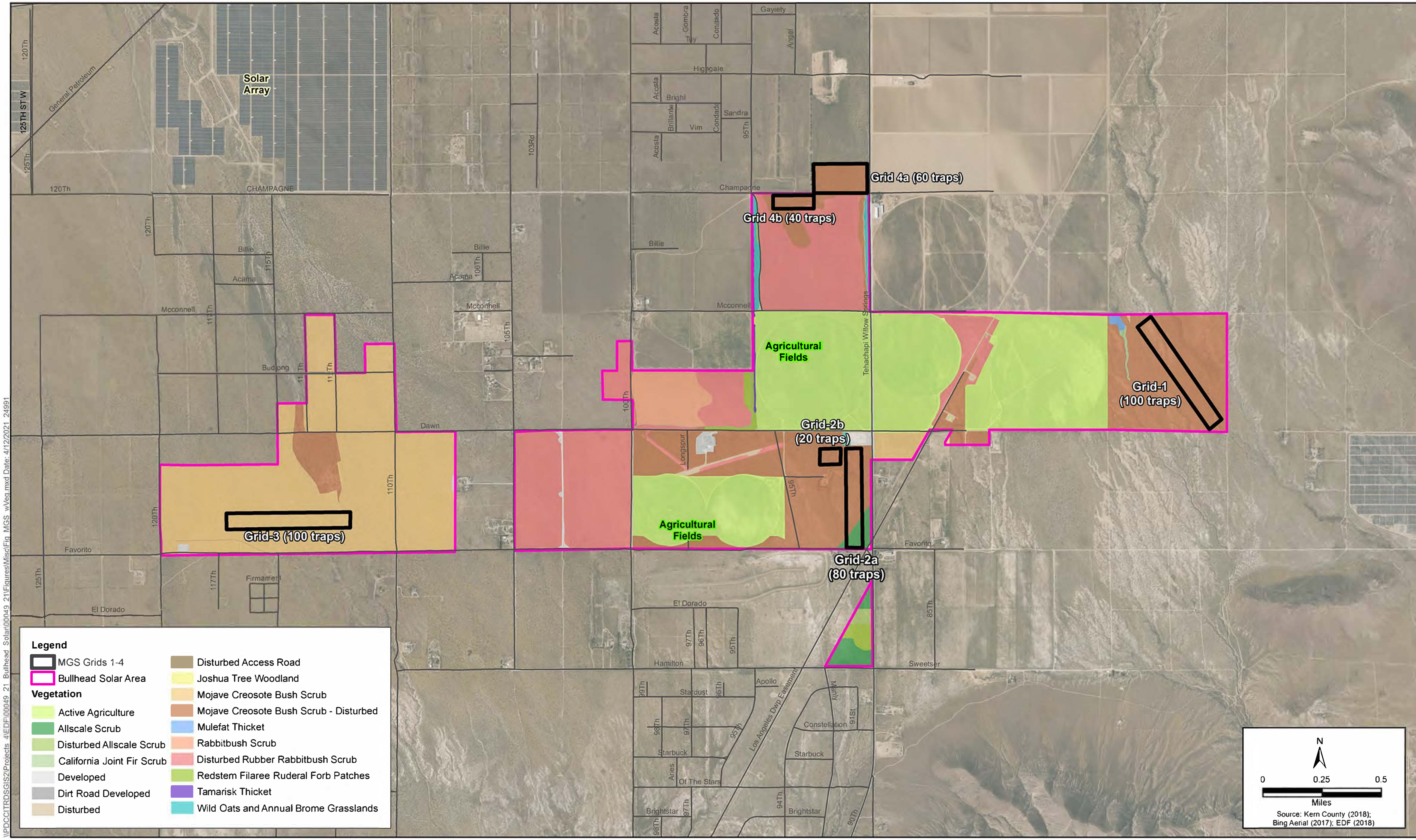
Brad Haley | Senior Biologist & Project Manager | +1.858.444.3974 direct | brad.haley@icf.com| icf.com
ICF | 525 B Street, Suite 1700, San Diego, CA 92101 USA | +1.619.633.6439 mobile

Enclosures:
Figures
1. Live-Trapping Grid Locations within Bullhead Solar Project
2. Proposed Game Camera Locations within Bullhead Solar Project
3. EDFR BigBeau Solar Project Previous MGS Studies. Camera Stations (2020), Trapping (2018)

Attachments

1. Use of Camera Traps in MGS Studies (Draft, 2017)
2. Compilation of previous MGS trapping grids and camera stations in vicinity of Bullhead Solar Project
    a. Leitner, P. 2014. Current Status of MGS. Antelope Valley MGS grids between 2008-2012.
    b. Heritage. 2020. BigBeau Solar Project MGS Survey and Monitoring Report. LSAA requirements. MGS camera stations and survey areas.
    c. Sapphos. 2012. Results of MGS Trapping Studies for Catalina Renewable Energy Project prior to 2010 through 2011.
    d. Environmental Intelligence. 2018. MGS Survey Plan for EDFR Valentine Solar Project. LSAA requirement.
    e. Environmental Intelligence. 2018. Summary table of MGS trapping efforts at select renewable energy projects near the Valentine Solar Project.

CC:
Mr. Craig Bailey (CDFW)
Ms. Renee Robison (CDFW)
Mr. Jaime Marquez (CDFW)
Ms. Christa Hudson (EDFR)
Mr. Scott Kuhlke (EDFR)



ICF

Figure 1
MGS Grids with Vegetation
Bullhead Solar

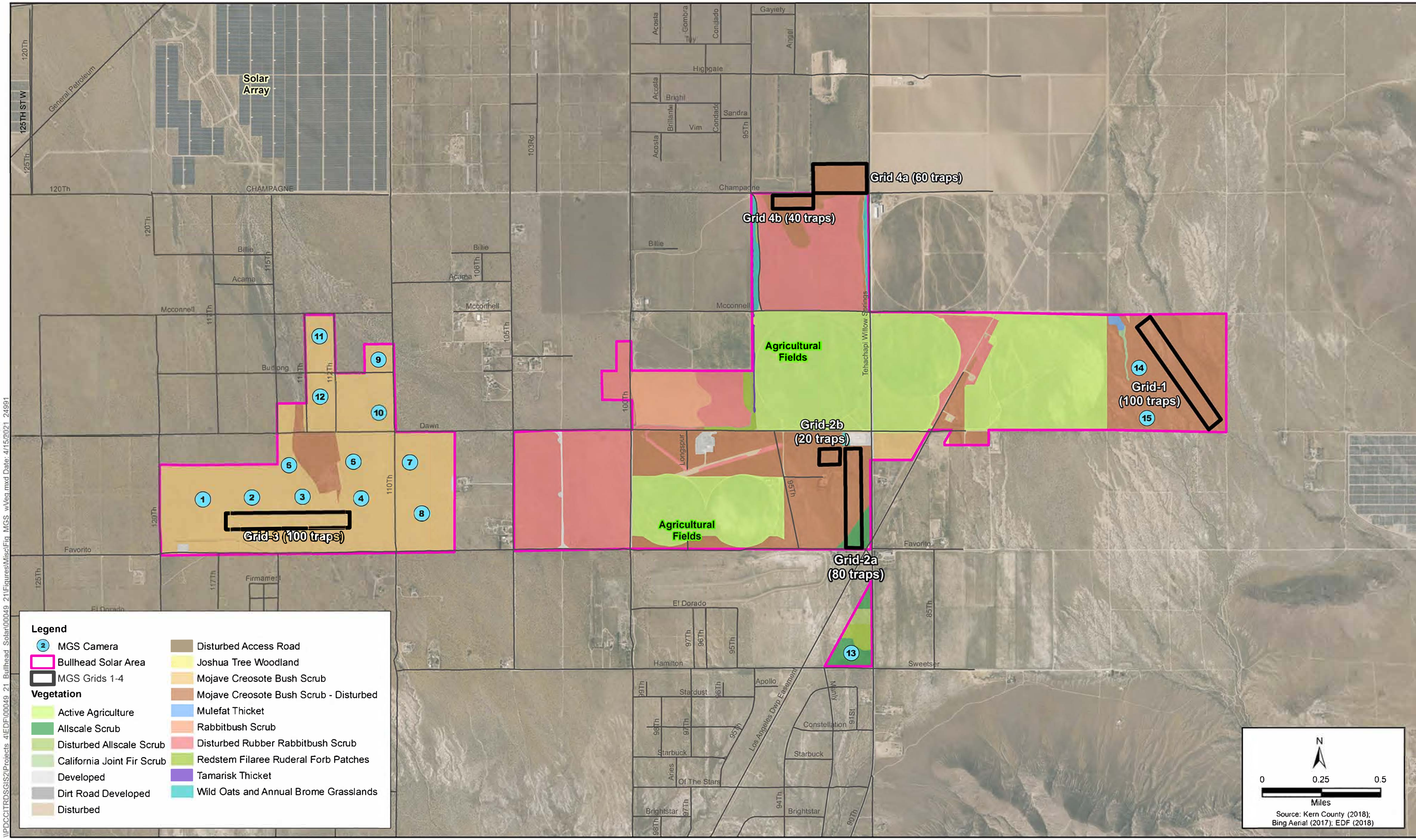


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Figure 2
Proposed Camera Stations
Bullhead Solar

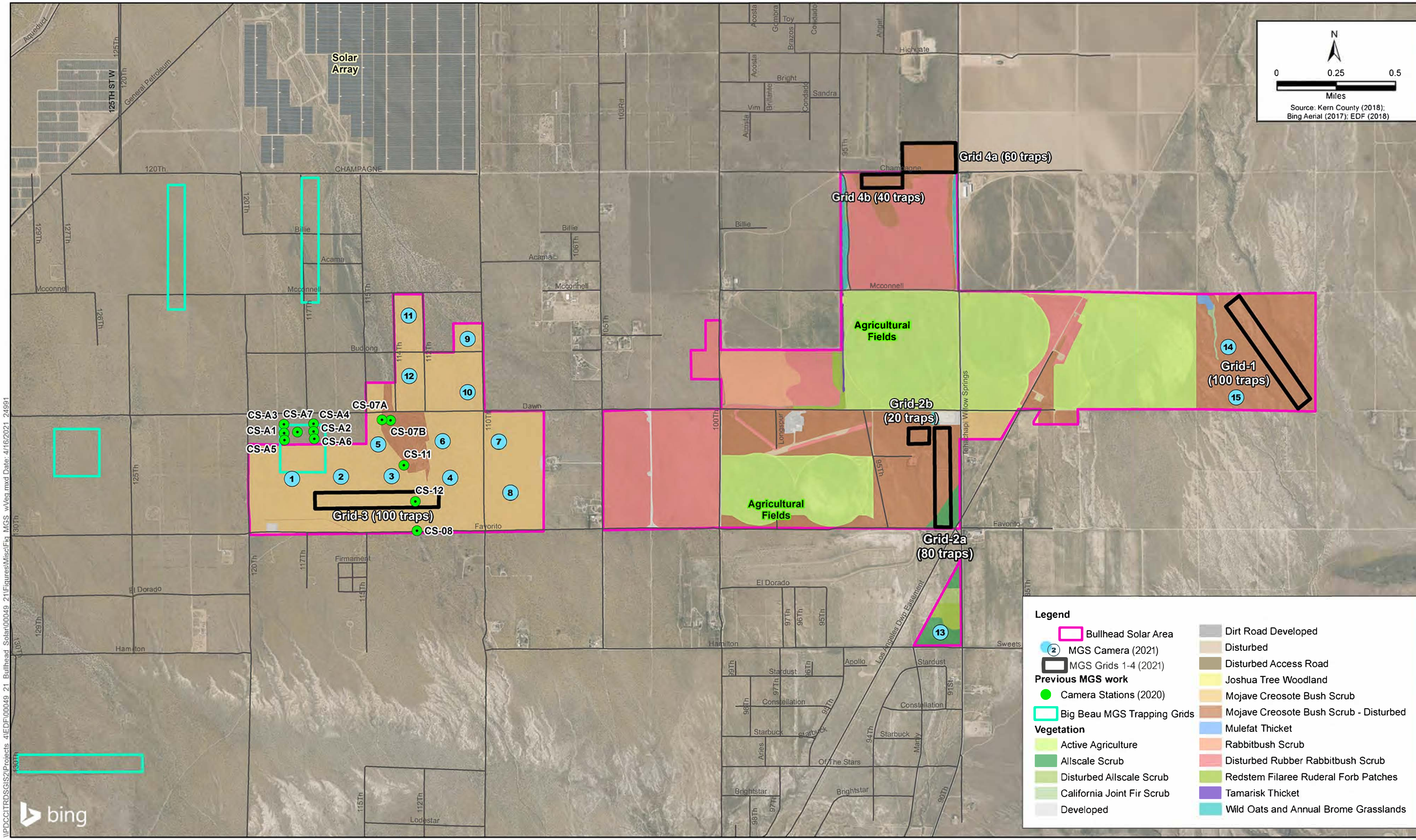


Figure 3
EDFR BigBeau Solar Project Previous MGS Studies
Camera Stations (2o2o); Trapping (2o18)
Bullhead Solar

Attachment 1.

Use of Camera Traps in Mohave Ground Squirrel Studies

David K. Delaney, Philip Leitner, and Dave Hacker

February 14, 2017

Camera traps have been used effectively in recent years to detect Mohave ground squirrels (*Xerospermophilus mohavensis*). This technique has great promise as an alternative or supplement to traditional live trapping. However, there is no generally accepted methodology for use of camera traps in Mohave ground squirrel (MGS) studies. We would like to present suggestions to standardize camera trapping methods based upon our field experience since 2009. We also present other recommendations related to the more effective use of camera traps for MGS studies.

These recommendations are not intended to supplant the current presence-absence survey protocol, which calls for traditional live-trapping. However, camera trapping can efficiently establish presence of MGS with less labor than would be required for a CDFW-protocol trapping array and may obviate the need to complete a protocol trapping survey. These techniques may also be useful in long-term monitoring of conservation lands.

This document starts with standard recommendations which apply to any camera trapping scenario. Next are recommendations for long-term site monitoring, and then additional considerations for all situations. Below is a summary list of camera trap basics for any situation. Keep in mind that ***all camera trap studies are site- and situation-specific, with many things to consider. We recommend reading the entirety of this document before designing any camera trap study***.

1. Camera specifications:
   a. At least 1 photo per second when triggered
   b. Trigger speed of <0.5 seconds
   c. Recovery speed of ≤1 second
   d. Minimum 60 Mb/s download speed on SD card
2. Camera trap setup
   a. 24-hour camera operation
   b. Face camera north
   c. Keep shrubs and other potential wind-triggers out of field of view
   d. Place bait approx. 4-5 ft from camera
   e. Place bait in center of field of view
   f. Test camera trigger at bait location before leaving
3. Bait must be present every day
4. 10 cameras per 160 acres (=835ft /254m apart)
5. March 15- May 15
6. Minimum two 5 full-day sessions (see description below) with three weeks between (or longer sessions as equipment and budget permit)

Standard Recommendations

It is important that there be consistency in how camera trap data are collected. This consistency includes, but is not limited to, uniformity in: 1) the type of camera traps used and the specifications; 2) how cameras are setup in the field; 4) the timing and duration of trap sessions; and 3) the method that bait is distributed to animals in the field. All of these variables can strongly influence the detectability of ground squirrels and other animals of interest, as well as the quantity and quality of the data being collected.

Camera Specifications and Settings

Cameras differ in many aspects, from recording medium (still photo and/or video), recording duration per trigger, color and/or b&w, detection range, picture/video quality, trigger speed, flash or infrared, delay between triggers (i.e., recovery time), detection sensitivity, cost, power draw, memory storage, durability, and reliability. These differences can lead to variations in animal detectability and reduce consistency in data collection. It is important to use cameras that have been shown to be effective under harsh field environments and will last over multiple years. Trigger speeds, recovery times and the number of photos taken per second vary between cameras which take photos, with the fastest cameras triggering in 0.05 sec with a recovery time of 0.50 sec, versus slower versions triggering in 2.0 sec with recovery times upwards of 8.0 sec. Cameras that record video have even slower trigger speeds and recovery times between triggers which needs to be considered if using video.

To effectively detect MGS presence, we suggest that camera traps have fast trigger speeds (less than 0.50 sec) and recovery times (about 1.0 sec or less), and take at least 1 photo per second to reduce the chances of missing MGS visits. Consider also the downloading speed of the secure digital (SD) card that is used within the camera unit. Download speed will influence how many photos can be taken per second. Cards with at least 60 MB/sec downloading speed are recommended. Card reliability is also essential to ensure that data collection is not compromised. We therefore recommend speaking with researchers who have used SD regularly in the field to determine which brands offer the best reliability. To minimize the number of field visits to maintain camera trap sites, it is recommended to use larger storage SD cards if possible, especially for camera sites placed in remote areas. It may also be important to collect data 24 hours/day if possible to identify all ground squirrel activity, as well as other animals in the area, especially potential predators and food competitors.

Camera Trap Setup in the Field

We suggest that camera traps have identical setup configurations, or as similar as possible if using different cameras, so that data collection will be more uniform in nature. We have found that 5 foot U-posts (about 3-3.5 inches wide) work well for securing cameras, though other methods could be used. Cameras can be attached to clips on the posts using wire. If the location is not too steep or rocky, posts can be hammered into the ground and then tilted at an angle to get the desired field of view. We suggest that the field of view not be too large because vegetation movement within the detection zone can cause many false detections. Most cameras allow for remote triggering of activity to allow the person setting up the equipment to know that their activity simulating the animal's presence is working, but that doesn't necessary guarantee that the picture is centered. A variety of devices capable of reading SD cards (e.g., laptops, cellular phones, electronic tablets, etc.) can be used to record images and make sure that pictures are centered. We suggest that bait stations be located about 4-5 ft in front of cameras in a centered position. It is important to center the bait to give the camera the most time available to detect animal movement through the detection zone. It is also important to keep cameras away from any vegetation that could sway in front of the camera during windy conditions. Of course for security purposes, sometimes it is necessary to hide cameras behind vegetation and limit proximity to any used trails or roads when possible. To lessen the chances of someone stealing cameras, lock boxes and ground anchors can be used. Cameras should be placed in a northerly facing direction to lessen the impact of direct sun onto the recorded images.

Equipment and Site Maintenance

Cameras will have to be periodically visited to replace data storage cards, batteries, and bait. We suggest using lithium batteries if possible to extend the operational life of the camera trap. Some SD cards can store as much as 32 GB of data, allowing the camera to run for weeks at a time depending on the amount of animal activity. The most limiting factor associated with camera traps is the availability of bait to draw animals to the cameras. There are at least four methods that could be used to distribute bait during camera trapping sessions (daily placement of small piles of loose bait such as 4-way livestock feed, blocks of bait for extended use, automated feeders, and perforated PVC pipe containing grain), though no specific large scale testing has been done to test which type of bait or which method of bait presentation is the most effective for detecting MGS. It is important that this information be documented because these factors may influence species detectability. It is also important to limit personnel time entering study areas which may influence animal behavior. If possible it is best to visit sites during early morning hours when ground squirrels are not active.

Methods of Bait Presentation

Manual placement of small bait piles (e.g., 4 way horse feed) onto the ground requires replacement each day. There is concern that food placed at camera trap stations throughout the desert might draw in ravens and other potential predators. To possibly reduce this issue, it has been suggested that pvc tubes filled with bait could be used to lessen the likelihood of ravens or other predators visiting the site due to the lack of a food reward. However, it is also possible that without a food reward, ground squirrels might not visit as readily as with other methods thereby reducing detectability. Also, squirrels might be more focused on getting at food within the tubes and not as vigilant in watching for predators as with other methods. Others have used bait blocks at camera traps to lessen personnel time in resupplying feed stations on a daily basis, though this method still has potential issues with predators congregating on site. Automated feeders are also starting to be field tested as a way to reduce human presence and logistical costs, but results are limited at this point. This method will likely have issues with predator presence as well.

Season

Camera trap sessions should occur between March 15 and May 15 so as to assess presence of resident adults, especially females. It may be tempting to set traps during the juvenile dispersal period (May 15-June 15) to determine whether a site is functioning as a habitat linkage. However, camera traps will not provide the data to make that determination. Camera trapping during juvenile dispersal is not recommended because detections may be of juveniles from natal sites very near the camera(s) (i.e. not dispersing) or from as much as several kilometers away. Detections of juveniles would tell us only that juveniles were detected and would shed no light on where they came from or where they were going.

Duration

We recommend two 5-day trapping sessions (i.e., where traps are placed on the 1st day and then started early the 2nd day and run for 5 full days, being removed early on the 7th day)Allow at least three weeks between sessions to capture variability in surface activity during the post-mating season. Cameras can always be left out longer if bait remains in place or is supplemented, battery life and camera memory are not limiting factors, and one has the capacity to process and review the additional photos that will be collected. If sessions are longer than 5 days, or one long session is selected instead of two, then the session(s) should span at least 31 days from start to end (equal to 5 days + three weeks + 5 days) to encompass variability in surface activity through the season. Where weekend recreational traffic causes concern of camera theft or damage, five-day sessions may have to be broken into multiple periods with cameras being removed for the weekend in between in order to have the cameras deployed for five *full* days.

Camera Spacing

The basic issue regarding intensity of camera spacing is whether to completely sample a property with cameras or to site cameras so that some percentage of the property is surveyed. The sampling approach (5%, 50%, 100%) doesn't necessarily have to be the same for all sites. Spacing and coverage will depend on the goals of the study. Smaller parcels (e.g., 160 acres) could receive 100% coverage while larger properties (e.g., 2000 acres) might be sampled to a lesser extent if the goal is not to determine presence across the whole site in a given year. If the habitat on larger parcels is relatively uniform, it would be reasonable to monitor by deploying cameras on a random basis. However, if different habitat types are present, there should be an effort to sample all habitats in proportion to their area within the property.

Harris and Leitner (2004) have reported on the movements of radio-tagged adult female MGS during the period from mid-March to the end of June. The maximum recorded within-day movements ranged from 24-371 m (median 205 m). These data suggest that MGS living within a distance of 150-200 m from a camera could be detected, especially given that cameras are operated for at least 5 days and are provided with a bait attractant. The assumptions discussed here about the area of camera coverage could be tested rigorously by radio-telemetry of adult MGS.

In the interest of standardizing data collection across different survey areas, and recognizing that the duration of camera trap-sets can likely ameliorate a potentially lowered detection rate caused by a low camera trap density, we recommend placing cameras in arrays of 10 per 160 acres, or 835ft (254m) apart. Some situations, such as long-term monitoring of a large-scale mitigation site, may not call for full coverage surveys. If it is not considered necessary to achieve 100% coverage of a larger parcel, cameras could be spaced farther apart or arrays of cameras could be located randomly, or according to other criteria, such as stratifying samples by plant community, and/or setting cameras at different locations between years to achieve full coverage over time.

Camera Traps for Long-Term Site Monitoring

Camera traps should be a useful tool for long-term monitoring of MGS populations on mitigation lands. The most appropriate application would be to determine presence within years rather than abundance; however, the number of camera sites at which MGS are detected could provide a relative index of abundance over time if camera trap methods are consistent across years within a site.

The frequency of camera monitoring should be guided by what we know about year-to-year fluctuations in MGS numbers. The only continuous record we have of MGS abundance was developed at two Coso study sites (Leitner 2015). The graph (Figure 1) below shows the record from 1990 through 2015. (The numbers of adult MGS captured in 2016 were slightly higher as compared to 2015.)

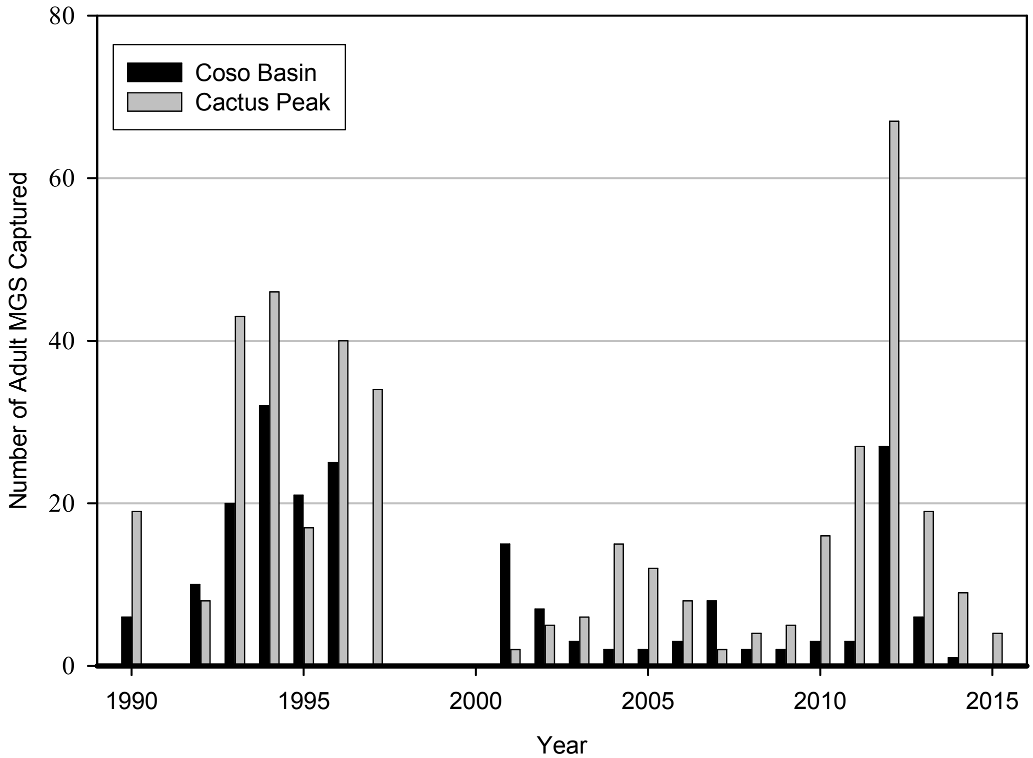


Figure 1. Mohave ground squirrel captures at the Coso Basin and Cactus Peak study sites in March-May during the period 1990-2015.

By examining these data, it can be seen that MGS numbers can change rapidly over the course of just a few years. For example, if sampling were conducted every 5 years (from 2010 to 2015 for example) the record-breaking high of 2012 would have been missed completely. As a result, it seems wise to conduct monitoring at least every 2-3 years. Annual monitoring would be the best approach but may not be feasible because of logistic or financial considerations.

Other Recommendations

1) Suggest collecting vegetation data, especially on shrubs, in combination with camera trapping, where this will help achieve study goals. It is important to not only understand where MGS are distributed on the landscape, but if other factors influence their presence and sustainability on the landscape. Vegetation is an important factor in species presence and it would be beneficial to collect such data in concert with large-scale camera trapping. A greater understanding of the relationship between MGS presence and vegetation is especially important when considering climate change issues. The method that we have employed at 10-camera arrays is to set up a 2x25 m belt transect at each camera at a random angle from the camera. We identify all living shrubs to species and measure greatest canopy extent, distance across canopy at right angles to that measure, and the shrub height. This gives density and

cover for each species. At this time we do not recommend collecting data on herbaceous vegetation because results fluctuate wildly with annual precipitation and little is known about relationships between annual vegetation production, composition, and MGS habitat suitability. It would be desirable though to sample herbaceous vegetation if assessing those relationships are an important goal of the study.

2) Suggest field testing different bait methods (bait in the open, bait in PVC tubes, bait blocks, or automated feeding stations) to see which method is most effective.

3) It is important to determine the relative number and spacing of camera traps needed to adequately sample conventional trapping grid sizes to compare detection rates with conventional live trapping surveys. At what point is there a diminishment in return based on MGS detection rate as a function of the number of cameras used for a specific sized grid?

4) It is important to test if camera traps can be used to determine bait preferences of ground squirrels to various food samples to improve catchability at live traps.

5) It is important to test if PIT tag readers can be effectively used to identify PIT-tagged individuals that visit feeding stations.

6) Suggest utilizing camera traps first in an area before live trapping to detect MGS presence to improve the cost effectiveness of future live-trapping surveys.

7) Suggest using human-based listening stations to survey for ground squirrel presence along transects using playback calls of MGS vocalizations and their responses to human presence heard by surveyors.

8) Suggest using camera trapping to document MGS presence during times of the year outside conventional trapping periods for the species (i.e., mid to late winter and mid-summer). Equipment use is not restricted by weather conditions like trapping surveys are.

9) It is important to determine aboveground MGS behavioral activity patterns using camera traps. Cameras could be placed at known burrow entrances to document above/below ground activity. This could be used in concert with weather stations to better understand the thermoregulatory behavior of MGS.

Literature Cited

Harris, J.H. and P. Leitner. 2004. Home-range size and use of space by adult Mohave ground squirrels, *Spermophilus mohavensis*. Journal of Mammalogy, 85:517-523.

Leitner, Philip. 2015. Mohave Ground Squirrel Research and Monitoring Program. Monitoring Mohave Ground Squirrel Populations in the Coso Region. 2015. Prepared for California Department of Fish and Wildlife, Inland Deserts Region, Ontario, CA. 14 pp + append.

Attachment 2.

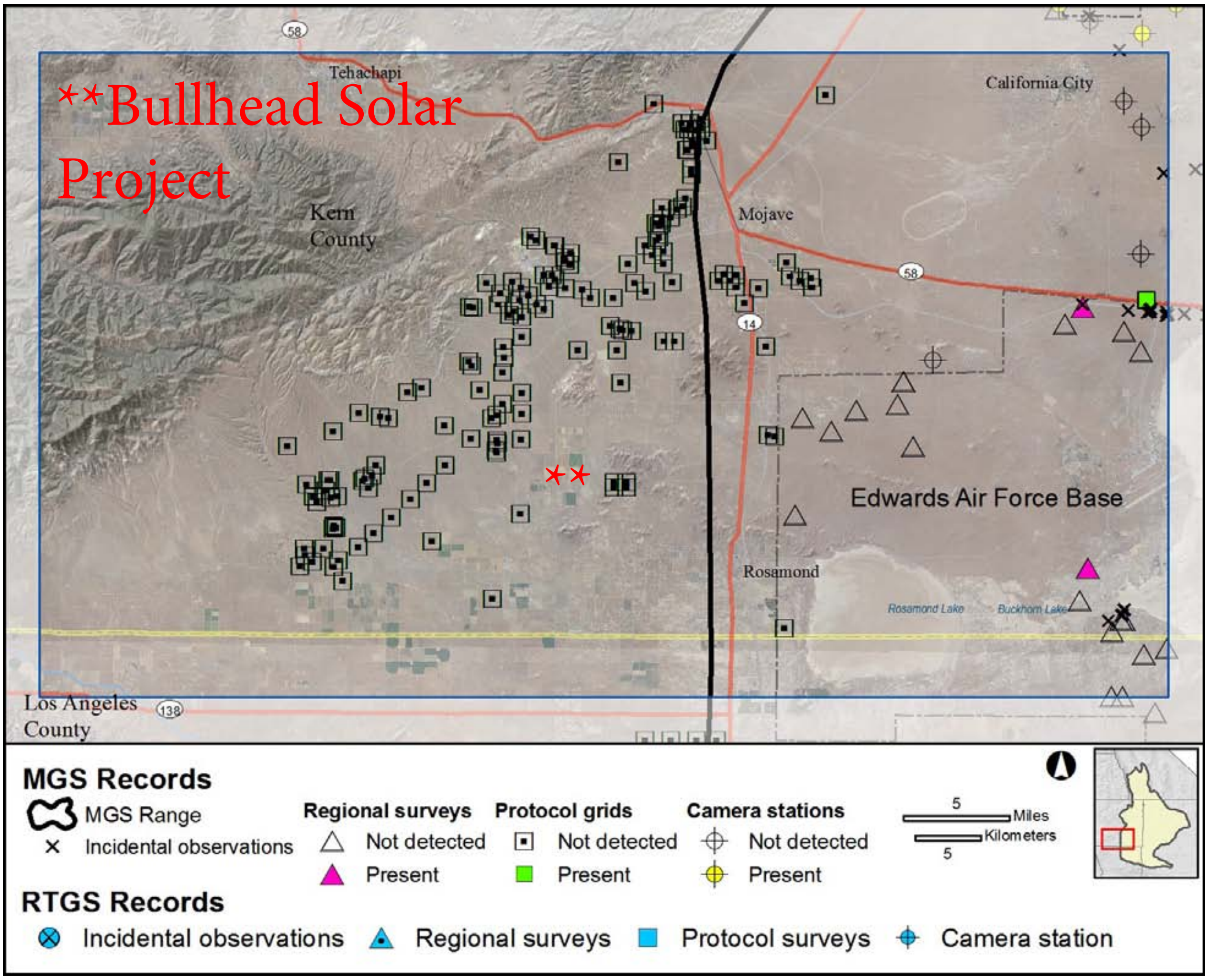
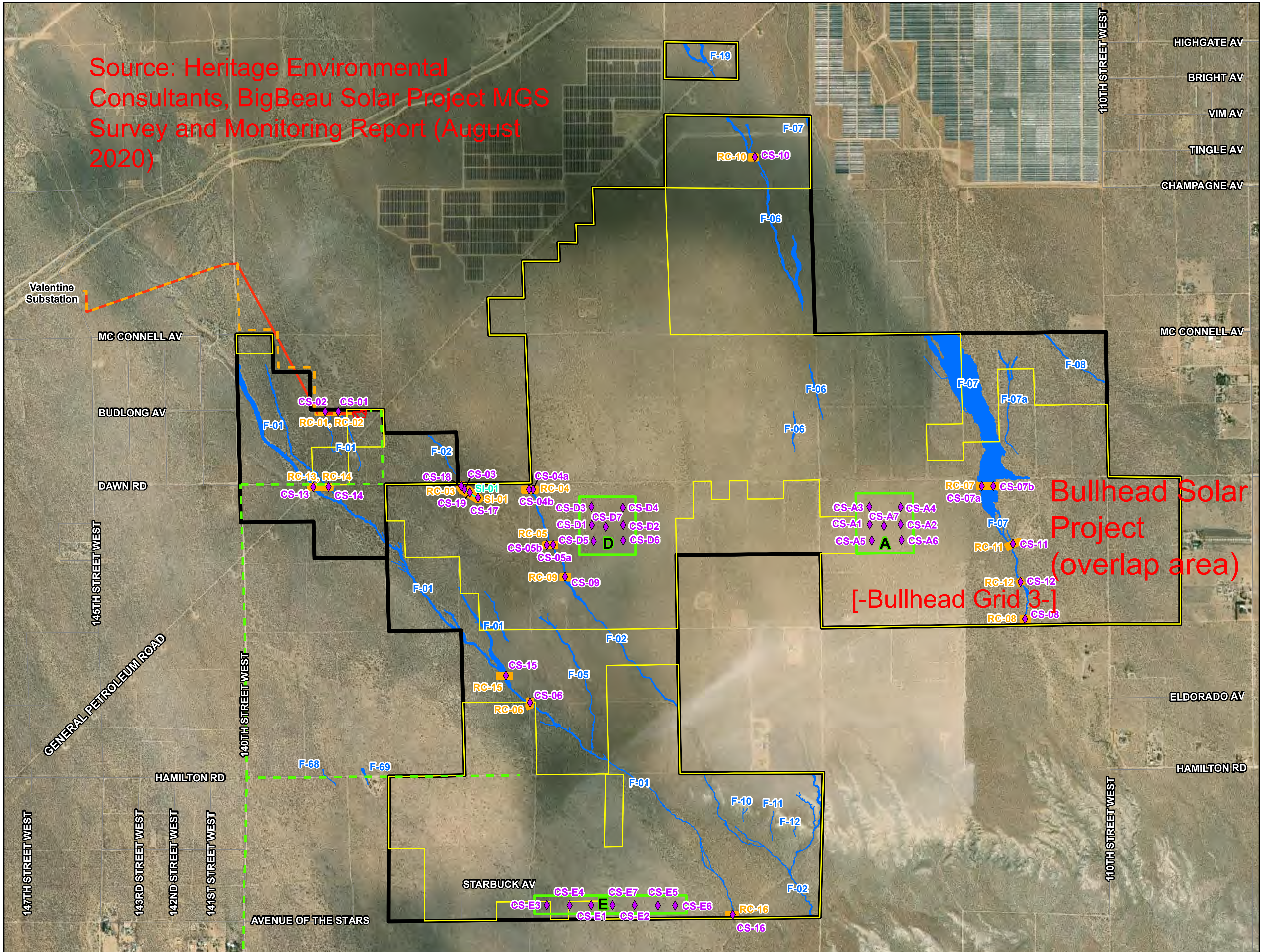


Figure 6. Mohave Ground Squirrel range (*Xerospermophilus mohavensis*) in the vicinity of the town of Mojave. Symbols indicate locations of 2008–2012 Mohave Ground Squirrel records, both positive and negative.

Source: Leitner, P. 2014. Current status of the Mohave ground squirrel: a five-year update, 2008-2012. Unpublished, draft. California State University, Stanislaus, Endangered Species Recovery Program, Turlock, CA. Prepared for: Renewable Energy Program, Renewable Energy and Climate Science Branch, California Department of Fish and Wildlife. Dated 15 April.



BigBeau Solar Project

Figure 3
Camera Stations and Survey Areas

Kern County, CA

LEGEND

- Camera Station
- Survey Areas
- Potentially Jurisdictional Water
- Solar Intersection
- Gen-Tie Option 1
- Gen-Tie Option 2
- Proposed Access Routes
- Road
- 2018 Live Trapping Grid Survey Areas
- Proposed Project Substation
- CUP Boundary
- BigBeau Project Boundary
- County Boundary

0 0.25 0.5
Miles

HERITAGE ENVIRONMENTAL CONSULTANTS, LLC

NAD 83, State Plane, California Zone V, Feet
Data Sources: BBSP, ESRI, Kern Co., USDA.
F:...\BBSP\Figure 3 Camera Stations and Survey Areas 061220.mxd 6-12-20 sjw

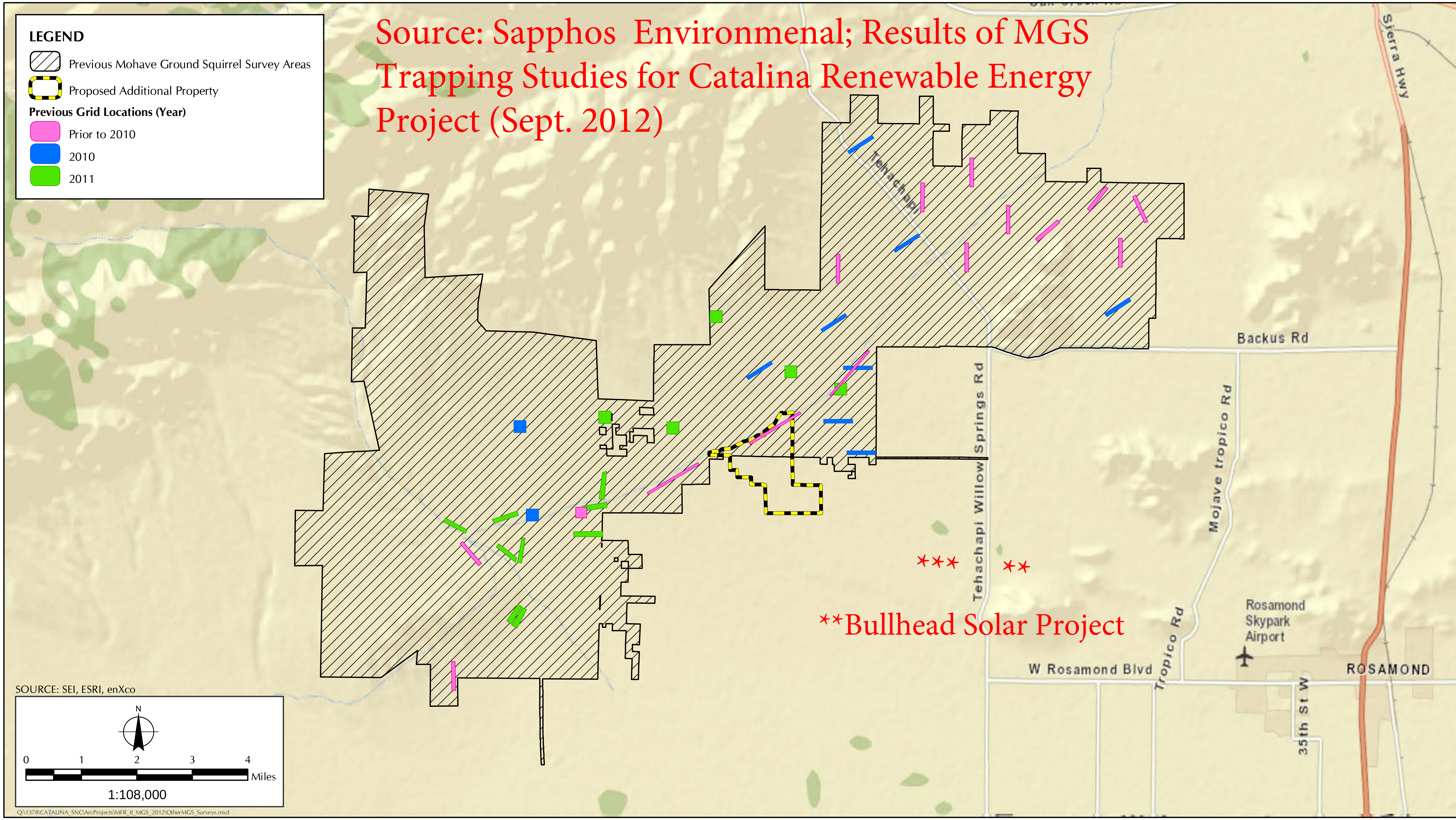


FIGURE 9

Other Mohave Ground Squirrel Surveys in the Antelope Valley

Source: Environmental Intelligence, LLC.; MGS Survey Plan for EDFR Valentine Solar Project (October 2018)

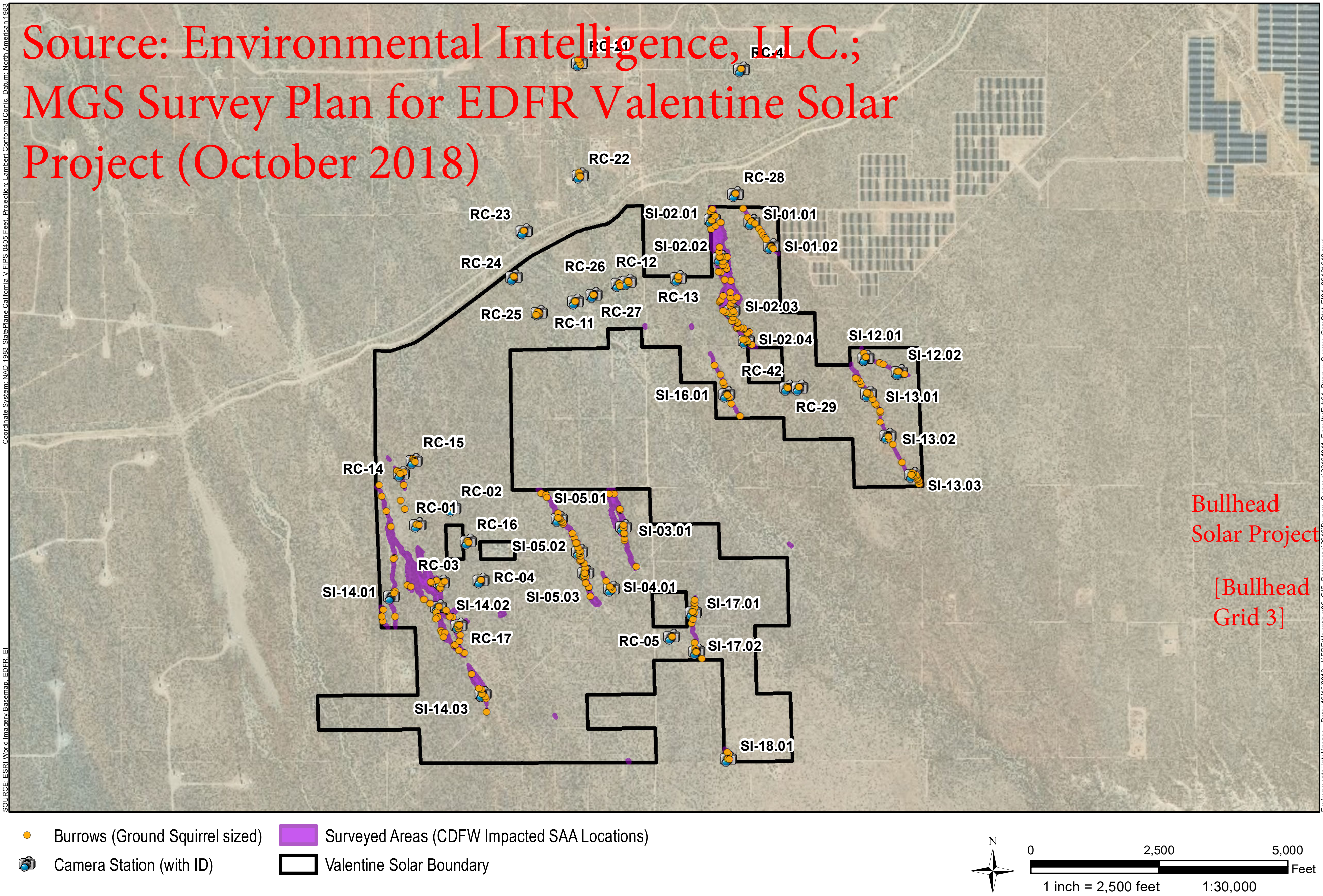


Exhibit 1: Ground Squirrel Burrow Results and Camera Station Map

EDF Renewables - Valentine Solar | Kern County, CA

Table 1. Mohave Ground Squirrel Trapping Effort at Selected Renewable Energy Projects Near the Valentine Solar Project

Project Name	Year	Acres (project area or suitable habitat)	No. of trapping grids	Acres per grid
Alta-Oak Creek	2007	8,640	9	960
	2008	2,560	4	640
	Project total	**11,200**	**13**	**862**
Avalon Wind Project	2009	6,259	10	626
	2010	Expansion area	7	Unknown
	Project total	**6,259**	**17**	**368**
Catalina Renewable Energy Project	“pre-2010”	Unknown	5	1,348
	2010	Unknown	3	Unknown
	2011	6,739	5	1,348
	Project total	**6,739**	**13**	**518**
Catalina Addendum (Cat. Solar 2)	2010	761	2	381
	2012	120	1.5	80
	Project total	**881**	**3.5**	**587**
Manzana Wind Power Project	2006	921	3	307
Pacific Wind Project	2008	6,164	9	684
Rising Tree Wind Farm	2011	3,472	15	231
Average				**660**

Table 2. Results of Mohave Ground Squirrel Trapping Efforts near the Valentine Project Site in Published Reports

Year	General Area	Trapper	Results	Reported In
2008	Western Mojave	Leitner	Negative	Leitner 2008b
1997-2008	Western Mojave	Leitner	Negative	Leitner 2008a
2006	Tehachapi (Willow Springs Road)	Vanherweg	Negative	BLM 2013
2010	Tehachapi (Willow Springs Road)	Vanherweg	Negative	BLM 2013
2011	Tehachapi (Willow Springs Road)	Vanherweg	Negative	BLM 2013

Appendix E-4
Mohave Ground Squirrel Survey Report (Grids 1–2)

September 3, 2021

Ms. Tanya Jones
Program Manager
ICF
49 Discovery, Suite 250
Irvine, CA 92618

SUBJECT: Results of Mohave Ground Squirrel Focused Surveys for Bullhead Solar, unincorporated Kern County, California

Dear Ms. Jones:

The purpose of this letter is to report the results of focused Mohave ground squirrel (MGS; *Xerospermophilus mohavensis*) surveys conducted by Randel Wildlife Consulting, Inc. for for the Bullhead Solar Project (project). This has been prepared in accordance with the requirements outlined in Task 3 (Mohave Ground Squirrel Survey Reporting) of Agreement No. 21MFSK0008 between Randel Wildlife Consulting, Inc. and ICF Jones & Stokes, Inc. under Prime Contract No.: EDF Renewable Development, Inc. dated February 9, 2015.

Project Location

The MGS focused survey sites are located with the EPA's Western Mojave Basins Level IV Ecoregion. Vegetation at both focused survey sites was consistent with *Larrea tidentata–Ambrosia dumosa* Shrubland Alliance (Sawyer et al. 2009). This vegetation alliance is found on minor washed and rills, alluvial fans, bajadas, and upland slopes of well-drained, alluvial, colluvial, and/or sandy soils. Evidence of vegetation community degradation was present at both focused survey locations with both anthropogenic sources and sheep grazing identified as primary factors in degraded status and a general lack native annual plant species on both sites. The proposed project and the MGS focused survey locations are located entirely within the Willow Springs Specific Plan area of the Kern County General Plan and within the Desert Renewable Energy Conservation Plan.

MGS Grid 1 Survey Location

MGS Grid 1 focused surveys were conducted on a 160 acre parcel located in the SW 1/4 of Section 33, Township 10 North, Range 13 West (APN: 346-240-26); and entirely within the U.S. Geological Survey (USGS) 7.5-Minute Series Willow Springs topographic quadrangle.

MGS Grid 2 Survey Location

MGS Grid 2 focused surveys were conducted on five parcels (APN: 315-011-60-1, 315-011-04-9, 315-011-05-6, 315-011-11-4, 315-011-51-0) with an aggregate area of 110.9 acres located in the east 1/2 of the NW 1/4 of Section 6, Township 9 North, Range 13 West; and entirely within the USGS 7.5-Minute Series Willow Springs topographic quadrangle

Methods

Site Reconnaissance / Habitat Assessment

A habitat assessment of the subject property was conducted by Dr. Phil Brylski in March 2021. Surveys were conducted to allow for 100% visual coverage of the subject site with biological resources and potential constraints to focused surveys identified. As a result of the reconnaissance level surveys, it was determined that suitable habitat for the Mojave ground squirrel was present and focused trapping surveys be conducted to determine presence/absence of the species within the subject properties.

Focused Surveys: Mohave ground squirrel

Randel Wildlife Consulting, Inc. conducted focused Mohave ground squirrel surveys in accordance with CDFW guidelines (CDFG 2003). Surveys consisted of five consecutive days of live-trapping during three predefined sessions (Session 1: 15 March–30 April; Session 2: 1–31 May; Session 3: 15 June – 15 July). Each survey session consisted of 100 live-traps spaced 35-m on center in a 4 x 25 array (Grid 1) or a modified 4 x 20 / 4 x 5 array (Grid 2), baited with 4-way horse feed, and shaded to prevent heat stress. Traps were checked no less frequently than every four hours, when temperatures were between 40°–90° F.

Focused Surveys: Small Mammals of Species Concern

Small mammal surveys were conducted at the request of ICF to determine the presence or absence of listed small mammal species of special concern. Randel Wildlife Consulting, Inc. conducted nocturnal small mammal surveys at each MGS survey location for four consecutive nights during session 1 and session 2, resulting in a total of 800 trapping nights.

RESULTS

Focused Surveys

CDFW Mohave ground squirrel guideline surveys were conducted by Randel Wildlife Consulting, Inc. on the following dates:

Grid 1

- Session 1: 25–29 March 2021
- Session 2: 16–20 May 2021
- Session 3: 10–14 July 2021

Grid 2

- Session 1: 30 March to 3 April 2021
- Session 2: 21–25 May 2021
- Session 3: 5–9 July 2021

No Mohave ground squirrels were identified as a result of focused surveys. Mammalian species captured included: white-tailed antelope squirrel (*Ammospermophilus leucurus*), California ground squirrel (*Otospermophilus beecheyi*), Merriam's kangaroo rat (*Dipodomys merriamii*), Chisel-toothed kangaroo rat (*D. microps*), San Joaquin pocket mouse (*Perognathus inornatus*), southern grasshopper mouse (*Onychomys torridus*), and North American deermouse (*Peromyscus maniculatus*).

Table 1. Summary of diurnal captures by species and trapping session (Grid 1).

Session	Species	New Captures	Recaptures	Total Captures
1	White-tailed Antelope Squirrel	25	41	66
1	California Ground Squirrel	1	0	1
2	White-tailed Antelope Squirrel	7	38	45
3	White-tailed Antelope Squirrel	3	0	3

Table 2. Summary of diurnal captures by species and trapping session (Grid 2).

Session	Species	New Captures	Recaptures	Total Captures
1	White-tailed Antelope Squirrel	8	23	31
2	White-tailed Antelope Squirrel	10	41	51
3	White-tailed Antelope Squirrel	3	1	4

Table 3. Summary of nocturnal captures by species and trapping session.

Session	Species	Grid 1	Grid 2	Total Captures
1	*Peromyscus maniculatus*	26	4	30
1	*Onychomys torridus*	1	0	1
1	*Dipodomys microps*	50	5	55
1	*Dipodomys merriami*	27	9	36
2	*Peromyscus maniculatus*	26	17	43
2	*Perognathus inornatus*	1	0	1
2	*Dipodomys microps*	18	3	21
2	*Dipodomys merriami*	28	9	37

Respectfully,

C.J. Randel, PhD
Randel Wildlife Consulting, Inc.

Bullhead Solar MGS Grid Forms

Part I – Project Information					
RWC Bullhead MGS Grid 1	Project Name:	Bullhead Solar	Township:	10N
	Property Owner:	Private	Range:	13W
	Quad/Map Series:	Willow Springs	Section:	33

UTM Coordinates of grid corners (NAD 83, error <6m)

NW Corner (A25)		NE Corner (D25)		SW Corner (A1)		SE Corner (D1)	
Easting	Northing	Easting	Northing	Easting	Northing	Easting	Northing
383843	3864209	383932	3864269	384321	3863515	384408	3863574

Acreage of Project Site (or linear distance):	
Acreage of potential MGS habitat on site (or linear distance):	
Visual Surveys of potential MGS habitat conducted on:	
Visual Surveys conducted by:	Dr. Phil Brylski
Total # of grids:	

Session	Start Date	End Date	Trapping Conducted By:
1	3/25/21	3/29/21	CJ Randel
2	5/16/21	5/20/21	CJ Randel
3	7/10/21	7/14/21	CJ Randel

Part II –General Habitat Description

Vegetation	
Dominant Perennials	*Larrea tridentata, Ambrosia dumosa, Ephedra sp.*
Other Perennials	*Yucca brevifolia, Hymenoclea salsola, Atriplex sp., Eriogonum fasciculatum Tetrademia sp.*
Dominant Annuals	Site was heavily grazed by sheep prior to Session 1. Likely *Schismus sp.*
Other Annuals	

Land Forms (*i.e.*, bajadas, washes): washes

Soil Description: Cajon loam sand, 0-5% slope
DeStazo sandy loam, 5-9% slopes, eroded

Elevation: 2,650-2,690 ft

Slope: 0-10%

Part I – Project Information					
RWC Bullhead MGS Grid 2	Project Name:	Bullhead Solar		Township:	9N
	Property Owner:	Private		Range:	13W
	Quad/Map Series:	Willow Springs		Section:	NE 1/4 6

UTM Coordinates of grid corners (NAD 83, error <6m)

NW Corner (D20)		NE Corner (A20)		SW Corner (D1)		SE Corner (A1)	
Easting	Northing	Easting	Northing	Easting	Northing	Easting	Northing
381850	3863400	381955	3863400	381849	3862732	381957	3862734
NW Corner (I4)		**NE Corner (E4)**		**SW Corner (I1)**		**SE Corner (E1)**	
Easting	Northing	Easting	Northing	Easting	Northing	Easting	Northing
381673	3863400	381815	3863400	381674	3863295	381814	3863294

Acreage of Project Site (or linear distance):	
Acreage of potential MGS habitat on site (or linear distance):	
Visual Surveys of potential MGS habitat conducted on:	
Visual Surveys conducted by:	Dr. Phil Brylski
Total # of grids:	

Session	Start Date	End Date
1	3/30/21	4/3/21
2	5/21/21	5/25/21
3	7/5/21	7/9/21

Trapping Conducted By:
CJ Randel
CJ Randel
CJ Randel

Part II –General Habitat Description

Vegetation	
Dominant Perennials	*Larrea tridentata, Ambrosia dumosa, Ephedra sp.*
Other Perennials	*Yucca brevifolia, Hymenoclea salsola, Atriplex sp., Eriogonum fasciculatum*
Dominant Annuals	*Schismus sp.*
Other Annuals	

Land Forms (*i.e.*, bajadas, washes): washes

Soil Description: Cajon loam sand, 0-5% slope

Elevation: 2,650-2,680 ft

Slope: 0-5%

Bullhead Solar MGS Weather Forms

Date: 3/25/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0700	0830	1100	1220	1500	1630	1800	1900			
Temp (F)	48	50	57	57	55	54	53	53			
Wind (mph)	5-20	5-20	10-20	10-20	10-25	10-25	10-25	10-25			
Cloud Cover (%)	25	50	75	75	70	70	90	90			

Date: 3/26/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0700	0820	1100	1300	1500	1610	1800				
Temp (F)	43	51	60	63	67	67	64				
Wind (mph)	5-10	0-10	0-15	10-20	5-15	0-10	5-15				
Cloud Cover (%)	100	75	25	25	10	10	10				

Date: 3/27/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0700	0830	1100	1220	1500	1620	1800	1900			
Temp (F)	39	43	64	68	71	71	72	69			
Wind (mph)	0-5	5-15	5-10	0-10	5-15	5-15	5-10	5-10			
Cloud Cover (%)	0	0	0	0	0	0	0	0			

Time	Trap	Species	Recap	Sex	Age	Repro Status	Comments

Date: 3/28/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0700	0820	1100	1220	1400	1510	1745	1900			
Temp (F)	39	51	68	73	81	81	78	77			
Wind (mph)	0-5	0-3	0-7	0-10	0-10	0-10	5-15	0-10			
Cloud Cover (%)	0	0	0	0	0	0	0	0			

Date: 3/29/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0700	0820	1100	1220	1500	1630	1800	1930			
Temp (F)	46	52	75	78	83	79	70	66			
Wind (mph)	5-15	0-15	0-12	5-20	15-25	15-25	20-30	20-33			
Cloud Cover (%)	0	0	0	0	0	0	0	0			

Session 2

Date: 5/16/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0700	0900	1100	1230	1500	1630	1800	1930			
Temp (F)	54	56	61	64	71	71	69	69			
Wind (mph)	5-10	5-10	5-15	5-15	10-25	10-25	15-30	15-30			
Cloud Cover (%)	0	0	0	0	0	0	0	0			

Date: 5/17/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0600	0715	1000	1050	1400	1500	1800	1900			
Temp (F)	62	64	74	77	83	83	81	80			
Wind (mph)	0-10	0-10	9-18	10-20	5-20	5-20	5-25	15-30			
Cloud Cover (%)	10	10	0	0	0	0	10	10			

Date: 5/18/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0600	0730	1000	1100	1400	1500					Closed at check 2 due to high winds
Temp (F)	63	68	76	78	86	88					
Wind (mph)	12-22	15-25	15-25	15-25	15-30	20-35					
Cloud Cover (%)	0	0	0	0	0	0					

Date: 5/19/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0600		0800	0900	1200	1315	1600				Opening delayed until 0800 due to high winds
Temp (F)	63		71	74	87	88	82				
Wind (mph)	27-38		5-15	5-15	10-20	10-20	5-15				
Cloud Cover (%)	20		0	0	0	0	0				

Date: 5/20/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0600	0700	1000	1100	1400	1500	1800	1900			
Temp (F)	51	54	61	61	64	64	62	61			
Wind (mph)	0-5	0-10	5-15	5-15	10-25	10-25	10-20	5-20			
Cloud Cover (%)	0	0	0	0	10	10	15	15			

Session 3

Date: 7/10/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0530	0700	0745	0915							Traps closed at check 1.
Temp (F)	76	80	89	95							
Wind (mph)	0-5	0-5	0-5	0-5							
Cloud Cover (%)	10	15	15	5							

Date: 7/11/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0520	0610	0700								Traps closed at check 1.
Temp (F)	89	88	92								
Wind (mph)	0-8	0-10	0-10								
Cloud Cover (%)	15	15	15								

Date: 7/12/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0530	0640	0730	0830							Traps closed at check 1.
Temp (F)	82	84	87	93							
Wind (mph)	0-3	0-5	0-5	0-5							
Cloud Cover (%)	5	5	5	5							

Date: 7/13/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0530	0630	0840	0940							Traps closed at check 1.
Temp (F)	80	83	88	92							
Wind (mph)	0-10	0-10	0-10	0-10							
Cloud Cover (%)	60	60	50	50							

Date: 7/14/21	Grid: RWC Bullhead Grid 1		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0530	0630	0900	1030							Traps closed at check 1.
Temp (F)	73	75	88	91							
Wind (mph)	0-8	0-8	0-15	10-15							
Cloud Cover (%)	50	50	50	30							

Grid 2

Date: 3/30/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0700	0830	1000	1130	1400	1530	1700	1830			
Temp (F)	49	58	64	73	83	79	80	73			
Wind (mph)	5-15	5-15	12-20	10-20	15-25	15-25	0-13	0-15			
Cloud Cover (%)	0	0	0	0	0	0	0	0			

Date: 3/31/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0700	0830	1100	1230	1500	1630	1800	1930			
Temp (F)	49	53	63	68	74	75	73	67			
Wind (mph)	0-10	5-10	10-20	10-25	10-25	10-25	10-20	10-20			
Cloud Cover (%)	0	0	0	0	0	0	0	0			

Date: 4/1/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0700	0820	1100	1200	1500	1600	1800	1900			
Temp (F)	43	56	73	76	81	79	78	75			
Wind (mph)	0	0	0-5	0-7	0-5	0-5	0-5	0-5			
Cloud Cover (%)	0	0	0	10	20	30	25				

Date: 4/2/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0700	0820	1030	1145	1430	1538	1800	1900			
Temp (F)	53	55	79	82	89	88	86	84			
Wind (mph)	0-5	0-5	0-5	0-5	5-15	5-15	5-15	5-15			
Cloud Cover (%)	0	0	0	0	0	0	0	0			

Date: 4/3/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0700	0800	1100	1215	1500	1600	1730	1900			
Temp (F)	52	54	81	86	86	86	82	73			
Wind (mph)	0-3	0-3	5-10	5-15	15-25	15-25	15-25	10-20			
Cloud Cover (%)	0	0	0	0	0	0	0	0			

Session 2

Date: 5/21/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0615	0730	1000	1100	1400	1500	1800	1910			
Temp (F)	46	46	54	56	63	64	63	60			
Wind (mph)	5-10	5-15	10-20	10-20	20-40	20-30	10-25	10-25			
Cloud Cover (%)	20	20	30	30	30	30	30	30			

Date: 5/22/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0600	0700	1000	1100	1400	1500	1800				
Temp (F)	46	49	61	63	69	69	63				
Wind (mph)	0-10	0-10	0-10	0-10	10-20	10-20	10-15				
Cloud Cover (%)	0	0	0	10	30	30	30				

Date: 5/23/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0600	0700	1000	1100	1400	1500	1800				
Temp (F)	45	48	63	66	76	76	76				
Wind (mph)	0-5	0-8	0-15	0-15	5-10	5-10	5-10				
Cloud Cover (%)	0	0	0	0	0	0	0				

Date: 5/24/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0530	0630	0930	1030	1330	1430	1730	1830			
Temp (F)	56	59	73	76	83	83	86	85			
Wind (mph)	0	0-3	0-5	0-5	0-5	0-5	0	0			
Cloud Cover (%)	0	0	0	0	0	0	0	0			

Date: 5/25/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0530	0630	0930	1030	1330	1430	1730	1830			
Temp (F)	68	66	81	83	86	89	82	81			
Wind (mph)	0	0	0-10	0-10	5-15	5-15	5-20	5-15			
Cloud Cover (%)	50	50	50	50	50	50					

Session 3

Date: 7/5/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0530	0630	0855	0920							Traps closed at check 1.
Temp (F)	64	72	86	90							
Wind (mph)	0-5	0-5	0-10	0-10							
Cloud Cover (%)	0	0	0	0							

Date: 7/6/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0530	0630	0835	0920							Traps closed at check 1.
Temp (F)	68	72	86	91							
Wind (mph)	0-5	0-5	0-10	0-10							
Cloud Cover (%)	5	5	10	10							

Date: 7/7/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0545	0645	0830	0930							Traps closed at check 1.
Temp (F)	71	74	85	90							
Wind (mph)	0-10	0-10	0-10	0-10							
Cloud Cover (%)	0	0	0	0							

Date: 7/8/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0530	0620	0745	0840							Traps closed at check 1.
Temp (F)	71	78	87	91							
Wind (mph)	0-10	4-8	4-12	0-10							
Cloud Cover (%)	0	0	0	0							

Date: 7/9/21	Grid: RWC Bullhead Grid 2		Investigator(s):		Charles J. Randel						
			Assistant(s):		N/A						
	Opening		Check #1		Check #2		Check #3		Check #4		Notes
	Start	End	Start	End	Start	End	Start	End	Start	End	
Time (24 hr)	0530	0640	0750	0915							Traps closed at check 1.
Temp (F)	74	81	87	93							
Wind (mph)	0-5	0-5	0-8	0-8							
Cloud Cover (%)	5	5	10	10							

Appendix E-5
Mohave Ground Squirrel Survey Report (Grids 3–4)

Mohave Ground Squirrel Survey for the
Bullhead Solar Project, Kern County, California

Prepared for:

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August 31, 2021

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1. INTRODUCTION

The Bullhead Solar project site is located in the western Antelope Valley in Kern County and ranges from approximately 6.5 to 10.6 miles west/northwest of Rosamond. The proposed project would develop a photovoltaic solar facility and associated infrastructure necessary to generate up to 170 megawatts of renewable electrical energy and/or energy storage capacity. The Bullhead solar generation site consists of approximately 1,854 acres of several land covers, including active agriculture, fallow fields, disturbed and undisturbed desert scrub vegetation, and developed uses.

This report provides the results of focused surveys for the State-threatened Mohave ground squirrel (MGS, *Xerospermophilus mohavensis*) carried out in 2021 on the proposed Bullhead Solar Project site in Kern County. The project site is not within the accepted range of the Mohave ground squirrel (CDFW 2019), although it may have been within the historic range of the species (Howell 1938; Gustafson 1993; USFWS 2011). There are no confirmed records of MGS from west of State Route 14 between Palmdale and Mojave (Gustafson 1993; Leitner 2008, 2014; CNDDB 2021). CDFW has nonetheless required trapping surveys for MGS in the vicinity of the project, given the large amounts of relatively undisturbed desert scrub habitat with vegetation, soils and topography typical of the west Mojave Desert and seemingly appropriate for the species (CDFG 2005; Leitner 2008, 2014). Over 150 protocol-level studies were conducted between 2008 and 2012 and 26 additional studies were conducted prior to 2008 in areas west of Highway 14, but no MGS were detected (Leitner 2014).

Figure 1, *Topographic Map*, shows the study area on the USGS Willow Springs topographic map (T9N, R14W Sections 1,2; T9N, R13W, Sections 6; and T10N, R14W, Sections 31-33, 35). Figure 2, *Aerial Photo*, shows the project site on an aerial photo. The UTM coordinates for the approximate center of the project site are 11S 380809E, 386522N. Site photos are found in Appendix 1.

Background on the Mohave Ground Squirrel

The MGS is a small ground squirrel (approximately 9 inches long) that inhabits the Mojave Desert, in parts of Inyo, Kern, Los Angeles and San Bernardino counties. The historical range of the MGS covered approximately 5 million acres from Palmdale in the south to Owens Lake in the north, and from the eastern edge of the Sierra Nevada to the Mojave River Valley (Gustafson 1993, Leitner 2008).

MGS occur in a range of open desert habitats, most commonly in creosote scrub but also in Joshua tree woodland, desert saltbush scrub, desert sink scrub, desert greasewood scrub, and shadscale scrub (Gustafson, 1993). MGS typically occur in 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. MGS consume leaves, forbs, shrubs, and grasses of several species and genera, including creosote (*Larrea tridentata*), winter fat (*Krascheninnikovia lanata*), spiny hop-sage (*Grayia spinosa*), saltbush (*Atriplex* spp.), golden linanthus (*Linanthus aureus*), Mediterranean grass (*Schismus arabicus*), box thorn (*Lycium* spp.), and several other plant species (Best 1995). Winter fat, spiny hop-sage, and saltbush are thought to make up approximately 60% of the species' shrub diet, indicating that these are important food sources when forbs are unavailable.

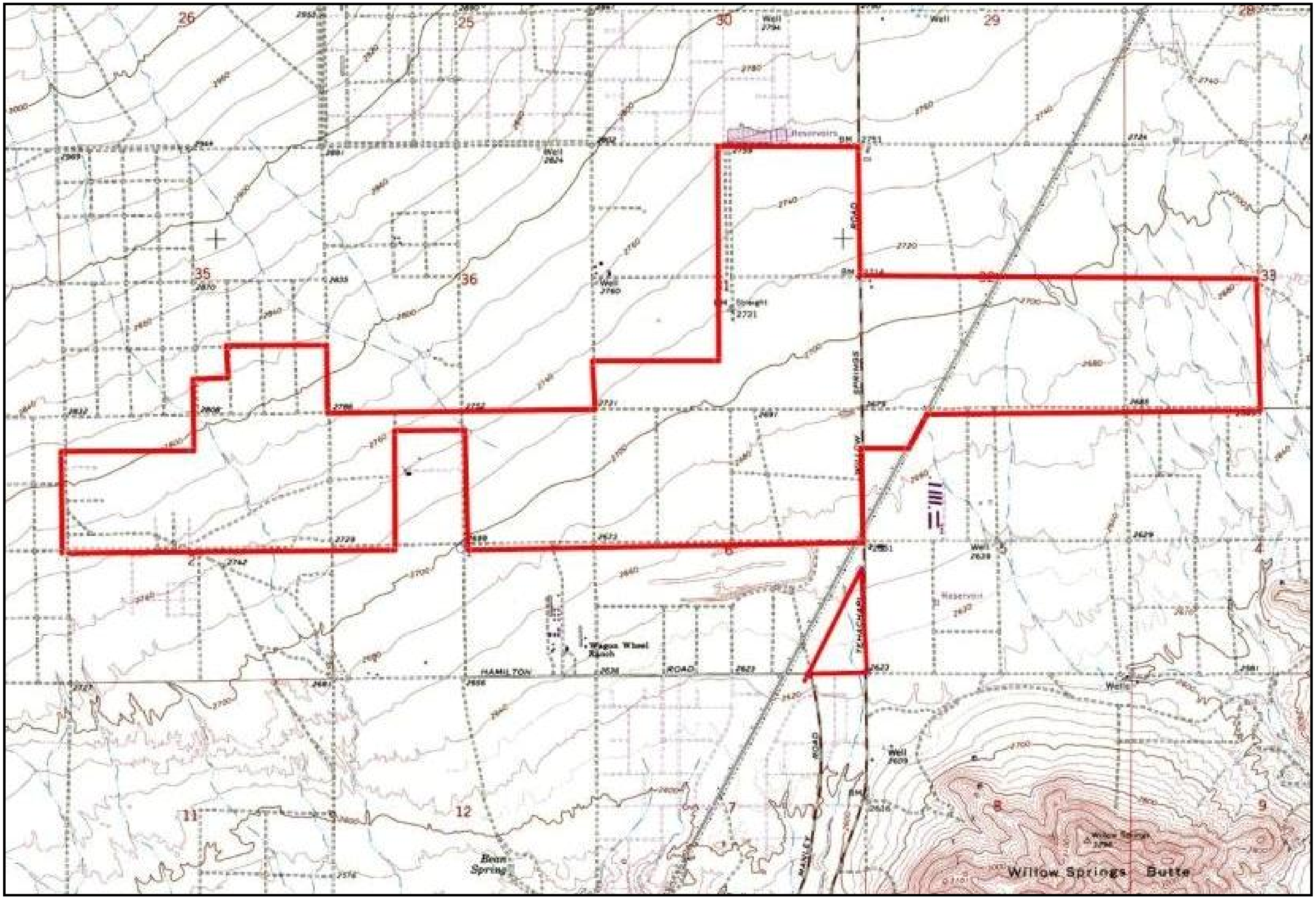

Figure 1. Solar field site on topographic map

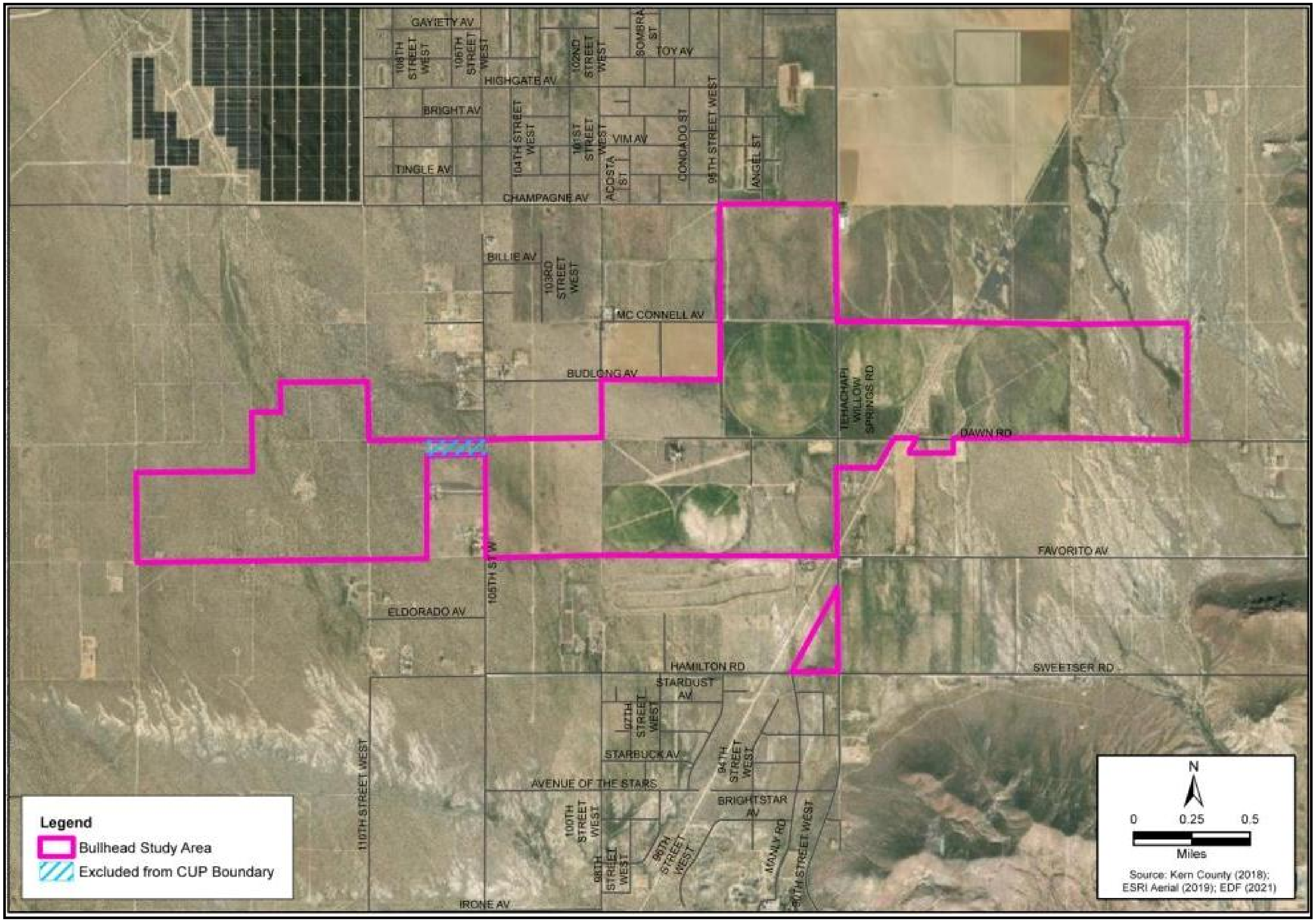

Figure 2. Solar field site on aerial photo

It has been suggested that habitats where winter fat and hop-sage are absent may be suboptimal for MGS (Desert Managers MGS Working Group, no date).

MGS dig burrows in sandy and gravelly soils on flat to moderately sloping terrain. The burrows are used to avoid predators and high temperatures, and for aestivating during winter months. MGS are active only during the spring-summer months and spend most of the year (approximately seven months) below ground.

2. Site Description

Topography

The solar field site ranges in elevation from approximately 2,620 to 2,870 feet above mean sea level and slopes slightly to the southeast (approximately 1.75%).

Vegetation

The plant communities in the solar field project area include land covers: creosote bush (disturbed and undisturbed), active agriculture, inactive agriculture/fallow fields, ruderal desert forb, rubber rabbitbrush scrub, and developed. A small area of Joshua tree woodland occurs in immediately north of the project site, northwest of the intersection of Tehachapi Willow Springs Rd and Champagne Ave. Figure 3, *Plant Communities*, shows the distribution of the plant communities in the study area. Descriptions of the plant communities are as follows.

Creosote bush scrub. Creosote bush scrub is one of the dominant plant community the project area, occurring largely in the western and easter sides of the site. Disturbed creosote bush scrub occurs in the western and south central parts of the site. Other shrubs in this community include rayless goldenhead (*Acamptopappus sphaerocephalus*), rabbitbrush (*Ericameria teretifolia*), rhatany (*Krameria* spp.), Mormon tea (*Ephedra nevadensis*), California buckwheat (*Eriogonum fasciculatum*), Cooper's box thorn (*Lycium cooperi*), winter fat (*Krascheninnikovia lanata*), Mojave cottonthorn (*Tetradymia stenolepis*), hop sage (*Grayia spinosa*), beavertail cactus (*Opuntia basilaris* var. *basilaris*), cheesebush (*Ambrosia salsola*), Indian rice grass (*Stipa hymenoides*), and one-sided blue grass (*Poa secunda*). Although creosote bush comprises from approximately 60 percent to greater than 90 percent cover within the community, it may support a large diverse herbaceous layer of spring ephemeral flowers and native perennial grasses.

Active agriculture. Active agriculture includes planted and artificially maintained fields and irrigated orchards.

Inactive agriculture/fallow fields. Inactive agriculture includes fields that were previously planted with crops but are no longer being farmed. These areas are generally low in cover and dominated by nonnative forb species.

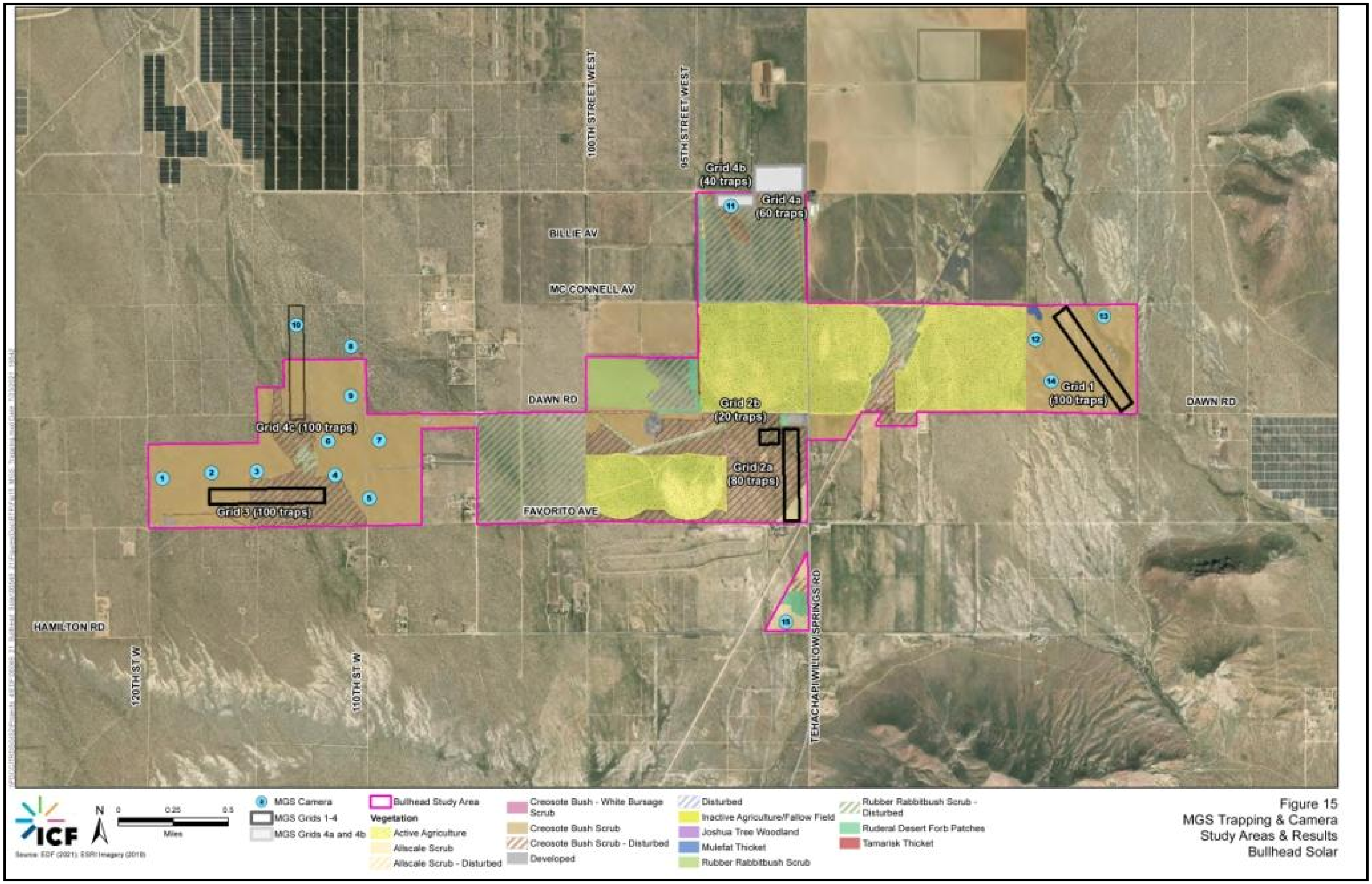

Figure 3. Plant communities with MGS grid and camera station locations.

Ruderal desert forb. Ruderal desert forb patches are common in the project site and typically found where ground disturbance has previously occurred, such as areas of heavy grazing, abandoned fields, and waste areas, and roadsides. Common plant species include red stemmed filaree (*Erodium cicutarium*) and nonnative mustards (*Sisymbrium* sp, and *Brassica* sp.). Native shrubs, such as California buckwheat, rabbitbrush, and cheesebush, may be present within this community, but with low cover.

Rubber rabbitbrush scrub. Rabbitbrush scrub occurs in areas with previous disturbance. Other common shrubs in this community include California buckwheat, sticky snakeweed, creosote bush, cheesebush, and Nevada ephedra. The understory is composed of nonnative grasses and ruderal desert forbs. and are mapped as disturbed on the vegetation map.

Developed. Developed land includes areas that are paved or other hardscape, structures, and landscaped areas, and local dump sites. Little to no vegetation occurs in these areas, other than ruderal, disturbance-loving species and a variety of ornamental (usually nonnative) plants.

Joshua Tree Woodland. Joshua tree woodland occurs outside of the project site, in the northeastern buffer, where it has an open tree and shrub canopy with an intermittent-to-continuous ground cover composed primarily of nonnative grasses, ruderal desert forbs, and sparse native forbs, such as fiddleneck (*Amsinkia* sp.) and angled-stem buckwheat (*Eriogonum angulosum*). Shrub composition is similar to creosote bush scrub, but at lower overall cover, and includes creosote bush, cheesebush, Nevada ephedra, silver cholla, California buckwheat, cooper's lycium, and Acton Encelia (*Encelia actoni*). This community is included in this site description because MGS Grid 4B, which was live-trapped in Session 1, contained Joshua Tree scrub habitat.

Soils

The soils in the solar field project site are Cajon loamy sands, Cajon sands, Hesperia fine sandy loams, and DeStazo sandy loams (NRCS 2021).

3. Methods

Although the Bullhead solar project site is considered outside of the historical range of MGS (CDFW 2019), there is potentially suitable habitat present within the project site. Therefore, a habitat assessment and live-trapping surveys, as well as a camera trapping study, were conducted for MGS within the Bullhead project site.

Habitat Assessment

A field-based habitat assessment carried out on March 16, 2021 that examined soil, vegetation, topographic and disturbance features to assess the suitability of habitat for MGS in the proposed solar fields. In addition, records were examined from the California Natural Diversity Database (CNDDB; CDFW 2021) and range maps for the species. Under the current survey guidelines (CDFG 2010), potential habitat is defined as "land supporting desert shrub vegetation within or adjacent to the geographic range of the species". Based on CDFW guidelines for this species, any open land within the historical range of the species triggers the need for a focused survey.

Live-trapping Surveys

Survey methods conformed to guidelines prepared by the California Department of Fish and Wildlife (CDFG 2010), except that the number of live-trapping grids was lower than would have been recommended by the protocol. Grid 3 was located in the southwestern corner of the solar field site and contained creosote bush scrub and disturbed creosote bush scrub (Photos 1, 2). Figure 3, *Plant communities with MGS grid and camera station locations*, shows the locations of the grids. Grid 4 was initially located west of Tehachapi Willow Springs Rd, north and south of Champagne Ave, shown as Grids 4A and 4B in Figure 3. However, following the first trap session, the parcel north of Champagne Ave was removed from the project. As a result, the trapping grid was relocated to creosote bush scrub habitat in the western part of the solar site north of Grid 3 and re-named Grid 4C, the location of which is shown in Figure 3. Appendix 3 contains the UTM coordinates of the grid corners and summary information on the grid and MGS surveys.

The survey effort included two grids of 100 live-traps arranged in a 4x25-trap rectangle with 35 meters spacing. The trapping survey for the two grids totaled 3,000 trap-days. Traps were opened within one hour of sunrise and checked at least every four hours. Traps were closed within one hour of sunset, or when the air temperature reached 90°F, measured at 6 inches above the ground in the shade. Traps were baited with four-way commercial livestock feed, a combination of rolled corn, rolled barley, oats and molasses. A separate effort covered by another MGS permittee trapped an additional two grids; the results are not included in this report.

Nocturnal small mammal trapping was also conducted within the Bullhead grids to inventory nocturnal small mammals. Concurrent with MGS (diurnal species) trapping, traps were left open between dusk and dawn.

Camera Study

A camera study was implemented on the solar site at the request of CDFW to supplement the live-trapping surveys (two of the four live-trapping grids are covered in this report). 14 Browning Dark Ops HD Pro X Trail Game cameras and one Reconyx PC900 Hyperfire camera were set up and operated in accordance with methods and recommendations included in Delaney et al (unpublished). The camera locations are shown in Figure *3, Plant Communities, Grid and Camera Station Locations*. The cameras were deployed in two sessions: May 8 to 13 and May 24 to 29. The use of camera stations through May 29 was necessitated by the late addition of camera use to the study design.

The 14 Browning cameras were set to capture images from dawn to dusk whereas the Reconyx camera captured images 24 hours a day. For each session, the bait was renewed and the SD cards replaced twice. The recorded images were stored on thumb drives and examined by Phil Brylski, who is permitted to handle and carry out MGS surveys. The information from the images (number of images and species observed) was entered on an Excel spreadsheet.

4. Results

Live-Trapping

Table 1 lists the dates of the MGS surveys for the three sessions. Appendix 2 summarizes the weather conditions during the surveys.

Table 1. Dates of MGS surveys			
Grid	**Session 1**	**Session 2**	**Session 3**
3	April 2-6	May 12-16	July 1-5
4	April 26-30	May 25-29	June 24-28

No Mohave ground squirrels (MGS) were captured during the survey, and none were observed or heard onsite or in the adjoining area. The antelope ground squirrel (AGS) was captured on both grids. Table 2 summarizes the antelope ground squirrel captures on the grids for the three sessions. There were several captures of the California ground squirrel (CGS, *Otospermophilus beecheyi*) on Grid 3. The nocturnal trapping yielded mostly two locally abundant kangaroo rat: Merriam's kangaroo rat (*Dipodomys merriami*) and the Panamint kangaroo rat (*D. panamintinus*) and several deer mice (*Peromyscus maniculatus*). In addition, nocturnal trapping at Grid 4A yielded a single little pocket mouse (*Perognathus longimembris*).

Table 2. MGS Trapping Survey Results		
Grid	**Session**	**AGS**
3	1	46
3	2	68
3	3	14
Grid 3 total		**128**
4	1	48
4	2	29
4	3	9
Grid 4 total		**86**
AGS, Antelope ground squirrel (*Ammospermophilus leucurus*)		

Camera Study

The camera study carried out at 15 locations for two five-day sessions yielded 163,904 images, many of them resulting from vegetation movement caused by wind and secondarily by animals moving within the field of view. The only ground squirrels found in the images recorded at the 15 camera sites were antelope ground squirrels, which were detected at all of the camera stations. No Mohave ground squirrels were detected. Ravens (*Corvus corax*) were commonly recorded in the daytime. Black-tailed jackrabbits (*Lepus californicus deserticola*) were commonly recorded both at night and in the day. Kit foxes (*Vulpes macrotis*) were detected at night and at dawn. Two bird species recorded during the day were the greater roadrunner (*Geococcyx californianus*) and a single lark sparrow (*Chondestes grammacus*).

5. Discussion

Project Site in Relation to MGS Habitat

The solar field site contains potentially suitable habitat for MGS. The soils on the site are Cajon loamy sands, Cajon sands, Hesperia fine sandy loams, and DeStazo sandy loams and the terrain is sloping gently to the southeast with elevations ranging from approximately 2,870 to 2,620 feet above mean sea level.

The visual/aural surveys of the project site and 500-foot buffer did not yield any observations or calls of MGS individuals. MGS typically occur in relatively undisturbed scrub habitats with a range of shrub species composition, often when food plants such as winter fat, spiny hop-sage, saltbush, and golden linanthus, are present. The dominant habitats on the project site are creosote bush scrub, disturbed creosote bush scrub, active agriculture, and inactive agriculture (fallow fields converting to ruderal desert forbs). The creosote bush scrub habitat on the site is suitable for MGS whereas the agricultural habitats are not. The food plants preferred by MGS noted above occur sparingly in the creosote scrub community on the project site.

MGS Captures in Project Region

The Bullhead Solar project site is located west of Highway 14, from approximately 6.5 to 10.6 miles W/NW of Rosamond. The most recent range-wide status assessments (Leitner 2008, 2014, 2019) concluded that the species does not currently occur in the Antelope Valley west of Highway 14 between Mojave and Palmdale. This conclusion is based on the negative results of many protocol-level surveys conducted in the area as part of wind and solar energy projects over the past 15 years (Leitner 2008, 2014; Biosearch 2015; SWCA 2015, SJM Biological and Biosearch 2018).

Given the results of this study, the negative results of numerous protocol-level surveys form the vicinity, and lack of historical records from the area, MGS are not likely to occur on the Bullhead Solar project site and are not expected to be directly impacted by the proposed project.

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Appendix 1. Site Photographs

Photo 1. Creosote bush scrub habitat in Grid 3, looking north.

Photo 2. Disturbed creosote bush scrub habitat in Grid 3, looking northwest.

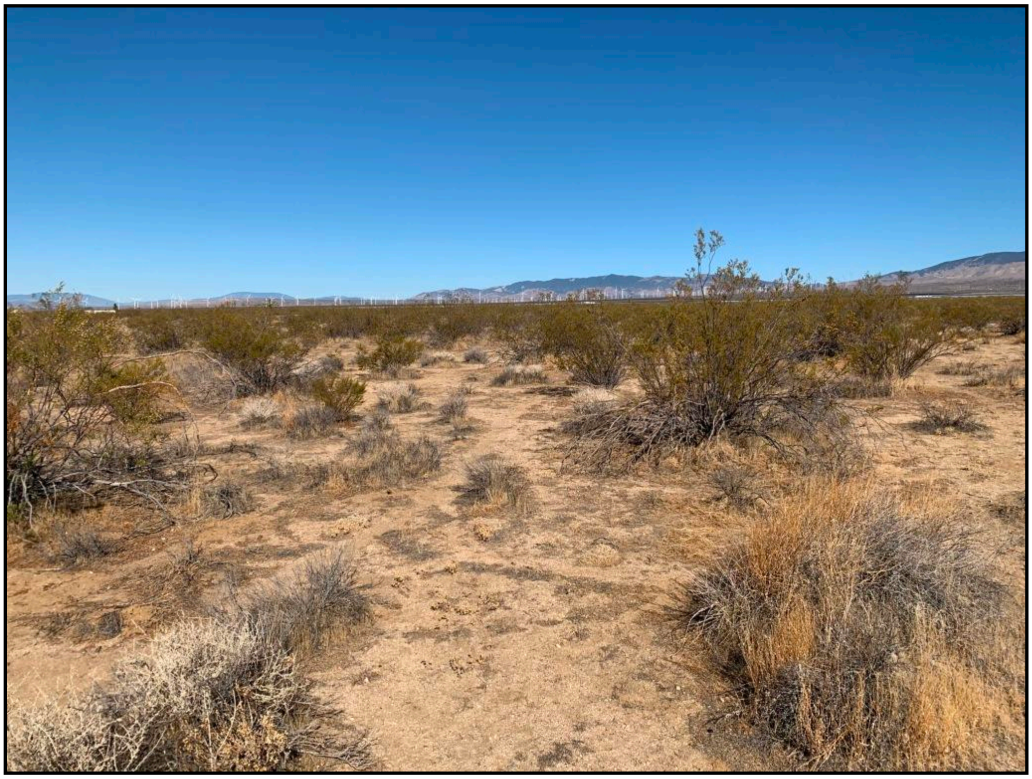

Photo 3. Creosote bush scrub habitat in Grid 4C, looking north.

Appendix 2. Weather Data for Mohave Ground Squirrel Trapping Grids

Grid 3

Date	Temperature (F)				Cloud Cover (%)				Wind (mph)			
	Min	Time	Max	Time	Min	Time	Max	Time	Min	Time	Max	Time
April 2	69	0650	87	1400	0	0650	0	1830	0-1	1000	3-5	1830
April 3	60	0700	90	1430	0	0700	0	1430	1-2	0700	2-4	1430
April 4	64	0645	86	1500	0	0645	10	1430	1-3	1000	5-9	1430
April 5	62	0700	72	1600	0	0700	45	1800	1-4	0900	3-9	1800
April 6	60	0650	85	1600	0	0650	0	1815	0	0650	0-1	0930
May 12	65	0700	90	1430	0	0700	0	1430	0	0700	2-8	1430
May 13	70	0645	90	1530	0	0645	0	1530	1-3	0645	4-8	1530
May 14	73	0655	89	1415	0	0655	0	1830	0	0655	0	1830
May 15	69	0700	80	1500	0	0700	0	1800	2-5	0700	4-8	1500
May 16	56	0645	74	1300	3	0645	3	1815	0-2	0645	3-8	1300
July 1	68	0640	90	1130	0	0640	0	1130	1-3	0640	2-7	1100
July 2	65	0630	90	1030	0	0630	0	1030	1-2	0630	2-4	1030
July 3	73	0630	90	1045	5	0630	5	1045	0	0630	0-1	0800
July 4	70	0645	90	1015	0	0645	1	0800	0	0645	2-7	1015
July 5	72	0630	90	1000	0	0630	0	1000	0	0630	0	1000

Grid 4

Date	Temperature (F)				Cloud Cover (%)				Wind (mph)			
	Min	Time	Max	Time	Min	Time	Max	Time	Min	Time	Max	Time
April 26	59	0700	69	1500	10	1800	75	0700	1-4	1800	2-8	1500
April 27	53	0700	67	1500	15	0830	70	1500	1-6	1400	3-8	1800
April 28	56	0700	81	1400	0	0700	0	1815	0	0700	1-4	1400
April 29	52	0650	88	1600	0	0650	1	1600	1-3	0650	2-5	1600
April 30	60	0700	90	1200	0	0700	0	1200	0	0700	1-2	1200
May 25	66	0700	89	1400	60	0700	95	1615	0	0700	3-5	1615
May 26	63	0650	85	1330	0	0700	0	1800	1-3	1100	3-7	1800
May 27	58	0650	90	1430	0	0650	0	1430	1-3	1100	2-4	0650
May 28	61	0645	89	1220	0	0645	0	1800	1-3	0645	3-6	1100
May 29	62	0650	85	1300	0	1000	1	0650	0	1300	1	0650
June 24	61	0650	90	1230	0	0650	0	1230	1-4	1045	2-5	0650
June 25	67	0700	90	1300	0	0700	0	1300	0	0700	2-4	1300
June 26	75	0640	90	1050	0	0640	0	1050	0	0640	0	1050
June 27	70	0645	90	1020	0	0645	0	1020	1-2	0645	3-4	1020
June 28	76	0630	90	1010	0	0630	0	1010	2-3	0630	4-6	1010

Appendix 3. Mohave Ground Squirrel (MGS) Survey and Trapping Form

Part I – Project Information							
Grid #3	Project Name:	Bullhead Solar Project				Township:	9N
	Property Owner:	Private				Range:	14W
	Quad/Map Series:	Willow Springs				Section:	2
UTM Coordinates of grid corners (NAD 83, error <6m)							
NW Corner		NE Corner		SE Corner		SW Corner	
Easting	Northing	Easting	Northing	Easting	Northing	Easting	Northing
377640	3863000	378480	3863000	378480	3862895	377640	3862895

Acreage of Project Site (or linear distance):	27 Acres
Acreage of potential MGS habitat on site (or linear distance):	27 Acres
Visual Surveys of potential MGS habitat conducted on:	March 16, 2021
Visual Surveys conducted by:	Phil Brylski
Total # of grids:	1

Session	Start Date	End Date	Trapping Conducted By:
1	4/2/21	4/6/21	Phil Brylski
2	5/12/21	5/16/21	Phil Brylski
3	7/1/21	7/5/21	Phil Brylski

Part II –General Habitat Description	
Vegetation	
Dominant Perennials	creosote bush (*Larrea tridentata*),
Other Perennials	rayless goldenhead (*Acamptopappus sphaerocephalus*), Cooper's box thorn (*Lycium cooperi*), California buckwheat (*Eriogonum fasciculatum*)
Dominant Annuals	*Bromus sp.* (dry conditions)
Other Annuals	Indian rice grass (*Stipa hymenoides*), and one-sided blue grass (*Poa secunda*)

Land Forms (*i.e*., bajadas, washes): bajada

Soil Description: Cajon loamy sand, Hesperia fine sandy loam

Elevation: 2,760-2,780 ft. | Slope 1.75% (SE)

Part I – Project Information							
Grid #4	Project Name:	Bullhead Solar Project				Township:	10N
	Property Owner:	Private				Range:	14W
	Quad/Map Series:	Willow Springs				Section:	35
UTM Coordinates of grid corners (NAD 83, error <6m)							
NW Corner		NE Corner		SE Corner		SW Corner	
Easting	Northing	Easting	Northing	Easting	Northing	Easting	Northing
4A							
381652.9	3865334	382013.8	3865334	382014.1	3865142	381649.5	3865139
4B							
381373	3865128	381650.5	3865126	381649	3865038	381373.5	3865041
4C							
378234.6	3864350	378340.6	3864350	378234.7	3863510	378339.3	3863510

Acreage of Project Site (or linear distance):	27 Acres
Acreage of potential MGS habitat on site (or linear distance):	27 Acres
Visual Surveys of potential MGS habitat conducted on:	March 16, 2021
Visual Surveys conducted by:	Phil Brylski
Total # of grids:	1

Session	Start Date	End Date	Trapping Conducted By:
1	4/26/21	4/30/21	Phil Brylski
2	5/25/21	5/29/21	Phil Brylski
3	6/24/21	6/28/21	Phil Brylski

Part II –General Habitat Description	
Vegetation	
Dominant Perennials	creosote bush (*Larrea tridentata*),
Other Perennials	rayless goldenhead (*Acamptopappus sphaerocephalus*), Cooper’s box thorn (*Lycium cooperi*), California buckwheat (*Eriogonum fasciculatum*)
Dominant Annuals	*Bromus sp.* (dry conditions)
Other Annuals	Indian rice grass (*Stipa hymenoides*), and one-sided blue grass (*Poa secunda*)

Land Forms (*i.e*., bajadas, washes): bajada	
Soil Description: Cajon loamy sand, Hesperia fine sandy loam	
Elevation: 2,820-2,860 ft.	Slope 1.75% (SE)

Appendix F
Swainson's Hawk Survey Report

Bullhead Solar Project Swainson's Hawk, Raptor, and Raven Nest Surveys

Final 2021 Survey Report

Prepared for:

ICF
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Contact: Brad Haley

Prepared by:

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Contact: Rainey Barton

18 July 2021

BLOOM BIOLOGICAL INC.
research | consulting | conservation

REPORT CONTRIBUTORS

Field Surveys: Peter H. Bloom, Ph.D., and Kerry Ross

Report Authors: Rainey Barton and Peter H. Bloom

GIS & Maps: Rainey Barton

ABOUT BLOOM BIOLOGICAL, INC,

For more than 45 years, Bloom Biological, Inc. (BBI) has provided biological consulting services for large and small clients. Our resume of services includes raptor and endangered species research, biological monitoring, impact assessment, permitting, conservation planning and geospatial analysis. Our innovative approach has provided solutions to complex problems for clients and projects throughout a range of industries including alternative energy, residential development, and the public sector. Collectively, the management and staff of BBI hold permits or memoranda of understanding for participating in the conservation and recovery of more than a dozen endangered or threatened species, as well as several other special-status species, in California and the western United States. Over the years, BBI has established an impeccable relationship with the resource agencies, project proponents, and environmental organizations by skillfully balancing the needs and objectives of land planning, resource conservation, and the public interest. In addition to our work in California and the western United States, BBI biologists have worked in Alaska, Central and South America, Europe, Southern Asia, and the western Pacific. BBI is a certified Small Business Enterprise and Woman-owned Business Enterprise.

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1.0 INTRODUCTION

Bloom Biological, Inc. (BBI) was retained by ICF and EDF Renewables (EDFR) to conduct California Department of Fish and Wildlife (CDFW) and California Energy Commissions (CEC) protocol level surveys for nesting Swainson's Hawk (*Buteo swainsoni*) and nest surveys of other raptors and ravens in the vicinity of the proposed Bullhead Solar Project in Kern County, California. This report details the methods and results of the surveys conducted during the period of April 5, 2021, through July 14, 2021.

2.0 PROJECT DESCRIPTION

EDFR proposes the Bullhead Solar Project (project) to develop up to 170MWac solar photovoltaic capacity derived from tracker technology and up to 150 MW of battery storage. The proposed project encompasses approximately 1,844 acres of private land. The project includes solar development with associated PV panels, inverters, converters, generators, foundations, transformers, and five (5) options for generation-tie (gen-tie) routes, including two deviations to one option and one deviation to another to the Rosamond or Whirlwind Substations, only one of which would be constructed. The project also includes laydown yards, a meteorological station, a microwave/communication tower, a substation, and a temporary concrete batch plant. The project is located in the vicinity of Willow Springs in unincorporated Kern County, California.

3.0 STUDY AREA DESCRIPTION

The project site is southeast of the Tehachapi Mountains in the western portion of the Mojave Desert. It is approximately 50 miles southeast of the city of Bakersfield, 16 miles south of the city of Tehachapi, 8 miles northwest of the community of Rosamond, and 2 miles north of the community of Willow Springs. The Study Area (Figure 1) consists of the Bullhead Solar Project footprint and surrounding five-mile survey buffer (CDFW 2010) in the northern central region of the Antelope Valley of Kern and Los Angeles Counties. The Study Area is largely comprised of desert containing a mixture of urban development, alfalfa fields, native desert, fallow agricultural fields, nut orchards, and existing solar and wind development. A small area in the northern region of the 5-mile survey buffer falls within the foothills of the Tehachapi Mountains. This region was surveyed to assess the presence of suitable nesting habitat. As no suitable nesting habitat was observed here, it was excluded from the remainder of the protocol su

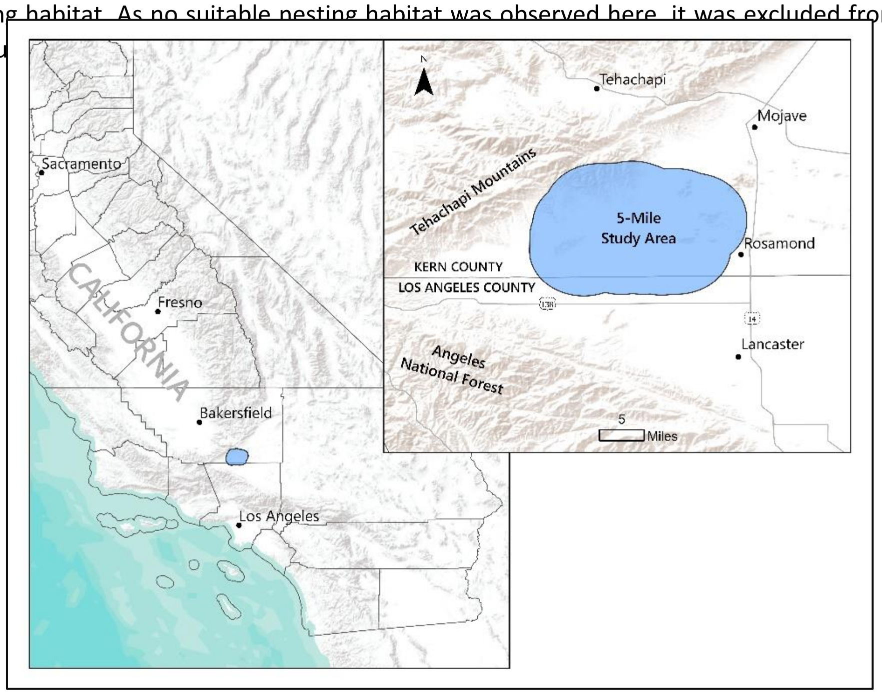


Figure 1. Study Area relative to the State (left) and Counties (right).

4.0 SURVEY METHODS

4.1 Survey Schedule and Methodology

BBI conducted protocol Swainson's Hawk surveys in accordance with the 2010 CDFW and CEC *Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California* ([CEC & CDFW Guidance] CEC & CDFW 2010). Surveys were conducted by BBI zoologist Peter H. Bloom and BBI biologist Kerry Ross from April 5, 2021, to July 14, 2021, for a total of 27 person/days of surveys (Table 1). As specified by the CEC & CDFW Guidance, surveys were conducted during the minimum three survey periods between April 1 and July 15, with three complete surveys per period each consisting of 3 person/days. Surveys were completed by driving slowly on roads through suitable habitat in the Study Area, while searching for Swainson's Hawks and their nests, using the vehicle as a "blind" to minimize disturbance to any hawks detected.

Swainson's Hawk surveys were conducted in accessible suitable habitat inside the Study Area, defined as the project footprint and all areas within 5 miles. Suitable nesting habitat for Swainson's Hawks in the Study Area was defined generally as low-growing agricultural areas, fallow agricultural fields, and native desert scrub bordered by or containing suitable nesting trees, and Joshua tree (*Yucca brevifolia*) woodland. Surveys for all other nesting raptors and ravens were conducted simultaneously, expanding the potential nesting habitat to include all suitable nest trees and structures throughout the Study Area (i.e., utility poles and towers, buildings, rocks, and cliffs).

The Study Area was divided into 6 quadrants and biologists systematically surveyed each quadrant, approximately 2 quadrants per day, before moving on to the next. The intent of this was to insure full coverage of the Study Area.

Table 2. Swainson's Hawk, Raptor, & Raven Nest Survey Schedule

Survey Period II *April 1 – April 30*	*Survey Period III* *May 1 – May 30*	*Survey Period IV* *June 1 – July 15*
4/5/2021, 4/6/2021, 4/7/2021	5/3/2021, 5/4/2021, 5/5/2021	6/7/2021, 6/8/2021, 6/9/2021
4/11/2021, 4/12/2021, 4/13/2021	5/13/2021, 5/14/2021, 5/15/2021	6/27/2021, 6/28/2021, 6/29/2021
4/21/2021, 4/22/2021, 4/23/2021	5/23/2021, 5/24/2021, 5/25/2021	7/12/2021, 7/13/2021, 7/14/2021

4.2 Data Collection

Data were collected in the field utilizing personal GPS devices and paper data forms as described below, which were subsequently scanned/transcribed into electronic format:

- New Nest – a form for documentation of new Swainson's Hawk, raptor, and corvid nests. Fields included:
  - Observer
  - Date
  - Time
  - Quadrant
  - Species
  - Nest Number
  - Location (GPS)
  - Distance from marked location to nest (m)
  - Direction from marked location to nest
  - Nest Substrate
  - Substrate Height (m)
  - Nest Tree Species
  - Nest Type
  - Nest Height (m)
  - Nest size (ft)
  - Age
  - Sex
  - Number of Individuals
  - Behavior
  - Band Numbers

- Description
- Nest Status
- Nest Stage
- Contents
- Quantity

- Nest Update – a form for updating the status of nests that had been previously document. Fields included:
    - Observer
    - Date
    - Time
    - Quadrant
    - Species
    - Nest Number
    - Nest Status
    - Nest Stage
    - Contents
    - Quantity
    - Band Numbers
    - Notes
- Raptor Locations – a form for documenting the location of any raptor observed. Fields included:
    - Observer
    - Date
    - Time
    - Quadrant
    - Species
    - Location (GPS)
    - Age
    - Sex
    - Number of Individuals
    - Behavior
    - Band Numbers
    - Description

4.3 Data Synthesis and Processing

The data forms were scanned at the conclusion of each field day and emailed to the project manager. Data was processed weekly, entered into the project's geospatial database, and then redistributed to biologists as a Google Earth KML file to reference during the following survey period. Forms with GPS location fields also prompted the surveyor to record a distance and direction to the subject being documented. The spatial locations were subsequently corrected based on that information.

4.4 Species Identification

Biologists determined the species that built or occupied all large stick nests discovered during surveys by observing adults present and exhibiting nesting behavior, the size of the nest, stick size, eggs and chicks, volume and height of excrement, and anthropogenic material if present. These distinctions were based on the experience of principal investigator (Dr. Bloom), which includes the entry and inspection of thousands of California raptor nests.

In southern California deserts, Common Raven (*Corvus corax)* and Red-tailed Hawk (*Buteo jamaicensis*) construct the most common large stick nests. Common Raven nests are most notably distinguished from Swainson's Hawk nests by the abundance of anthropogenic materials incorporated into the nest. Red-tailed Hawk nests are commonly significantly larger in size than Swainson's Hawk nests ranging from 2 to 3 ft in diameter and 1 to 3 feet tall. Great Horned Owls (*Bubo virginianus*) commonly usurp Common Raven, Red-tailed Hawk, and Swainson's Hawk nests and are best distinguished by the presence of pellets beneath the nest, the straight-down trajectory of fecal excrement, in addition to adults being present on the nest during daylight hours.

4.5 Nest Status

A nest was considered active if any of the following three conditions was met: (1) fresh nesting material such as sticks, grasses, or twigs had been added during the current nesting season, (2) the nest was found to contain eggs or young (dead or alive), or (3) an adult was observed on the nest in an incubating (or brooding) posture. Nests without any of these signs were considered inactive. A failed nest was an active nest that was determined not to have successfully fledged young. A successful nest was one that fledged at least one young (typically assumed if young were greater than 5.5 weeks old during an observation). Active nests found at the end of the nesting cycle to have considerable excrement in and around the nest were considered to have fledged. Due to the large abundance of Common Raven throughout the study area and the greater Mojave Desert, no attempt was made to document nest success in this species and only active Common Raven nests were recorded.

5.0 RESULTS AND DISCUSSION

BBI's surveys identified 79 nests of 4 species in the Study Area. These results are discussed in the following sections. Nests are summarized in tabular format in Appendix A, Tables 1-4. Maps showing the same data are provided in Appendix B, Maps 1-4. As raptor nests are sensitive resources, locations in the results maps are displayed via 100-acre hexagonal grids to obscure precise location information.

5.1 Swainson's Hawk

A total of 12 Swainson's Hawk nests were documented during the survey within the 5-mile Study Area. Of the documented nests, 7 were documented as active in 2021 and all failed prior to fledging or egg laying. Five known historical nests were observed within the 5-mile Study Area and determined to be inactive in 2021. One additional historical nest site (SWH-13), at which the nest appears to have been removed since the 2020 breeding season, was previously documented by BBI and reported to the CDFW California Natural Diversity Database (CNDDB) as having been active in the last 5 years (CDFW 2021). There are a total of 11 nest sites within the Study Area that have been documented as active within the last 5 years (2017-2021). These data are provided in Appendix A, Table 1 and Appendix B, Map 1.

The following summarizes the status of documented Swainson's Hawk nests active in 2021 within the 5-mile Study Area:

- SWHA-01 – located south of Willow Springs, active and failed in 2021.
- SWHA-02 – located south of Willow Springs, active and failed in 2021.
- SWHA-03 – located southwest of Willow Springs, active and failed in 2021.
- SWHA-04 – located north of Willow Springs, active and failed in 2021.
- SWHA-05 – located north of Willow Springs, active and failed in 2021.
- SWHA-06 – located west of Willow Springs, active and failed in 2021.
- SWHA-07 – located southwest of Rosamond, active and failed 2021.

The following summarizes the status of the known historical Swainson's Hawk nests documented as inactive in 2021 within the 5-mile Study Area:

- SWHA-08 – located south of Willow Springs, known historical nest inactive in 2021.
- SWHA-09 – located south of Willow Springs, known historical nest inactive in 2021.
- SWHA-10 – located southwest of Willow Springs, known historical nest inactive in 2021.
- SWHA-11 – located north of Willow Springs, known historical nest inactive in 2021.
- SWHA-12 – located southeast of Willow Springs, known historical nest inactive in 2021.

In addition to the nests observed in 2021, there is 1 known historical Swainson's Hawk nest site within the 5-mile Study Area that has been active within the last 5-years at which a nest no longer remains:

- SWHA-13 – located southwest of Willow Springs, known historical nest site where nest was potentially removed between the 2020 and 2021 Swainson's Hawk breeding season. This nest removal occurred independent of and without knowledge by the project proponents or BBI.

5.2 Red-tailed Hawk

A total of 8 Red-tailed Hawk nests were documented during the survey within the 5-mile Study Area. Of these nests, 4 successfully fledged young, 1 failed prior to fledging or egg laying, 1 was inactive, and the outcome of 2 nests was undocumented. These data are provided in Appendix A, Table 2 and Appendix B, Map 2.

The following summarizes the status of documented Red-tailed Hawk nests within the 5-mile Study Area:

- RTHA-01 – located north of Willow Springs, active in 2021 and failed.
- RTHA-02 – located north of Willow Springs, active in 2021 and success undocumented.
- RTHA-03 – located northwest of Willow Springs, fledged young in 2021.
- RTHA-04 – located northwest of Willow Springs, fledged young in 2021.
- RTHA-05 – located southwest of Rosamond, fledged young in 2021.
- RTHA-06 – located west of Willow Springs, fledged young in 2021.
- RTHA-07 – located southwest of Willow Springs, inactive in 2021.
- RTHA-08 – located northeast of Willow Springs, active in 2021 and success undocumented.

5.3 Great Horned Owl

A total of 4 Great Horned Owl nests were documented during the survey within the 5-mile Study Area. Of these nests, 1 successfully fledged young and 3 were inactive during the 2021 season. These data are provided in Appendix A, Table 3 and Appendix B, Map 3.

The following summarizes the status of documented Great Horned Owl nests within the 5-mile Study Area:

- GHOW-01 – located north of Willow Springs, inactive in 2021.
- GHOW-02 – located southwest of Rosamond, inactive in 2021.
- GHOW-03 – located north of Willow Springs, fledged young in 2021.
- GHOW-04 – located south of Willow Springs, inactive in 2021.

5.4 Common Raven

A total of 55 Common Raven nests were documented during the survey within the 5-mile Study Area. The objective of the Common Raven nest surveys was to document the locations of the active nests within the Study Area. As such, nest success was not documented for this species. These data are provided in Appendix A, Table 4 and Appendix B, Map 4.

The following summarizes the status of documented Common Raven nests within the 5-mile Study Area:

- CORA-01 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-02 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-03 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-04 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-05 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-06 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-07 – located northeast of Willow Springs, active in 2021 and success unknown.
- CORA-08 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-09 – located northeast of Willow Springs, active in 2021 and success unknown.
- CORA-10 – located northeast of Willow Springs, active in 2021 and success unknown.
- CORA-11 – located northeast of Willow Springs, active in 2021 and success unknown.
- CORA-12 – located northeast of Willow Springs, active in 2021 and success unknown.
- CORA-13 – located northeast of Willow Springs, active in 2021 and success unknown.

- CORA-14 – located northeast of Willow Springs, active in 2021 and success unknown.
- CORA-15 – located east of Willow Springs, active in 2021 and success unknown.
- CORA-16 – located east of Willow Springs, active in 2021 and success unknown.
- CORA-17 – located east of Willow Springs, active in 2021 and success unknown.
- CORA-18 – located east of Willow Springs, active in 2021 and success unknown.
- CORA-19 – located east of Willow Springs, active in 2021 and success unknown.
- CORA-20 – located southeast of Willow Springs, active in 2021 and success unknown.
- CORA-21 – located southeast of Willow Springs, active in 2021 and success unknown.
- CORA-22 – located southeast of Willow Springs, active in 2021 and success unknown.
- CORA-23 – located southeast of Willow Springs, active in 2021 and success unknown.
- CORA-24 – located southeast of Willow Springs, active in 2021 and success unknown.
- CORA-25 – located southeast of Willow Springs, active in 2021 and success unknown.
- CORA-26 – located south of Willow Springs, active in 2021 and success unknown.
- CORA-27 – located south of Willow Springs, active in 2021 and success unknown.
- CORA-28 – located south of Willow Springs, status and success unknown in 2021.
- CORA-29 – located south of Willow Springs, active in 2021 and success unknown.
- CORA-30 – located south of Willow Springs, active in 2021 and success unknown.
- CORA-31 – located southwest of Rosamond, active in 2021 and success unknown.
- CORA-32 – located south of Willow Springs, active in 2021 and success unknown.
- CORA-33 – located south of Willow Springs, active in 2021 and success unknown.
- CORA-34 – located south of Willow Springs, active in 2021 and success unknown.
- CORA-35 – located south of Willow Springs, active in 2021 and success unknown.
- CORA-36 – located south of Willow Springs, active in 2021 and success unknown.
- CORA-37 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-38 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-39 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-40 – located southwest of Willow Springs, active in 2021 and success unknown.
- CORA-41 – located southwest of Willow Springs, active in 2021 and success unknown.
- CORA-42 – located southwest of Willow Springs, active in 2021 and success unknown.
- CORA-43 – located west of Willow Springs, active in 2021 and success unknown.
- CORA-44 – located west of Willow Springs, active in 2021 and success unknown.
- CORA-45 – located south of Willow Springs, active in 2021 and success unknown.
- CORA-46 – located in Willow Springs, active in 2021 and success unknown.
- CORA-47 – located in Willow Springs, active in 2021 and success unknown.
- CORA-48 – located in Willow Springs, active in 2021 and success unknown.
- CORA-49 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-50 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-51 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-52 – located north of Willow Springs, active in 2021 and success unknown.
- CORA-53 – located northwest of Willow Springs, active in 2021 and success unknown.
- CORA-54 – located southeast of Willow Springs, active in 2021 and success unknown.
- CORA-55 – located south of Willow Springs, active in 2021 and success unknown.

5.5 Other Species

Other notable species observed within the Study Area included 1 Golden Eagle (*Aquila chrysaetos*) and 1 Prairie Falcon (*Falco mexicanus*). The Golden Eagle was a second-year bird observed in the afternoon of April 11, flying in the northern region of the Study Area exhibiting foraging behavior (i.e., flying low and slow with head down). The adult Prairie Falcon was observed perched on a utility pole near fallow agricultural fields north of the proposed project area on the morning of June 28.

While no Long-eared Owl (*Asio otus*) nests were documented during this survey effort, this species has been known to nest in abandoned Common Raven nests located in tamarisk trees in the Antelope Valley in the recent past and have the potential to occur within the Study Area. Additionally, no American Kestrel (*Falco sparverius*) nests were observed, but they have the potential to nest in cavities within the Study Area.

6.0 LITERATURE CITED

California Energy Commission and Department of Fish and Wildlife. 2010. Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California.

California Department of Fish and Wildlife. 2021. California Natural Diversity Database (CNDDB) – Commercial version dated April 1, 2021. Retrieved April 3, 2021 from https://map.dfg.ca.gov/rarefind/view/RareFind.aspx

APPENDIX A. SURVEY RESULTS TABLES

Note: The following describes the fields in each table:

- ID: Nest number
- Date: Date the nest was last checked in the field.
- Status: Status of the nest at time of last update.
- Activity: Bird activity at the nest at time of last update.
- Contents: Contents of the nest at time of last update.
- Quantity: Quantity of eggs or chicks, if any, at time of last update.

Table 1. Swainson's Hawk Nests

Table 2. Red-tailed Hawk Nests

Table 3. Great Horned Owl Nests

Table 4. Common Raven Nests

Table 1. Swainson's Hawk Nests

ID	Date	Status	Activity	Contents	Quantity	Active between 2017-2021
SWHA-01	7/13/2021	Failed	None	Unknown	Unknown	Yes
SWHA-02	7/13/2021	Failed	None	Unknown	Unknown	Yes
SWHA-03	7/12/2021	Failed	None	Unknown	Unknown	Yes
SWHA-04	7/13/2021	Failed	None	Unknown	Unknown	Yes
SWHA-05	7/13/2021	Failed	None	Unknown	Unknown	Yes
SWHA-06	7/12/2021	Failed	None	Unknown	Unknown	Yes
SWHA-07	7/14/2021	Failed	None	Empty	0	Yes
SWHA-08	7/13/2021	Inactive	None	Empty	0	Yes
SWHA-09	6/17/2021	Inactive	None	Empty	0	Yes
SWHA-10	7/12/2021	Inactive	None	Empty	0	Yes
SWHA-11	7/7/2021	Inactive	None	Empty	0	No
SWHA-12	7/7/2021	Inactive	None	Empty	0	No
SWHA-13	7/13/2021	Inactive	None	Nest is gone	0	Yes

Table 2. Red-tailed Hawk Nests

ID	Date	Status	Activity	Contents	Quantity
RTHA-01	7/7/2021	Failed	None	Unknown	Unknown
RTHA-02	7/8/2021	Inactive	None	Unknown	Unknown
RTHA-03	7/7/2021	Fledged	None	Unknown	At least 1
RTHA-04	7/7/2021	Fledged	None	Unknown	At least 1
RTHA-05	5/24/2021	Active	Feeding	Nestlings	At least 1
RTHA-06	6/28/2021	Fledged	None	Unknown	At least 1
RTHA-07	7/7/2021	Inactive	None	Unknown	Unknown
RTHA-08	5/5/2021	Active	Incubating	Unknown	Unknown

Table 3. Great Horned Owl Nests

ID	Date	Status	Activity	Contents	Quantity
GHOW-01	4/23/2021	Inactive	None	Empty	0
GHOW-02	7/7/2021	Inactive	None	Empty	0
GHOW-03	6/28/2021	Fledged	None	Empty	2
GHOW-04	7/8/2021	Inactive	None	Empty	0

Table 4. Common Raven Nests

ID	Date	Status	Activity	Contents	Quantity
CORA-01	4/23/2021	Active	Incubating	Unknown	Unknown
CORA-02	4/23/2021	Active	Incubating	Unknown	Unknown
CORA-03	4/11/2021	Active	Incubating	Unknown	Unknown
CORA-04	4/12/2021	Active	Building	Unknown	Unknown
CORA-05	4/23/2021	Active	Building	Unknown	Unknown
CORA-06	4/12/2021	Active	Incubating	Unknown	Unknown
CORA-07	4/12/2021	Active	Adult at nest	Unknown	Unknown
CORA-08	4/22/2021	Active	Incubating	Unknown	Unknown
CORA-09	5/5/2021	Active	Incubating	Unknown	Unknown
CORA-10	5/25/2021	Inactive	None	Unknown	Unknown
CORA-11	5/5/2021	Active	Incubating	Unknown	Unknown
CORA-12	5/25/2021	Inactive	None	Unknown	Unknown
CORA-13	5/25/2021	Active	Incubating	Unknown	Unknown
CORA-14	4/7/2021	Active	Incubating	Unknown	Unknown
CORA-15	4/12/2021	Active	Adult at nest	Unknown	Unknown
CORA-16	4/12/2012	Active	Incubating	Unknown	Unknown
CORA-17	4/12/2021	Active	Incubating	Unknown	Unknown
CORA-18	4/12/2021	Active	Adult at nest	Unknown	Unknown
CORA-19	5/5/2021	Active	Adult at nest	Nestlings	At least 1
CORA-20	4/12/2021	Active	Adult at nest	Unknown	Unknown
CORA-21	4/22/2021	Active	Building	Unknown	Unknown
CORA-22	4/12/2021	Active	Building	Unknown	Unknown
CORA-23	4/12/2021	Active	Building	Unknown	Unknown
CORA-24	4/12/2021	Active	Incubating	Unknown	Unknown
CORA-25	4/12/2021	Active	Building	Unknown	Unknown
CORA-26	4/22/2021	Active	Incubating	Unknown	Unknown
CORA-27	4/7/2021	Active	Incubating	Unknown	Unknown
CORA-28	4/22/2021	Active	Adult at nest	Unknown	Unknown
CORA-29	4/7/2021	Active	Incubating	Unknown	Unknown
CORA-30	4/5/2021	Active	Incubating	Unknown	Unknown
CORA-31	4/22/2021	Active	Building	Unknown	Unknown

ID	Date	Status	Activity	Contents	Quantity
CORA-32	4/22/2021	Active	Incubating	Unknown	Unknown
CORA-33	4/22/2021	Active	Building	Unknown	Unknown
CORA-34	5/13/2021	Active	Feeding	Nestlings	At least 1
CORA-35	5/23/2021	Active	Chicks at nest	Nestlings	Unknown
CORA-36	5/13/2021	Active	Building	Unknown	Unknown
CORA-37	5/4/2021	Active	Building	Unknown	Unknown
CORA-38	5/4/2021	Active	Incubating	Unknown	Unknown
CORA-39	5/4/2021	Active	Incubating	Unknown	Unknown
CORA-40	4/5/2021	Active	Adult at nest	Unknown	Unknown
CORA-41	6/28/2021	Fledged	None	Unknown	At least 1
CORA-42	6/28/2021	Inactive	None	Unknown	Unknown
CORA-43	4/23/2021	Active	Incubating	Unknown	Unknown
CORA-44	5/24/2021	Active	Incubating	Unknown	Unknown
CORA-45	6/28/2021	Fledged	None	Unknown	At least 1
CORA-46	4/7/2021	Active	Incubating	Unknown	Unknown
CORA-47	4/7/2021	Active	Incubating	Unknown	Unknown
CORA-48	5/13/2021	Active	Building	Unknown	Unknown
CORA-49	5/25/2021	Active	Chicks at nest	Nestlings	At least 1
CORA-50	6/28/2021	Fledged	None	Empty	At least 2
CORA-51	6/28/2021	Fledged	None	Empty	At least 2
CORA-52	5/13/2021	Active	Incubating	Unknown	Unknown
CORA-53	5/25/2021	Active	Adult at nest	Unknown	Unknown
CORA-54	4/7/2021	Active	Incubating	Unknown	Unknown
CORA-55	4/22/2021	Active	Incubating	Unknown	Unknown

APPENDIX B. SURVEY RESULTS MAPS

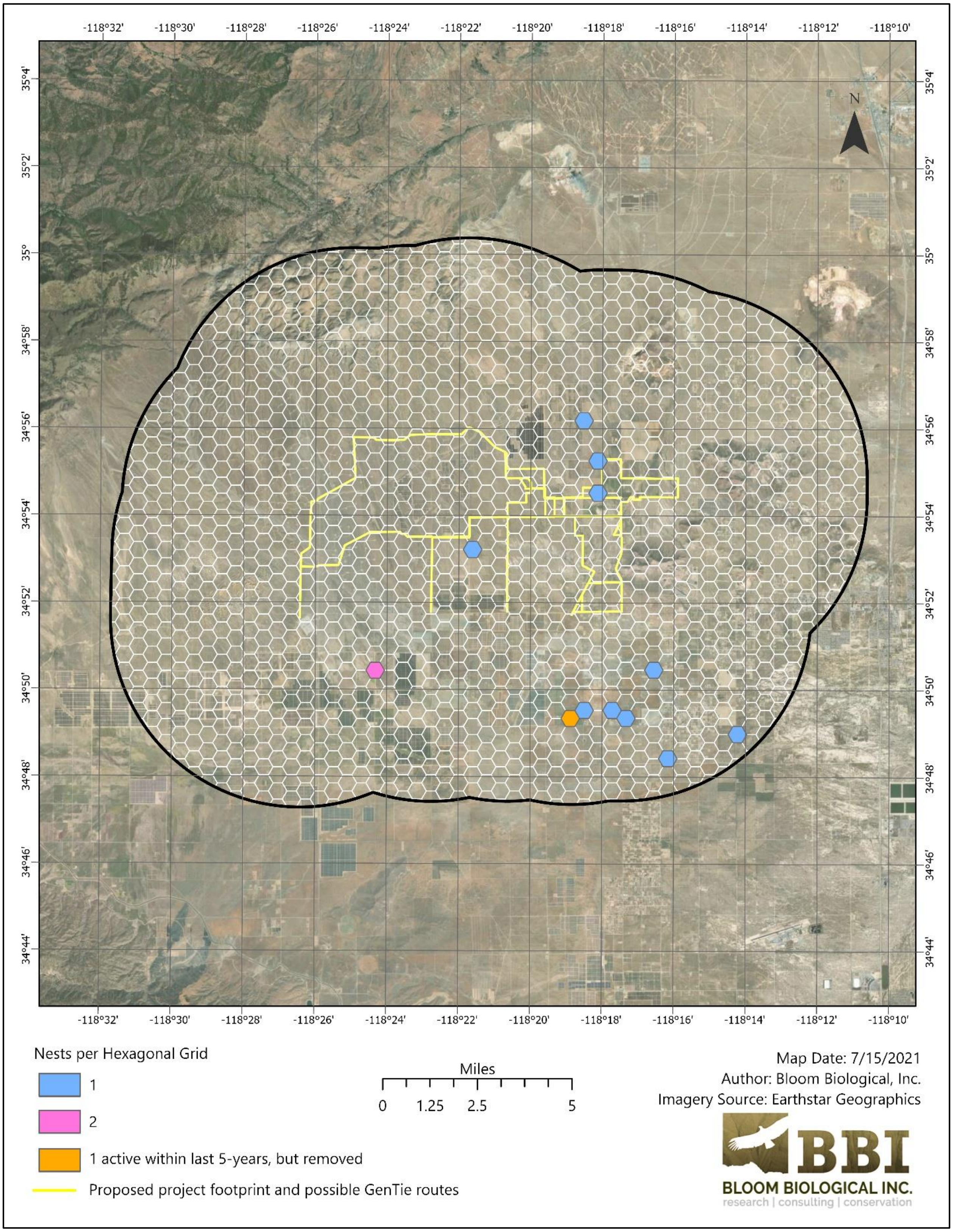
Map 1. Swainson's Hawk Nests

Map 2. Red-tailed Hawk Nests

Map 3. Great Horned Owl Nests

Map 4. Common Raven Nests

Map 1. Swainson's Hawk Nests



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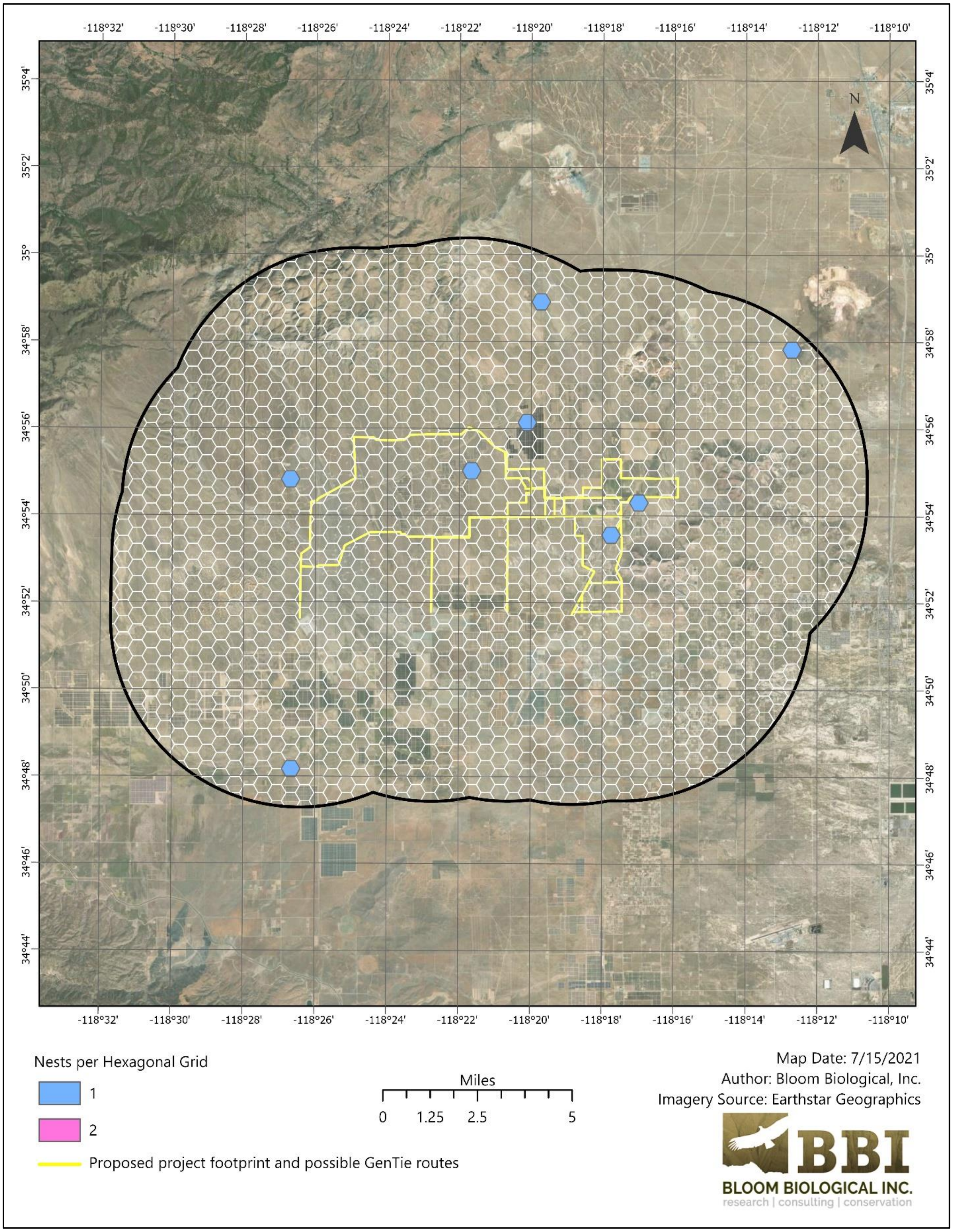
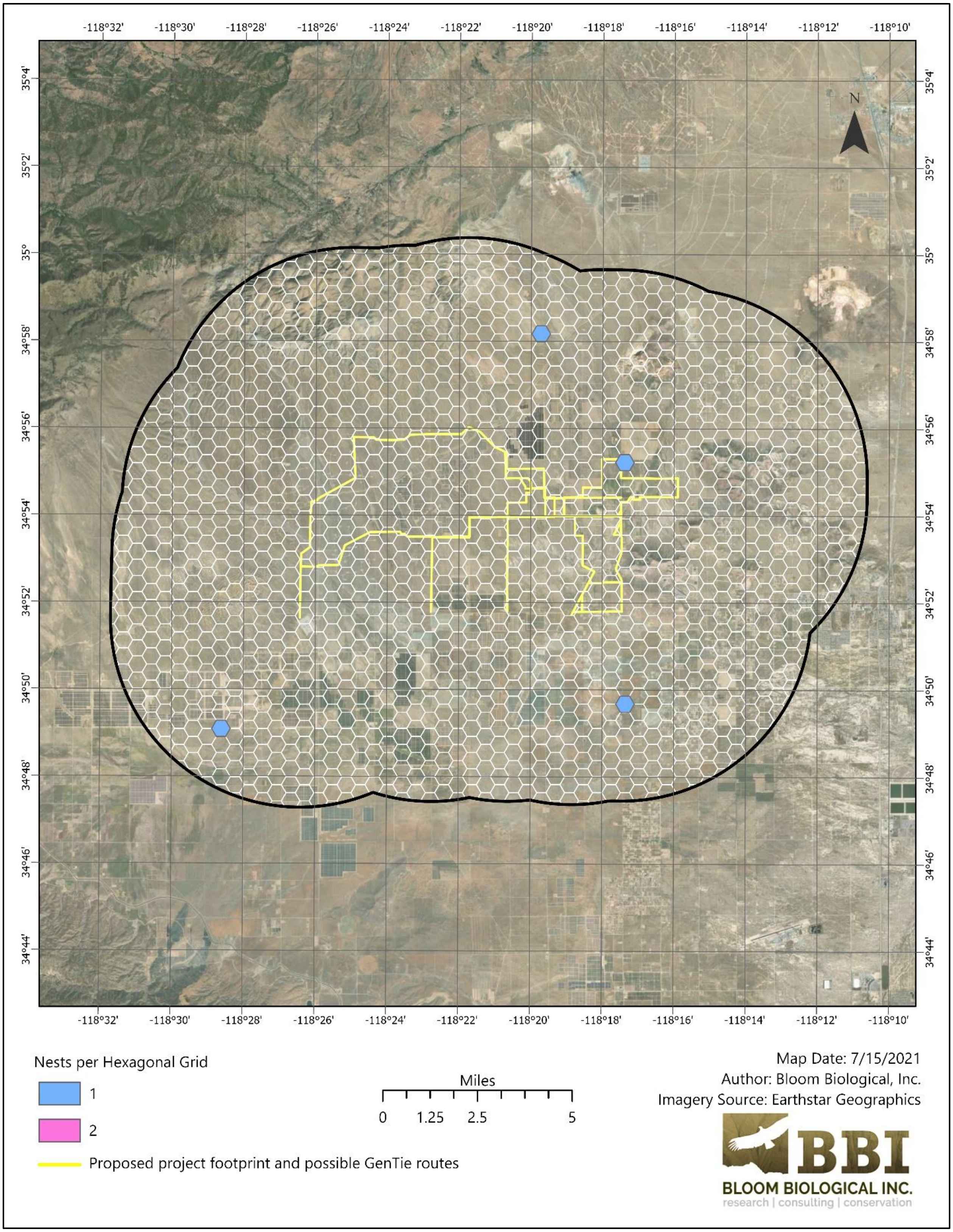
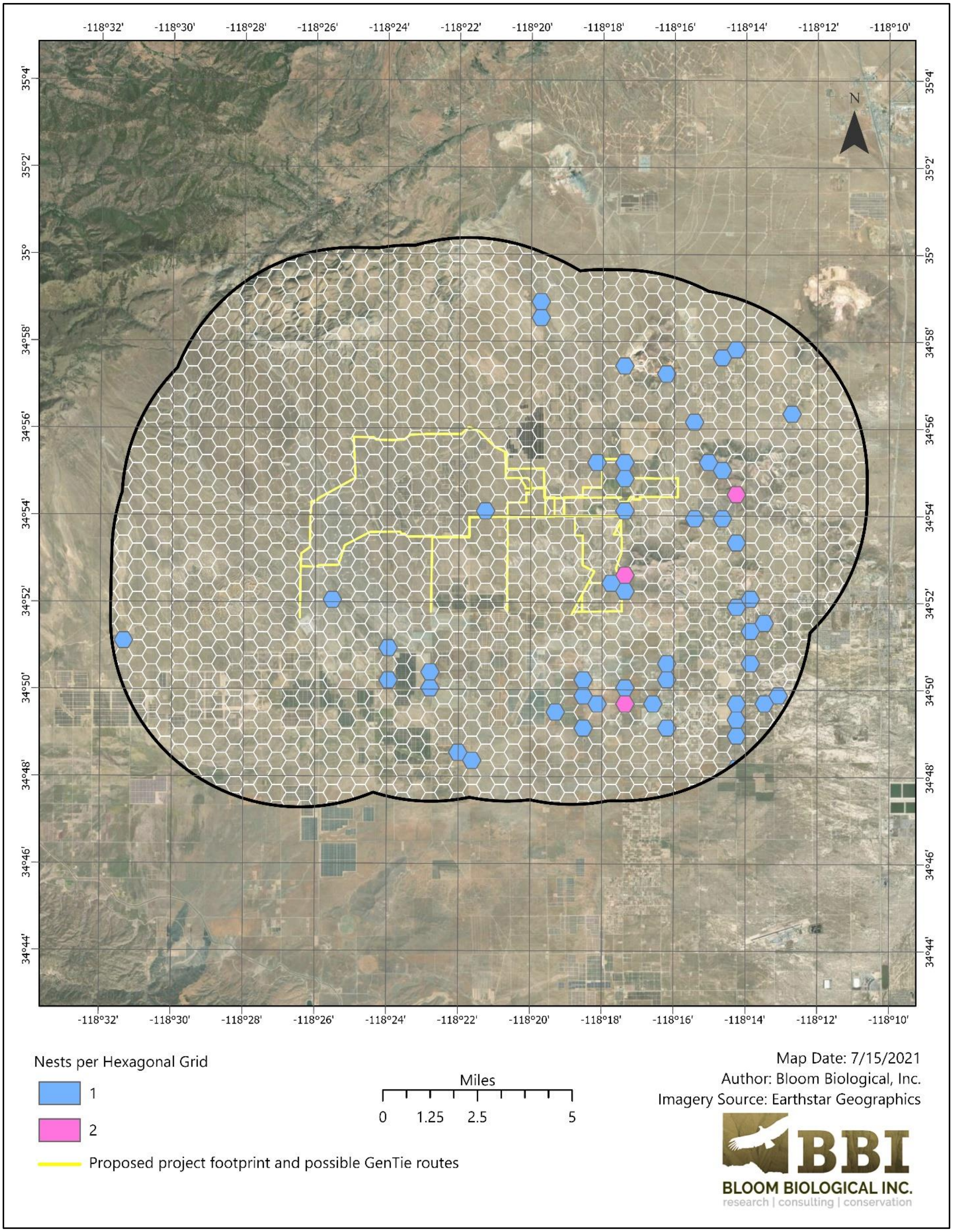
Map 2. Red-tailed Hawk Nests



Map 3. Great Horned Owl Nests



Map 4. Common Raven Nests



Appendix G
Jurisdictional Waters Report

Bullhead Solar Facility and Gen-tie Jurisdictional Waters Report

June 2022

Prepared For:
Kern County
Army Corp of Engineers
California Department of Fish and Wildlife and
Lahontan Region South Basin Regional Water Quality Control Board (Region 6)

Prepared By:
Heritage Environmental Consultants, LLC

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1. Introduction

Heritage Environmental Consultants (Heritage) was retained by EDF Renewables Development, (EDFR) LLC to conduct a jurisdictional delineation to determine the extent of lakes, rivers, or streambeds and associated riparian vegetation pursuant to the California Fish and Game Code, regulated by the California Department of Fish and Wildlife (CDFW) within the EDFR Bullhead Solar Project (Solar + Storage Facility) and multiple generation-tie ("gen-tie") options (totaling 26.5 miles in length) in Kern County, California (the "Project"). Boundaries of potential waters of the U.S. (WOTUS) and waters of the state (WOS) were also determined, as regulated by the U.S. Army Corps of Engineers (USACE), the State Water Resources Control Board (SWRCB) and the Lahontan Regional Water Quality Control Board (RWQCB), which regulate discharges of waste that could affect WOTUS and/or WOS.

The purpose of conducting this delineation was:

1. Map all potentially jurisdictional CDFW, USACE and RWQCB features at the Bullhead Project site using accepted methodologies, comments, and direction provided during a site visit with CDFW and the RWQCB at an adjacent project site on June 7 and 8, 2018;
2. Revisit all CDFW and RWQCB features that were previously mapped for the adjacent BigBeau Solar Project (BBSP) that fall within the Bullhead study area. BBSP has been constructed and several features along the proposed Bullhead gen-tie routes were mapped during a jurisdictional waters survey for BBSP.
3. Provide data to EDFR to allow for site re-design to avoid or minimize impacts to CDFW, USACE and RWQCB jurisdictional features.

2. Bullhead Solar Project Description

The proposed Project would produce up to 270 megawatts (MW) (alternating current or "AC") of solar photovoltaic (PV) capacity derived from fixed-tilt or tracker technology, and up to 270 MW of battery storage. The proposed Project includes solar development with associated PV panels; inverters; converters; generators; foundations; transformers; and optional gen-tie routes to the Rosamond and Whirlwind Substations, only one of which would be constructed. The proposed Project also includes laydown yards, access roads, a meteorological tower, a microwave/communication tower, and a substation. See **Attachment A** for the general Project location.

3. Environmental Setting

For the purposes of this Jurisdictional Delineation, the "study area" consists of approximately 1,775 acres of land. The study area is composed of all land within the Project including the solar facility area, proposed gen-tie options including an approximately 125-foot right-of-way (ROW; different sized ROWs exist for several of the options based on land ownership and location), and access routes (**Attachment A**). The study area is located in southern Kern County, California, approximately 12 miles south of State Route (SR) 58 and approximately 33 miles east of Interstate 5. The Antelope Valley Freeway (SR 14) is approximately 6 miles to the east and SR 138 (West Avenue D) is approximately 8 miles to the south. Tehachapi Willow Springs Road runs north-south through the eastern portion of the solar facility. The solar facility is generally bound by Favorito Avenue to the south, Champagne Avenue to the north, 105th Street West to the west, and 75th Street West to the east. The gen-tie options are located generally to the south and northwest of the solar facility area. Several access routes to the Project site are proposed. The primary access runs along Tehachapi Willow Springs Road and the secondary option runs north from Rosamond Boulevard along 120th Street West. After following 120th Street West to the north, the secondary option would reach the fully permitted BigBeau Project site and would run through the BigBeau Project area to the Bullhead Project (**Attachment A**).

The study area is located in the northwestern portion of the Antelope Valley on the U.S. Geological Survey (USGS) Tylerhorse Canyon, Willow Springs, Little Buttes, and Fairmont Butte 7.5- minute quadrangles. The study area is located within the western Mojave Desert, a region that occurs between the hot, low-elevation Sonoran Desert to the south and the relatively cool, high-elevation Great Basin to the north. Temperatures in the study area vary significantly, with highs typically exceeding 100 degrees Fahrenheit (°F) in the summer to lows of near 40°F in the winter. Average annual precipitation is about 5 inches.

3.1. Topography

The study area lies on a gentle south-facing slope below the Tehachapi Mountains in the northwestern portion of the Antelope Valley and on the relatively flat Antelope Valley floor. Elevation within the area ranges from 2,477–3,465 feet above mean sea level (amsl).

3.2. Vegetation Communities

The features in the study area traverse lands dominated by Creosote Bush Scrub (Holland 1986; Thomas et al. 2004; CNPS 2021). Other communities include Allscale Scrub, California Buckwheat Scrub, Cheesebush–Sweetbush Scrub, Creosote Bush-White Bursage Scrub, Joshua Tree Woodland, Mulefat Thicket, Rubber Rabbitbrush Scrub, Ruderal Desert Forb Patches, Scale Broom Scrub, Snakeweed Scrub, Tamarisk Grove, Active Agriculture, Inactive Agriculture/Fallow Field, Disturbed Habitat, and Urban/Developed (Holland 1986; Thomas et al. 2004; CNPS 2021) and are described in more detail below. Vegetation communities within the study area are taken from the Bullhead Solar Project Biological Technical Report (BTR, ICF 2022). It should be noted that approximately half of the Antelope Valley watershed (encompasses approximately 3,369 square miles in Kern, Los Angeles, and San Bernardino counties) experienced a fire event during 2007, changing vegetation regimes across the area.

Allscale Scrub

Allscale scrub is a low-growing, shrub community typically found on fine-textured, poorly drained soils with high alkalinity and dominated (i.e., greater than 50 percent relative cover) by allscale (*Atriplex polycarpa*) (Thomas et al. 2004; CNPS 2021). The shrub canopy is typically less than 6 feet in height with an open to continuous cover and a variable herbaceous cover that may include seasonal annuals (CNPS 2021).

Within the study area, allscale scrub is strongly dominated by allscale with little to no shrub diversity. Associated shrub species when present may include rubber rabbitbrush (*Ericameria nauseosa*), cheesebush (*Ambrosia salsola*), sticky snakeweed (*Gutierrezia microcephala*), wirelettuce (*Stephanomeria pauciflora*), and fourwing saltbush (*Atriplex canescens*). Where this community intergrades with creosote bush scrub, it may be codominant with creosote bush (*Larrea tridentata*), and shrub diversity increases with such species as white bursage (*Ambrosia dumosa*), cheesebush and Nevada ephedra (*Ephedra nevadensis*). The understory was composed primarily of annual nonnative grasses and forbs. Allscale scrub exists in tracts of varying quality and species composition within the study area. Disturbed allscale scrub is characterized by reduced native shrub cover, with higher cover from ruderal, nonnative annual grasses and forbs. The community is a commonly encountered vegetation type located predominantly along the southern portion of the study area within the proposed Rosamond gen-tie line options and proposed Project site.

California Buckwheat Scrub

California buckwheat scrub is typically a disturbance-maintained or successional shrub community dominated or codominated (50 percent or greater relative cover) by California buckwheat (*Eriogonum fasciculatum*) (Sawyer et al. 2009; CNPS 2021) within the shrub layer. The shrub canopy is open-to-continuous and typically less than 6 feet in height and emergent trees may be present (CNPS 2021).

Within the study area, this community is dominated by California buckwheat with associated shrubs, such as rubber rabbitbrush, and sticky snakeweed, creosote bush, cheesebush, and Nevada ephedra commonly present within the shrub layer. The understory was composed of nonnative grasses and ruderal desert forbs. California buckwheat scrub is located within the southern-central portion of the study area along the proposed secondary access route.

Cheesebush-Sweetbush Scrub

Cheesebush–sweetbush scrub is characterized by the dominance of cheesebush, a low-growing, perennial shrub having greater than 1-percent absolute cover in the shrub canopy; other shrubs, if present, have less than half the cover of cheesebush, except desert lavender (*Hyptis emoryi*) and desert sage (*Salvia dorrii*), which may have higher cover (Thomas et al. 2004). The shrub canopy is typically less than 6 feet in height with an open-to-intermittent cover, and the herbaceous cover is variable and may include seasonal annuals (CNPS 2021).

Cheesebush–sweetbush scrub within the study area was typically associated with previous ground disturbance and is strongly dominated by cheesebush. Associated shrub species within this community include California buckwheat, rubber rabbitbrush, sweetbush (*Bebbia juncea*), Nevada ephedra, and Acton encelia (*Encelia actoni*). The herbaceous layer comprises nonnative grasses and ruderal forbs. Cheesebush–sweetbush scrub occurs in relatively small patches at several locations along the Whirlwind Gen-tie Line and secondary access route within the study area.

Creosote Bush Scrub

Creosote bush scrub is typically a widely spaced and often diverse shrub community, with creosote bush characteristically present within the shrub layer, and no shrubs with cover greater than creosote bush except for the following exceptions: rayless goldenhead (*Acamptopappus sphaerocephalus*), sweet bush, green rabbitbrush (*Ericameria teretifolia*), rhatany (*Krameria spp.*) Mormon tea (*Ephedra nevadensis*) or buckhorn cholla (*Cylindropuntia acanthocarpa*), which may have higher cover, but no more than two times the cover of creosote bush (Thomas et al. 2004; CNPS 2021). This community may support a large diverse herbaceous layer of spring ephemeral flowers and native perennial grasses. Shrub canopy height is typically less than 10 feet, with an open-to intermittent canopy, and emergent trees may be present at low cover, including honey mesquite (*Prosopis glandulosa*) and Joshua tree (CNPS 2021).

Creosote bush scrub within the study area varies from strongly dominated by creosote bush with a relative cover ranging from approximately 60 percent to greater than 90 percent to a highly diverse mix of desert shrub species. Associated shrub species varied widely within this community, from little shrub diversity with an understory composed of ruderal desert forbs to a highly diverse composition of nondominant shrub and perennial grasses, which included species such as Nevada ephedra, California buckwheat, Cooper's box thorn (*Lycium cooperi*), winter fat (*Krascheninnikovia lanata*), Mojave cottonthorn (*Tetradymia stenolepis*), hop sage (*Grayia spinosa*), beavertail cactus (*Opuntia basilaris var. basilaris*), cheesebush, Indian rice grass (*Stipa *hymenoides*), and one-sided blue grass (*Poa secunda*). In addition, Joshua trees can be widely scattered within this vegetation community. Appendix B of the BTR depicts the distribution of Joshua trees throughout the study area. Joshua trees, although very conspicuous, negligibly (i.e., less than 1 percent absolute cover) contribute to the overall percent cover, but remain a significant component of this vegetation community because they are the only arborescent species within the over-story. Creosote bush scrub within the study area exists in tracts of varying quality and species composition due to various past disturbances, including grazing, fire, and mechanical disturbance. Disturbed creosote bush scrub is characterized by reduced native shrub diversity, often limited to just a few associated species, such as Nevada ephedra, California buckwheat, white bursage, and Cooper's box thorn, along with a greater herbaceous cover composed of ruderal desert forbs and nonnative grasses. Creosote Bush Scrub is widespread throughout the study area, but does not occur within Rosamond Gen-tie Line Option 3.1.

Creosote Bush-White Bursage Scrub

Creosote bush–white bursage scrub is characterized by a codominance of creosote bush and white bursage within the shrub layer. White bursage may be higher in cover than creosote bush, but no other shrubs achieve a greater cover than creosote bush and white bursage, with the following exceptions: rayless goldenhead, sweetbush, buckthorn cholla, Nevada ephedra, green rabbitbrush, or rhatany may have higher cover, but no more than three times the height of creosote bush or white bursage (Thomas et al. 2004). The shrub canopy is typically less than 9 feet tall, with an open-to-intermittent cover; the herbaceous cover is typically composed of abundant seasonal annuals. Emergent trees may be present, but at low cover, including Joshua trees (CNPS 2021).

Creosote bush–white bursage scrub within the study area has an open shrub canopy with bare-to-intermittent ground cover composed primarily of nonnative grasses and native forbs. The shrub layer was generally more diverse than creosote bush scrub, with commonly observed species such as Nevada ephedra, California buckwheat, Cooper's box thorn, winter fat, Mojave cottonthorn, hop sage, Silver cholla (*Cylindropuntia echinocarpa*), beavertail cactus, desert beardtongue (*Penstemon fruticiformis*), cheesebush, Indian rice grass, and one-sided blue grass. This vegetation community integrates with both allscale scrub and creosote bush scrub within the study area. Like creosote bush scrub, Joshua trees can be widely scattered within this vegetation community. Joshua trees, although very conspicuous, negligibly (i.e., less than 1 percent absolute cover) contribute to the overall percent cover, but remain a significant component of this vegetation community because they are the only arborescent species within the over-story. This community is commonly encountered throughout much of the study area including on Whirlwind Gen-tie Options 1, 1.1 and 1.2.

Joshua Tree Woodland

Joshua tree woodland is characterized by the even distribution of Joshua trees at 1 percent or greater absolute cover within the tree canopy, with other tree species, such as junipers or pines, having less than 1 percent absolute cover. Joshua trees are long-lived, fast-growing trees that are emergent over a shrub or grass layer; tree canopy heights can reach 45 feet, but are typically less than 25 feet, and the shrub and herbaceous layer varies from open to closed (CNPS 2021). Joshua tree woodland is considered a sensitive natural community by CDFW.

Joshua tree woodland within the study area is an open tree and shrub canopy with an intermittent-to-continuous ground cover composed primarily of nonnative grasses, ruderal desert forbs, and sparse native forbs, such as fiddleneck (*Amsinkia sp.*) and angled-stem buckwheat (*Eriogonum angulosum*). Shrub composition is similar to creosote bush scrub, but at lower overall cover, and includes creosote bush, cheesebush, Nevada ephedra, silver cholla, California buckwheat, Cooper's lycium, and Acton encelia. Joshua tree woodland is restricted to a small area within the northeastern buffer of the proposed Project site.

Mulefat Thicket

Mulefat thicket is a dense, riparian shrub community dominated by or codominated by mulefat (*Baccharis salicifolia*). This community may form monotypic stands of mulefat or be composed of a diverse mix of riparian shrubs and emergent trees, which can include willows and other riparian tree species. The shrub cover is variable, typically less than 10 feet tall, with an open-to-intermittent herbaceous layer (CNPS 2021). Mulefat thickets are defined as a sensitive riparian vegetation community by CDFW.

Within the study area, the shrub canopy varies from intermittent to continuous and is strongly dominated by mulefat, with little shrub diversity. The herbaceous cover was intermittent-to-closed and primarily composed of nonnative grasses and ruderal desert forbs. Within the study area, a mulefat thicket is located within a small area on the northeastern portion of the proposed solar site, where existing farmland runoff contributes to mesic conditions needed for this vegetation community to establish and persist. The mulefat thicket occurs at the northern end of Feature BSP004.

Rubber Rabbitbrush Scrub

Rubber rabbitbrush scrub is a disturbance-maintained shrub community dominated (i.e., relative cover of 50 percent or greater) by rubber rabbitbrush, usually with evenly spaced gray shrubs that flower in late summer or fall (Holland 1986; CNPS 2021). Shrub canopy is open to continuous and typically less than 10 feet tall; emergent trees may be present, including Joshua tree, juniper, and pine (CNPS 2021).

Rabbitbrush scrub within the study area is dominated by rubber rabbitbrush with associated shrubs, such as California buckwheat, and sticky snakeweed, creosote bush, cheesebush, and Nevada ephedra commonly found within this community. The understory is composed of nonnative grasses and ruderal desert forbs. Large tracts of rubber rabbitbrush scrub are common throughout the study area and often occur within previously disturbed areas where ground disturbance, heavy grazing, or fire has occurred, as well as adjacent to roadsides. Disturbed rubber rabbitbrush scrub is characterized by reduced shrub diversity and cover, coupled with an increase in ruderal desert forbs. Rubber rabbitbrush scrub occurs within the proposed Project sites and Rosamond Gen-tie Options 1, 2, and 3.

Ruderal Desert Forbs Patches

Ruderal desert forb patches is a disturbance-maintained herbaceous community dominated by weedy, nonnative annual forbs with little to no native plant cover. Herbaceous cover is continuous to intermittent, typically less than 3 feet tall; shrubs and trees may be present, but at low cover.

Within the study area, ruderal desert forb patches are dominated or co-dominated by red stemmed filaree (*Erodium cicutarium*) or nonnative mustards (*Sisymbrium ssp*, and *Brassica spp.*). Native shrubs, such as California buckwheat, rabbitbrush, and cheesebush, may be present within this community, but cover is very low and less than 5 percent absolute cover. Ruderal desert forb patches are common throughout the study area and typically found where ground disturbance has previously occurred, such as areas of heavy grazing, abandoned fields, and waste areas, as well as adjacent to roadsides. Ruderal desert forb patches are common within the study area, but are not found within Rosamond Gen-tie Option 3.1 and Whirlwind Gen-tie Options 1, 1.1, and 1.2.

Scale Broom Scrub

Scale broom scrub is typically found within ephemeral washes and on alluvial fans with scale broom (*Lepidospartum squamatum*) characteristically present within the shrub layer (CNPS 2021). The shrub canopy is typically less than 6 feet tall, with an open-to-continuous cover; the herbaceous cover is variable and may be grassy, and emergent trees may be present, but at low cover (CNPS 2021). Scale broom scrub is considered a sensitive natural community by CDFW.

Scale broom scrub within the study area has an open shrub canopy with bare-to-intermittent ground cover composed primarily of nonnative grasses and native herbs on sandy soils. Shrub diversity is similar to creosote bush scrub, with species such as Acton encelia, creosote bush, cheesebush, and Nevada ephedra commonly present. Within the study area, this community occurs within a large wash (Cottonwood Creek) that crosses the Whirlwind Gen-tie within the western portion of the study area.

Snakeweed Scrub

Snakeweed scrub is typically a disturbance-maintained or successional shrub community that is dominated (i.e., 50 percent or greater relative cover) by sticky snakeweed or broom snakeweed (*Gutierrezia sarothrae*) (CNPS 2021). The shrub canopy is open to intermittent and typically less than 4 feet tall (CNPS 2021). Scale broom scrub is considered a sensitive natural community by CDFW.

Within the study area, this community is marked by low shrub cover strongly dominated by sticky snakeweed, with associated shrubs such as rubber rabbitbrush, allscale, and cheesebush scantly scattered throughout this community. The understory is open to intermittent and composed of nonnative grasses and ruderal desert forbs and native herbs, such as turkey-mullein (*Croton setiger*) and angled stem buckwheat. Within the study area, snakeweed scrub is found within Rosamond Gen-tie Option 2.

Tamarisk Grove

Tamarisk grove is a non-native woodland community characterized by athel tamarisk (*Tamarisk aphylla)* strongly dominant or codominant within the tree canopy. The tree canopy is open to continuous reaching heights up to 80 feet. The shrub layer, if present, is open to intermittent.

Within the study area, this community is associated with developments and agricultural lands that provide windbreak, shade, and aesthetics and is entirely composed by athel tree, which reach heights of up to 80 feet. The tree canopy is closed to intermittent, and a shrub layer was not present. The herbaceous layer is open to intermittent and composed of nonnative grasses and desert ruderal forbs. Within the study area, large linear tracks of tamarisk groves are present surrounding agricultural lands and developed lands within the Bullhead study area.

Active Agriculture

Lands that support active agricultural operations may be classified as active agriculture. This includes orchards of artificially irrigated land dominated by one or more tree species. Active agriculture includes planted fields, which are monoculture crops that are usually artificially seeded, irrigated, and maintained. Active agriculture also includes row crops comprised of annual and perennial crops grown in rows with open space between the rows.

Inactive Agriculture/Fallow Field

Inactive agriculture includes fields that were recently in planted fields or row crops, which are no longer being farmed. These areas are generally low in cover and dominated by nonnative forb species.

Disturbed Habitat

Disturbed habitat consists of areas that have experienced persistent mechanical disturbance, resulting in severely limited native plant growth, and are void of vegetation altogether (i.e., bare ground), or may have a high percentage cover of nonnative weedy broadleaf species (i.e., ruderal) or sparsely distributed native vegetation. Bare ground within the study area consists of abandoned dirt lots and unpaved roads, off-highway vehicle trails, as well as recently cleared areas that are planned for development or equipment staging.

Urban/Developed

Urban/developed land cover is characterized by areas that have been built on or otherwise physically altered to the extent that native vegetation is no longer supported. Developed land is characterized by permanent or semipermanent structures, pavement or hardscape, and landscaped areas that often require irrigation. Areas where no natural land is evident due to a large quantity of debris or other materials being placed on it may also be considered urban/developed (e.g., equipment staging area, quarry). Little to no vegetation occurs in these areas, other than ruderal, disturbance-loving species and a variety of ornamental (usually nonnative) plants.

3.3. Geomorphology and Soils

The study area is located in the Antelope Valley, at the western edge of the Mojave Desert. The western Mojave Desert is largely composed of a variety of non-marine sedimentary, pyroclastic, and volcanic rocks, and some marine sediments along the San Andreas fault zone. These sediments are underlain by a Tertiary crystalline basement complex that underwent deep erosion during the late Cretaceous and early Tertiary. The Tertiary rocks are locally deformed and cut by volcanic intrusions. Older alluvium, presumably of Pleistocene age, composed of semi-consolidated fanglomerate, gravel, sand, silt, and clay, underlies much of Mojave Desert, as much as 1,000 feet thick in some areas. The older alluvium is located primarily near the margins of the Antelope Valley at the flanks of the Sierra Pelona and Tehachapi Mountains and consists of weakly consolidated, uplifted and moderately to severely dissected alluvial fan and terrace deposits composed primarily of sand and gravel. These sediments are exposed and dissected in areas because of crustal movements and are overlain by Holocene alluvium deposits that consist of slightly dissected alluvial fan deposits of gravel, sand and clay (Mabey 1967; Dibblee 1960). Unweathered alluvial detritus (soil parent material) within about 15 km of the front of the Tehachapi Mountains and Transverse Ranges is composed almost entirely of sand or gravelly sand, with less than four percent silt and clay. In more distal areas, parent-material textures are finer and range from sandy loam to silt loam (Ponti 1985). Maps of the Quaternary geology of the Antelope Valley show that stream-terrace deposits can be continuously traced from the foothill valleys of both mountain ranges onto the basin floor, where upper Palmdale sediments form broad alluvial fans that grade laterally into one another.

All soils occurring within the study area (**Attachment B**) are entisols and are considered very deep, well drained to excessively drained (e.g., high infiltration rates and low runoff potential when thoroughly saturated, and water transmission through the soil is unimpeded) soils that formed in moderately coarse textured alluvium dominantly from granite. The soils underlying the study area are found on floodplains and alluvial fans and have slopes that range between 0 to 15 percent. Entisols are geologically young soils primarily originating from sediments and alluvium that show little alteration of the parent material from which they were derived, and that exhibit little pedogenesis (soil formation process). Since entisols are primarily associated with fluvial and aeolian (wind) processes and deposition, they are by nature dynamic and do not have the ability to develop buried soil horizons (Brady 1990; NRCS 2006; USDA 1970).

The study area is located on a broad alluvial slope called a bajada, and is comprised of a network of alluvial fans, active channels, dormant channels, abandoned channels, braided streams, interfluves, and floodplains that emanate from the Tehachapi range. Alluvial fans are gently sloping fan-shaped landforms that form where steep, confined mountain streams flow out onto a piedmont plain. They often resemble extended fans when viewed on maps or aerial photographs, but their morphology can be irregular forms bounded laterally by adjacent fans, bedrock outcrops, and relict fan surfaces, among other possibilities (House 2005). Stream channels are generally subject to flow path uncertainty due to rapid diversion of one channel to another in response to blockages and changes in sediment accumulation from previous flow events (CDFG 2010). This region of the Mojave is characterized by low precipitation, which rarely allows for surface runoff in the highly porous soils and colluvium. Parent material from mountain sources is generally only mobilized to lower fan areas during localized major storm events. Streams in this region are generally ephemeral to intermittent, and only flow in response to rain events. Because of the high infiltration rates of the sediments, consistent stream flow usually only occurs after periods of steady rain, typically during a wet winter. Heavy floods produce visually definable channels in streambeds, and localized flood events can produce overbank flow transporting sediment and debris onto the floodplain.

Even in the mountainous regions most streams flow only during or shortly after storms. Perennial water only flows in groundwater discharge areas associated with springs in a few mountain canyons, in Afton Canyon where the regional groundwater table intersects the canyon bottom, and a few other springs. In most areas within the Mojave region, streams will flow only after long periods of steady rain, typically during a wet winter. The periodicity and intensity of such rain events depends on elevation, but in the lower regions, historically, floods may only happen in intervals measured in several years to decades.

Floods produce the visually definable channels in streambeds (active channels). When water is not flowing in the stream between storm events, an active channel typically consists of sand, gravel, dried mud, or barren bedrock. Cut and fill sediment bedforms appear relatively fresh (where not trampled by animals, including humans). Flowing water strips away vegetation, moves sediment, and reconfigures bedforms in the channel. Sediment character and supply, slope, and flow volume and duration are controlling factors that defines the size of stream channels and the character of sediment found in the barren channel once a flood event is over. In canyons above the mountain front, stream channels are typically filled with angular rock fragments ranging from coarse sand to large boulders, with rapids or falls occurring where bedrock is exposed in the stream channel. Larger floods can scour the channel clear of sediments, whereas lesser flood events can contribute to the backfilling of channels. Backfilling is most evident to desert travelers who frequently travel the same stream beds year after year. In one year, a stream bed in mountainous area may be easily passable by vehicle, but the next year the wash is inaccessible because finer materials between larger boulders may have vanished due to an erosion event. Later, the fine deposits between boulders may reaccumulate after a different storm event. These changes reflect the differences in duration, spatial patterns, and intensity of individual storm events affecting a drainage basin.

Downstream of a mountain front, streams deposit sediments on alluvial fans. In the more upland areas, the channels on the upper alluvial fan may go through periods of down-cutting, infilling, and channel migration. Typically, the size and depth of the channel and the size of the rock fragments diminish in size downslope and away from the mountain front. In the mid to lower fan area, stream channels typically diminish to depths less than a meter, and sediment consists of fine gravel and sand. In most areas, a trunk stream defines the main drainage between coalescing alluvial fans. Playas (dry lake beds) may exist were topographic barriers impede the flow of surface water from a drainage basin.

3.4. Hydrology

The study area is within the South Lahontan Hydrologic Region in the Antelope Valley watershed (**Attachment C**).

South Lahontan Hydrologic Region

The South Lahontan Hydrologic Region (SLHR) represents about 17 percent of the land area in California. The region includes Inyo County and portions of Mono, San Bernardino, Kern, and Los Angeles Counties.

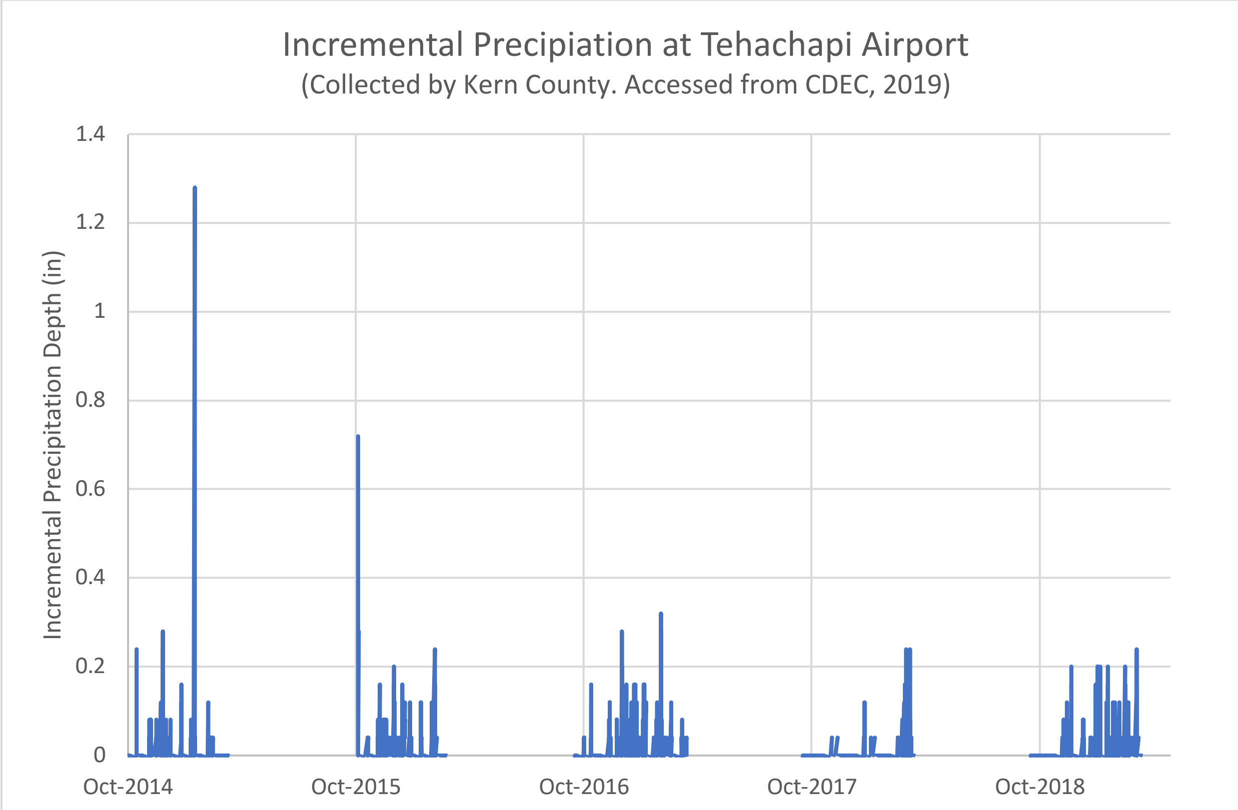
The SLHR is bound to the north by the drainage divide between Mono Lake and East Walker River, to the west and south by the Sierra Nevada, San Gabriel, San Bernardino and Tehachapi Mountains, and to the east by the State of Nevada. Drainage for most of the watershed in the region is under-ground. Along with the arid climate, this accounts for the presence of many dry lakebeds or playas in the region. Major lakes in the region include Mono Lake, June Lake, Convict Lake, Crowley Lake, Isabella Lake, Owens Lake, Tinemaha Reservoir, Lake Arrowhead, Silverwood Lake, and Lake Palmdale. Rivers in the region include the Owens River, the Mojave River, and the Armargosa River.

Within the SLHR, the study area is located within the Antelope Valley Hydrologic Unit/Watershed and includes the Cottonwood Creek-Tylerhorse Canyon (HUC 10 #1809020618), Tropico Hill-Oak Creek (HUC 10 #1809020617), and Sacatara Creek-Kings Canyon (HUC 10 #1809020613) sub-watersheds. The Antelope Valley underlies an extensive alluvial valley in the western Mojave Desert. The elevation of the valley floor ranges from 2,300 to 3,500 feet above mean sea level (amsl). The valley is bound on the northwest by the Garlock fault zone at the base of the Tehachapi Mountains and on the southwest by the San Andreas Fault zone at the base of the San Gabriel Mountains. The valley is bound on the east by ridges, buttes and low hills and on the north by the Fremont Valley. The Antelope Valley Watershed is a closed basin situated within the western Mojave Desert, with a system of Rosamond, Buckhorn, and Rogers dry lakes as the central watershed terminus. Rosamond, Buckhorn, and Rogers Lakes and their tributaries (Antelope Valley Watershed; HUC 10 #s 1809020609 through 1809020624) function as an isolated intrastate watershed system and are non-jurisdictional WOTUS (USACE 2013).

Rainfall runoff conditions of the study area are driven by long-lasting frontal storms which tend to saturate the upper portions of the watershed, where orographic lifting of moisture-laden air masses mean annual precipitation rates are nearly twice as high as in the lower portion of Antelope Valley. Localized convective storm cells develop during these atmospheric river type events, resulting in flash flooding that can be isolated in individual drainages. Small watersheds that have little to no stormwater runoff, even in average precipitation years, routinely experience sudden large events that contribute considerable amounts of flow and sediment to the system. The sporadic nature of these landscape-forming events, combined with aeolian processes that obfuscate subtle fluvial landforms, can make jurisdictional delineation challenging. This analysis is intended to assist with quantifying the flow regime of the site, and provide input into geomorphic processes.

Cumulative precipitation data from water year 2015 through 2019 at Tehachapi Airport were accessed from the California Data Exchange Center (CDEC 2019). Tehachapi Airport (TAP) is located in the Antelope Valley watershed, 15 miles from the study area, at an elevation of 4,040 ft, roughly 1000 feet higher than the study area. Cumulative data were converted to incremental data, in 30-minute time steps, and plotted in **Figure 1**. Additionally, the Antecedent Precipitation Tool (APT) (USACE 2021) was used to compare precipitation in the 90 days prior to the field survey against normal precipitation. The APT results showed that the study area was in normal conditions for the 90-day period, but is in severe drought (**Appendix H**). Since the beginning of 2021, there has been less than 1 inch of total rainfall, well below the 30-year normal range, and the study area has been in severe to extreme drought (USACE 2021).

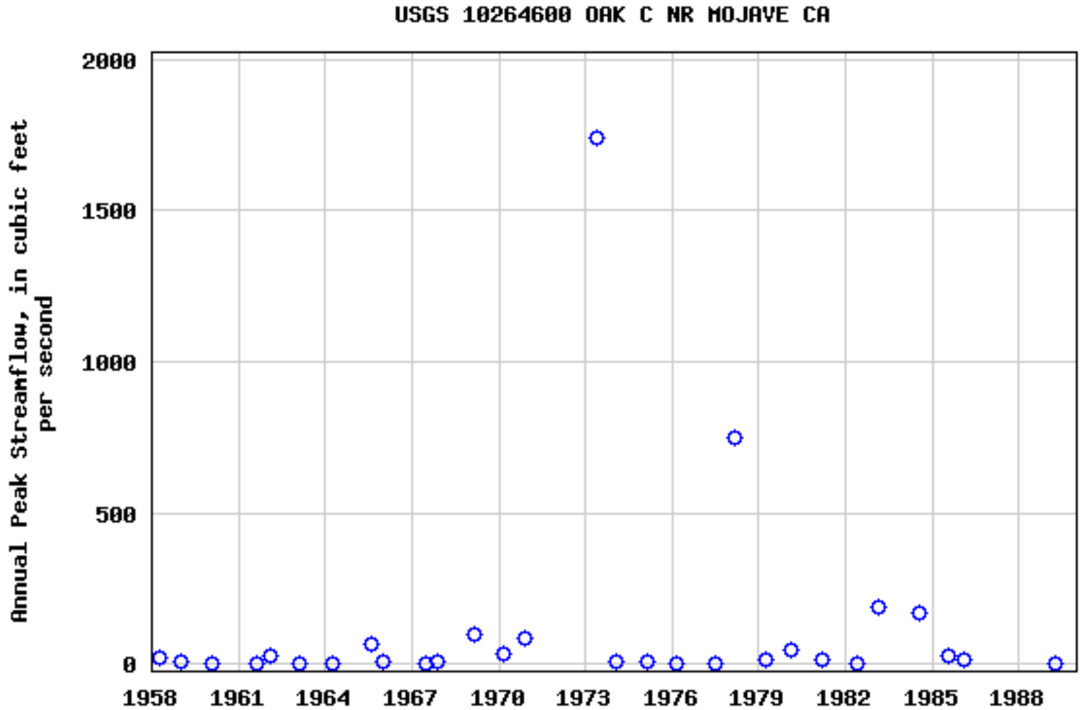
Figure 1

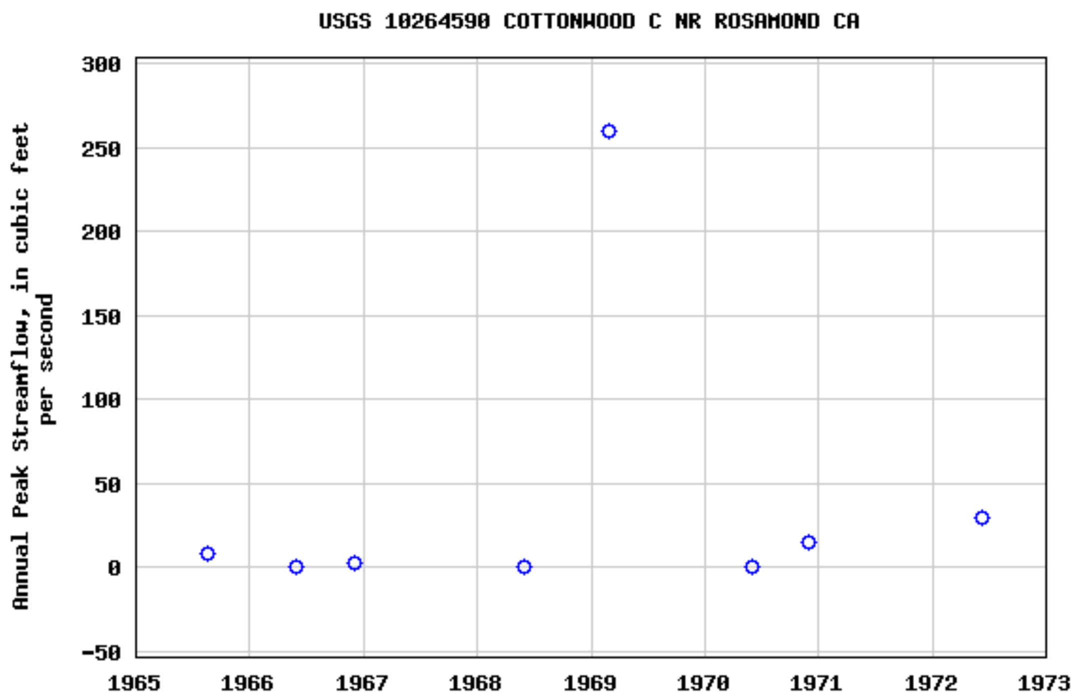


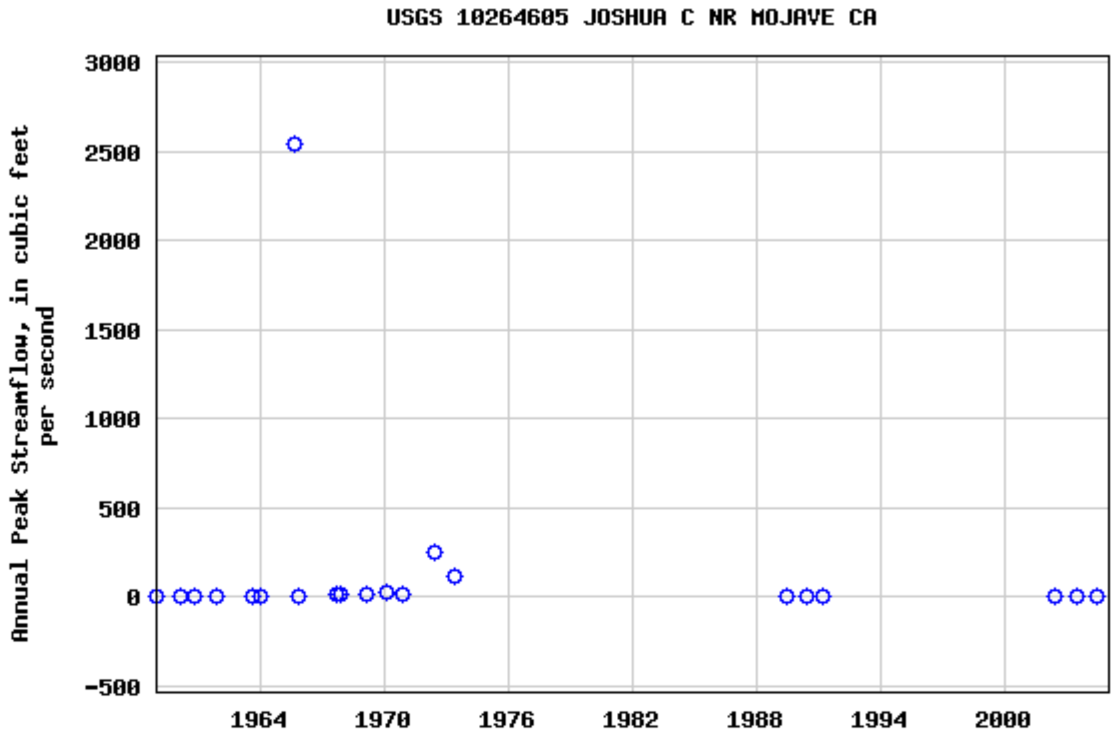
A brief but large event was recorded on February 1, 2015, with over 1.2 inches of rain falling in 30 minutes. This would be equivalent to a 100- to 200-year event, based on NOAA Atlas 14 precipitation frequency estimates for TAP (NOAA 2019). Although a 100-year precipitation event does not necessarily produce a 100-year runoff event due to variability in watershed conditions, the rainfall recorded at TAP in February 2015 and October 2015 likely resulted in significant channel erosion and floodplain sediment deposition. Our analysis of the precipitation records indicates the October 2015 precipitation event had a 25-year recurrence interval.

Stream gauge records illustrate the highly variable nature of stormflow events in the region. Historical peak flow data were accessed from the United States Geological Survey National Water Information System (USGS 2019). USGS Gauge #10264600 on Oak Creek near Mojave, which was operational from 1958 to 1988. It was located approximately 10 miles from the study area at an elevation of 4080 ft (NGVD 29), and had a drainage area of 16 square miles. **Figure 2** shows that annual peak flows were frequently zero, even during average rainfall years, but on one occasion in 1973 exceeded 1,500 cfs, a considerable flow for the small contributing area. A similar phenomenon was observed in reviewing data from USGS Gauge #10264590 on Cottonwood Creek, though it had a shorter period of record. This gauge was located directly within one of the jurisdictional features identified by this study on one of the gen-tie lines, BS028 (**Attachment D**). Interestingly, the large event that was recorded on Cottonwood Creek in 1969 was recorded as a typical, small event on Oak Creek. This illustrates the local variability in discharge on streams that are in close regional proximity. Historical data from a third nearby gauge on Joshua Creek (USGS Gauge #10264605) is impressive in that the drainage area at that gauge is only 4 square miles, and normally does not flow at all in a typical year, yet a peak flow of over 2,500 cfs was recorded in 1965 (**Figure 2**). These drainages can be dormant for many years, and suddenly spring to life with astounding vigor.

Figure 2 – Historical Data from Nearby Gauges







Peak flow frequencies for selected drainages near the study area were estimated using regional regression equations developed by the United States Geological Survey for the desert region of California (USGS 2012). The equations are a function of the drainage area, a coefficient, and an exponent. Although the uncertainty bounds for these equations can be large, they are useful in estimating the magnitude and frequency of the types of events that form jurisdictional features, and providing hydrologic context for the historic runoff record at these three gauges. Peak flow magnitudes for the three stream gauges, and two potentially jurisdictional features mapped using field methods, were calculated using the regression equations and are presented in **Table 1**, the largest events from the periods of record for Oak Creek in 1973, Cottonwood Creek in 1969 and Joshua Creek in 1964 had roughly 25-year, 100-year, and 5-year recurrence intervals, respectively.

Table 1 – Peak Flow Magnitudes

Annual Prob.	Recurrence. Interval (yr)	Coefficient	Exponent	Estimated Peak Flows (cfs)				
				Oak Creek	Joshua Creek	Cottonwood Creek (BSP028)	BBSP F-6	BBSP F-15
50%	2	10.3	0.506	40	20	60	20	30
20%	5	60.0	0.506	240	120	360	110	170
10%	10	151	0.506	600	300	900	300	400
4%	25	403	0.506	1,600	800	2,400	800	1,100
2%	50	760	0.506	3,000	1,000	5,000	1,000	2,000
1%	100	1350	0.506	5,000	3,000	8,000	3,000	4,000
0.5%	200	2270	0.506	9,000	4,000	14,000	4,000	6,000
0.2%	500	4280	0.506	17,000	8,000	26,000	8,000	12,000

In summary, rainfall-runoff events in the study area are highly variable, both temporally and spatially. Large, infrequent flows appear to occur with sufficient regularity in the study area to form and maintain the jurisdictional features that were mapped in the field.

4. Regulatory Background

The jurisdictional limits of regulatory agencies vary due to different regulations and their different jurisdictional definitions. The following section describes USACE, RWQCB, and CDFW jurisdiction over wetlands and waters.

4.1. Waters of the United States (WOTUS)

The USACE administers Section 404 of the *Clean Water Act* (CWA). Section 404 Clean Water Act gives the Environmental Protection Agency (EPA) and the Corps regulatory and permitting authority regarding discharge of dredged or fill material into “navigable waters of the United States.” Section 502(7) of the CWA defines “navigable waters” as “waters of the United States, including territorial seas.” The USACE is implementing the pre-2015 WOTUS rule as issued by the EPA and Corps and is in effect at this time. Under that Rule, Section 328 of Chapter 33 in the Code of Federal Regulations (CFR) defines the term “waters of the United States” as it applies to the jurisdictional limits of the authority of the Corps under the CWA. The “relatively permanent standard” means waters that are relatively permanent, standing or continuously flowing and waters with a continuous surface connection to such waters. The “significant nexus standard” means waters that either alone or in combination with similarly situated waters in the region, significantly affect the chemical, physical, or biological integrity of traditional navigable waters, interstate waters, or the territorial seas (the “foundational waters”). A summary of the definition of “waters of the United States” in 33 CFR 328.3 (a) includes:

(1) Traditional Navigable Waters - All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

(2) Interstate waters and wetlands;

(3) Territorial seas;

(4) Impoundments of waters listed here that meet either the relatively permanent standard or the significant nexus standard;

(5) Tributaries to the above waters that meet either the relatively permanent standard or the significant nexus standard;

(6) Waters and wetlands adjacent to the above waters that meet either the relatively permanent standard or the significant nexus standard;

(7) Prairie potholes, Carolina and Delmarva bays, pocosins, western vernal pools, and Texas coastal prairie wetlands, provided these features meet either the relatively permanent standard or the significant nexus standard;

(8) All waters located within the 100-year floodplain of waters listed above in items 1-3 or within 4,000 feet of the high tide line (HTL) or ordinary high water mark (OHWM) of a water listed above in items 1-5, provided those waters are determined to have a significant nexus to waters identified in items 1-3 above. For purposes of the determining Corps jurisdiction under the CWA, "navigable waters" as defined in the CWA are the same as "waters of the U.S." defined in 33 CFR 328.3.;

Areas not considered to be "waters of the United States" as defined in 33 CFR 328.3 (b), are summarized as follows:

(1) Water treatment systems;

(2) Prior converted cropland;

(3) Specific classes of ditches, including (i) ditches with ephemeral flow that are not a relocated tributary or excavated in a tributary, (ii) ditches with intermittent flow that are not a relocated tributary, excavated in a tributary, or drain wetlands, and (iii) ditches that do not flow, either directly or through another water, into a water identified in 33 CFR 328.3 paragraphs (a) (1) through (3);

(4) Artificially irrigated areas that would otherwise revert to dry land and manmade aquatic features in otherwise dry land such as stock watering ponds, irrigation ponds, settling basins, fields flooded for rice growing, log cleaning ponds, cooling ponds, reflecting pools, swimming pools, small ornamental waters, depressions incidental to mining and construction activity, erosional features, and puddles;

(5) Groundwater;

(6) Stormwater control features;

(7) Wastewater recycling structures, groundwater recharge basins, percolation ponds for wastewater recycling, and distribution networks for wastewater recycling.

The study area does not contain any wetlands or non-wetland waters that are subject to federal jurisdiction under Section 404 of the CWA; all tributaries are drained internally and do not have a significant nexus, none flow to any relatively permanent waters, and are therefore isolated and do not connect to any navigable water features. This finding is consistent with the ACOE Approved Jurisdictional Determination for the Antelope Valley Watershed Unit (SPL-2011-01084-SLP) that found all features within this watershed were non-jurisdictional. As a result, this aquatic resources delineation report focuses on WOS under the jurisdiction of the Regional Water Quality Control Board (RWQCB) and Section 1602 features under the jurisdiction of the California Department of Fish and Wildlife (CDFW).

4.2. Clean Water Act – Section 401 and the California Porter-Cologne Water Quality Act

The California State Water Resources Control Board (SWRCB) and its Regional Water Quality Control Boards (RWQCBs) regulate discharges of waste that could affect the waters of the State under the California Porter-Cologne Water Quality Act or waters of the U.S. under Section 401 of the federal Clean Water Act. Under the Porter-Cologne Water Quality Control Act, a Report of Waste Discharge must be submitted prior to discharging waste, or proposing to discharge waste, within any region that could affect the quality of the waters of the State (California Water Code §13260). Waste Discharge Requirements (WDRs) or a waiver of WDRs will then be issued by the RWQCB. Waters of the State are defined as any surface water or groundwater, including saline waters that are within the boundaries of the state (California Water Code §13050).

4.3. California Fish and Game Code §§ 1600–1616: Streambeds and Banks and Riparian Habitats

The CDFW asserts jurisdiction over the bed and bank of a stream and associated wildlife and habitats as established in California Fish and Game Code §§1600–1616. In accordance with §1602 of the Code (Streambed Alteration), the CDFW regulates activities that will "substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake" and requires notification prior to such activities. In addition, §1603 of the Code states that "after the notification is complete, the department shall determine whether the activity may substantially adversely affect an existing fish and wildlife resource," and a Streambed Alteration Agreement (SAA) may be pursued. These regulations were established to protect the wildlife resources that are associated with the riparian habitats that occur within and adjacent to ephemeral or year-round drainage systems. A discussion of the methodology for determining CDFW jurisdiction is provided below.

This report provides both a delineation based on field-checked USGS topographic maps, USGS modeled stream features (National Hydrography Dataset [NHD]), National Wetlands Inventory (NWI) data (**Attachment F**) and field-checked aerial signatures, so that all features that might be considered potentially jurisdictional by RWQCB and/or CDFW are included. Each feature or aerial signature was further investigated, photographed, and documented.

5. Methodology

On November 10-12, 2021, Heritage biologists walked the JD study area, including the gen-tie and access road options, and collected data on all potential CDFW and RWQCB jurisdictional features. One portion of the northernmost Whirlwind gen-tie line option 1 would be co-located on existing poles along the previously surveyed Antelope Valley Transmission Line (AVTL). This section was surveyed during Bullhead field surveys, but washes in this area were not mapped since the proposed disturbance areas (i.e. pull sites) are already disturbed by the AVTL and the existing access road has been modified along existing washes and will not need to be upgraded.

Some of the features that occur within the western portion of the study area along portions of the

Whirlwind gen-tie options were mapped during surveys for the adjacent BigBeau Solar Project (BBSP), and were used to generate acreage calculations for this report (Heritage 2019). All of the washes included in the BBSP JD report were confirmed to be jurisdictional by one or both of CDFW and the Lahontan RWQCB (CDFW 2020, California Water Boards 2020). These washes were checked during field surveys for the Bullhead Project to ensure that no changes had occurred since previous mapping took place. BBSP features that had not changed since being mapped previously were not re-named or re-numbered in **Attachments D and E** and **Table 2**. These washes are named "BBSP F-##", while washes that were newly mapped for Bullhead, including those BBSP features that were changed or updated are named in **Attachments D and E** and **Table 2** as "BSP###". Photographs of these BBSP washes are included in **Appendix G**.

The outer boundaries of jurisdictional limits for all washes were identified and the boundaries were mapped with sub-meter accurate Trimble GEO7x handheld GPS units using ESRI ArcPad 10 software. GPS data were then converted into shapefiles using ESRI ArcGIS 10 to compile the data into a database for the analysis. The aerial base for figures in the report are from 2016. Photographs were taken to document site conditions at most features, regardless of identifiable indicators, and are included as **Attachment G**.

The boundaries of waters potentially subject to regulation by the CDFW were delineated using agency-issued guidance under the California Fish and Game Code, related CDFW materials (CDFW 2014), CDFW onsite verbal requests and guidance from site visits at other projects in the vicinity, as well as standard practices by CDFW personnel and wetland delineation and geomorphology professionals, including *A Review of Stream Processes and Forms in Dryland Watersheds* (CDFG 2010).

As defined by CDFW, a stream is "a body of water that flows perennially or episodically and that is defined by the area in which water currently flows, or has flowed, over a given course during the historic hydrologic regime, and where the width of its course can reasonably be identified by physical or biological indicators." Because all the features are non-aquatic and ephemeral, and some of them very small, many lacked obvious banks in some areas. Bank indicators such as slope (first point of inflection), bed erosion or evidence of flow, wrack, and soil sorting (texture and color) were also used to determine the extent of potential jurisdiction. Vegetation is typically another good indicator, however, no riparian vegetation species were observed onsite, and vegetation types, including species composition (e.g., creosote bush scrub) and density generally did not differ between channels or flow areas, and surrounding upland areas.

CDFW jurisdictional areas were mapped as the top of bank of the feature or to the outer dripline of immediately adjacent vegetation (i.e. where overhanging or included within top of bank). Jurisdictional floodplains were interpreted to be relatively flat areas of land associated with a stream, over which evidence of water and sediment were apparent from a parent stream flow. Floodplains parallel stream channels but may also occur at the terminal end of a stream where the channel joins an axial valley stream, transitions into a playa, or the channel ends and its flow subsides into the ground to join the groundwater. Additionally, some of the features mapped within the study area are discontinuous on the landscape. As defined under the Mapping Episodic Stream Activity (MESA) (CDFW 2014), discontinuous channels have poorly defined channel form and unconfined or subsurface flow. These features may alternate with well-defined erosional channel segments or terminate in the landscape where flow infiltrates into the streambed. The boundaries for WOS subject to regulation by the RWQCB were delineated as the ordinary high-water mark (OHWM, defined in 33 C.F.R. §328.3 as the line on the shore established by fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, or the presence of litter and debris) of the feature (Lichvar & McColley 2008, Lichvar et al. 2009).

6. Results

The floor of the Antelope Valley generally lacks defined natural channels outside of the foothills and is subsequently subject to water traveling in unpredictable sheet flow patterns rather than within confined channels. The features of the solar facility area are associated with an alluvial fan. The alluvial fan is part of the south facing slopes of the Tehachapi Mountains, Gamble Springs Canyon and Burnham Canyon. Alluvial fans are depositional features formed over a long period of time where sediment is transferred from one part of the watershed to another. As a stream leaves a mountain canyon, flow velocity decreases and sediment carried by the stream is deposited over centuries to result in a large plain. These characteristics are evident in the features at the Bullhead Solar Project.

As previously stated, all washes that were previously mapped for BBSP were determined to be jurisdictional by one or both of CDFW and the Lahontan RWQCB (CDFW 2020, California Water Boards 2020).

Some features, such as BSP011 (formerly BBSP F-07), have well-defined bed and bank whereas others have marginal bed and banks in the form of poorly formed topographical slopes, little evidence of scouring, or deposition of sediment. Many features are discontinuous on the landscape and appear to dissipate and lose channel definition or only have evidence of sheet flow. The typical depositional function and flow of the features within the study area have been altered and slightly reduced due to the installation of the California Aqueduct, public roads, transmission lines, solar facilities, wind turbines, and associated access roads, which redirect much of the historical flow upstream of the study area. The Aqueduct bisects these features and diverts part of the water and sediment flow along the northern portion of the Aqueduct and not downstream within the features, reducing the hydrological character of the features and their function. The features at the solar facility, gen-tie, and proposed access roads primarily provide for the dispersion of runoff from the surrounding topography.

As described above, a large portion of the solar facility is located on either active or fallow agricultural fields or disturbed/developed areas associated with the agricultural areas. Many of these fields have been active for 30+ years and have changed historic flows throughout the region by intercepting waters from upstream and changing flow regimes downstream. All irrigation for these fields appears to be provided by pumping groundwater and irrigating using center-pivot and movable sprinklers and most of the water is contained within the fields – there are no tail ditches that convey water downstream. These fields contain no potentially jurisdictional features.

There are 4 features within the solar facility boundary that are likely jurisdictional waters subject to CDFW jurisdiction and/or RWQCB jurisdiction under the Porter-Cologne Water Quality Control Act. There are 22 features along gen-tie routes that are likely jurisdictional waters subject to CDFW jurisdiction and/or RWQCB jurisdiction; 1 of these 22 features also cross the proposed access routes outside the solar facility boundary. There are 4 features along the proposed access routes outside the solar facility boundary that are likely jurisdictional waters subject to CDFW jurisdiction and/or RWQCB jurisdiction; 1 of these 4 features also cross the gen-tie options. The majority of the features subject to CDFW jurisdiction are larger than those subject to RWQCB jurisdiction.

The features generally flow from the northwest to the southeast over the majority of the study area. The features are generally characterized as ephemeral, single-thread, low-gradient and low-sinuosity channels lacking riparian or desert wash species. Most are located in Mojave Creosote Bush Scrub. Some features are located in either lightly or heavily disturbed areas. Many of the features lack obvious bed or bank characteristics and evidence of concentrated flow, and occur in flat to rolling topography. Water is expected to only flow through the features during localized or large rain events. Many of these features are also discontinuous and do not exhibit flow indicators along their entire length.

BSP011 (formerly BBSP F-07) is the largest feature with defined bed and bank, but it did not support any riparian or desert wash plant species. It is approximately 20 feet wide and 10 feet deep along one of the Whirlwind gen-tie options; it gets narrower and shallower moving downstream, until it is approximately 1-foot wide with no incision.

The northern end of feature BSP004 is located within the mulefat thicket vegetation type. Mulefat is most common and typically grows near water sources. As previously described, the mulefat thicket occurs in an area where agricultural runoff contributes to mesic conditions. This feature is very wide within the mulefat area where water appears to spread out and pool after draining from the agricultural fields before concentrating and narrowing into a smaller feature downstream.

Several features include floodplain areas that abut or parallel features for a majority of their length (features BSP011, BSP015, and BSP016). These areas of deposition were likely caused by the extremely high-energy event in February 2015 when flows over-topped some of the streambanks. In feature BSP011, there was evidence of large debris that was deposited during the 2015 event, including large logs upwards of 30 feet tall, large boulders, and pine cones from gray pine (*Pinus sabiniana*) originating in the Tehachapi mountains over 10 miles northwest of the Project. Most of the other floodplain features do not exhibit the same amount of large debris, but were likely deposited during the same event that pushed sediment and debris over the banks.

There are 29 features that total 13.87 acres and 19,686 linear feet of potentially jurisdictional waters subject to CDFW jurisdiction (**Attachment D** and **Table 2**). There are 19 features that total 0.465 acres and 6,152 linear feet of potentially jurisdictional waters subject to RWQCB jurisdiction (**Attachment E** and **Table 2**). As discussed in **Section 5**, the boundaries for WOS subject to regulation by the RWQCB were delineated as the OHWM which is typically smaller than CDFW jurisdictional areas, and not all CDFW jurisdictional areas have OHWM indicators. The larger area of potentially jurisdictional CDFW waters as compared to the smaller area of RWQCB waters is the result of including the area between the OHWM and top-of-bank, and the inclusion of floodplain areas discussed above, under CDFW jurisdiction. The longer length of potentially jurisdictional CDFW waters as compared to RWQCB waters is the inclusion of the length of the numerous "fingers" of CDFW waters in floodplain areas that do not exhibit OHWM indicators and the fact that some features only exhibited CDFW jurisdictional top-of-bank characteristics and did not contain OHWM indicators. Vegetation communities that were encountered in the area surrounding the features are also shown in **Table 2**.

6.1. Recommended Agency Coordination

It is recommended that EDFR consult with the responsible resource agencies (CDFW and RWQCB) to verify the limits of the jurisdiction results presented herein. This should occur as early in the permitting process as possible so that impacts can be accurately calculated and mitigation lands can be secured. Based on our current understanding of proposed Project activities, the following permits/authorizations would likely be required and should be obtained prior to undertaking ground-disturbing activities within or immediately adjacent to identified jurisdictional features:

- RWQCB (subject to a Waste Discharge Requirement)
- CDFW Section 1602 Lake or Streambed Alteration Agreement.

Table 2: CDFW and RWQCB Jurisdictional Features

	CDFW		RWQCB				
Feature ID	**Area (Acres)**	**Length (Feet)**	**Area (Acres)**	**Length (Feet)**	**Description**	**Potentially Jurisdictional**	**Vegetation Types**
BBSP F-02	0.10	284	0.012	167	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub, Developed
BBSP F-07a	0.27	683	0.039	510	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub, Developed, Disturbed
BSP001	0.59	2526	0	0	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub, Disturbed
BSP002	0.57	1773	0.094	1663	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub
BSP003	0.64	3730	0	0	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub, Disturbed
BSP004	2.32	3731	0	0	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub, Mulefat Thicket, Disturbed
BSP006	0.02	119	0.003	119	Ephemeral Wash	Yes	Creosote Bush - White Bursage Scrub, Developed
BSP007	0.12	177	0	0	Ephemeral Wash	Yes	Creosote Bush - White Bursage Scrub, Disturbed, Rubber Rabbitbush Scrub
BSP008	0.01	126	0	0	Ephemeral Wash	Yes	Creosote Bush - White Bursage Scrub
BSP009	0.01	51	0.001	51	Ephemeral Wash	Yes	Creosote Bush - White Bursage Scrub, Disturbed
BSP010	0.02	132	0.004	132	Ephemeral Wash	Yes	Creosote Bush - White Bursage Scrub, Disturbed
BSP011	1.73	1254	0.051	329	Ephemeral Wash	Yes	Creosote Bush Scrub - Disturbed, Mojave Creosote Bush Scrub, Disturbed,

							Developed
BSP012	0.07	177	0.002	177	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub, Disturbed
BSP013	0.09	178	0.020	178	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub
BSP014	0.07	149	0.021	122	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub, Disturbed
BSP015	2.00	177	0.013	177	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub, Disturbed
BSP016	0.19	333	0	0	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub
BSP017	0.53	141	0.026	141	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub
BSP018	1.04	131	0.013	131	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub
BSP019	0.27	342	0.035	342	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub, Disturbed, Developed
BSP020	0.08	493	0.006	493	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub
BSP021	0.56	1032	0.009	793	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub, Disturbed
BSP022	0.10	151	0	0	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub, Disturbed
BSP024	0.02	168	0	0	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub
BSP025	0.82	547	0	0	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub
BSP026	0.27	449	0	0	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub
BSP027	0.20	226	0.070	226	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub

BSP028	1.10	131	0.025	131	Ephemeral Wash	Yes	Creosote Bush - White Bursage Scrub, Mojave Creosote Bush Scrub, Scale Broom Scrub
BSP029	0.07	275	0.022	270	Ephemeral Wash	Yes	Mojave Creosote Bush Scrub
Totals	**13.87**	**19,686**	**0.465**	**6,152**			

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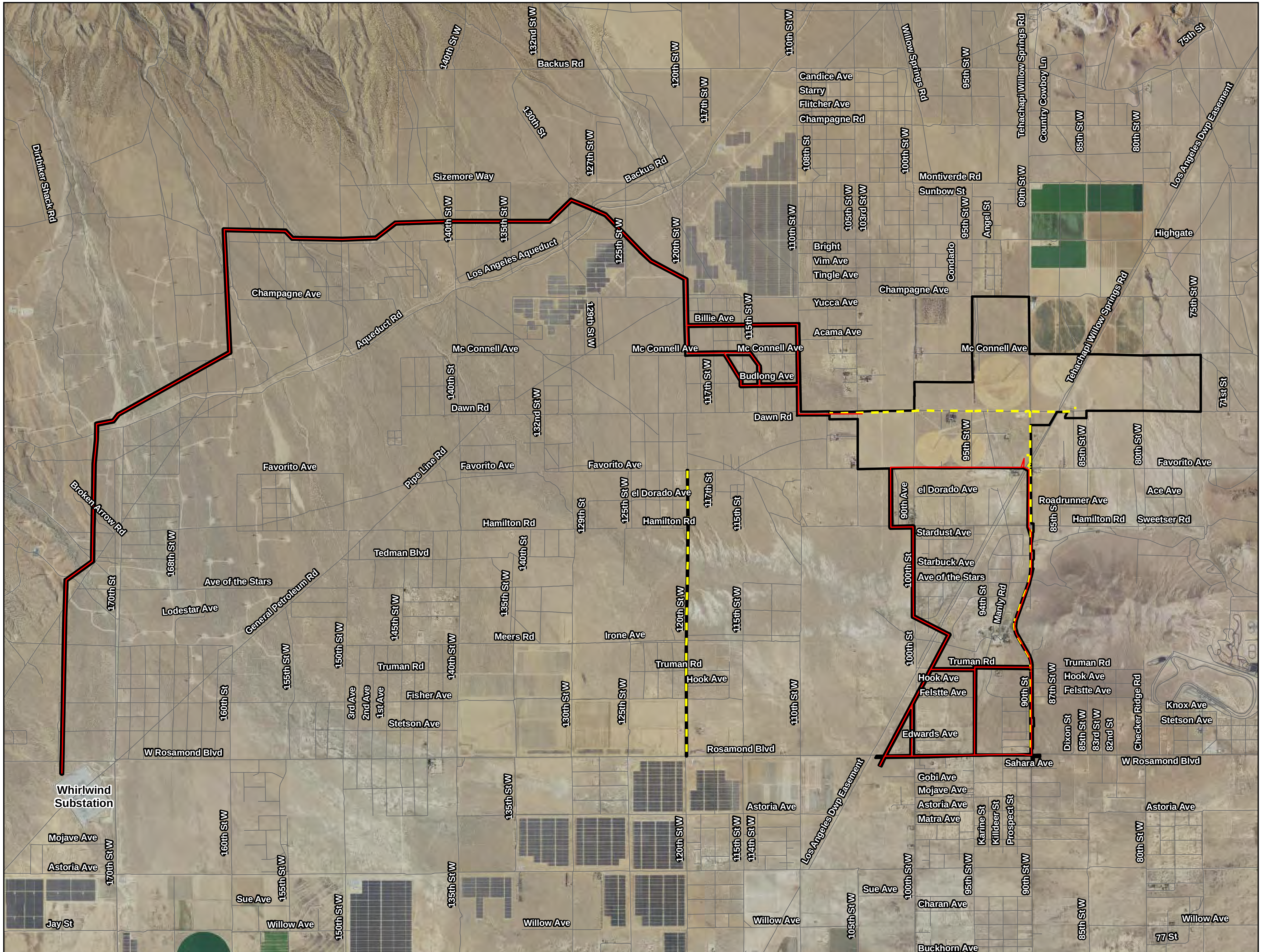
Attachment A – Bullhead Solar Project Vicinity

Bullhead Solar Project

Attachment A
Project Vicinity

Kern County, CA



LEGEND

- Gen-Tie Options
- Proposed Access Routes
- Road
- Bullhead JD Study Area

0 0.25 0.5 0.75 1
Miles

HERITAGE ENVIRONMENTAL CONSULTANTS, LLC

NAD 83, State Plane, California Zone V, Feet
Data Sources: BSP, ESRI, Kern Co., USDA.
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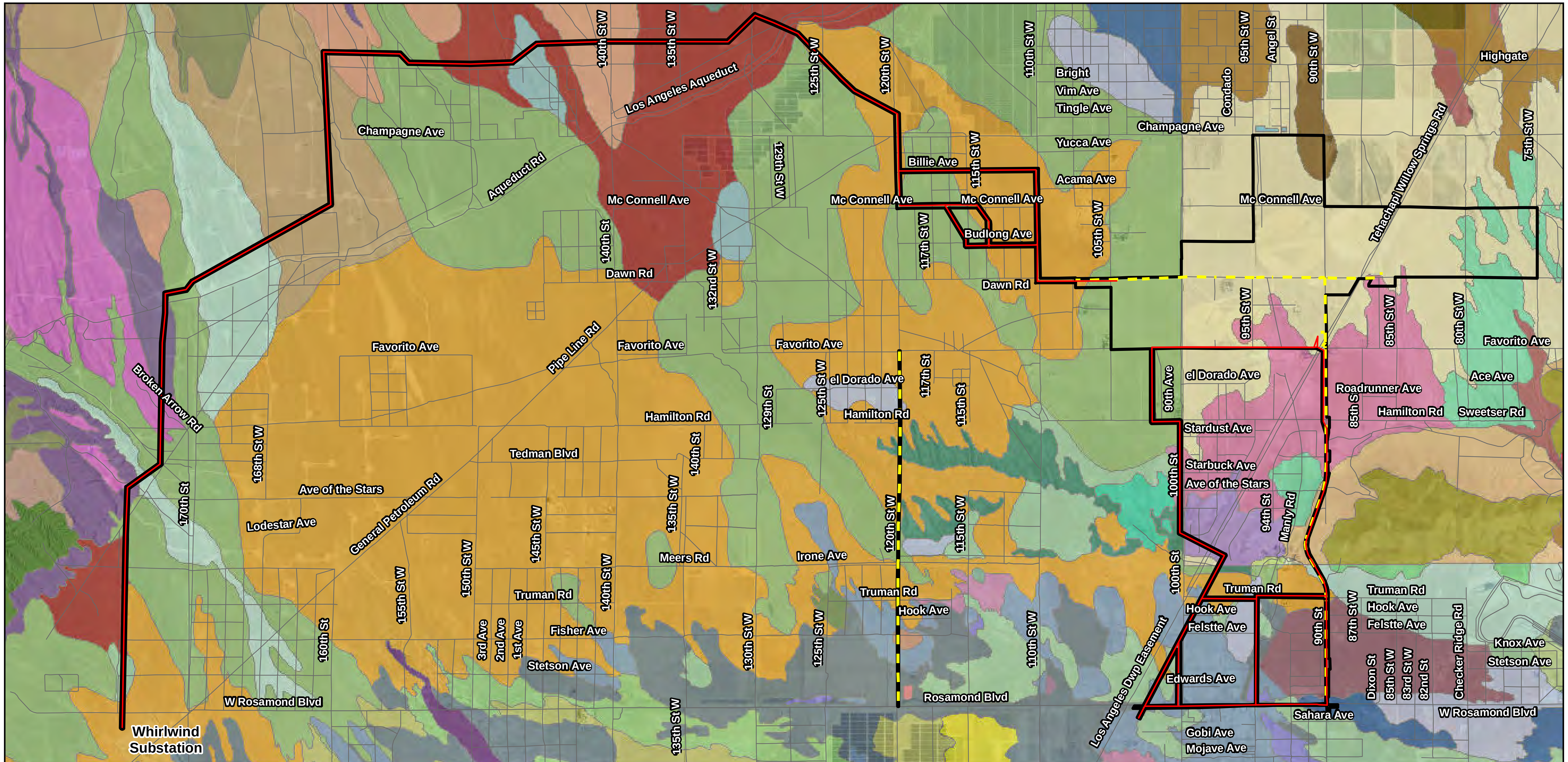
Attachment B – Soils Map

Bullhead Solar Project

Attachment B
Soils Map

Kern County, CA



LEGEND

- Gen-Tie Options
- Proposed Access Routes
- Road
- Bullhead JD Study Area

0 0.25 0.5 0.75 1
Miles

HERITAGE ENVIRONMENTAL CONSULTANTS, LLC

Soil Types

Adelanto coarse sandy loam, 2 to 5 percent slopes	Greenfield sandy loam, 2 to 9 percent slopes	Ramona sandy loam, 9 to 30 percent slopes, eroded	Terrace escarpments
Adelanto loamy sand, 2 to 5 percent slopes	Hanford coarse sandy loam, 2 to 9 percent slopes	Rock land	Torriorthents-Rock outcrop complex, very steep
Arizo gravelly loamy sand, 0 to 5 percent slopes	Hanford gravelly sandy loam, 2 to 9 percent slopes	Rock outcrop	Water
Arizo gravelly loamy sand, 2 to 9 percent slopes	Hanford loamy sand, 2 to 5 percent slopes, hummocky	Rosamond clay loam	
Badland-Orthents complex, 30 to 75 percent slopes	Hanford sandy loam, 2 to 9 percent slopes	Rosamond fine sandy loam	
Cajon gravelly loamy sand, 0 to 9 percent slopes	Hesperia fine sandy loam, 0 to 2 percent slopes	Rosamond loam	
Cajon loamy sand, 0 to 2 percent slopes	Hesperia fine sandy loam, 2 to 5 percent slopes	Rosamond loam, saline-alkali	
Cajon loamy sand, 0 to 5 percent slopes	Hesperia fine sandy loam, loamy substratum, 0 to 2 percent slopes	Rosamond loam, sandy loam substratum	
Cajon loamy sand, 2 to 9 percent slopes	Hesperia loam, 0 to 2 percent slopes	Rosamond loamy fine sand	
Cajon loamy sand, loamy substratum, 0 to 2 percent slopes	Hesperia loamy fine sand, 0 to 2 percent slopes	Rosamond loamy fine sand, hummocky	
Cajon sand, 5 to 15 percent slopes	Hesperia loamy fine sand, 0 to 2 percent slopes, hummocky	Rosamond silty clay loam	
DeStazo sandy loam, 0 to 2 percent slopes	Mohave coarse sandy loam, 2 to 5 percent slopes	Rosamond silty clay loam, saline-alkali	
DeStazo sandy loam, 5 to 9 percent slopes, eroded	Ramona coarse sandy loam, 2 to 5 percent slopes	Rough broken land	
Dumps, mine	Ramona coarse sandy loam, 5 to 9 percent slopes	Sunrise loam	
Dune land	Ramona coarse sandy loam, 9 to 15 percent slopes	Sunrise sandy loam	
Garlock loamy sand, 2 to 9 percent slopes	Ramona gravelly sandy loam, 2 to 9 percent slopes	Sunrise sandy loam, shallow	

NAD 83, State Plane, California Zone V, Feet
Data Sources: BSP, ESRI, Kern Co., USDA.
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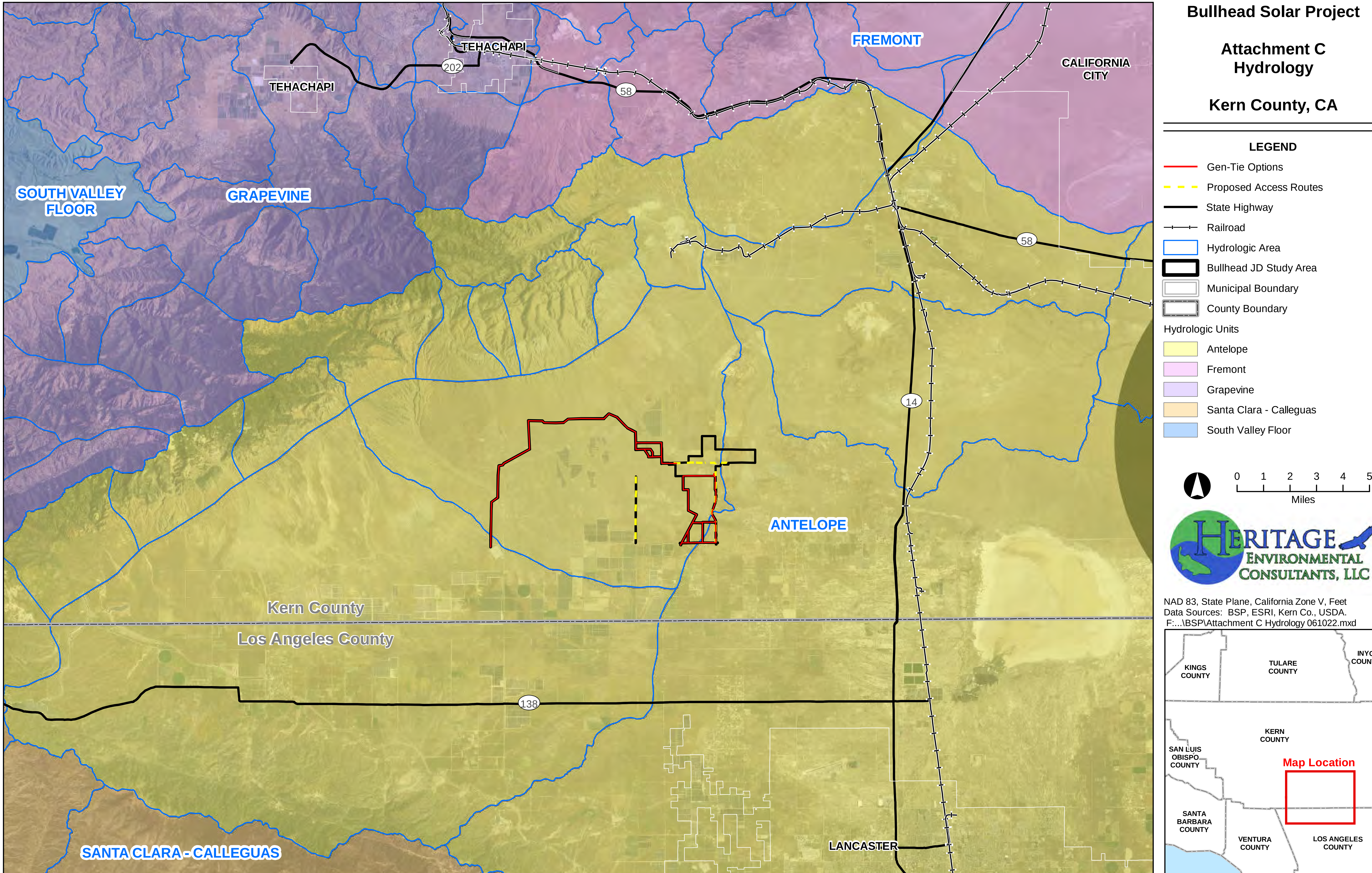
06-10-22

Attachment C – Hydrology Map

Bullhead Solar Project

Attachment C
Hydrology

Kern County, CA

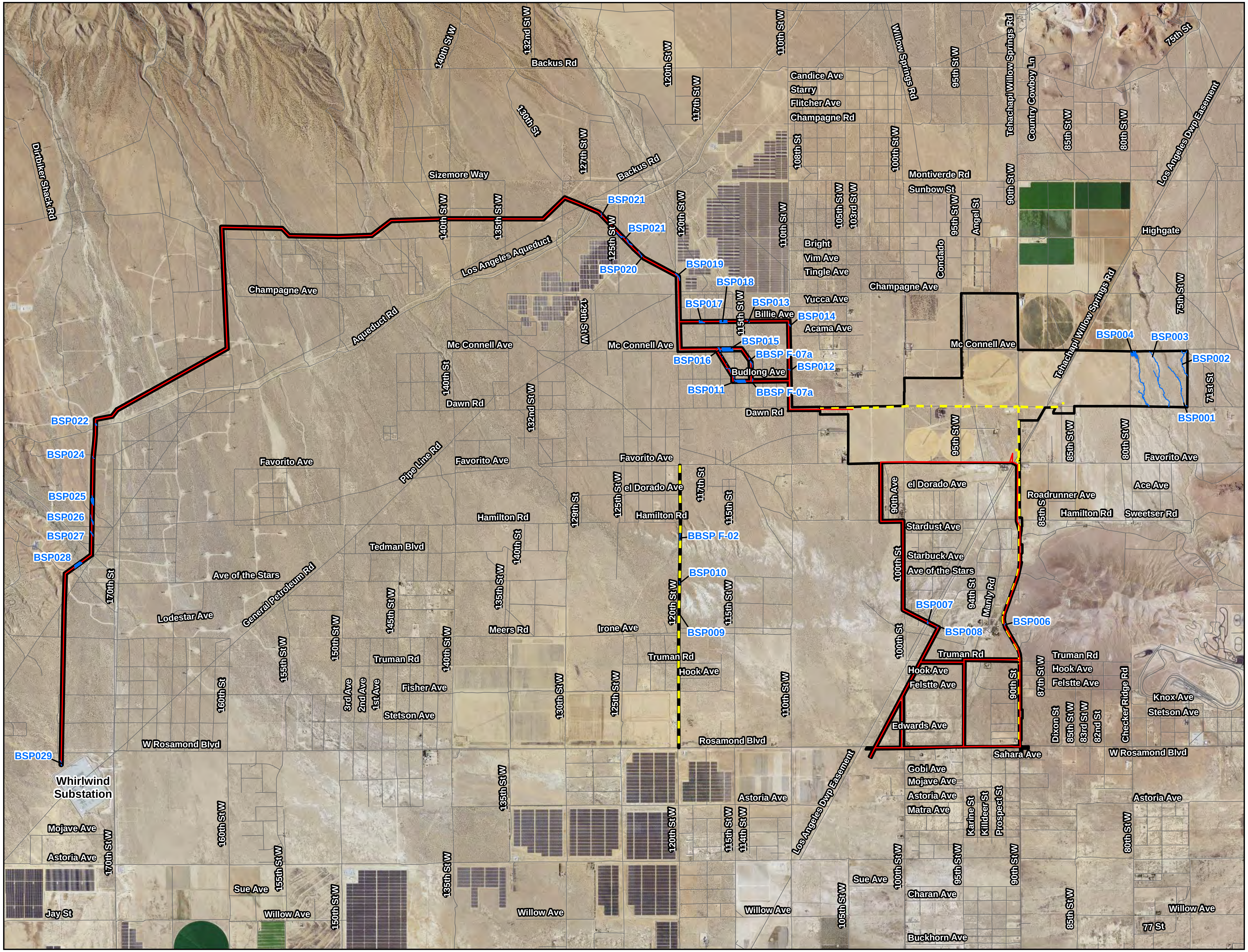


Attachment D – CDFW Potentially Jurisdictional Waters Map

Bullhead Solar Project

Attachment D
CDFW Drainages

Kern County, CA



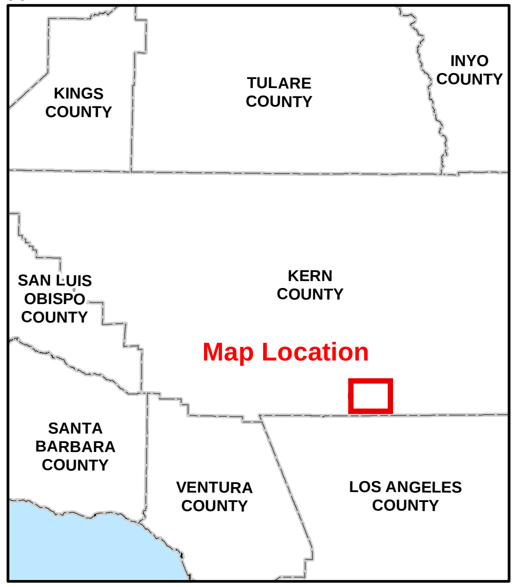
LEGEND

- Potentially Jurisdictional Water
- Gen-Tie Options
- Proposed Access Routes
- Road
- Bullhead JD Study Area

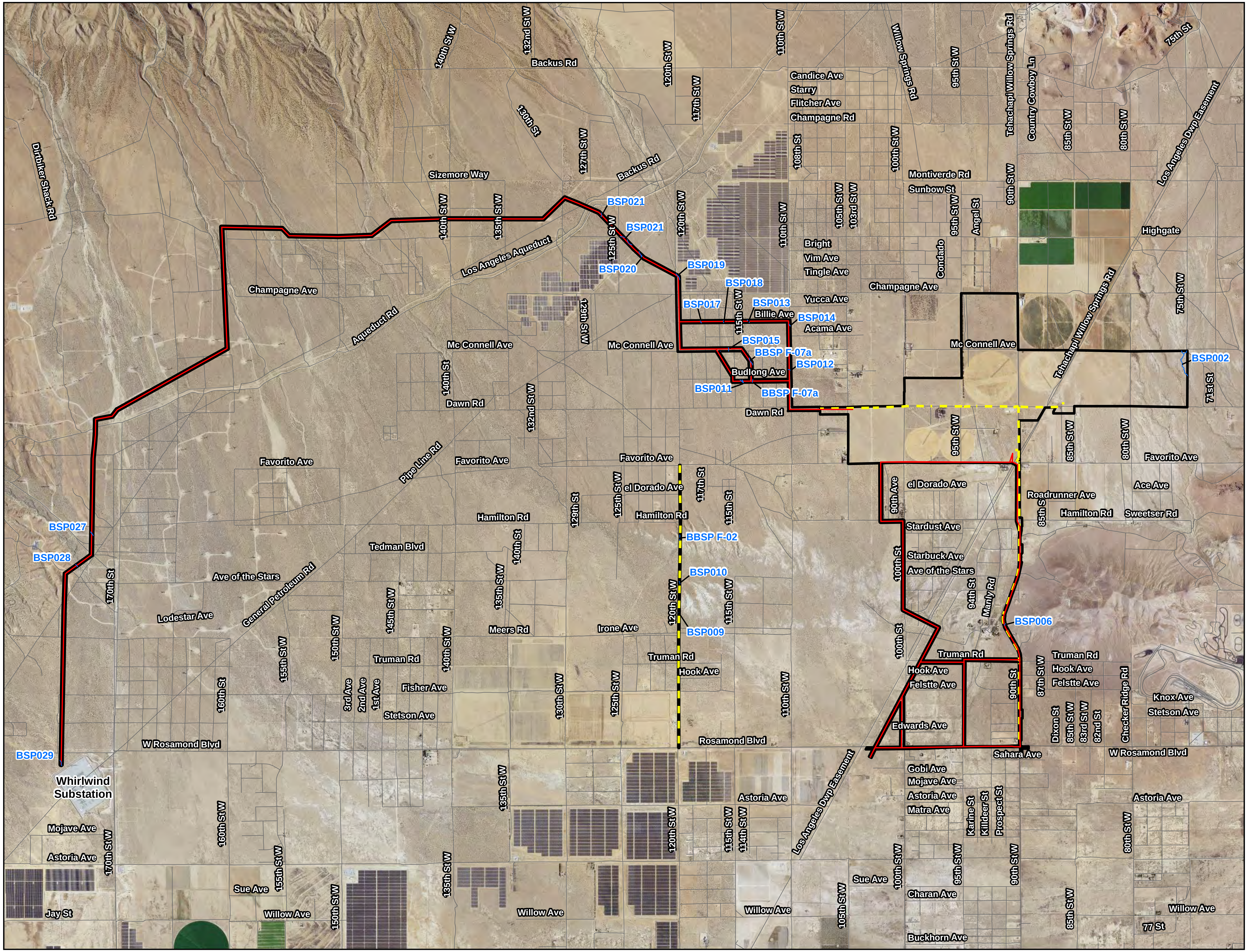
0 0.25 0.5 0.75 1
Miles

HERITAGE ENVIRONMENTAL CONSULTANTS, LLC

NAD 83, State Plane, California Zone V, Feet
Data Sources: BSP, ESRI, Kern Co., USDA.
F:...\BSP\Attachment D 061422.mxd
06-14-22



Attachment E – RWQCB Potentially Jurisdictional Waters Map



Bullhead Solar Project

Attachment E
RWQCB Drainages

Kern County, CA

LEGEND

- RWQCB Water
- Gen-Tie Options
- Proposed Access Routes
- Road
- Bullhead JD Study Area

0 0.25 0.5 0.75 1
Miles

HERITAGE ENVIRONMENTAL CONSULTANTS, LLC

NAD 83, State Plane, California Zone V, Feet
Data Sources: BSP, ESRI, Kern Co., USDA.
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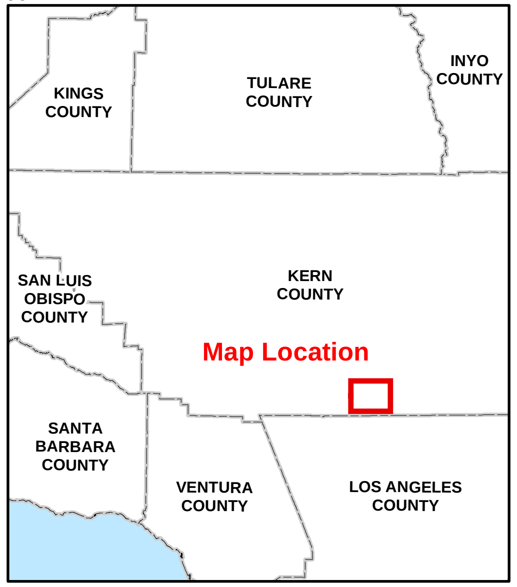
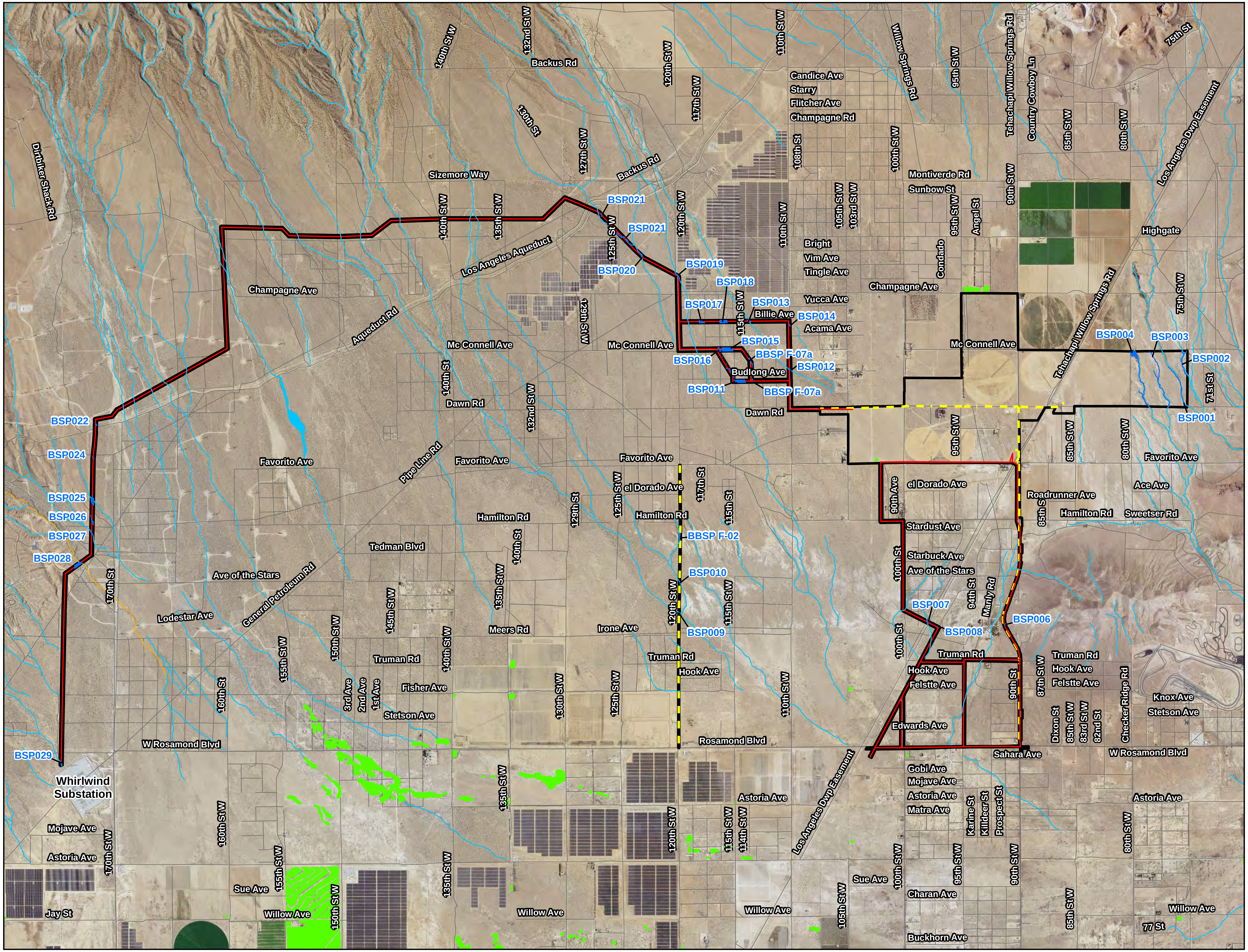


Attachment F –NWI Mapping



Bullhead Solar Project

Attachment F
CDFW Drainages with NWI Wetlands

Kern County, CA

LEGEND

- Potentially Jurisdictional Water
- Gen-Tie Options
- Proposed Access Routes
- Road
- Bullhead JD Study Area

USFWS NWI Wetlands

- Riverine (R4SBA, Temporary Flooded)
- Riverine (R4SBJ, Intermittently Flooded)
- Freshwater Pond or Lake

0 0.25 0.5 0.75 1
Miles

HERITAGE ENVIRONMENTAL CONSULTANTS, LLC

NAD 83, State Plane, California Zone V, Feet
Data Sources: BSP, ESRI, Kern Co., USDA.
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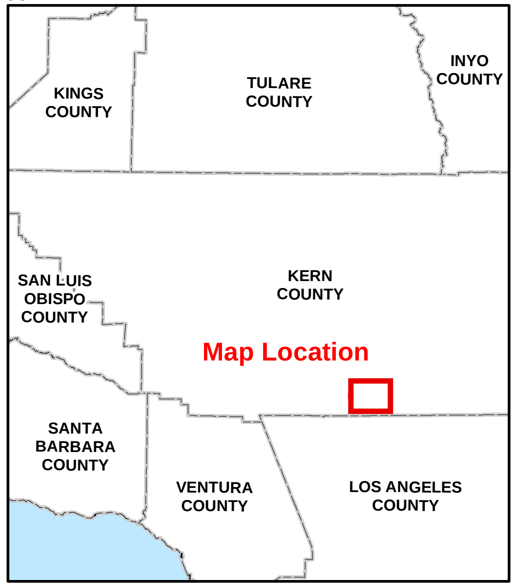
06-14-22



Attachment G – Photographic Log


Feature BSP001 – Facing upstream – Ephemeral wash


Feature BSP002 – Facing upstream – Ephemeral Wash


Feature BSP003 – Facing downstream – Ephemeral wash


Feature BSP004 – Facing downstream – Ephemeral wash


Feature BSP004 – Mulefat thicket - low pooling area


Feature BSP004 – Mulefat thicket – low pooling area

BSP004 – Mulefat thicket – low pooling area

Feature BSP006 – Facing upstream – Ephemeral wash


Feature BSP007 – Facing downstream – Ephemeral wash


Feature BSP008 – Facing downstream – Ephemeral wash

Feature BSP009 – Facing downstream – Ephemeral wash

Feature BSP010 – Facing upstream – Ephemeral wash

Feature BSP011 (Formerly BBSP F07) – Facing upstream – Ephemeral wash

Feature BSP012 (formerly BBSP F08) – Facing upstream – Ephemeral wash


Feature BSP013 – Facing upstream – Ephemeral wash


Feature BSP014 – Facing upstream – Ephemeral wash

Feature BSP015 – Facing downstream – Ephemeral wash

Feature BSP016 – Facing downstream – Ephemeral wash – showing the edge of the depositional area

Feature BSP017 – Facing upstream – Ephemeral wash

Feature BSP018 – Facing upstream – Ephemeral wash – showing the edge of the depositional area


Feature BSP018 – Facing upstream – Ephemeral wash


Feature BSP019 – Facing upstream – Ephemeral wash


Feature BSP020 – Facing downstream – Ephemeral wash


Feature BSP021 – Facing downstream – Ephemeral wash

Feature BSP024 – Facing upstream – Ephemeral wash

Feature BSP025 – Facing downstream – Ephemeral wash


Feature BSP026 – Facing downstream – Ephemeral wash


Feature BSP027 – Facing downstream – Ephemeral wash


Feature BSP028 (Cottonwood Creek) – Facing upstream – Ephemeral wash

Feature BBSP F-02 – Facing upstream – Ephemeral wash

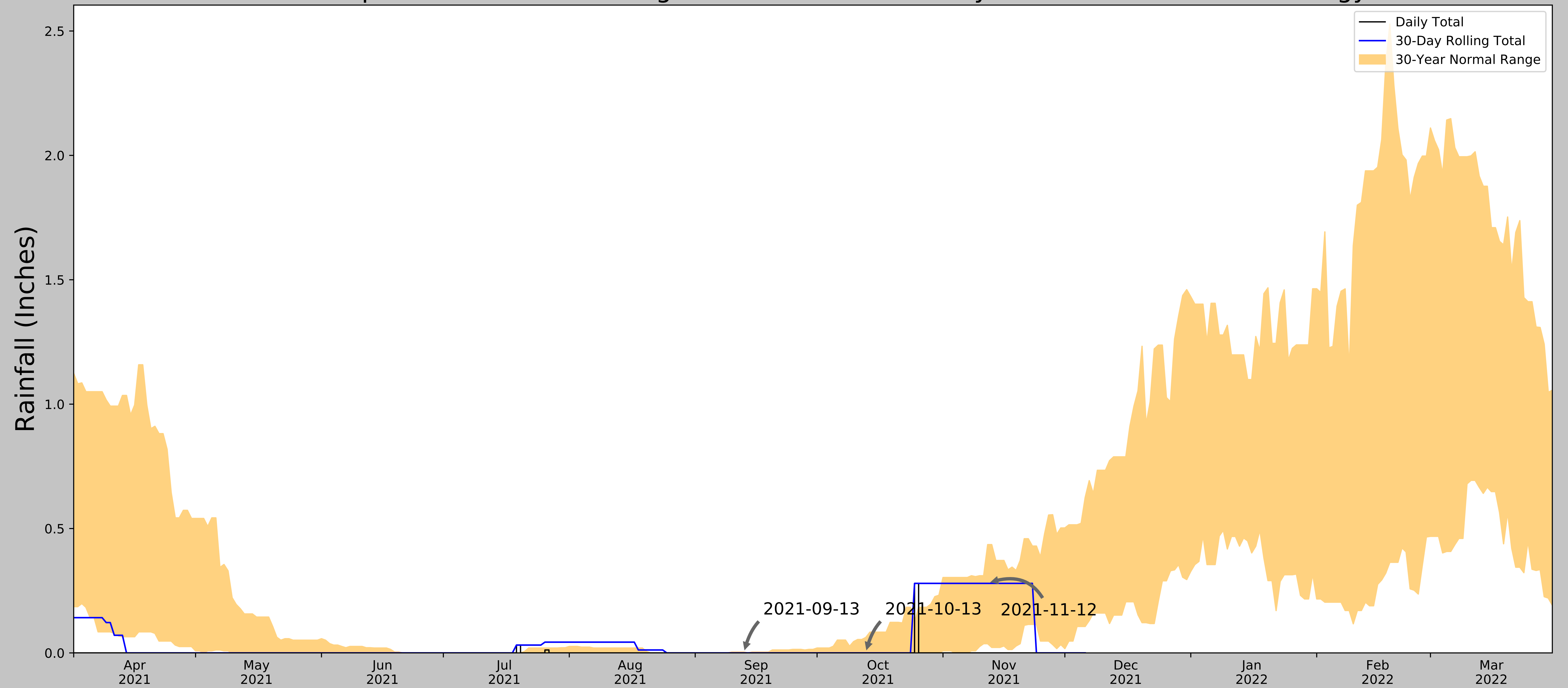
Feature BSP011/BBSP F-07 – Facing upstream – Ephemeral wash – Showing depositional area

Feature BSP011/BBSP F-07 – Facing upstream – Ephemeral wash

Feature BBSP F-07a – Facing upstream – Ephemeral wash

Attachment H – Antecedent Precipitation Tool (APT)

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	34.904844, -118.313503
Observation Date	2021-11-12
Elevation (ft)	2720.31
Drought Index (PDSI)	Severe drought
WebWIMP H_2O Balance	Dry Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2021-11-12	0.037008	0.435433	0.279528	Normal	2	3	6
2021-10-13	0.0	0.062205	0.0	Normal	2	2	4
2021-09-13	0.0	0.003543	0.0	Normal	2	1	2
Result							Normal Conditions - 12

Figure and tables made by the **Antecedent Precipitation Tool** Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days (Normal)	Days (Antecedent)
LANCASTER WM J FOX FLD	34.7411, -118.2117	2337.927	12.702	382.383	10.573	11225	90
MOJAVE	35.0492, -118.1619	2734.908	13.159	14.598	6.113	126	0
FAIRMONT	34.705, -118.4297	3060.039	15.301	339.729	12.083	2	0

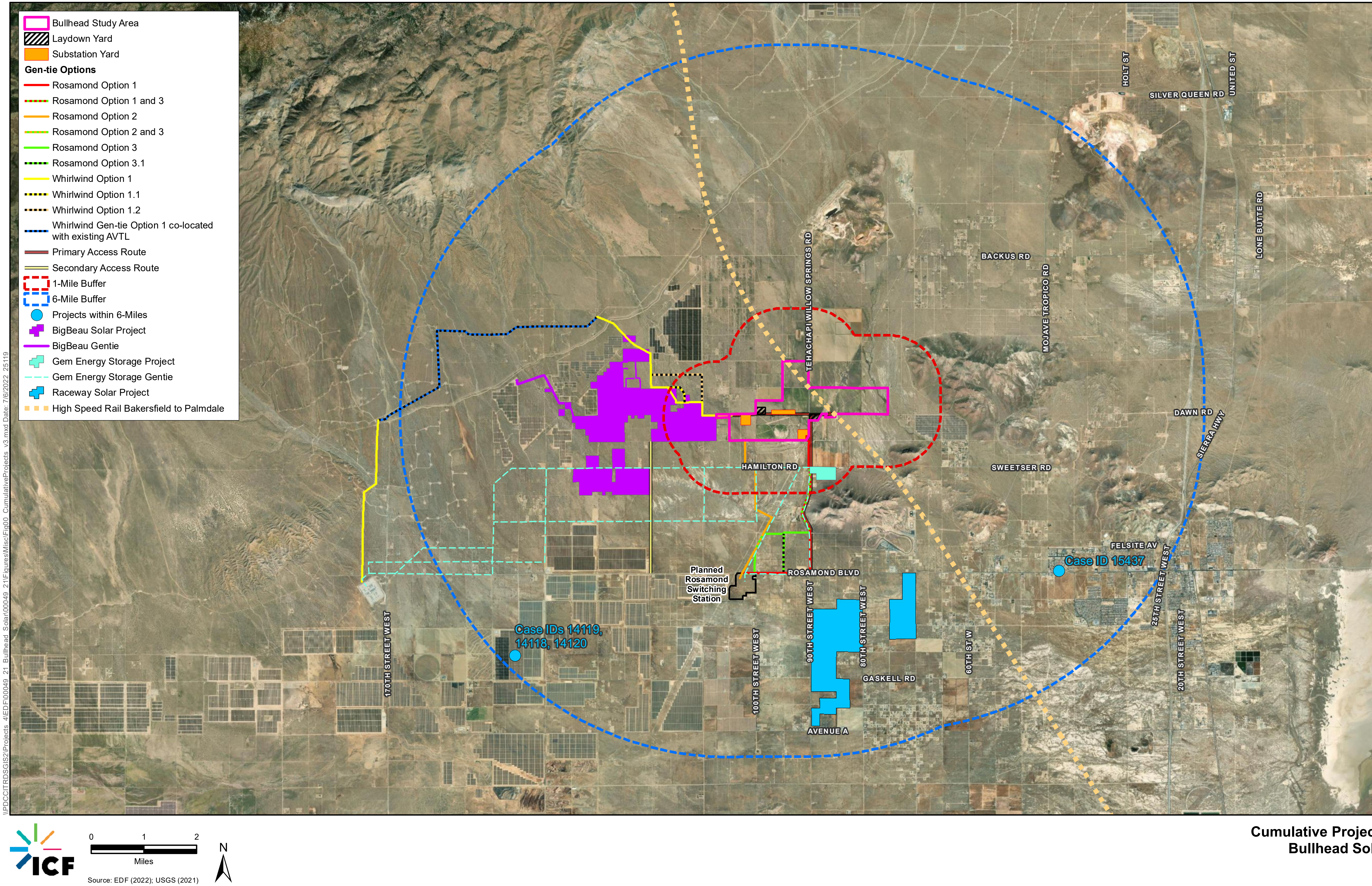
Appendix H
Cumulative Projects

Table 1. Cumulative Projects List

Distance from Bullhead Solar (Within)	CaseID/ Map ID	Applicant/Project Name	Project Location	Project Description	Case Type	Project Site APN	Project Phase/Schedule	Acreage/ SF/Miles	Project Status	MW
1-Mile	-	EDFR/Big Beau Solar Project	North of Ave. to the Stars, South of 125th/Champagne Ave, East of 135th W., West of 105th St W.	128 MW AC photovoltaic solar and associated infrastructure, Gen-Tie Line, and 60 MW Battery Energy Storage System	ZCC, CUPs	Multiple	Under construction (10-14 months. Will be in full operation by time Bullhead is under construction in 2024.	2,285 acres	Approved Construction Phase	128
1-Mile	-	California High Speed Rail Authority, High Speed Rail Bakersfield to Palmdale Section	This segment of HSR is approximately 80 miles in length, with a stretch of approximately 1.5 miles crossing through the project study area in a northwest to southeast direction.	The High Speed Rail project in total consists of Phase 1 which is 520 miles connecting San Francisco to Los Angeles and Anaheim through the Central Valley of California. Phase 2 is approximately 300 miles connecting the Central Valley to Sacramento, Los Angeles and San Diego. The segment crossing through the Bullhead site is part of Phase 1. The HSR would consist of state-of-the-art, electrically powered, high-speed, steel while on steel wheel technology capable of operating up to 220 miles per hour over a fully grad-separated dedicated track.	N/A	346-032-20, 346-032-21, 346-032-52, 346-032-53, 315-050-40	A joint CEQA/NEPA document was completed in August 2021 with a Notice of Determination and NEPA Record of Decision. hould this segment be funded for construction, a portion of the alignment crosses through part of the Bullhead Solar project site and accommodations may need to be made to reconfigure panels in that area should it become necessary. Construction of the Bakersfield to Palmdale segment is not projected to commence until after the Bullhead Solar project is operational.	1.5 miles in study area (80 miles in total length)	CEQA Approved. Construction funding and start is to be determined.	N/A
1-Mile	-	Hydrostar Gem A-CAES, LLC/Gem Energy Storage Center	South of Hamilton Road, east of Tehachapi Willow Springs Road. Transmission line alternatives generally follow Hamilton Road, Irone Avenue, 150th Street W., and Fisher Ave heading toward existing Whirlwind Substation.	An Application for Certification is being processed with the California Energy Commission (CEC) for the development of an advanced compressed air energy storage facility. Gem would include all-electric air compressor trains, air driven power turbine generators, underground compressed air storage cavern, a 31-acre hydrostatically compensating water reservoir, an onsite 230kV substation, and up to 10.9 miles of transmission line to the Whirlwind substation, among other infrastructure.	ZC, CUP	315-081-01, 315-011-09, 315-081--09	Under review by the CEC. Anticipated construction to commence in Q3 or Q4 2023 and would be operational before Bullhead is constructed.	71 acres plus 40-acre laydown area.	Anticipated CEC approvals by July 2023	500

Distance from Bullhead Solar (Within)	CaseID/ Map ID	Applicant/Project Name	Project Location	Project Description	Case Type	Project Site APN	Project Phase/Schedule	Acreage/ SF/Miles	Project Status	MW
6-Miles	15437	Investment Concepts	NE corner of Rosamond and Sedona	A CUP to construct an 18-unit apartment complex in a C-1 zone.	CUP	252-161-492	Construction phase not available; assumed overlap with Bullhead construction.	18 units	Approved	NA
6-Miles	14119, 14118, 14120	SGS Antelope Valley Development /Rosamond Solar Modification Project	East side of 150th Street W, approximately 1/2 mile south of Rosamond Boulevard and 1/2 mile north of Avenue A in the Rosamond area.	Addition of 100 MW of solar power on 400 adjacent acres to original project.	SPA, ZCC, CUP Mod	Multiple	Construction phase not available; assumed overlap with Bullhead construction.	1,360 acres	Approved	100
6-Miles	-	Raceway Solar	Between Rosamond Blvd. and Avenue A and between 70th Street W and 90th Street W.	Two solar photovoltaic projects on six sites totaling 1,330 acres, with 291 MW of electricity and 291 MWh energy storage.	SPA, ZCC, CUPs	Multiple	Construction underway. Will be completed by 2023; project will not overlap with Bullhead Solar construction.	1,330 acres	Approved	291

(-) not available. N/A = Not Applicable



\\PDCCITRDSGIS2\Projects_4\EDF\00049_21_Bullhead_Solar\00049_21\Figures\Misc\Fig00_CumulativeProjects_v3.mxd Date: 7/6/2022 25119

Cumulative Projects
Bullhead Solar

Appendix E.2:
Crotch Bumble bee Habitat Report

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Memorandum

To:	Kern County Planning and Natural Resources Department Terrance Smalls smallst@kerncounty.com
From:	Brad Haley and James Hickman Senior Biologists ICF
Date:	August 30, 2023
Re:	**Bullhead Solar Project Crotch Bumble bee Habitat Assessment Report**

Dear Mr. Smalls,

This report documents the methods and results of Crotch bumble bee (CBB) (*Bombus crotchii)* habitat assessment surveys for the proposed Bullhead Solar Project (Project or Proposed Project). Following comments received from the California Department of Fish and Wildlife (CDFW) on the Environmental Impact Report (EIR) Notice of Preparation (NOP) in January 2023, ICF designed and conducted a habitat assessment for CBB. This report is intended to supplement the Project's previously prepared Biological Resources Technical Report (BRTR; ICF 2023).

Location

The Proposed Project is in southwestern Kern County, California, approximately 6 miles northwest of the community of Rosamond and State Route (SR-) 14, in northern-central Antelope Valley. (Appendix A, Figure 1). The project site is on the eastern and western sides of Tehachapi Willow Springs Road, north of Favorito Road and south of Champagne Avenue (Appendix A, Figure 2).

Existing Conditions

The Project site consists of relatively flat land associated with an alluvial plain south of the Tehachapi Mountains. The site is generally covered by previously disturbed vegetation communities, especially fallow agricultural and ruderal, with pockets of native communities spread out. Areas immediately adjacent to the study area generally include active agricultural fields to the northeast, existing renewable developments, fallow agricultural and ruderal habitat to the west, native communities to the south and east, and generally low-density residential development elsewhere. The larger area includes a combination of native vegetation communities intermixed with low-density residential use, ruderal communities, and active agricultural land.

Background

CBB is currently a candidate species for listing under the California Endangered Species Act (CESA), as defined by California Fish and Game Code section 2068. As such, CBB is afforded the same protections as a listed threatened or endangered species, and the "take" of CBB is prohibited by law

(California Fish and Game Code § 2085). It is therefore important to determine whether CBB or their habitat are present at the proposed Project location.

The flight periods for CBB vary between queens, workers, and males (Thorp et al. 1983). The flight period for CBB queens in California is from late February to late October, peaking in early April, with a second pulse in July. The flight period for workers and males is from late March through September (CDFW 2023). The start, peak, and end period of bumble bee activity vary and are related to temperature and the period when foraging sources are most abundant in the region. CBB inhabits open grasslands and scrub habitats (Xerces 2018). In an analysis that Thorp et al. (1983) conducted, CBB was found to be most strongly associated with the plants in the following families: *Asclepiadaceae*, *Compositae* (*Asteraceae*), *Hydrophyllaceae*, *Labiatae* (*Laminaceae*), and *Leguminosae* (*Fabaceae*). A generalist forager, CBB also feeds on a variety of widely distributed plant genera, including *Antirrhinum, Asclepias, Phacelia, Chaenactis, Clarkia, Dendromecon, Eriogonum, Eschscholzia, Lupinus, Medicago,* and *Salvia* (Koch et al. 2012; Williams et al. 2014). These floral associations do not necessarily represent the species' foraging preference, but may represent prevalence of these flower types in the landscape (Xerces 2018).

At the time that ICF conducted this habitat assessment, no defined or CDFW-accepted survey protocols for CBB existed. ICF developed a CBB habitat-assessment methodology to employ within the Project footprint to evaluate the site qualitatively for species suitability. The CBB habitat-assessment methodology was sent to CDFW Region 4 Environmental Scientists Jeremy Pohlman and Larry Bonner for review, on which they expressed no comments or concerns. The protocols and efforts described below informed the protocol that ICF proposed to CDFW for use on the Project site. The CBB habitat assessment approach and CDFW response is provided in Appendix B. On June 6, 2023, CDFW released its *Survey Considerations for CESA Candidate Bumble Bee Species* (CDFW 2023), which describes methods that are generally similar to those that ICF used for their CBB habitat assessment.

To guide the methodology development for this assessment, ICF used other survey protocols for similar species. ICF biologists reviewed the survey protocol for the rusty-patched bumble bee (*Bombus affinis*; USFWS 2019), the only federally listed bumble bee species in the United States, for which the Xerces Society developed the Rusty-Patched Bumble Bee Habitat Assessment Form and Guide (Xerces 2017). Within California, the California Bumble Bee Atlas (CBBA; N.D.) has started a citizen science effort to conduct surveys for bumble bees within defined survey plots throughout the state. The CBBA has also developed survey protocols (including basic training from experts) for conducting point, habitat, and incidental surveys.

Methods

Consistent with the approach proposed to CDFW (Appendix B), ICF used geographic information systems (GIS) to locate fourteen 3-acre plots for each of two survey sessions (i.e., 14 plots per session, for a total of 28 plots). Table 1 shows the distribution of survey plots within the Project site's habitat types, and Figure 3 shows the locations of the plots relative to the vegetation types.

Table 1. Bullhead Vegetation Community Composition and Crotch's Bumble Bee Survey Plot Distribution Per Session

Vegetation Type	Acreage	Survey Plots (% of site)
Native Desert [1]	392.7 acres	5 plots (36%)
Ruderal [2]	381.1 acres	4 plots (28%)
Fallow Agriculture/Disturbed [3]	555.2 acres	5 plots (36%)
Total	1,329.1 acres	14 plots (100%)

[1] Creosote bush scrub, creosote bush scrub-disturbed, allscale scrub, allscale scrub-disturbed.
[2] Rubber rabbitbrush scrub, rubber rabbitbrush scrub-disturbed, ruderal desert forb patches.
[3] Inactive Agriculture and disturbed.
Note: The Mulefat Thicket and Tamarisk Grove vegetation communities and Developed land cover type are not considered to be potentially suitable for CBB and were therefore not included in the habitat assessment.

For each plot, ICF biologists located a central point, and then mapped a 3-acre circle around that point. When surveyors were on site, they shifted some plots to capture the highest-quality representative habitat (e.g., greater cover by flowering plants, fewer disturbances) in each habitat type based on the site conditions during the survey.

To collect data for the scoring sheet created for the Project (Appendix B), one to two surveyors visited and walked meandering transects through each plot, deriving scores by evaluating six different categories, as follows.

1. **Section 1**: Percentage of survey plot in natural or semi-natural habitat
2. **Section 2**: Diversity of wildflowers/native plants, pastureland with presence of bee-friendly legumes, nearby water sources
3. **Section 3**: Foraging habitat (i.e., absolute cover by flowering plants)
4. **Section 4**: Known bumble bee–important plant genera (i.e., number of species of plants of genera known for bumble bee use)
5. **Section 5:** Nesting and overwintering habitat (e.g., areas of native bunch grasses, evidence of burrowing mammals, woody debris, unmowed/ungrazed habitat)
6. **Section 6**: Pesticide and other management practices (e.g., evidence of invasive-weed control, use of insecticides, pesticides, mowing, grazing, burning)

ICF biologists gave each plot a score for each Section. Each plot could score up to 100 points for Sections 1 through 6, or up to 80 points for Section 1 through 5, with various ranges determining the general suitability of each plot; bumble bees observed incidentally also were mapped. Table 2 shows the scores and their relative suitability for CBB.

Table 2. Bullhead Solar Project Crotch's Bumble Bee Habitat Suitability

Total Score	Habitat Suitability for CBB
Total Score = 0%	No potential to occur
Total Score = 1–32%	Low potential to occur (i.e., missing most habitat parameters)
Total Score = 33–65%	Moderate potential to occur (i.e., missing one or more habitat parameters)
Total Score = 66–100%	High potential to occur (i.e., majority of habitat parameters are present)

The first session occurred from May 9 to May 10, 2023. The second session occurred approximately 2 weeks later, from May 24 to May 25, 2023. Table 3 shows the conditions during each session.

Table 3. Bullhead Solar Project Crotch's Bumble Bee Survey Conditions

Date	Weather Conditions	Personnel
Session 1		
5/9/2023	61–68°F, 3–5 MPH wind, 0% cloud cover	Amy Anderson, James Hickman
5/10/2023	61–81°F, 3–5 MPH wind, 5% cloud cover	Amy Anderson, James Hickman
Session 2		
5/24/2023	60–82°F, 3–5 MPH wind, 0% cloud cover	Amy Anderson, James Hickman
5/25/2023	58–78°F, 3–5 MPH wind, 0% cloud cover	Amy Anderson, James Hickman

°F = degrees Fahrenheit; MPH = miles per hour.

Results

ICF biologists collected scores for each plot on paper datasheets, and then tabulated the scores to determine the overall plot suitability for CBB. Appendix C contains the datasheets, and Appendix D contains representative plot photographs. Table 4, below, provides a summary of the plot scores, sorted by highest to lowest score.

When collecting data, ICF biologists noted that plots seemed to receive relatively high scores, compared to a qualitative review. For example, plots that had relatively high levels of disturbance, no native habitat, little to no diversity of plants, no important genera of plants, and few flowering plants were still receiving scores that indicated a moderate potential for CBB to occur. A review of the scoring for parameters found that, due to the lack of any weed and pest management on the site, all plots received 100 percent of the 20 points allotted for Section 6 (i.e., insecticide or pesticide use, burning, or presence of managed beehives). These 20 points represent 20 percent of the overall score, which is double the maximum score of any other section, including those that considered the presence of foraging habitat and diversity of plant species. ICF determined that this likely resulted in elevated scores that may not be representative of the presence, or lack thereof, of required features for suitable CBB habitat.

Plot 33 is an example of how the quantitative score does not seem to be an accurate representation of the qualitative presence of suitable habitat. This plot has 0-percent cover of native vegetation (i.e., score 0/10), less than 40-percent cover of native plants (i.e., score 0/15), no legumes (i.e., score 0/15), no nearby water sources (i.e., score 0/5), less than 10-percent cover of flowering plants (i.e., score 1/10), and no important genera of plant species (i.e., score 0/10), but was elevated to moderate potential for CBB based on the lack of mowing (i.e., score 10/10), presence of woody debris (i.e., score 2/5), and, as found in Section 6, the lack of insecticide use (i.e., score 5/5), lack of pesticide use (i.e., score 5/5), less than one-third of the habitat burned (i.e., score 5/5), and lack of managed beehives within 0.25 mile (i.e., score 5/5).

In order to avoid a potential survey bias, ICF biologists derived a second score that eliminated Section 6 and focused the evaluation on the presence of factors that CBB require (i.e., diversity of native cover and wildflowers), rather than the lack of insecticides, pesticides, and burning and the presence of beehives. Because of this, Table 4 shows tabulations for Sections 1 through 5. Note: to be comparable with the final score, a percent of the total score was used to determine the final score. For purposes of results, only the scores from Sections 1 through 5, represented in Table 4, are discussed hereafter.

Table 4. Summary of Crotch Bumble Bee Scoresheet Values

Plot ID (Session) [1]	Habitat [2]	Sections 1–5: 1	2	3	4	5	Total Score (Total Possible: 80): Score [4]	% [3]
1 (1)	ND	10	10	7	6	19	52	65%
30 (2)	ND	10	10	7	10	14	51	64%
27 (2)	ND	10	10	10	5	16	41	64%
3 (1)	ND	10	10	5	10	13	48	60%
31 (2)	ND	10	10	7	5	14	46	58%
17 (1)	ND	10	10	3	3	18	44	55%
18 (1)	ND	10	10	5	3	16	44	55%
7 (1)	ND	10	0	7	3	19	39	49%
9 (1)	RUD	10	0	10	3	13	36	45%
10 (1)	RUD	10	0	7	3	15	35	44%
24 (2)	RUD	10	0	5	3	17	35	44%
28 (2)	ND	10	0	5	5	14	34	43%
15 (1)	RUD	10	0	7	3	12	32	40%
29 (2)	ND	10	0	1	3	13	27	34%
23 (2)	RUD	5	0	3	5	12	25	31%
34 (2)	FA/D	0	0	10	3	11	24	30%
16 (1)	RUD	3	0	3	3	13	22	28%
21 (2)	RUD	3	0	3	3	12	21	26%
35 (2)	FA/D	0	0	7	3	10	20	25%
36 (2)	FA/D	0	0	7	3	10	20	25%
2 (1)	FA/D	0	0	7	0	11	18	23%
22 (2)	RUD	3	0	1	3	11	18	23%
12 (1)	FA/D	0	0	7	0	11	18	23%
13 (1)	FA/D	0	0	7	0	11	18	23%
5 (1)	FA/D	0	0	3	3	11	17	21%
14 (1)	FA/D	0	0	3	0	11	14	18%
32 (2)	FA/D	0	0	1	0	11	12	15%
33 (2)	FA/D	0	0	1	0	11	12	15%

[1] Plots are sorted in order of highest to lowest score.
[2] Vegetation types: FA/D = Fallow Agriculture/Disturbed; ND = Native Desert; RUD = Ruderal.
[3] Refer to Table 2 for Crotch's Bumble Bee habitat-suitability potentials based on plot scores.
[4] Adding 20 points to each plot score and then dividing the total by 100 would equal plot score percentage if including Section 6 habitat categories.

As Table 4 shows, when Section 6 is not included in the calculations, 14 plots have low potential for CBB (i.e., scores ranging from 15 to 31 percent), and the other 14 plots have a moderate potential for CBB (i.e., scores ranging from 34 to 65 percent). No sites have a high potential for CBB.

Bumble Bees Observed

Four bumble bees were observed incidentally during the habitat assessment, three of which were within Native Desert habitat types. The bees were not captured for identification (either physically or by camera), so the species is unknown. Three bumble bees were observed on *Phacelia fremontii* plants, two approximately 225 feet from the center of Plot 1 and one within Plot 1. The fourth bumble bee was observed flying by, without landing, in Plot 2. Plot 1 is within Native Desert habitat, and Plot 2 is within Fallow Agriculture/Disturbed habitat type. The bumble bees observed in Plot 1 were foraging on native wildflowers, whereas the bumble bee observed in Plot 2 was merely flying through.

CNDDB Results

Figure 4 provides the results of CDFW's California Natural Diversity Database (CNDDB) in relation to the Project. Within the CNDDB, there are no records of CBB within 10 miles of the Project. The most recent CBB observations, according to CNDDB, occurred in 2019 approximately 12 miles south of the Project, and another occurred in 2017 in the Tehachapi Mountain foothills to the northwest of the Project (CDFW 2023). Databases that track and verify CBB records such as Bumble Bee Watch (www.bumblebeewatch.org) and iNaturalist (www.inaturalist.org) do not contain additional CBB records when compared to the CNDDB (Figure 4). However, other databases (which may not be considered public) contain records of CBB in the Antelope Valley between 1936–1974, primarily located at the San Gabriel Mountain and Tehachapi foothills south and west of the Project. However, the lack of CBB data occurrences does not mean the species does not occur in a given area, particularly because of the lack of survey requirements for this species until quite recently and lack of inventory survey effort in less-than-high quality habitat (e.g., the Antelope Valley desert floor).

Discussion

ICF evaluated twenty-eight 3-acre plots proportionately located in three different general habitat types found on the Project site, representing a total of approximately 1,329.1 acres (excluding Mulefat Thicket, Tamarisk Grove, and Developed vegetation communities/land cover types). All plots scored at least a low potential for CBB to use the site. Consistent with what would be expected, the highest scores were found in the Native Desert habitat types, and the lowest scores were found in the most disturbed habitats. When eliminating Section 6, the category representing management practices (i.e., use of pesticides, insecticides, burning, and beehives), no communities have a high potential for CBB to occur.

Native Desert Habitats

Native Desert habitats on site include Creosote Bush Scrub, Creosote Bush Scrub – Disturbed, Allscale Scrub, and Allscale Scrub – Disturbed. Between the two survey sessions, ICF biologists evaluated a total of 10 plots mapped as Native Desert. When evaluating only Sections 1 through 5, all

10 Native Desert plots, representing approximately 393 acres, have a moderate potential for CBB to occur, with scores ranging from 34 to 65 percent.

Fallow Agriculture/Disturbed Habitats

Fallow Agriculture/Disturbed habitats on site comprise inactive agricultural sites that show recent signs of disturbance. Between the two survey sessions, ICF biologists evaluated a total of 10 plots mapped as Fallow Agriculture/Disturbed. When evaluating only Sections 1 through 5, all 10 Fallow Agriculture/Disturbed plots, representing approximately 555 acres, have a low potential for CBB to occur, with scores ranging from 15 to 30 percent.

Ruderal Habitats

Ruderal habitats on site include Rubber Rabbitbrush Scrub, Rubber Rabbitbrush Scrub – Disturbed, and Ruderal Desert Forb Patches. Between the two survey sessions, ICF biologists evaluated a total of eight plots, representing approximately 381 acres, mapped as Ruderal. When evaluating only Sections 1 through 5, four Ruderal plots have a low potential, and four have a moderate potential for CBB to occur, both representing approximately 190 acres each, with scores ranging from 23 to 45 percent.

Summary and Impact Analysis

Based on the sampling performed for evaluating the 28 plots across the three habitat types found on site, ICF biologists determined that there is a low potential for CBB to occur over the majority of the Project site, but a moderate potential within Native Desert habitats. The potential to occur is lowest among the Fallow Agriculture/Disturbed communities and highest among the Native Desert communities.

It is likely that several plots received a non-representatively high score when including the management-practices parameters, especially where little-to-no plant species diversity and few flowering plants were found. As such, based on the representative plots evaluated, all of the Fallow Agriculture/Disturbed habitats and half of the Ruderal habitats present within the Bullhead Solar Project, representing approximately 746 acres of habitat, have a low potential for CBB to occur. The remaining 582 acres, which include all of the Native Desert and half of the Ruderal habitats present within the Bullhead Solar Project, have a moderate potential for CBB to occur.

Project activities could result in direct and/or indirect effects on individual CBB, if CBB are present, and could include but would not be limited to: initial site preparation; heavy equipment operation; grading; excavation, trenching and backfilling; installation and/or removal of structures and equipment; vehicle and foot traffic; access road construction, repair, and resurfacing; handling of stockpiles and stored materials; soil compaction; vegetation clearing and maintenance (grading, mowing, and grubbing); washing of photovoltaic (PV) panels; and other development activities related to the Project. The Project could cause the permanent loss of up to 582 acres of suitable habitat with moderate potential for CBB and approximately 746 acres of suitable habitat with low potential for CBB.

Direct effects on CBB individuals and nests may result from vehicle/equipment strikes and materials placement (crushing); nest collapse associated with earthwork, vegetation removal, or vehicle passage (entombment, crushing, or suffocation); equipment laydown, trenching, other excavations, grading, pile driving, laying of foundations, or disking; placement of spoils and/or fill materials (entombment, crushing, or suffocation); or flooding (drowning) from washing of PV panels.

Indirect effects on CBB may include temporal losses, increased habitat fragmentation and edge effects, effects from lighting at night, and the Project's incremental contribution to cumulative impacts. These impacts include: stress resulting from noise and vibration from ground disturbance, equipment operation, and traffic; increased exposure or stress from disorientation; introduction or spread of invasive species; and long-term effects. Long-term effects could include displacement from preferred habitat; barriers to movement to and increased travel distance to breeding habitat (decreased reproductive output, energetic expenses, and exposure to predation and elements); loss of foraging habitat; changes in drainage patterns that favor different vegetative growth; increased pollution; increased competition for food and space; loss of nesting habitat used for shelter, reproduction, and escape cover; increased vulnerability to predation; exposure to contaminants through introduction of contaminated water, contaminated substrates, hazardous materials (including herbicides and pesticides), or vehicle and equipment fuels and fluids; exposure to pathogens through introduction of contaminated water; and decreased food supply through changes in composition of floral nectar resources or prey abundance (starvation). Individuals displaced due to habitat loss and degradation may be unable to survive in adjacent areas if these areas are at carrying capacity or are unsuitable for colonization.

Should you have any questions, please contact me at (909) 499-8230 or James.Hickman@icf.com.

Sincerely,

James Hickman
Senior Biologist
ICF

Enclosed:
Appendix A, Figures
Appendix B, Crotch's Bumble Bee Habitat Assessment Methodology
Appendix C, Data Sheets
Appendix D, Site Photos

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Appendix A

Figures

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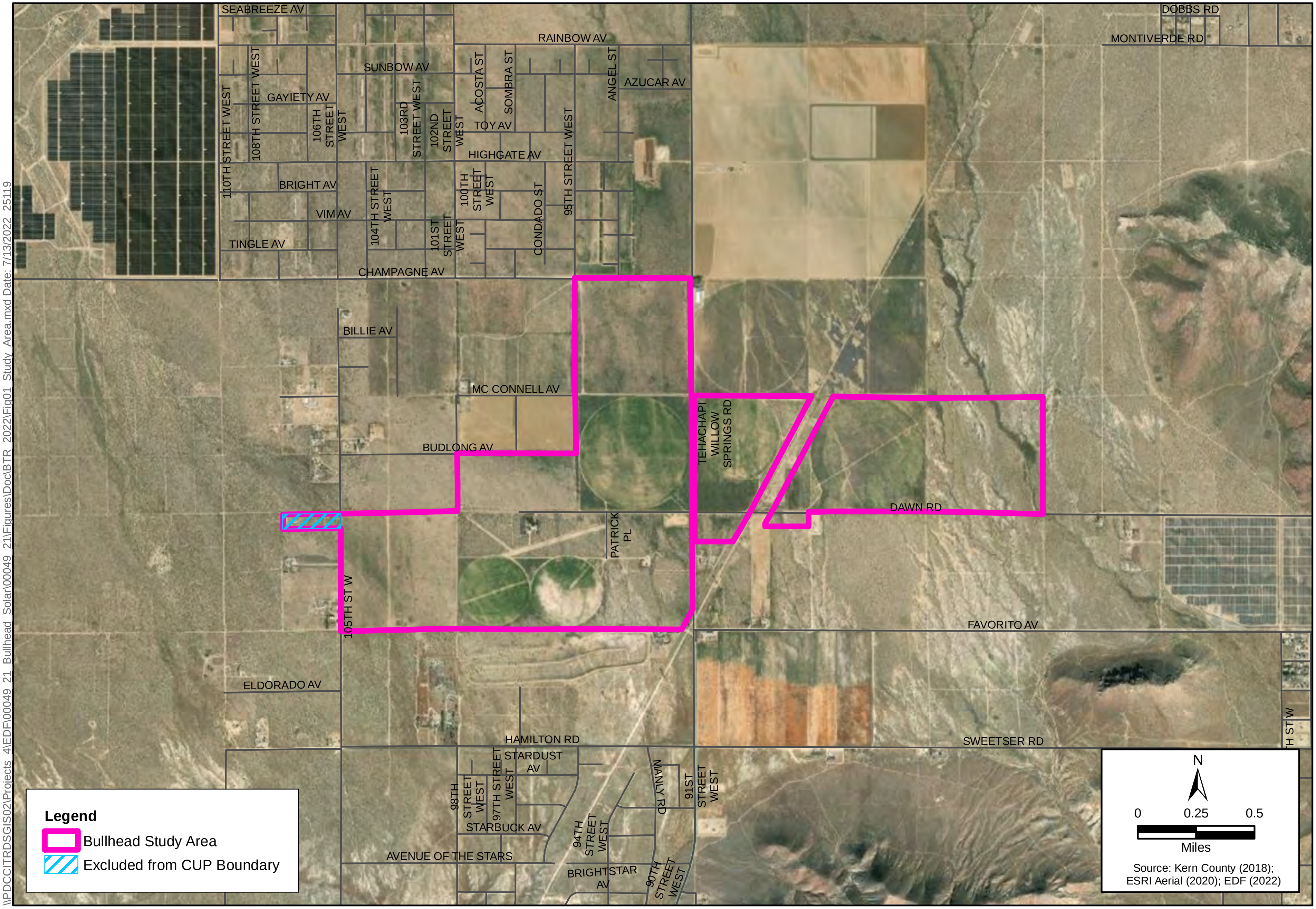

ICF

Figure 1
Study Area
Bullhead Solar

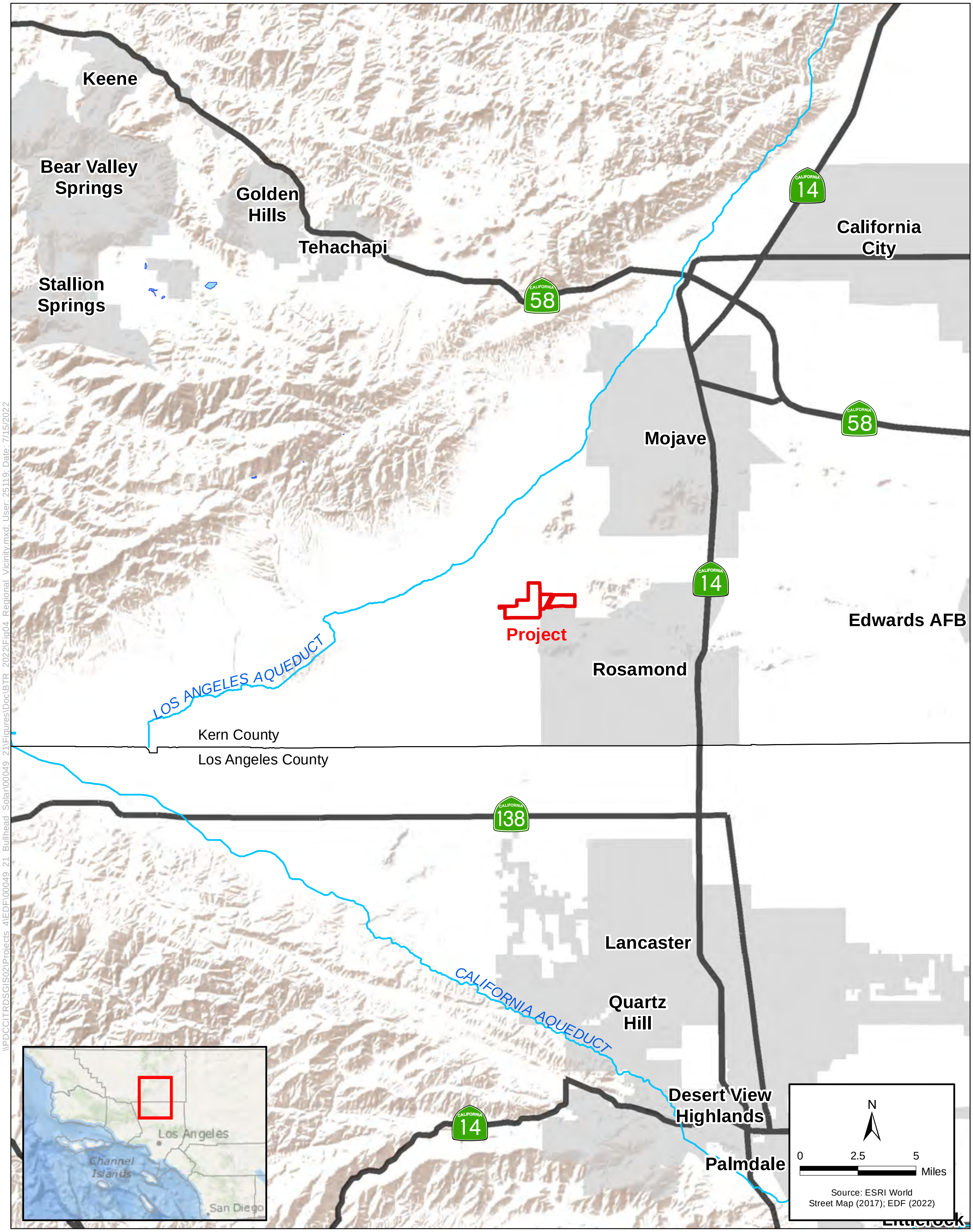

Figure 2
Regional Vicinity Map
Bullhead Solar

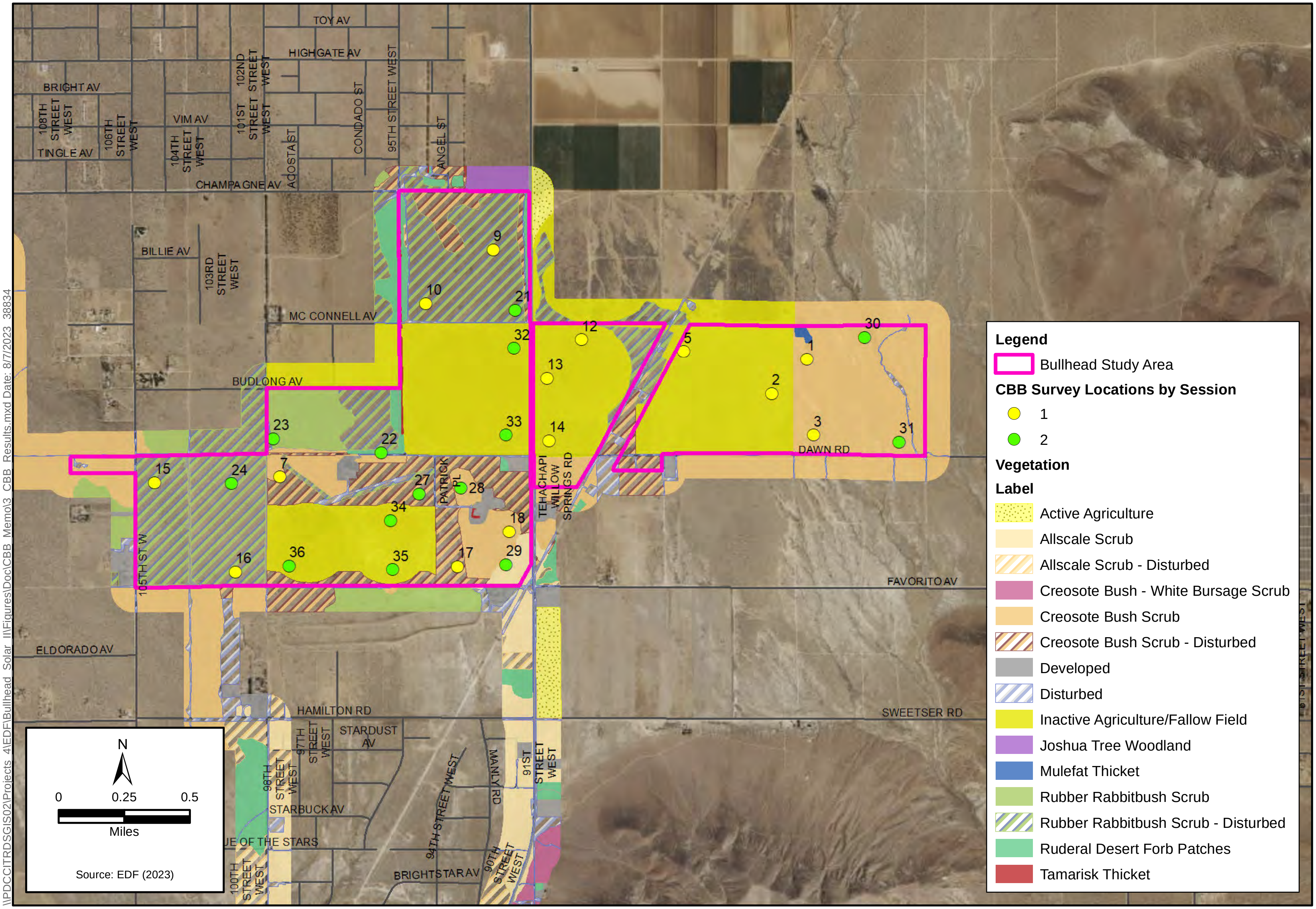

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Figure 3
CBB Survey Locations
Bullhead Solar

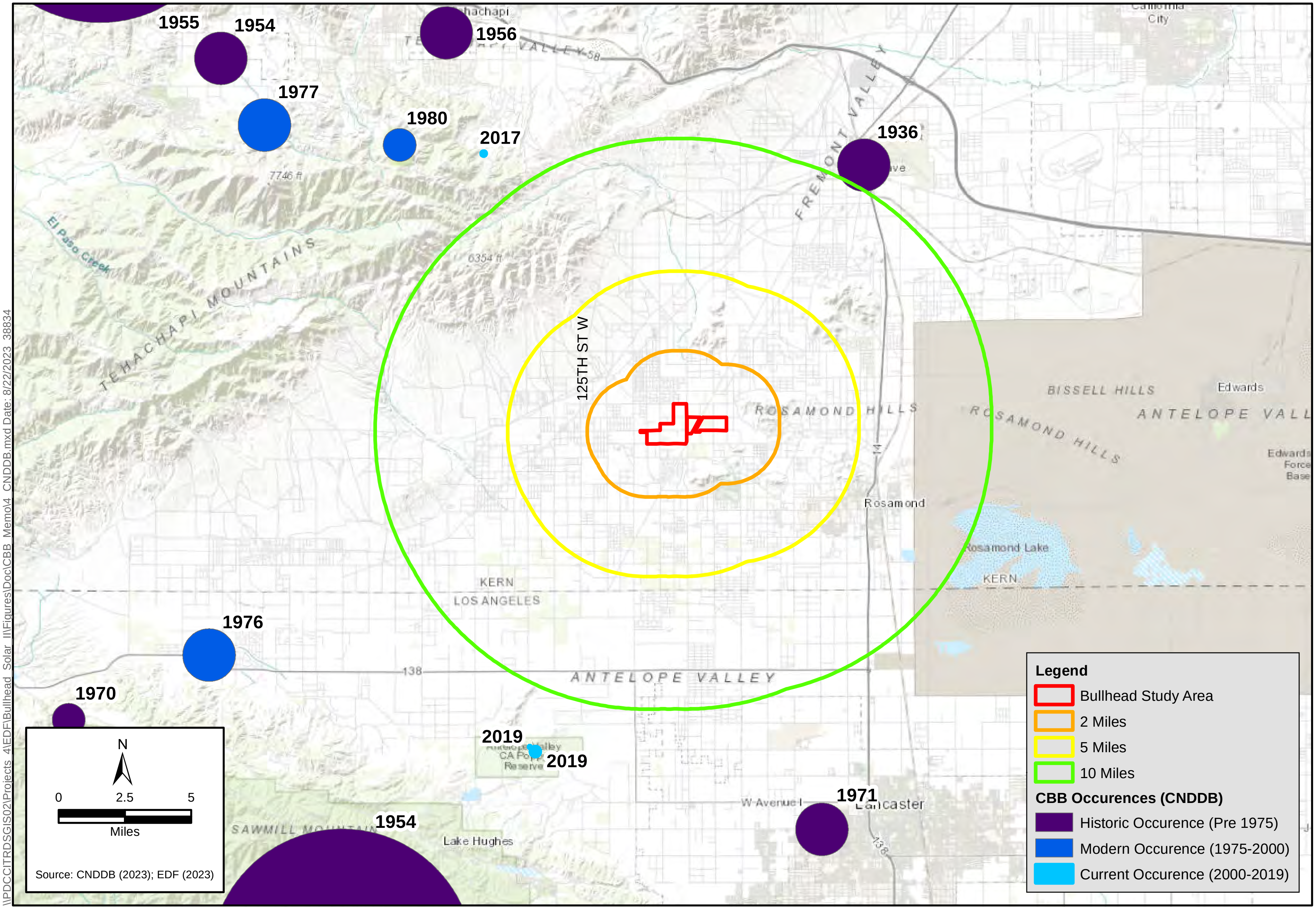

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Figure 4
CBB Occurences (CNDDB)
Bullhead Solar

Appendix B

CBB Habitat Assessment Methodology

May 3, 2023

Habitat Conservation Planning
San Joaquin Valley and Southern Sierra Region
California Department of Fish and Wildlife, Region 4
1234 E. Shaw Avenue
Fresno, California 93710

Subject: Crotch's Bumble Bee Habitat Assessment Methodology

To Whom it May Concern:

EDF Renewables (EDFR) is in the process of conducting environmental technical studies to support the potential development of a solar generation project, the proposed Bullhead Solar Project (proposed project). The proposed project is located in southwestern Kern County, California, approximately 6 miles northwest of the community of Rosamond and SR-14, in north-central Antelope Valley. ICF has been retained on behalf of EDFR to conduct field surveys for biological resources. As part of these surveys, ICF plans to conduct a habitat assessment for the Crotch's Bumble Bee (CBB)(*Bombus crotchii*) at the proposed project site in 2023 based on comments received from CDFW in the EIR Notice of Preparation in January 2023. Potentially suitable CBB foraging and nesting habitat occurs within the Bullhead footprint, therefore a habitat assessment will be performed to evaluate the quality of the habitat. This memorandum has been prepared to present ICF's work plan for the CBB habitat assessment.

Background

The flight periods for Crotch's Bumble Bee (CBB; *Bombus crotchii*) vary between queens, workers, and males (Thorp et al. 1983). The flight period for CBB queens in California is from late February to late October. The flight period peaks in early April with a second pulse in July. The flight period for workers and males is from late March through September (CDFW 2019b). The start, peak, and end period of bumble bees varies and is related to temperature and the period when foraging sources are most abundant in the region. CBB inhabits open grasslands and scrub habitats (Xerces Society for Invertebrate Conservation 2018). In an analysis conducted by Thorp et al. (1983), CBB was found to be most strongly associated with the plants in the following genera: Asclepiadaceae, Compositae (Asteraceae), Hydrophyllaceae, Labiatae (Laminaceae), and Leguminosae (Fabaceae). CBB is a generalist forager that also feeds on a variety of widely distributed plant genera including Antirrhinum, Asclepias, Phacelia, Chaenactis, Clarkia, Dendromecon, Eriogonum, Eschscholzia, Lupinus, Medicago, and Salvia (Koch et al. 2012; Williams et al. 2014). These floral associations do not necessarily represent the species' foraging preference but may represent prevalence of these flower types in the landscape (Xerces Society for Invertebrate Conservation 2018).

ICF developed a CBB habitat assessment methodology to employ within the Bullhead footprint in the spring of 2023. No defined or CDFW-accepted survey protocols for CBB currently exist. In cases where a species is newly listed and the wildlife agencies have not yet developed a protocol, it is common practice for biologists to review other survey protocols for similar species to guide development of species- or project-specific protocols. ICF biologists reviewed the survey protocol for the rusty-patched bumble bee (USFWS 2019), which is the only federally listed bumble bee species in the United States. Additionally, the Xerces Society has developed the rusty-patched bumble bee habitat assessment form and guide (Xerces Society 2017). Within California, the California Bumble Bee Atlas (CBBA) has started a citizen science effort to conduct surveys for bumble bees within defined survey plots located throughout the state. The CBBA has also developed survey protocols (with basic training by experts) for conducting point, habitat, and incidental surveys. The protocols and efforts described above inform the proposed approach below.

Overview

- Surveys to describe and quantify the habitat characteristics for Bullhead footprint will be conducted. The surveys will not be suitable to conclude presence/absence definitively (unless CBB are observed) but will provide information useful to characterize the potential for CBB to occur.
- No bumble bees will be captured during surveys, which could require a Scientific Collection Permit from CDFW. Surveys will be visual only and using photography when possible.
- Given the size of the project area (over 1,300 acres), the surveys will be representative sample plots within each of the habitats present (# of plots proportional to their abundance on the site).

Habitat Assessment Methodology

- Using the vegetation mapping for Bullhead, 14 plots that are 3 acres each will be placed throughout the project footprint for two separate survey sessions, for a total of 28 plots to be sampled in spring 2023.
    - Session 1 will contain 14 plots sampled and Session 2 will contain 14 additional plots in different locations than Session 1 (28 total plots).
    - The Sessions will be separated by 2 or 3 weeks.
    - Plots will be placed proportionately based on the vegetation type, as shown below in Table 1 and approximate locations of Session 1 (Attachment A).

Table 1. Bullhead Vegetation Community Composition and CBB Survey Plot Distribution

Vegetation Type	Acreage	Survey Plots (% of site)
Native Desert[1]	392.66 acres	4 plots (30%)
Ruderal[2]	381.12 acres	4 plots (29%)
Fallow Ag/Disturbed[3]	555.16 acres	6 plots (41%)
Total	**1,328.94 acres**	**14 plots (100%)**

[1] Creosote bush scrub, creosote bush scrub-disturbed, allscale scrub, allscale scrub-disturbed,
[2] Rubber rabbitbrush scrub, rubber rabbitbrush scrub-disturbed, ruderal desert forb patches
[3] Inactive Agriculture and disturbed

- Surveys will be conducted by one or two surveyors per plot, one to identify and photograph any bumble bees that are observed, and the other to conduct plant identification and to record habitat attributes.
  - Within each plot, surveyors will perform qualitative surveys for a period of 60 minutes per plot. Surveyors will walk meandering transects throughout each plot in order to populate the scoring sheet (Attachment B).
- Surveys will be conducted during appropriate weather conditions (daylight hours, low wind speeds, temperatures of at least 60F), if possible.
- Approximate locations for each plot will be determined intuitively based on the number of plots per vegetation type (Table 1). The biologists will confirm the final location of each survey plot based upon the field conditions present. The plots will be placed in the most optimal locations for CBB, both in terms of the vegetation and floral resources present, but also to avoid close proximity to disturbances (roads, structures, denuded land, etc.) and taking into account access difficulty. Approximate locations for Session #1 are shown in Attachment A and are subject to adjustment in the field. Fourteen separate plots will be assessed during Session #2, but will include the same number of plots per vegetation category as Session #1.
- Bumble bees observed incidentally during the surveys (i.e., observed while traveling to each survey plot) will be recorded and photographed whenever possible.
- ICF developed a habitat assessment scoring sheet using a similar approach to the Xerces Society habitat assessment protocol for rusty-patched bumble bee (Attachment B). The scoring sheet will assess each of the following with a numerical rating:
  - Site features (e.g., percentage of the site that is in natural or semi-natural condition)
  - Foraging habitat (e.g., number and type of floral resources present, including those known to be used by CBB[1])
  - Nesting and overwintering habitat (e.g., areas of native bunch grasses, evidence of burrowing mammals, woody debris)
  - Pesticide practices (e.g., evidence of invasive weed control, use of insecticides)

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[1] CBBA has some more information on this. Or at least plants that BB's were most often observed on. https://www.cabumblebeeatlas.org/project-highlights.html

- Management practices (e.g., evidence of mowing, grazing, burning)
- Presence of bumble bees (e.g., number and type observed)

The result will be a total score (100 maximum points) which quantifies the overall suitability of each plot.

Should CDFW have any comments on this work plan, or recommendations on additional or alternative survey methods that may be required to determine CBB presence or absence at the proposed project, please contact Brad Haley at (619) 633-6439 or brad.haley@icf.com. Based on current status of wildflowers and nectar sources for CBB at the proposed project, the habitat assessment will proceed based on the methods described herein the week of May 8, 2023.

Sincerely,

Brad Haley
Senior Biologist & Project Manager
ICF
525 B Street, Suite 1700
San Diego, CA 92101
858.444.3974 direct

Attachment A	Session 1 Potential Plot Locations
Attachment B	CBB Habitat Assessment Datasheet

Attachment A
Session 1 Potential Plot Locations

Session 1 Potential Plot Locations

Attachment B
CBB Habitat Assessment Datasheet

CBB Habitat Assessment Scoring Sheet

Date: ___________________________________
Surveyor(s):_______________________________
Survey Plot: _________________________

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat				
Select only one	*Score*	*Observed*		
>75%	10			
50%-75%	7			
25%-49%	5			
10%-24%	3			
<10%	0			
			Subtotal	max = 10

2. Additional site features that are present				
Select all that apply	*Score*	*Observed*		
Diverse native wildflowers/plants (native plant cover is at least 40%)	10			
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5			
Water sources within proximity (.25 mile)	0-5			
			Subtotal	max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)

Select only one	*Score*	*Observed*		
>50% cover	10			
30-50% cover	7			
20-30% cover	5			
10-20% cover	3			
<10% cover	1			
			Subtotal	max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)				
Select only one	*Score*	*Observed*		
10+ species	10			
5-9 species	5			
1-4 species	3			
0 species	0			
			Subtotal	max = 10

5. Nesting and Overwintering Habitat				
Score all options that apply	*Score*	*Observed*		
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5			
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5			
1 point for every 10% of area that is unmowed and ungrazed	0-10			
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5			
Leaf litter (for overwintering queens)	5			
			Subtotal	max = 30

6. Management and Pesticide Practices				
Score all options that apply	*Score*	*Observed*		
No evidence of herbicide use	5			
No evidene of insecticide use	5			
If burning occurs, burning is limited to 1/3 of habitat per year	5			
Managed bee hives (honey bees) are not present within 0.25 mile.	5			
			Subtotal	max = 20
		Total Score		max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Genus or Family	Source
Acmispon	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Agastache	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Angelica	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Asclepiadaceae	CESA listing petition, page 32. Available at: https://www.xerces.org/sites/default/files/2019-10/CESA-petition-Bombus-Oct2018.pdf
Asclepias	CESA listing petition, page 32. Available at: https://www.xerces.org/sites/default/files/2019-10/CESA-petition-Bombus-Oct2018.pdf
Asteraceae	CESA listing petition, page 32. Available at: https://www.xerces.org/sites/default/files/2019-10/CESA-petition-Bombus-Oct2018.pdf
Carduus	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Chaenactis	CESA listing petition, page 32. Available at: https://www.xerces.org/sites/default/files/2019-10/CESA-petition-Bombus-Oct2018.pdf
Cirsium	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Dendromecon	Koch et al. 2012/Williams et al. 2014
Ericameria	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Eriogonum	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Eschscholzia	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Eschscholzia	Koch et al. 2012/Williams et al. 2014
Fabaceae	CESA listing petition, page 32. Available at: https://www.xerces.org/sites/default/files/2019-10/CESA-petition-Bombus-Oct2018.pdf
Hydrophyllaceae	CESA listing petition, page 32. Available at: https://www.xerces.org/sites/default/files/2019-10/CESA-petition-Bombus-Oct2018.pdf
Lamiaceae	CESA listing petition, page 32. Available at: https://www.xerces.org/sites/default/files/2019-10/CESA-petition-Bombus-Oct2018.pdf
Lavandula	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Lupinus	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Medicago	CESA listing petition, page 32. Available at: https://www.xerces.org/sites/default/files/2019-10/CESA-petition-Bombus-Oct2018.pdf
Monardella	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Penstemon	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Phacelia	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Salvia	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Salvia	CESA listing petition, page 32. Available at: https://www.xerces.org/sites/default/files/2019-10/CESA-petition-Bombus-Oct2018.pdf
Senecio	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Solidago	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Stachys	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Symphyotrichum	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Trifolium	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html
Vicia	"Top 20 most important plant genera for California bumble bees" Available at: https://www.cabumblebeeatlas.org/project-highlights.html

From:	Pohlman, Jeremy@Wildlife
To:	Haley, Brad; Bonner, Lawrence(Larry)@Wildlife
Cc:	Scott Kuhlke; Carr, Chris; Patrick Golden; Miille, Ellen; Devon Muto; Christa Hudson (Consultant)
Subject:	RE: EDFR Bullhead Solar Project - Crotch''s Bumble Bee Habitat Assessment
Date:	Friday, May 5, 2023 2:50:09 PM

Hi Brad,

Thank you for providing the CBB habitat assessment methodology. We appreciate the detailed approach for assessing CBB habitat for the Bullhead Solar Project and have no comments or concerns. Please be aware that depending on the results of the habitat assessment, CDFW may recommend additional focused surveys for CBB during review of the DEIR. If EDF/ICF anticipate that focused surveys are going to be conducted to provide support for absence of the species, please feel free to reach out prior to circulation of the DEIR for CDFW guidance.

Good luck out there with the assessment.

Cheers,

Jeremy Pohlman | Senior Environmental Scientist (Specialist) | California Department of Fish and Wildlife | Central Region Renewable Energy Program | 3196 S. Higuera, Suite A, San Luis Obispo, CA 93401 | (Mobile) 805-503-2375

NEW for Rails, Roads, and Renewables!
RRR.R4@wildlife.ca.gov (please use this email address for all permit-related submittals and administrative program questions)

From: Haley, Brad <Brad.Haley@icf.com>
Sent: Wednesday, May 3, 2023 1:36 PM
To: Pohlman, Jeremy@Wildlife <Jeremy.Pohlman@Wildlife.ca.gov>; Bonner, Lawrence(Larry)@Wildlife <Lawrence.Bonner@Wildlife.ca.gov>
Cc: Scott Kuhlke <Scott.Kuhlke@edf-re.com>; Carr, Chris <chriscarr@paulhastings.com>; Patrick Golden <pgolden@heritage-ec.com>; Miille, Ellen <Ellen.Miille@icf.com>; Devon Muto <devon.muto@edf-re.com>; Christa Hudson (Consultant) <christa.hudson.consultant@edf-re.com>
Subject: EDFR Bullhead Solar Project - Crotch's Bumble Bee Habitat Assessment

Hello Jeremy and Larry.
EDF Renewables (EDFR) is in the process of conducting environmental technical studies to support the potential development of a solar generation project, the proposed Bullhead Solar Project (proposed project). The proposed project is located in southwestern Kern County, California, approximately 6 miles northwest of the community of Rosamond and SR-14, in north-central Antelope Valley. ICF has been retained on behalf of EDFR to conduct field surveys for biological

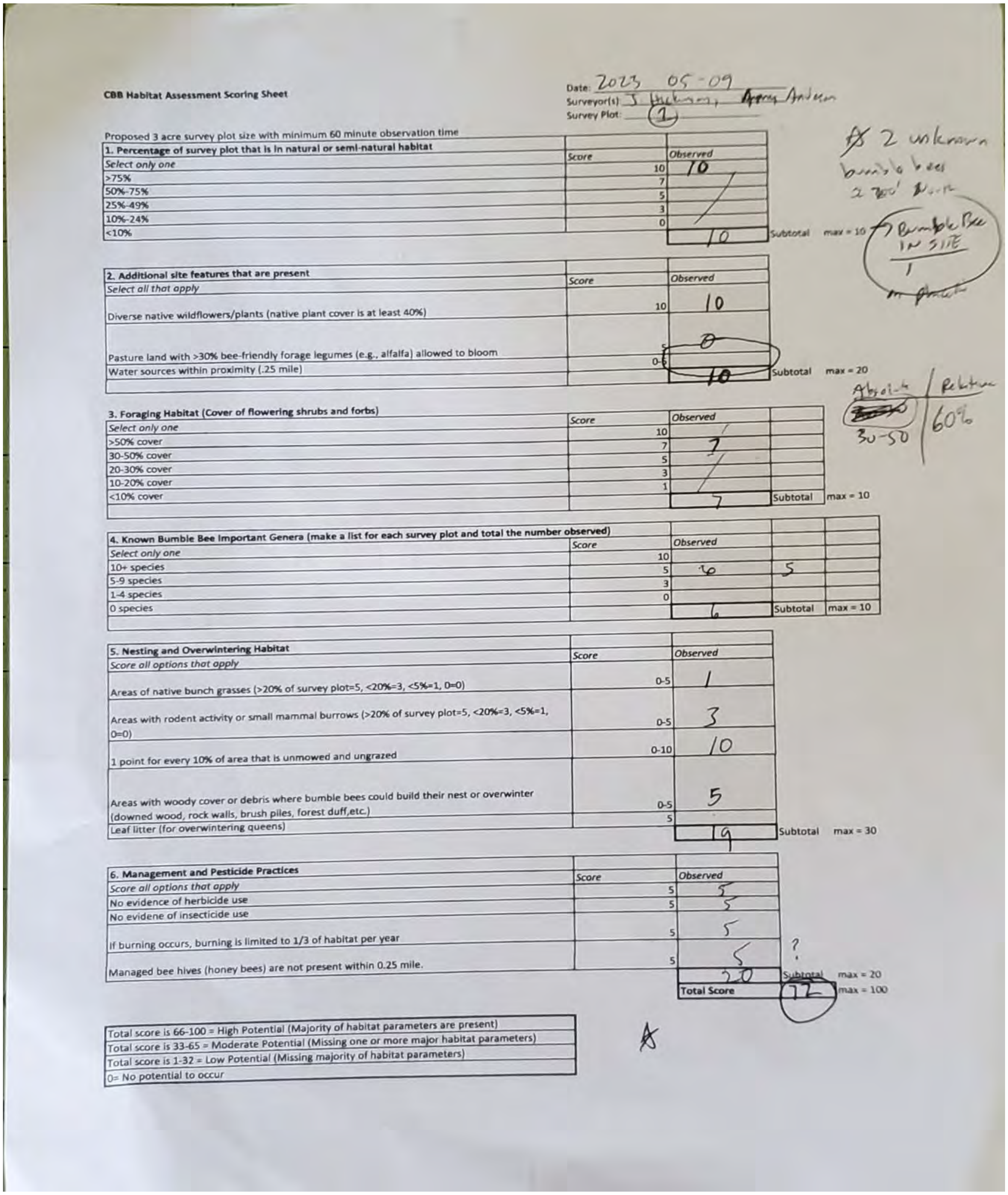
resources to support the project's CEQA document that will be prepared by Kern County. As part of these surveys, ICF plans to conduct a habitat assessment for the Crotch's Bumble Bee (CBB; *Bombus crotchii*) at the proposed project site in May 2023 based on comments received from CDFW in the EIR Notice of Preparation in January 2023. Potentially suitable CBB foraging and nesting habitat occurs within the Bullhead footprint, therefore a habitat assessment will be performed to evaluate the quality of the habitat. The attached memorandum has been prepared to present ICF's approach to performing the CBB habitat assessment.

We plan to conduct the first of two sessions of the CBB habitat assessment next week (May 8-12) with the second session being towards the end May.

Thank you,
Brad Haley | Senior Biologist & Project Manager | +1.858.444.3974 direct | brad.haley@icf.com| icf.com
ICF | 525 B Street, Suite 1700, San Diego, CA 92101 USA | +1.619.633.6439 mobile

Appendix C

Data Sheets



CBB Habitat Assessment Scoring Sheet

Date: 2023 05-09
Surveyor(s): J. [illegible], [illegible] Anderson
Survey Plot: 1

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat	Score	Observed
Select only one		
>75%	10	10
50%-75%	7	
25%-49%	5	
10%-24%	3	
<10%	0	
	Subtotal (max = 10)	10

2. Additional site features that are present	Score	Observed
Select all that apply		
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	10
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	0
Water sources within proximity (.25 mile)	0-5	
	Subtotal (max = 20)	10

3. Foraging Habitat (Cover of flowering shrubs and forbs)	Score	Observed
Select only one		
>50% cover	10	
30-50% cover	7	7
20-30% cover	5	
10-20% cover	3	
<10% cover	1	
	Subtotal (max = 10)	7

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)	Score	Observed	
Select only one			
10+ species	10		
5-9 species	5	6	5
1-4 species	3		
0 species	0		
	Subtotal (max = 10)	6	

5. Nesting and Overwintering Habitat	Score	Observed
Score all options that apply		
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	3
1 point for every 10% of area that is unmowed and ungrazed	0-10	10
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	5
Leaf litter (for overwintering queens)	5	
	Subtotal (max = 30)	19

6. Management and Pesticide Practices	Score	Observed
Score all options that apply		
No evidence of herbicide use	5	5
No evidene of insecticide use	5	5
If burning occurs, burning is limited to 1/3 of habitat per year	5	5
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5 ?
	Subtotal (max = 20)	20
	Total Score (max = 100)	72

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

2 unknown bumble bees
Bumble Bee IN SITE
1
Absolute / Relative
30-50 / 60%

Plot 1

(Fallow Ag)

CBB Habitat Assessment Scoring Sheet

Date: 5/9/23
Surveyor(s): AA & JH
Survey Plot: 2

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat			
Select only one	*Score*	*Observed*	
>75%	10		
50%-75%	7		
25%-49%	5		
10%-24%	3		
<10%	0 0		
		0	Subtotal max = 10

Dry field Irrigated

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10		
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	0 5		
Water sources within proximity (.25 mile)	0 0-5		
		0	Subtotal max = 20

mustard +FN

3. Foraging Habitat (Cover of flowering shrubs and forbs)				
Select only one	*Score*	*Observed*		
>50% cover	10			
30-50% cover	7	7		
20-30% cover	5			
10-20% cover	3			
<10% cover	1			
		7	Subtotal	max = 10

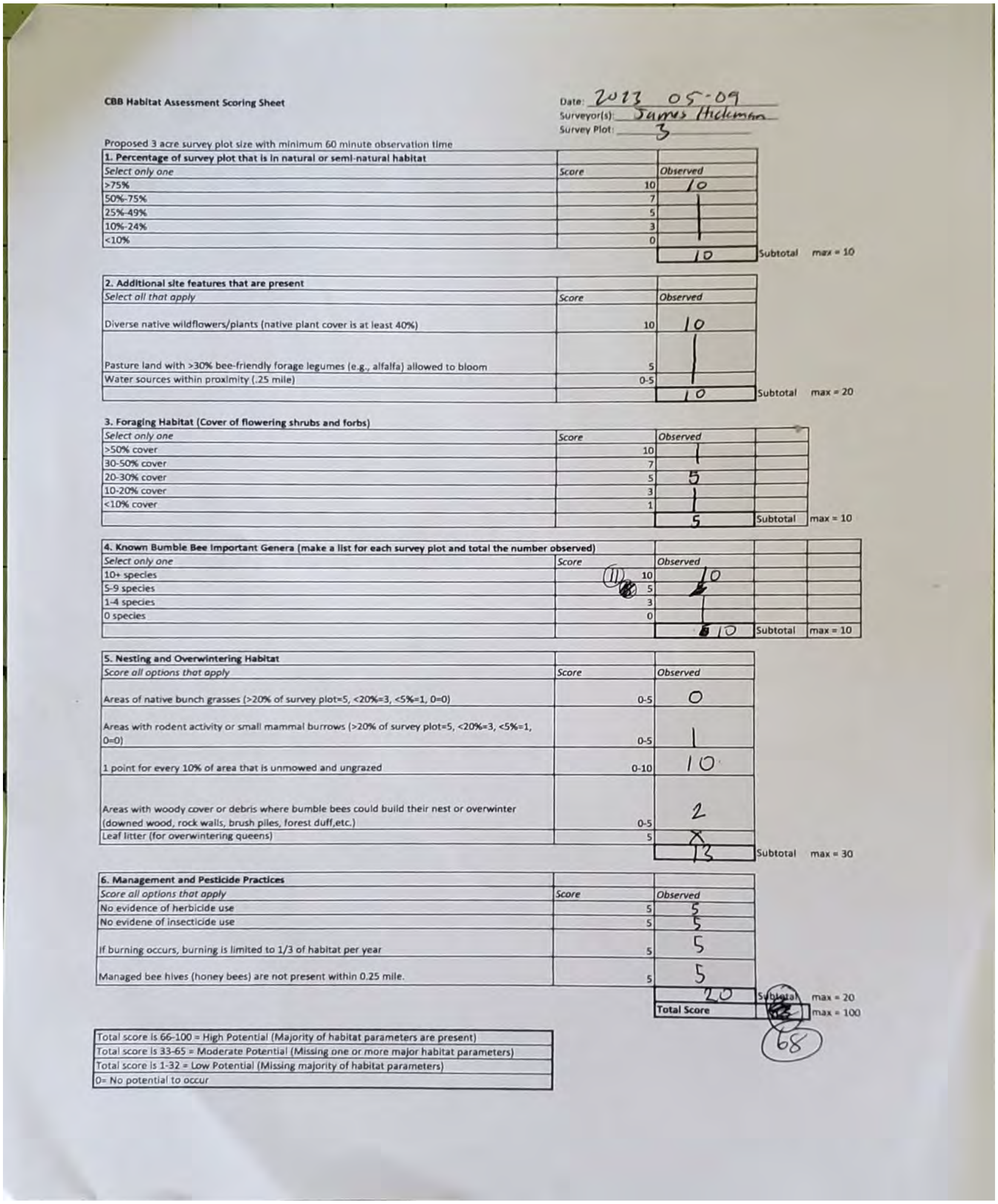
4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)				
Select only one	*Score*	*Observed*		
10+ species	10			
5-9 species	5			
1-4 species	3			
0 species	0	0		
		0	Subtotal	max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5		
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5		
Leaf litter (for overwintering queens)	5		
		11	Subtotal max = 30

6. Management and Pesticide Practices			
Score all options that apply	*Score*	*Observed*	
No evidence of herbicide use	5	5	
No evidene of insecticide use	5	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5	
		20	Subtotal max = 20
		Total Score 38	max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)	
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)	
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)	
0= No potential to occur	

Plot 2



CBB Habitat Assessment Scoring Sheet

Date: 2023 05-09
Surveyor(s): James Hickman
Survey Plot: 3

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat				
Select only one	*Score*	*Observed*		
>75%	10	10		
50%-75%	7			
25%-49%	5			
10%-24%	3			
<10%	0			
		10	Subtotal	max = 10

2. Additional site features that are present				
Select all that apply	*Score*	*Observed*		
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	10		
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5			
Water sources within proximity (.25 mile)	0-5			
		10	Subtotal	max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)				
Select only one	*Score*	*Observed*		
>50% cover	10			
30-50% cover	7			
20-30% cover	5	5		
10-20% cover	3			
<10% cover	1			
		5	Subtotal	max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)				
Select only one	*Score*	*Observed*		
10+ species	11 10	10		
5-9 species	5			
1-4 species	3			
0 species	0			
		10	Subtotal	max = 10

5. Nesting and Overwintering Habitat				
Score all options that apply	*Score*	*Observed*		
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0		
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1		
1 point for every 10% of area that is unmowed and ungrazed	0-10	10		
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	2		
Leaf litter (for overwintering queens)	5	X		
		13	Subtotal	max = 30

6. Management and Pesticide Practices				
Score all options that apply	*Score*	*Observed*		
No evidence of herbicide use	5	5		
No evidene of insecticide use	5	5		
If burning occurs, burning is limited to 1/3 of habitat per year	5	5		
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5		
		20	Subtotal	max = 20
		Total Score	68	max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 3

CBB Habitat Assessment Scoring Sheet

Date: 2023 05-09
Surveyor(s): James Hickman
Survey Plot: 5

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat			
Select only one	*Score*	*Observed*	
>75%	10		
50%-75%	7		
25%-49%	5		
10%-24%	3		
<10%	0	0	
		0	Subtotal max = 10

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	X	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	X	
Water sources within proximity (.25 mile)	0-5	0	
		0	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)			
Select only one	*Score*	*Observed*	
>50% cover	10	|	
30-50% cover	7	|	
20-30% cover	5		
10-20% cover	3	2	
<10% cover	1	1	
		3	Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)			
Select only one	*Score*	*Observed*	
10+ species	10		
5-9 species	5	|	
1-4 species	3	3	
0 species	0	|	
		3	Subtotal max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0	
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	0	
Leaf litter (for overwintering queens)	5	X	
		11	Subtotal max = 30

6. Management and Pesticide Practices			
Score all options that apply	*Score*	*Observed*	
No evidence of herbicide use	5	5	
No evidene of insecticide use	5	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5	
		20	Subtotal max = 20
		Total Score	37 max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 5

CBB Habitat Assessment Scoring Sheet

Date: 2023 05-10
Surveyor(s): James Hickman
Survey Plot: 7

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat			
Select only one	*Score*	*Observed*	
>75%	10	10	
50%-75%	7		
25%-49%	5		
10%-24%	3		
<10%	0		
		10	Subtotal max = 10

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	X	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	X	
Water sources within proximity (.25 mile)	0-5	X	
		0	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)			
Select only one	*Score*	*Observed*	
>50% cover	10		
30-50% cover	7	7	
20-30% cover	5		
10-20% cover	3		
<10% cover	1		
		7	Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)			
Select only one	*Score*	*Observed*	
10+ species	10		
5-9 species	5		
1-4 species	3	3	
0 species	0		
		3	Subtotal max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1	
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	5	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	3	
Leaf litter (for overwintering queens)	5	X	
		19	Subtotal max = 30

6. Management and Pesticide Practices			
Score all options that apply	*Score*	*Observed*	
No evidence of herbicide use	5	5	
No evidene of insecticide use	5	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5	
		20	Subtotal max = 20
		Total Score 59	max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)	
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)	✓
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)	
0= No potential to occur	

Plot 7

CBB Habitat Assessment Scoring Sheet

Date: 2023 05-10
Surveyor(s): James Hickman
Survey Plot: 9

Proposed 3 acre survey plot size with minimum 60 minute observation time

Ruderal - semi natural?

1. Percentage of survey plot that is in natural or semi-natural habitat		
Select only one	*Score*	*Observed*
>75%	10	10
50%-75%	7	
25%-49%	5	
10%-24%	3	
<10%	0	
	Subtotal max = 10	10

- Erosion is 60% abs. & 90% rel!

2. Additional site features that are present		
Select all that apply	*Score*	*Observed*
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	X
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	X
Water sources within proximity (.25 mile)	0-5	0
	Subtotal max = 20	0

3. Foraging Habitat (Cover of flowering shrubs and forbs)		
Select only one	*Score*	*Observed*
>50% cover	10	10
30-50% cover	7	
20-30% cover	5	
10-20% cover	3	
<10% cover	1	
	Subtotal max = 10	10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)		
Select only one	*Score*	*Observed*
10+ species	10	
5-9 species	5	
1-4 species	4 [illegible] 3	3
0 species	0	
	Subtotal max = 10	3

5. Nesting and Overwintering Habitat		
Score all options that apply	*Score*	*Observed*
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	3
1 point for every 10% of area that is unmowed and ungrazed	0-10	10
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	0
Leaf litter (for overwintering queens)	5	X
	Subtotal max = 30	13

6. Management and Pesticide Practices		
Score all options that apply	*Score*	*Observed*
No evidence of herbicide use	5	5
No evidene of insecticide use	5	5
If burning occurs, burning is limited to 1/3 of habitat per year	5	5
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5
	Subtotal max = 20	20
	Total Score max = 100	56

Total score is 66-100 = High Potential (Majority of habitat parameters are present)	
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)	✓
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)	
0= No potential to occur	

Plot 9

CBB Habitat Assessment Scoring Sheet

Date: 2023 05-10
Surveyor(s): James Hickman
Survey Plot: 10

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat	Score	Observed	
Select only one			
>75%	10	10	Ruck- Semi?
50%-75%	7		
25%-49%	5		
10%-24%	3		
<10%	0		
		10	Subtotal max = 10

2. Additional site features that are present	Score	Observed	
Select all that apply			
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	X	- Erodium Dom
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	X	
Water sources within proximity (.25 mile)	0-5	X	
		0	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)	Score	Observed	
Select only one			
>50% cover	10		
30-50% cover	7	7	
20-30% cover	5		
10-20% cover	3		
<10% cover	1		
		7	Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)	Score	Observed	
Select only one			
10+ species	10		
5-9 species	5		
1-4 species	3 3	3	
0 species	0		
		3	Subtotal max = 10

5. Nesting and Overwintering Habitat	Score	Observed	
Score all options that apply			
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1	
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	3	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	1	
Leaf litter (for overwintering queens)	5	0	
		15	Subtotal max = 30

6. Management and Pesticide Practices	Score	Observed	
Score all options that apply			
No evidence of herbicide use	5	5	
No evidene of insecticide use	5	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5	
		20	Subtotal max = 20
		Total Score	55 max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)	
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)	✓
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)	
0= No potential to occur	

Plot 10

CBB Habitat Assessment Scoring Sheet

Date: 5/9/23
Surveyor(s): AA
Survey Plot: 12, F-ag-D

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat				
Select only one	*Score*	*Observed*		
>75%	10			
50%-75%	7			
25%-49%	5			
10%-24%	3			
<10%	0			
		0	Subtotal	max = 10

2. Additional site features that are present				
Select all that apply	*Score*	*Observed*		
Diverse native wildflowers/plants (native plant cover is at least 40%)	10			
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5			
Water sources within proximity (.25 mile)	0-5			
		0	Subtotal	max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)				
Select only one	*Score*	*Observed*		
>50% cover	10			
30-50% cover	7	7		
20-30% cover	5			
10-20% cover	3			
<10% cover	1			
		7	Subtotal	max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)				
Select only one	*Score*	*Observed*		
10+ species	10			
5-9 species	5			
1-4 species	3			
0 species	0			
		~~8~~ 0	Subtotal	max = 10

5. Nesting and Overwintering Habitat				
Score all options that apply	*Score*	*Observed*		
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5			
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1		
1 point for every 10% of area that is unmowed and ungrazed	0-10	10		
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff, etc.)	0-5	0		
Leaf litter (for overwintering queens)	5	0		
		11	Subtotal	max = 30

6. Management and Pesticide Practices				
Score all options that apply	*Score*	*Observed*		
No evidence of herbicide use	5			
No evidene of insecticide use	5			
If burning occurs, burning is limited to 1/3 of habitat per year	5			
Managed bee hives (honey bees) are not present within 0.25 mile.	5	20		
			Subtotal	max = 20
		Total Score 38		max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 12

CBB Habitat Assessment Scoring Sheet

Date: 5/9/23
Surveyor(s): NA
Survey Plot: ~~38~~ = 13 F-ag-Disturbed

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat		
Select only one	*Score*	*Observed*
>75%	10	
50%-75%	7	
25%-49%	5	
10%-24%	3	
<10%	0 0	
		0 Subtotal max = 10

2. Additional site features that are present		
Select all that apply	*Score*	*Observed*
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	
Water sources within proximity (.25 mile)	0-5	
		0 Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)		
Select only one	*Score*	*Observed*
>50% cover	10	
30-50% cover	7	7
20-30% cover	5	
10-20% cover	3	
<10% cover	1	
		7 Subtotal max = 10

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4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)		
Select only one	*Score*	*Observed*
10+ species	10	
5-9 species	5	
1-4 species	3	
0 species	0	
		0 Subtotal max = 10

5. Nesting and Overwintering Habitat		
Score all options that apply	*Score*	*Observed*
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1
1 point for every 10% of area that is unmowed and ungrazed	0-10	10
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	0
Leaf litter (for overwintering queens)	5	
		11 Subtotal max = 30

6. Management and Pesticide Practices		
Score all options that apply	*Score*	*Observed*
No evidence of herbicide use	5	✓
No evidene of insecticide use	5	✓
If burning occurs, burning is limited to 1/3 of habitat per year	5	✓
Managed bee hives (honey bees) are not present within 0.25 mile.	5	20
		Subtotal max = 20
		Total Score max = 100

38

Total score is 66-100 = High Potential (Majority of habitat parameters are present)	
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)	
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)	
0= No potential to occur	

Plot 13

CBB Habitat Assessment Scoring Sheet

Date: 5-9-23
Surveyor(s): AM
Survey Plot: ~~5-D~~ 14-FAg-D

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat		
Select only one	*Score*	*Observed*
>75%	10	
50%-75%	7	
25%-49%	5	
10%-24%	3	
<10%	0	0
	Subtotal max = 10	0

2. Additional site features that are present		
Select all that apply	*Score*	*Observed*
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	
Water sources within proximity (.25 mile)	0-5	
	Subtotal max = 20	0

3. Foraging Habitat (Cover of flowering shrubs and forbs)		
Select only one	*Score*	*Observed*
>50% cover	10	
30-50% cover	7	
20-30% cover	5	
10-20% cover	3	3
<10% cover	1	
	Subtotal max = 10	3

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)		
Select only one	*Score*	*Observed*
10+ species	10	
5-9 species	5	
1-4 species	3	
0 species	0	
	Subtotal max = 10	0

5. Nesting and Overwintering Habitat		
Score all options that apply	*Score*	*Observed*
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1
1 point for every 10% of area that is unmowed and ungrazed	0-10	10
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	
Leaf litter (for overwintering queens)	5	
	Subtotal max = 30	11

6. Management and Pesticide Practices		
Score all options that apply	*Score*	*Observed*
No evidence of herbicide use	5	
No evidene of insecticide use	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	
	Subtotal max = 20	20
	Total Score max = 100	34

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 14

CBB Habitat Assessment Scoring Sheet

Date: 2023 05-10
Surveyor(s): James Hickman
Survey Plot: 15

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat			
Select only one	*Score*	*Observed*	
>75%	10	10	
50%-75%	7		
25%-49%	5		
10%-24%	3		
<10%	0		
		10	Subtotal max = 10

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	X	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	X	
Water sources within proximity (.25 mile)	0-5	0	
		0	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)			
Select only one	*Score*	*Observed*	
>50% cover	10		
30-50% cover	7	7	
20-30% cover	5		
10-20% cover	3		
<10% cover	1		
		7	Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)			
Select only one	*Score*	*Observed*	
10+ species	10		
5-9 species	5		
1-4 species	2 3	3	
0 species	0		
		3	Subtotal max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0	
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	1	
Leaf litter (for overwintering queens)	5	X	
		12	Subtotal max = 30

6. Management and Pesticide Practices			
Score all options that apply	*Score*	*Observed*	
No evidence of herbicide use	5	5	
No evidene of insecticide use	5	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5	
		20	Subtotal max = 20
		Total Score	52 max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)	
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)	✓
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)	
0= No potential to occur	

Plot 15

CBB Habitat Assessment Scoring Sheet

Date: 5/10/23
Surveyor(s): ALA
Survey Plot: 16 RUD

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat			
Select only one	*Score*	*Observed*	
>75%	10		
50%-75%	7		
25%-49%	5		
10%-24%	3	3	
<10%	0		
		3	Subtotal max = 10

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10		
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5		
Water sources within proximity (.25 mile)	0-5		
		0	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)			
Select only one	*Score*	*Observed*	
>50% cover	10		
30-50% cover	7		
20-30% cover	5		
10-20% cover	3	3	
<10% cover	1		
		3	Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)			
Select only one	*Score*	*Observed*	
10+ species	10		
5-9 species	5		
1-4 species	3	3	
0 species	0		
		3	Subtotal max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5		
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	3	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff, etc.)	0-5		
Leaf litter (for overwintering queens)	5		
		13	Subtotal max = 30

6. Management and Pesticide Practices			
Score all options that apply	*Score*	*Observed*	
No evidence of herbicide use	5	5	
No evidene of insecticide use	5	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5	
		20	Subtotal max = 20
		Total Score	42 max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

42

Plot 16

CBB Habitat Assessment Scoring Sheet

Date: 5-10-23
Surveyor(s): AT - ND
Survey Plot: 17

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi natural habitat			
Select only one	*Score*	*Observed*	
>75%	10	10	
50%-75%	7		
25%-49%	5		
10%-24%	3		
<10%	0		
		10	Subtotal max = 10

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	10	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5		
Water sources within proximity (.25 mile)	0-5		
		10	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)			
Select only one	*Score*	*Observed*	
>50% cover	10		
30-50% cover	7		
20-30% cover	5	~~5~~	
10-20% cover	3	3	
<10% cover	1		
		~~5~~ 3	Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)			
Select only one	*Score*	*Observed*	
10+ species	10		
5-9 species	5		
1-4 species	3	3	
0 species	0		
		3	Subtotal max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1	
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	5	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	2	DEAD
Leaf litter (for overwintering queens)	5		
		18	Subtotal max = 30

6. Management and Pesticide Practices			
Score all options that apply	*Score*	*Observed*	
No evidence of herbicide use	5		
No evidene of insecticide use	5		
If burning occurs, burning is limited to 1/3 of habitat per year	5		
Managed bee hives (honey bees) are not present within 0.25 mile.	5	20	
			Subtotal max = 20
		Total Score	max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
No potential to occur

64

Plot 17

CBB Habitat Assessment Scoring Sheet

Date: 5-10-23
Surveyor(s): AR
Survey Plot: 18 - ND

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat		
Select only one	*Score*	*Observed*
>75%	10	10
50%-75%	7	
25%-49%	5	
10%-24%	3	
<10%	0	
	Subtotal (max = 10)	10

2. Additional site features that are present		
Select all that apply	*Score*	*Observed*
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	10
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	
Water sources within proximity (.25 mile)	0-5	
	Subtotal (max = 20)	10

3. Foraging Habitat (Cover of flowering shrubs and forbs)		
Select only one	*Score*	*Observed*
>50% cover	10	
30-50% cover	7	
20-30% cover	5	5
10-20% cover	3	
<10% cover	1	
	Subtotal (max = 10)	5

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)		
Select only one	*Score*	*Observed*
10+ species	10	
5-9 species	5	
1-4 species	3	3
0 species	0	
	Subtotal (max = 10)	3

5. Nesting and Overwintering Habitat		
Score all options that apply	*Score*	*Observed*
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	3
1 point for every 10% of area that is unmowed and ungrazed	0-10	10
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff, etc.)	0-5	3
Leaf litter (for overwintering queens)	5	
	Subtotal (max = 30)	16

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6. Management and Pesticide Practices		
Score all options that apply	*Score*	*Observed*
No evidence of herbicide use	5	
No evidene of insecticide use	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	
	Subtotal (max = 20)	20
	Total Score (max = 100)	64

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 18

CBB Habitat Assessment Scoring Sheet

Date: 5/24/23
Surveyor(s): KH
Survey Plot: RUD - 21

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat		
Select only one	*Score*	*Observed*
>75%	10	
50%-75%	7	
25%-49%	5	
10%-24%	3	3
<10%	0	
	Subtotal max = 10	3

2. Additional site features that are present		
Select all that apply	*Score*	*Observed*
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	
Water sources within proximity (.25 mile)	0-5	
	Subtotal max = 20	0

3. Foraging Habitat (Cover of flowering shrubs and forbs)		
Select only one	*Score*	*Observed*
>50% cover	10	
30-50% cover	7	
20-30% cover	5	
10-20% cover	3	3
<10% cover	1	
	Subtotal max = 10	3

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)		
Select only one	*Score*	*Observed*
10+ species	10	
5-9 species	5	
1-4 species	3	3
0 species	0	
	Subtotal max = 10	3

5. Nesting and Overwintering Habitat		
Score all options that apply	*Score*	*Observed*
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1
1 point for every 10% of area that is unmowed and ungrazed	0-10	10
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	
Leaf litter (for overwintering queens)	5	
	Subtotal max = 30	12

6. Management and Pesticide Practices		
Score all options that apply	*Score*	*Observed*
No evidence of herbicide use	5	
No evidene of insecticide use	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	
	Subtotal max = 20	20
	Total Score max = 100	41

Total score is 66-100 = High Potential (Majority of habitat parameters are present)	
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)	
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)	
0= No potential to occur	

Plot 21

CBB Habitat Assessment Scoring Sheet

Date: 5/24/23
Surveyor(s): MA
Survey Plot: RUD-22

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat			
Select only one	*Score*	*Observed*	
>75%	10		
50%-75%	7		
25%-49%	5		
10%-24%	3	3	
<10%	0		
			Subtotal max = 10

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10		
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5		
Water sources within proximity (.25 mile)	0-5		
		0	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)			
Select only one	*Score*	*Observed*	
>50% cover	10		
30-50% cover	7		
20-30% cover	5		
10-20% cover	3		
<10% cover	1	1	
			Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)			
Select only one	*Score*	*Observed*	
10+ species	10		
5-9 species	5		
1-4 species	3	3	
0 species	0		
		3	Subtotal max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5		
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5		
Leaf litter (for overwintering queens)	5		
		11	Subtotal max = 30

6. Management and Pesticide Practices			
Score all options that apply	*Score*	*Observed*	
No evidence of herbicide use	5		
No evidene of insecticide use	5		
If burning occurs, burning is limited to 1/3 of habitat per year	5		
Managed bee hives (honey bees) are not present within 0.25 mile.	5		
		20	Subtotal max = 20
		Total Score	max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)	
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)	38
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)	
0= No potential to occur	

Plot 22

CBB Habitat Assessment Scoring Sheet

Date: 5/24/23
Surveyor(s): AB
Survey Plot: RUD-23

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat		
Select only one	*Score*	*Observed*
>75%	10	
50%-75%	7	
25%-49%	5	5
10%-24%	3	
<10%	0	
		5	Subtotal max = 10

2. Additional site features that are present		
Select all that apply	*Score*	*Observed*
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	
Water sources within proximity (.25 mile)	0-5	
		0	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)		
Select only one	*Score*	*Observed*
>50% cover	10	
30-50% cover	7	
20-30% cover	5	
10-20% cover	3	3
<10% cover	1	
		3	Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)		
Select only one	*Score*	*Observed*
10+ species	10	
5-9 species	5	5
1-4 species	3	3
0 species	0	
		5	Subtotal max = 10

5. Nesting and Overwintering Habitat		
Score all options that apply	*Score*	*Observed*
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1
1 point for every 10% of area that is unmowed and ungrazed	0-10	10
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	
Leaf litter (for overwintering queens)	5	
		12	Subtotal max = 30

6. Management and Pesticide Practices		
Score all options that apply	*Score*	*Observed*
No evidence of herbicide use	5	
No evidene of insecticide use	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	
		20	Subtotal max = 20
		Total Score	max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

45

Plot 23

CBB Habitat Assessment Scoring Sheet

Date: 2024 05-24
Surveyor(s): James Hickman
Survey Plot: 24

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat			
Select only one	*Score*	*Observed*	
>75%	10	10	– ruderal - semi-natural?
50%-75%	7		
25%-49%	5		
10%-24%	3		
<10%	0		
		10	Subtotal max = 10

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10		
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5		
Water sources within proximity (.25 mile)	0-5	0	
		ø	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)

Select only one	*Score*	*Observed*		
>50% cover	10			
30-50% cover	7			
20-30% cover	5	5		
10-20% cover	3			
<10% cover	1			
		5	Subtotal	max = 10

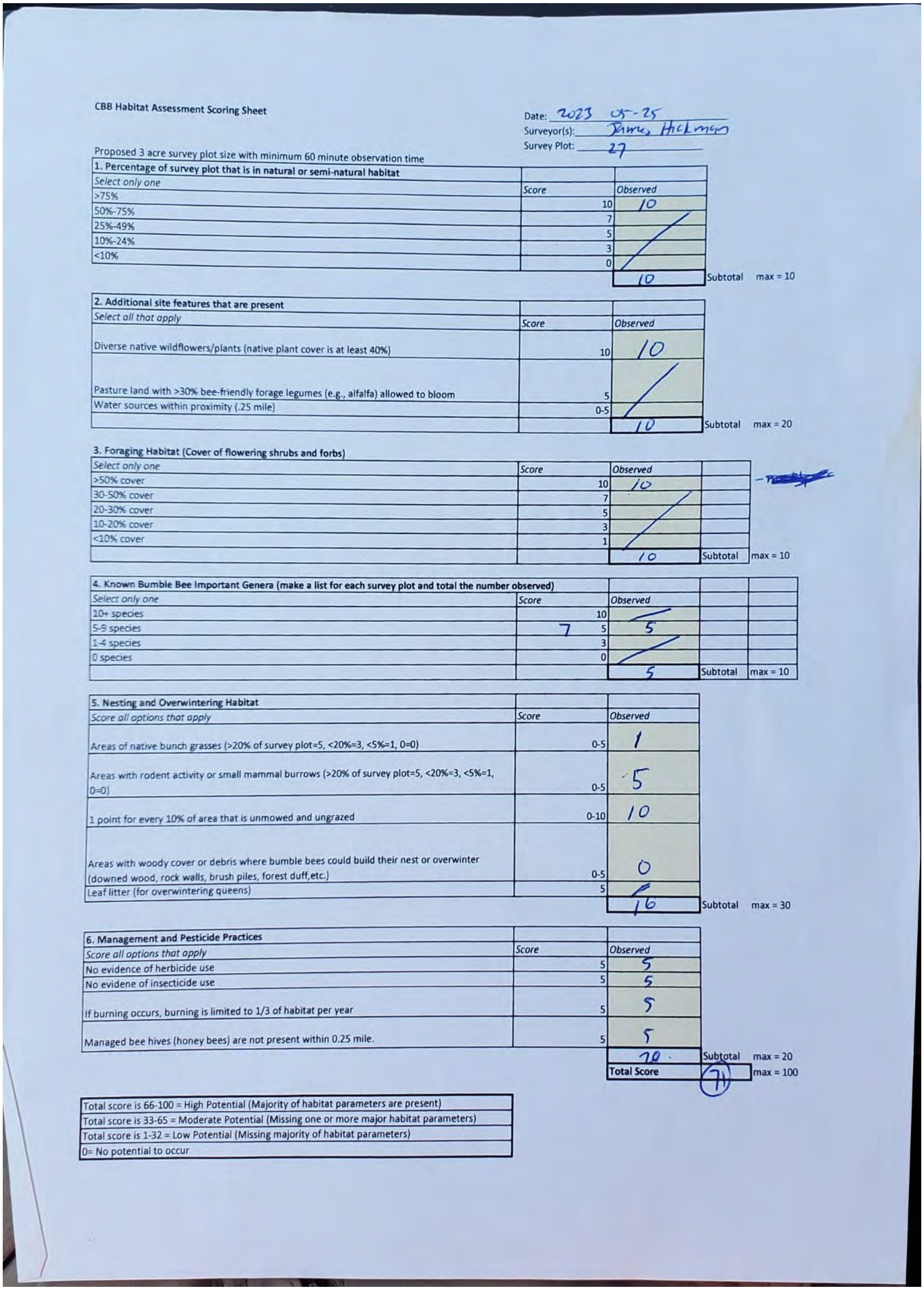
4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)				
Select only one	*Score*	*Observed*		
10+ species	10			
5-9 species	5			
1-4 species	3	3		
0 species	0			
		3	Subtotal	max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0	
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	5	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	2	
Leaf litter (for overwintering queens)	5	—	
		17	Subtotal max = 30

6. Management and Pesticide Practices				
Score all options that apply	*Score*	*Observed*		
No evidence of herbicide use	5	5		
No evidene of insecticide use	5	5		
If burning occurs, burning is limited to 1/3 of habitat per year	5	5		
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5		
		20	Subtotal	max = 20
		Total Score	50	max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 24



CBB Habitat Assessment Scoring Sheet

Date: 2023 05-25
Surveyor(s): James Hickman
Survey Plot: 27

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat			
Select only one	*Score*	*Observed*	
>75%	10	10	
50%-75%	7		
25%-49%	5		
10%-24%	3		
<10%	0		
		10	Subtotal max = 10

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	10	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5		
Water sources within proximity (.25 mile)	0-5		
		10	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)			
Select only one	*Score*	*Observed*	
>50% cover	10	10	
30-50% cover	7		
20-30% cover	5		
10-20% cover	3		
<10% cover	1		
		10	Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)			
Select only one	*Score*	*Observed*	
10+ species	10		
5-9 species	7 5	5	
1-4 species	3		
0 species	0		
		5	Subtotal max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1	
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	5	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	0	
Leaf litter (for overwintering queens)	5		
		16	Subtotal max = 30

6. Management and Pesticide Practices			
Score all options that apply	*Score*	*Observed*	
No evidence of herbicide use	5	5	
No evidene of insecticide use	5	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5	
		20	Subtotal max = 20
		Total Score	71 max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 27

CBB Habitat Assessment Scoring Sheet

Date: 2023 05-25
Surveyor(s): James Hickman
Survey Plot: 28

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat		
Select only one	*Score*	*Observed*
>75%	10	10
50%-75%	7	
25%-49%	5	
10%-24%	3	
<10%	0	
		10 Subtotal max = 10

2. Additional site features that are present		
Select all that apply	*Score*	*Observed*
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	
Water sources within proximity (.25 mile)	0-5	
		0 Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)		
Select only one	*Score*	*Observed*
>50% cover	10	
30-50% cover	7	
20-30% cover	5	5
10-20% cover	3	
<10% cover	1	
		5 Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)			
Select only one	*Score*		*Observed*
10+ species		10	
5-9 species	6	5	5
1-4 species		3	
0 species		0	
			5 Subtotal max = 10

5. Nesting and Overwintering Habitat		
Score all options that apply	*Score*	*Observed*
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	3
1 point for every 10% of area that is unmowed and ungrazed	0-10	10
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	1
Leaf litter (for overwintering queens)	5	
		14 Subtotal max = 30

6. Management and Pesticide Practices		
Score all options that apply	*Score*	*Observed*
No evidence of herbicide use	5	5
No evidene of insecticide use	5	5
If burning occurs, burning is limited to 1/3 of habitat per year	5	5
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5
		20 Subtotal max = 20
	Total Score	54 max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 28

Habitat Assessment Scoring Sheet

Date: 5/25/23
Surveyor(s): J. Hickman
Survey Plot: 29

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat

Select only one

	Score	Observed
>75%	10	10
50%-75%	7	
25%-49%	5	
10%-24%	3	
<10%	0	
	Subtotal max = 10	10

2. Additional site features that are present

Select all that apply

	Score	Observed
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	/
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	
Water sources within proximity (.25 mile)	0-5	
	Subtotal max = 20	0

3. Foraging Habitat (Cover of flowering shrubs and forbs)

Select only one

	Score	Observed
>50% cover	10	
30-50% cover	7	
20-30% cover	5	
10-20% cover	3	
<10% cover	1	/
	Subtotal max = 10	1

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number ...)

Select only one

	Score	Observed
10+ species	10	/
5-9 species	5	
1-4 species	3	3
0 species	0	/
	Subtotal max = 10	3

5. Nesting and Overwintering Habitat

Score all options that apply

	Score	Observed
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	/
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	3
1 point for every 10% of area that is unmowed and ungrazed	0-10	10
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	/
Leaf litter (for overwintering queens)	5	/
	Subtotal max = 30	13

6. Management and Pesticide Practices

Score all options that apply

	Score	Observed
No evidence of herbicide use	5	5
No evidene of insecticide use	5	5
If burning occurs, burning is limited to 1/3 of habitat per year	5	5
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5
	Subtotal max = 20	20
	Total Score max = 100	47

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 29

CBB Habitat Assessment Scoring Sheet

Date: 2023-05-24
Surveyor(s): James Hickman
Survey Plot: 30

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat			
Select only one	*Score*	*Observed*	
>75%	10	10	
50%-75%	7		
25%-49%	5		
10%-24%	3		
<10%	0		
		10	Subtotal max = 10

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	10	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5		
Water sources within proximity (.25 mile)	0-5		
		10	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)			
Select only one	*Score*	*Observed*	
>50% cover	10		
30-50% cover	7	7	
20-30% cover	5		
10-20% cover	3		
<10% cover	1		
		7	Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)			
Select only one	*Score*	*Observed*	
10+ species	10 10	10	
5-9 species	5		
1-4 species	3		
0 species	0		
		10	Subtotal max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0	
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	19
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	2	
Leaf litter (for overwintering queens)	5	1	
		14	Subtotal max = 30

6. Management and Pesticide Practices			
Score all options that apply	*Score*	*Observed*	
No evidence of herbicide use	5	5	
No evidene of insecticide use	5	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5	
		20	Subtotal max = 20
		Total Score	71 max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 30

CBB Habitat Assessment Scoring Sheet

Date: 2023 05-24
Surveyor(s): James Hickman
Survey Plot: 31

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat			
Select only one	*Score*	*Observed*	
>75%	10	10	
50%-75%	7		
25%-49%	5		
10%-24%	3		
<10%	0		
		10	Subtotal max = 10

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	10	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	—	
Water sources within proximity (.25 mile)	0-5	—	
		10	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)			
Select only one	*Score*	*Observed*	
>50% cover	10		
30-50% cover	7	7	
20-30% cover	5		
10-20% cover	3		
<10% cover	1		
		7	Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)			
Select only one	*Score*	*Observed*	
10+ species	10		
5-9 species	~~8~~9 5	5	
1-4 species	3		
0 species	0		
		5	Subtotal max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0	
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	3	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	1	
Leaf litter (for overwintering queens)	5	0	
		14	Subtotal max = 30

6. Management and Pesticide Practices			
Score all options that apply	*Score*	*Observed*	
No evidence of herbicide use	5	5	
No evidene of insecticide use	5	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5	
		20	Subtotal max = 20
		Total Score	66 max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 31

CBB Habitat Assessment Scoring Sheet

Date: 5/24/23
Surveyor(s): AH
Survey Plot: FA-D-32

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat		
Select only one	*Score*	*Observed*
>75%	10	
50%-75%	7	
25%-49%	5	
10%-24%	3	
<10%	0	
		0 Subtotal max = 10

2. Additional site features that are present		
Select all that apply	*Score*	*Observed*
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	
Water sources within proximity (.25 mile)	0-5	
		0 Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)		
Select only one	*Score*	*Observed*
>50% cover	10	
30-50% cover	7	
20-30% cover	5	
10-20% cover	3	
<10% cover	1	1
		1 Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)		
Select only one	*Score*	*Observed*
10+ species	10	
5-9 species	5	
1-4 species	3	
0 species	0	
		0 Subtotal max = 10

5. Nesting and Overwintering Habitat		
Score all options that apply	*Score*	*Observed*
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1
1 point for every 10% of area that is unmowed and ungrazed	0-10	10
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	
Leaf litter (for overwintering queens)	5	
		11 Subtotal max = 30

6. Management and Pesticide Practices		
Score all options that apply	*Score*	*Observed*
No evidence of herbicide use	5	
No evidene of insecticide use	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	
		20 Subtotal max = 20
		Total Score max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

32

Plot 32

CBB Habitat Assessment Scoring Sheet

Date: 5/24/23
Surveyor(s): AA
Survey Plot: FA-D-33

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat			
Select only one	*Score*	*Observed*	
>75%	10		
50%-75%	7		
25%-49%	5		
10%-24%	3		
<10%	0		
		0	Subtotal max = 10

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10		
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5		
Water sources within proximity (.25 mile)	0-5		
		0	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)				
Select only one	*Score*	*Observed*		
>50% cover	10			
30-50% cover	7			
20-30% cover	5			
10-20% cover	3			
<10% cover	1	1		
		1	Subtotal	max = 10

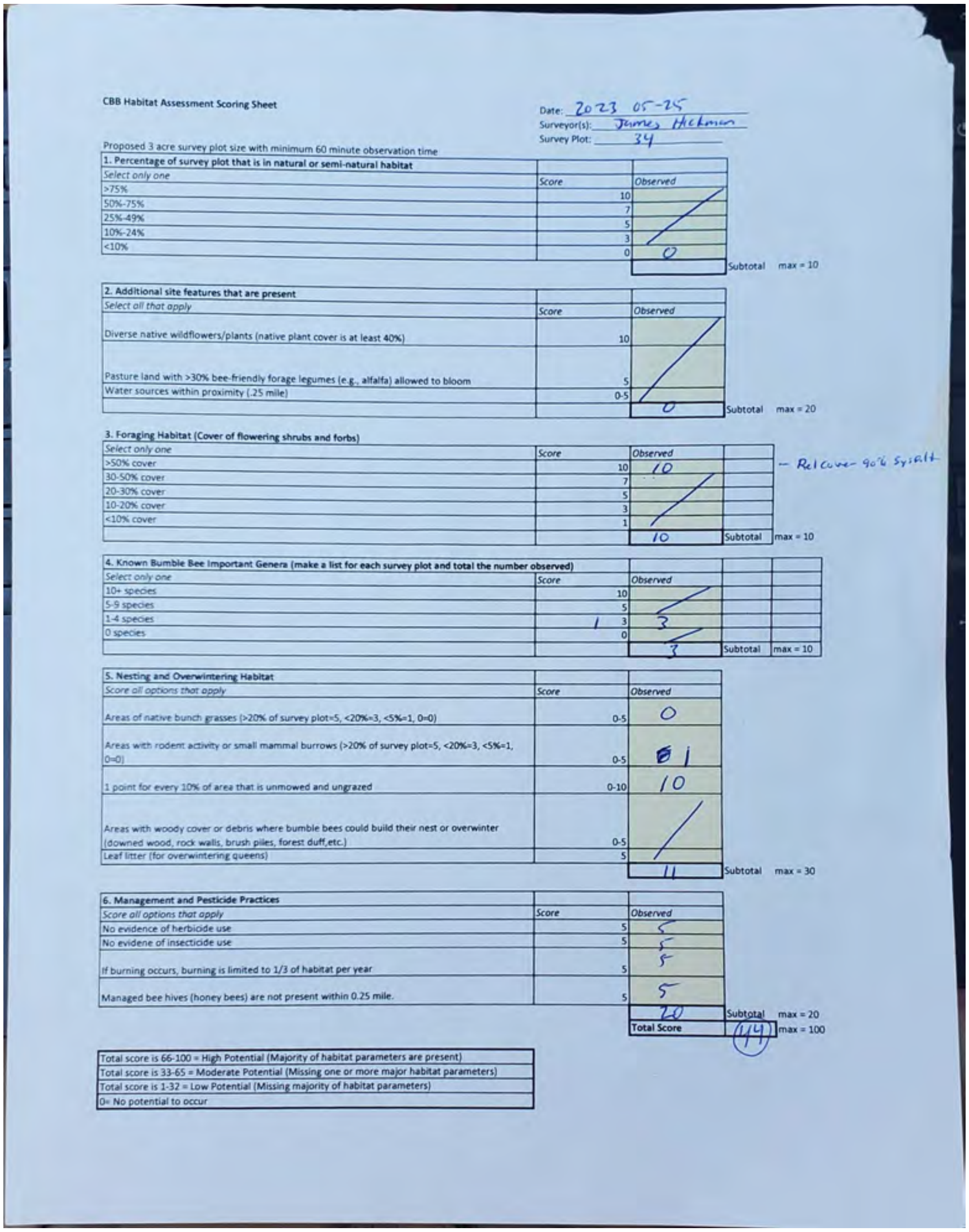
4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)				
Select only one	*Score*	*Observed*		
10+ species	10			
5-9 species	5			
1-4 species	3			
0 species	0			
		0	Subtotal	max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5		
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	1	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5		
Leaf litter (for overwintering queens)	5		
		11	Subtotal max = 30

6. Management and Pesticide Practices				
Score all options that apply	*Score*	*Observed*		
No evidence of herbicide use	5			
No evidene of insecticide use	5			
If burning occurs, burning is limited to 1/3 of habitat per year	5			
Managed bee hives (honey bees) are not present within 0.25 mile.	5			
		20	Subtotal	max = 20
		Total Score		max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)	
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)	
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)	32
0= No potential to occur	

Plot 33



CBB Habitat Assessment Scoring Sheet

Date: 2023 05-25
Surveyor(s): James Hickman
Survey Plot: 34

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat		
Select only one	*Score*	*Observed*
>75%	10	
50%-75%	7	
25%-49%	5	
10%-24%	3	
<10%	0	0
	Subtotal max = 10	

2. Additional site features that are present		
Select all that apply	*Score*	*Observed*
Diverse native wildflowers/plants (native plant cover is at least 40%)	10	
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5	
Water sources within proximity (.25 mile)	0-5	
		0
	Subtotal max = 20	

3. Foraging Habitat (Cover of flowering shrubs and forbs)		
Select only one	*Score*	*Observed*
>50% cover	10	10
30-50% cover	7	
20-30% cover	5	
10-20% cover	3	
<10% cover	1	
		10
	Subtotal max = 10	

— Rel cover- 90% Sysalt

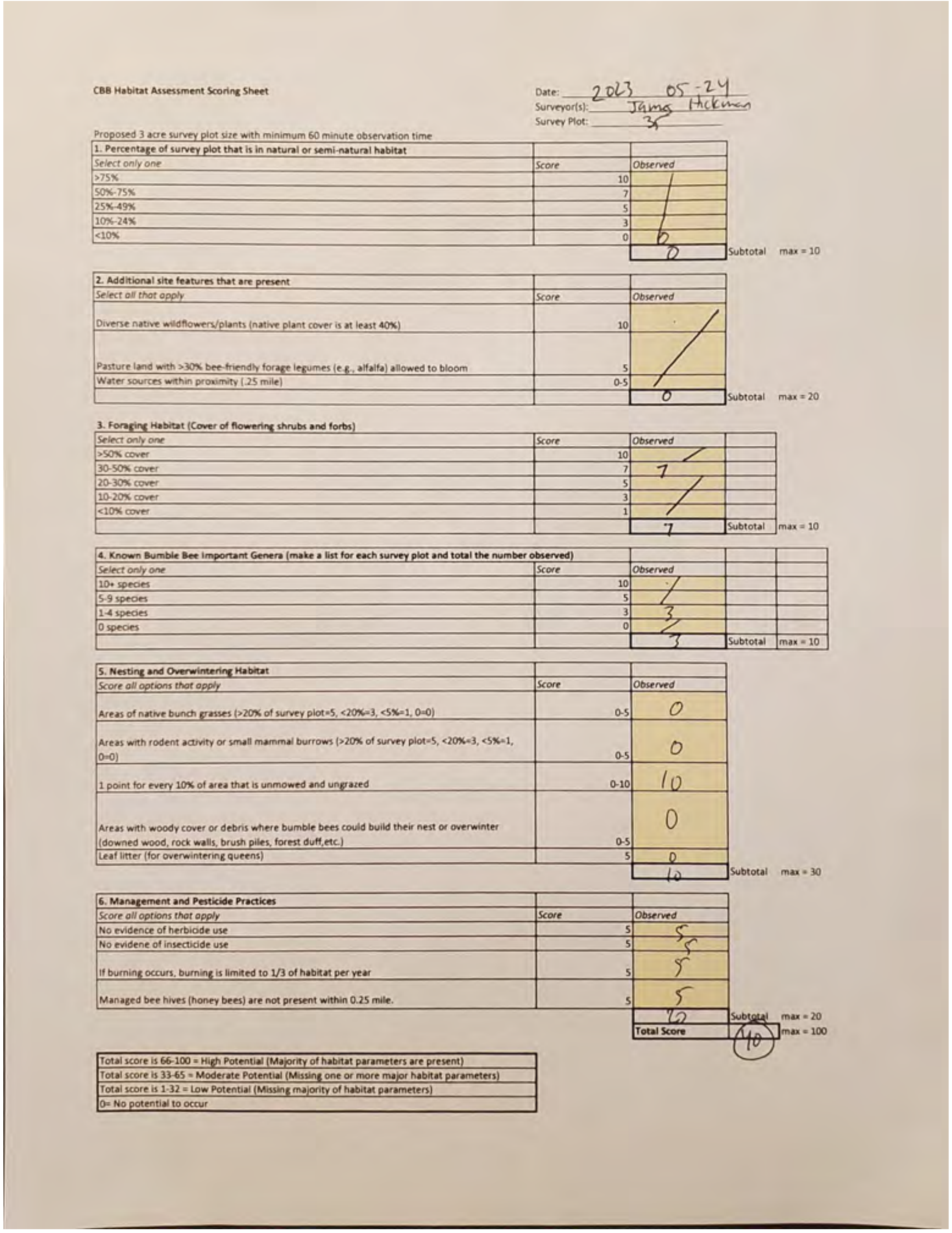
4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)		
Select only one	*Score*	*Observed*
10+ species	10	
5-9 species	5	
1-4 species	1 3	3
0 species	0	
		3
	Subtotal max = 10	

5. Nesting and Overwintering Habitat		
Score all options that apply	*Score*	*Observed*
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	~~0~~ 1
1 point for every 10% of area that is unmowed and ungrazed	0-10	10
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	
Leaf litter (for overwintering queens)	5	
		11
	Subtotal max = 30	

6. Management and Pesticide Practices		
Score all options that apply	*Score*	*Observed*
No evidence of herbicide use	5	5
No evidene of insecticide use	5	5
If burning occurs, burning is limited to 1/3 of habitat per year	5	5
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5
		20
	Subtotal max = 20	
	Total Score	44 max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 34



CBB Habitat Assessment Scoring Sheet

Date: 2023 05-24
Surveyor(s): James Hickman
Survey Plot: 35

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat				
Select only one	*Score*	*Observed*		
>75%	10			
50%-75%	7			
25%-49%	5			
10%-24%	3			
<10%	0	0		
		0	Subtotal	max = 10

2. Additional site features that are present				
Select all that apply	*Score*	*Observed*		
Diverse native wildflowers/plants (native plant cover is at least 40%)	10			
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5			
Water sources within proximity (.25 mile)	0-5			
		0	Subtotal	max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)				
Select only one	*Score*	*Observed*		
>50% cover	10			
30-50% cover	7	7		
20-30% cover	5			
10-20% cover	3			
<10% cover	1			
		7	Subtotal	max = 10

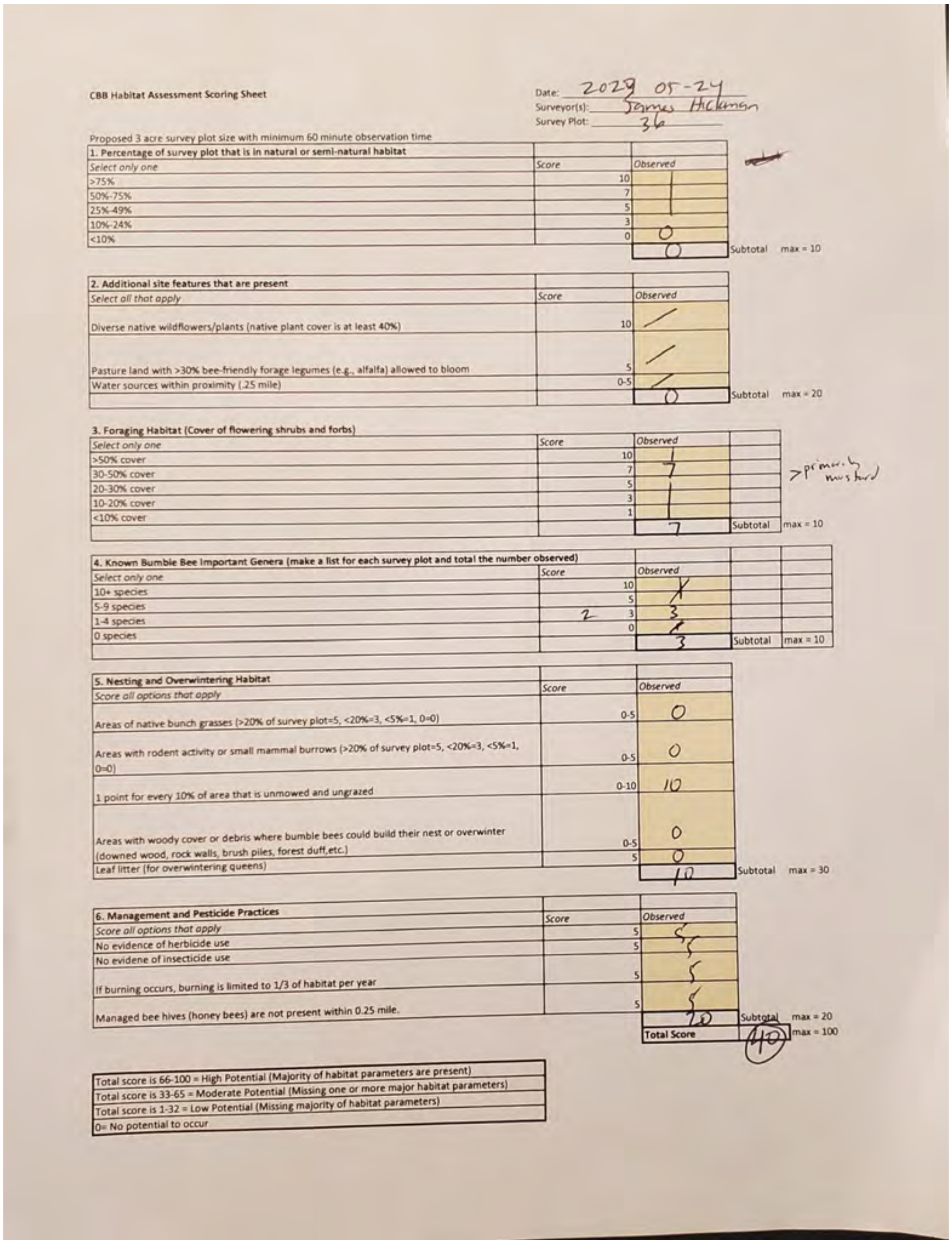
4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)				
Select only one	*Score*	*Observed*		
10+ species	10			
5-9 species	5			
1-4 species	3	3		
0 species	0			
		3	Subtotal	max = 10

5. Nesting and Overwintering Habitat				
Score all options that apply	*Score*	*Observed*		
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0		
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0		
1 point for every 10% of area that is unmowed and ungrazed	0-10	10		
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	0		
Leaf litter (for overwintering queens)	5	0		
		10	Subtotal	max = 30

6. Management and Pesticide Practices				
Score all options that apply	*Score*	*Observed*		
No evidence of herbicide use	5	5		
No evidene of insecticide use	5	5		
If burning occurs, burning is limited to 1/3 of habitat per year	5	5		
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5		
		20	Subtotal	max = 20
		Total Score	40	max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 35



CBB Habitat Assessment Scoring Sheet

Date: 2023 05-24
Surveyor(s): James Hickman
Survey Plot: 36

Proposed 3 acre survey plot size with minimum 60 minute observation time

1. Percentage of survey plot that is in natural or semi-natural habitat			
Select only one	*Score*	*Observed*	
>75%	10		
50%-75%	7		
25%-49%	5		
10%-24%	3		
<10%	0	0	
		0	Subtotal max = 10

2. Additional site features that are present			
Select all that apply	*Score*	*Observed*	
Diverse native wildflowers/plants (native plant cover is at least 40%)	10		
Pasture land with >30% bee-friendly forage legumes (e.g., alfalfa) allowed to bloom	5		
Water sources within proximity (.25 mile)	0-5		
		0	Subtotal max = 20

3. Foraging Habitat (Cover of flowering shrubs and forbs)			
Select only one	*Score*	*Observed*	
>50% cover	10		
30-50% cover	7	7	> primarily mustard
20-30% cover	5		
10-20% cover	3		
<10% cover	1		
		7	Subtotal max = 10

4. Known Bumble Bee Important Genera (make a list for each survey plot and total the number observed)			
Select only one	*Score*	*Observed*	
10+ species	10		
5-9 species	5		
1-4 species	2 3	3	
0 species	0		
		3	Subtotal max = 10

5. Nesting and Overwintering Habitat			
Score all options that apply	*Score*	*Observed*	
Areas of native bunch grasses (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0	
Areas with rodent activity or small mammal burrows (>20% of survey plot=5, <20%=3, <5%=1, 0=0)	0-5	0	
1 point for every 10% of area that is unmowed and ungrazed	0-10	10	
Areas with woody cover or debris where bumble bees could build their nest or overwinter (downed wood, rock walls, brush piles, forest duff,etc.)	0-5	0	
Leaf litter (for overwintering queens)	5	0	
		10	Subtotal max = 30

6. Management and Pesticide Practices			
Score all options that apply	*Score*	*Observed*	
No evidence of herbicide use	5	5	
No evidene of insecticide use	5	5	
If burning occurs, burning is limited to 1/3 of habitat per year	5	5	
Managed bee hives (honey bees) are not present within 0.25 mile.	5	5	
		20	Subtotal max = 20
		Total Score	40 max = 100

Total score is 66-100 = High Potential (Majority of habitat parameters are present)
Total score is 33-65 = Moderate Potential (Missing one or more major habitat parameters)
Total score is 1-32 = Low Potential (Missing majority of habitat parameters)
0= No potential to occur

Plot 36

Appendix D

Site Photos

Appendix B
Site Photos

Photograph 1: Plot 9 (Fallow Agriculture/Disturbed) Facing West

Photograph 2: Plot 36 (Fallow Agriculture/Disturbed) Facing East

Photograph 3: Plot 1 (Native Desert) Facing North

Photograph 4: Plot 3 (Native Desert) Facing South

Photograph 5: Plot 2 (Ruderal) Facing South

Photograph 6: Plot 10 (Ruderal) Facing South

Appendix F.1:
Cultural Resources Technical Report

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Cultural Resources Technical Report
Bullhead Solar Project

Prepared for:

EDF Renewables
1999 Harrison Street, Suite 675
Oakland, CA 94612

Prepared by:

ICF
49 Discovery, Suite 250
Irvine, CA 92618

August 2022

ICF. 2022. *Cultural Resources Technical Report, Bullhead Solar Project*. August. (ICF 104036) Prepared for: EDF Renewables, Oakland, CA.

Contents

Tables

Figures

Plates

Acronyms and Abbreviations

AVTL	Antelope Valley Transmission Line
B.P.	before present
BigBeau	BigBeau Solar Project
CCR	California Code of Regulations
CCS	cryptocrystalline silicate
CEQA	California Environmental Quality Act
CHL	California Historical Landmark
County	Kern County
CRHR	California Register of Historical Resources
CUP	Conditional Use Permit
DPR	Department of Parks and Recreation
EDFR	EDF Renewables
F	Feature
gen-tie	generation-tie
I-	Interstate
kV	kilovolt
LADWP	Los Angeles Department of Water and Power
MW	megawatt
NAHC	Native American Heritage Commission
NRHP	National Register of Historic Places
PRC	Public Resources Code
project	Bullhead Solar Project
PV	photovoltaic
Qsu	Undifferentiated Surficial Deposits
quad	quadrangle map
Qyf	Young Alluvial Fan Deposits
SCE	Southern California Edison
SHPO	State Historic Preservation Officer
SR-	State Route
SSJVIC	Southern San Joaquin Valley Information Center
STP	shovel test pit
TRTP	Tehachapi Renewable Transmission Project
USGS	U.S. Geological Survey

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Chapter 1
Introduction

EDF Renewables (EDFR) proposes the Bullhead Solar Project (project) to develop up to 270 megawatts (MW) (alternating current) of solar photovoltaic (PV) capacity derived from tracker technology and up to 270 MW of battery storage. The project includes solar development with associated PV panels, battery storage units, inverters, converters, generators, foundations, transformers, and optional generation-tie (gen-tie) routes to the Rosamond Switching Station and the Whirlwind Substation, only one of which would be constructed. The project also includes laydown yards, a meteorological station, a microwave/communication tower, substation and battery storage system (see Figure 1-1, Conceptual Site Plan, at the end of this chapter).

The archaeological study area and built-environment study area defined for the project are generally located in southern Kern County, central California (see Figure 2-1, Project Vicinity Map, at the end of this chapter). The project site land is controlled via lease or fee simple ownership by EDFR. The project site is south of the Tehachapi Mountains on lands that gradually slope downward from the northwest to the southeast. It is approximately 52 miles southeast of the city of Bakersfield, 19 miles south of the city of Tehachapi, 8 miles northwest of the community of Rosamond, and 2 miles north of the community of Willow Springs. Other communities in the vicinity of the project site include Mojave in Kern County and the cities of Lancaster, Palmdale, and Neenach in Los Angeles County, which are roughly 12 miles northeast, 17 miles southeast, 24 miles southeast, and 18 miles southwest of the project, respectively. Edwards Air Force Base is 22 miles east of the project's eastern boundary.

The project site is approximately 12 miles southwest of State Route (SR-) 58 and approximately 34 miles east of Interstate (I-) 5. SR-14 (Antelope Valley Freeway) is approximately 7 miles to the east of the site, and SR-138 (West Avenue D) is approximately 9 miles to the south in Los Angeles County. The project site is generally bounded by Favorito Avenue to the south, Champagne Avenue to the north, 110th Street West to the west, and 80th Street West to the east. The project site is bisected by Tehachapi Willow Springs Road.

The Bullhead solar field can be found within the Willow Springs, California, U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle map (quad). Rosamond Gen-tie Options 1, 2, and 3 are in the Willow Springs and Little Buttes quads; and Whirlwind Gen-tie Option 1 is in the Willow Springs and Tylerhorse Canyon quads. Proposed access roads that would be used to access the site fall within the Willow Springs and Little Buttes quads (see Figure 1-3 at the end of this chapter for the archaeological and built-environment study areas overlaid on USGS topographic maps). This area of the county is recognized by the National Renewable Energy Laboratory as having solar and wind resources that are suitable for renewable energy development. The proposed project is also in an area of low population density and is traversed by a network of dirt roads.

1.1 Purpose of the Study

This study was prepared to support the preparation of an environmental impact report for the project. It summarizes the results of the cultural resources study, which includes both the archaeological and built-environment technical analyses. Specific study areas were defined for each of these analyses, as shown on Figure 1-2. The archaeological study area consists of the Bullhead solar field, a 50-foot (15.2-meter) corridor surrounding proposed access routes, and a 125-foot (38-meter) corridor around proposed gen-tie routes. It encompasses all areas where surface and subsurface activities are anticipated as part of the project. The built-environment study area consists of the archaeological study area plus a 0.5-mile buffer around gen-tie routes to account for potential visual impacts on historical resources.

Since the initial cultural resources analyses in 2021, the Bullhead site plan (Bullhead solar field, gen-tie routes, and access routes) have been refined to a smaller footprint. This report reflects the May 2022 site plan. Table 1-1 defines the terms used to describe specific geographic areas for this study and their current acreages. It should be noted as part of these analyses, ICF cultural resources personnel arranged a records search through the California Historical Resources Inventory System at the Southern San Joaquin Valley Information Center (SSJVIC). This geographic area defined for the records search consisted of a larger study area for proposed project and a 0.5-mile buffer. The records search area remains static; a new records search was not conducted for the smaller, updated site boundary, as its footprint is completely within the previously conducted records search area.

Table 1-1. Study Areas Defined for the Project

Area	Delineation	Purpose	Original Acreage	Current Acreage
Records Search Area	Originally proposed project site and a 0.5-mile buffer	The geographic area submitted to SSJVIC to complete the records search	28,667.8	Does not change
Archaeological Study Area	Bullhead solar field, a 50-foot corridor surrounding proposed access routes, 125-foot corridor around proposed gen-tie routes	The geographic area in which the project may have the potential to impact archaeological resources	3,487.3	1,734.9
Built-Environment Study Area	Archaeological study area plus a 0.5-mile buffer around gen-tie routes	The geographic area in which the project may have the potential to impact built-environment resources	18,382.4	14,117.0

gen-tie = generation tie; SSJVIC = Southern San Joaquin Valley Information Center.

As stated above, this report reviews potential impacts on identified cultural resources and proposes management recommendations for those in accordance with the California Environmental Quality Act (CEQA; California Public Resources Code [PRC] § 21000 et seq., as amended) and implementing guidelines (California Code of Regulations [CCR], Title 14 § 15000 et. seq.) and supports the preparation of an environmental impact report for the project.

Staff at the SSJVIC conducted a cultural resources record search of the defined records search area for the project, as defined in Table 1-1 above. The SSJVIC provided the results to ICF on March 1, 2021. The record search results indicated that a total of 84 cultural studies have been conducted within the records search area, 44 of which included a portion of the archaeological study area.

Additionally, the results indicated that 250 previously recorded resources are within the records search area; 16 of these are archaeological resources which intersect the archaeological study area. Of the 16 resources, 9 were previously recorded as archaeological sites and 7 as isolates.

Qualified archaeologists conducted a pedestrian survey of approximately 2,516.0 acres between June 1 and June 4, June 7 and June 11, and July 6 and July 8, 2021, which was based on a larger project site. Portions of the archaeological study area were able to be excluded from the archaeological survey as they were either recently surveyed and evaluated as part of the BigBeau and Valentine solar projects, or were part of the of Whirlwind Gen-tie Option 1 which would collocate on a second circuit of the existing Antelope Valley Transmission Line (AVTL) corridor (see Figure 1-1). During the archaeological survey effort covered in this report, 27 newly identified archaeological sites and 51 new identified isolates were recorded. The majority of the newly recorded archaeological resources are prehistoric lithic reduction sites, isolated prehistoric lithic flakes, and historic-era trash deposits. Although most of the archaeological resources are completely within the archaeological study area, some of the resources are only partially within the archaeological study area and partially extending outside the area. Isolated resources do not qualify as historical resources under CEQA; thus, further evaluation of isolated resources is unnecessary and not included in this report. No subsurface testing occurred during the pedestrian surveys. Phase II testing of archaeological sites was conducted in October and November 2021 and is presented under separate cover.

ICF personnel also conducted a reconnaissance survey of the built-environment study area for intact built-environment resources 45 years of age or older and evaluated built resources for potential California Register of Historical Resources (CRHR) significance. This survey was conducted on June 8, 2021, by professionally qualified architectural historians from the public right-of-way. Through the records search and the reconnaissance survey of the built-environment study area, architectural historians identified a total of 25 intact built-environment resources and one cultural resource that may have intact built-environment resource components. Twenty-one built resources that have not been previously recorded. Five are previously recorded built resources or cultural resources that may be considered built resources after additional investigation. Two of the five have been previously evaluated and recommended ineligible for the National Register of Historic Places (NRHP) and the CRHR. One of the five is California Historical Landmark (CHL) No. 130, Willow Springs. This CHL may be associated with intact built resources on properties within the built-environment study area in the vicinity of the CHL plaque along Tehachapi Willow Springs Road. Two of the five are historical resources under CEQA as a result of being listed in, or determined eligible for listing in, the NRHP and the CRHR: the Southern California Edison (SCE) Vincent (Big Creek No. 3) 220-kilovolt (kV) Transmission Line (P-15-017243) and the First Los Angeles Aqueduct (P-15-003549).

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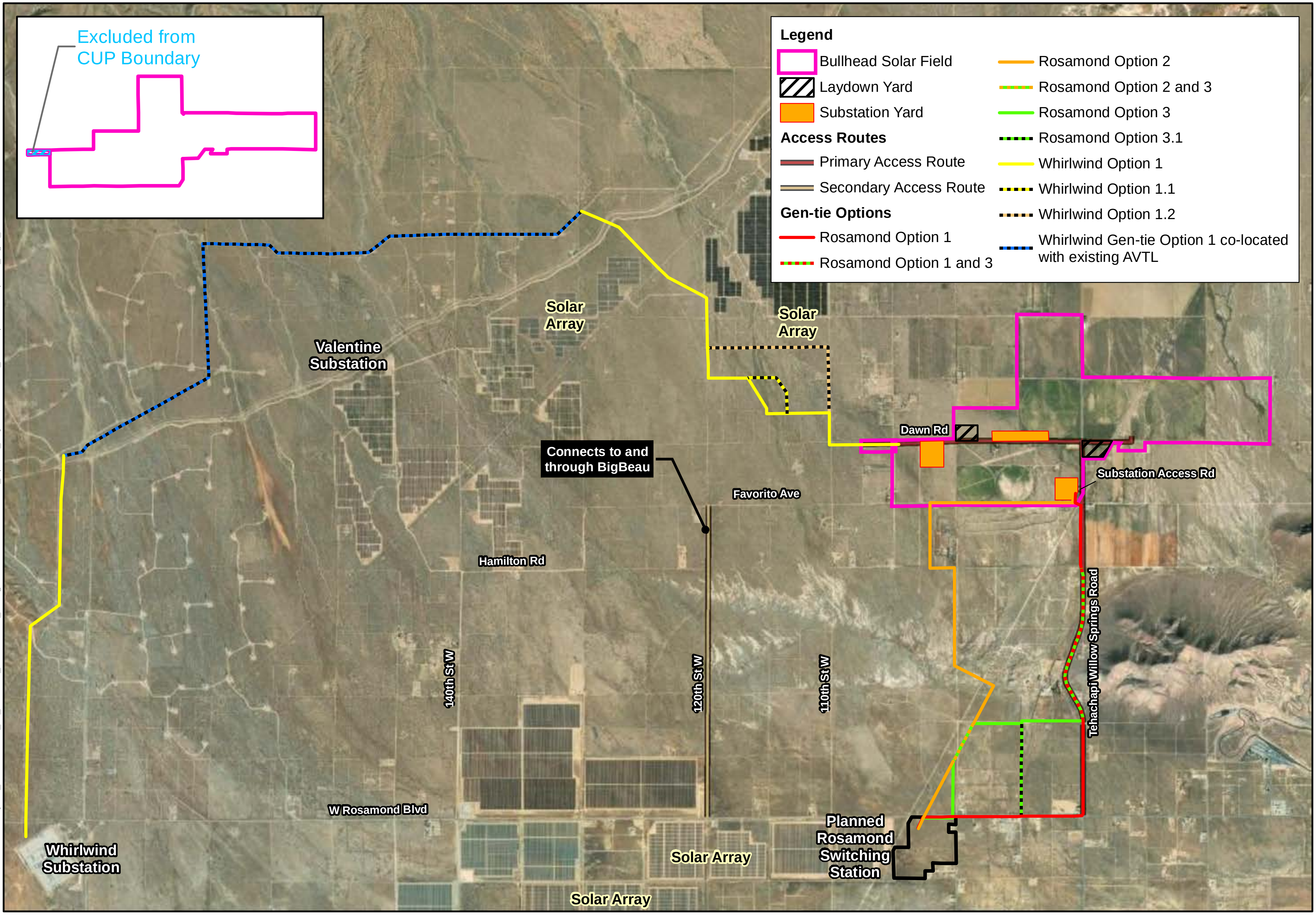

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Source: EDF 2022, USGS-ESRI Imagery 2019

Figure 1-1
Conceptual Site Plan

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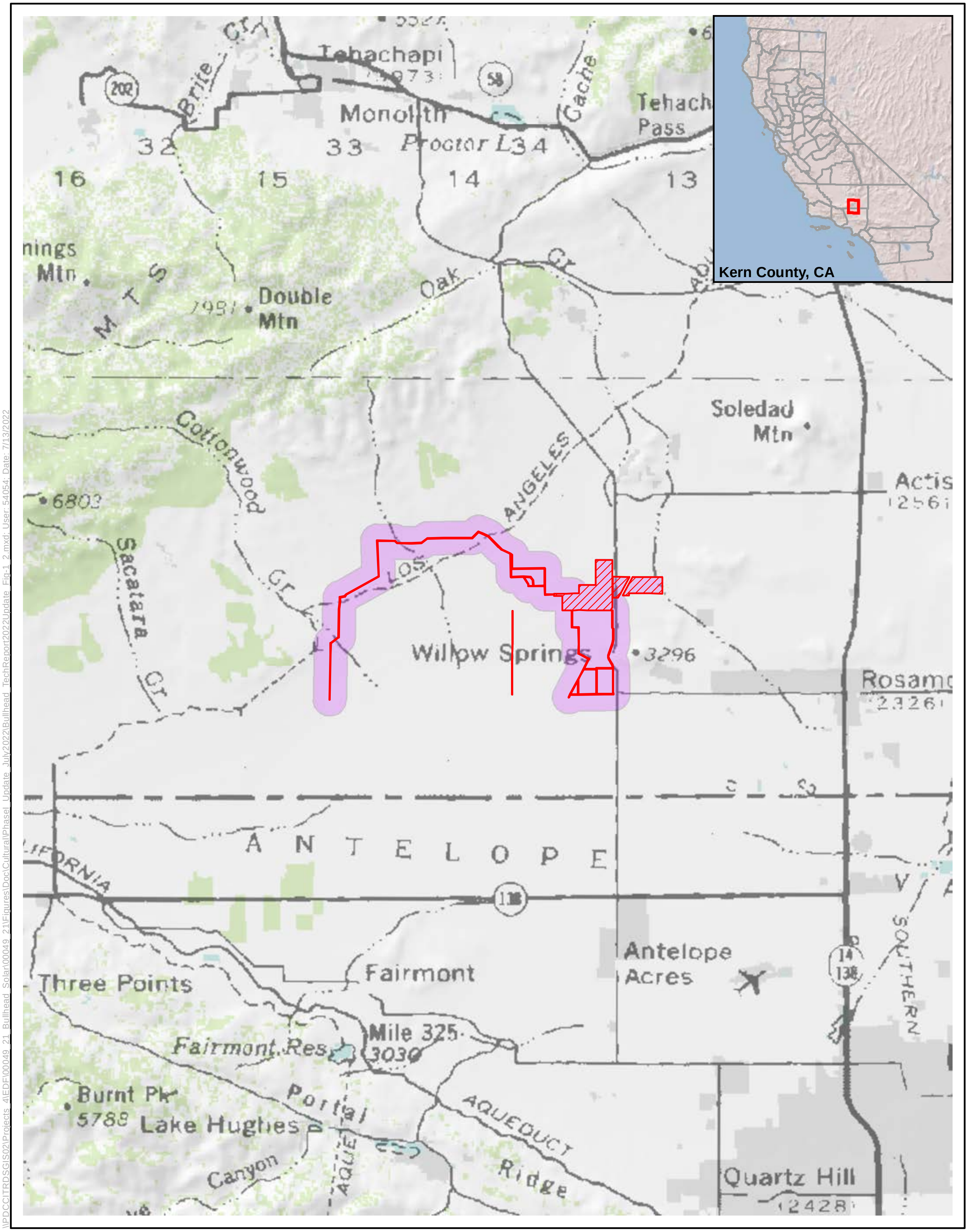

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Source: USGS-ESRI Imagery, 2019

Legend

Archaeological Study Area

Built-Environment Study Area

Figure 1-2
Project Vicinity

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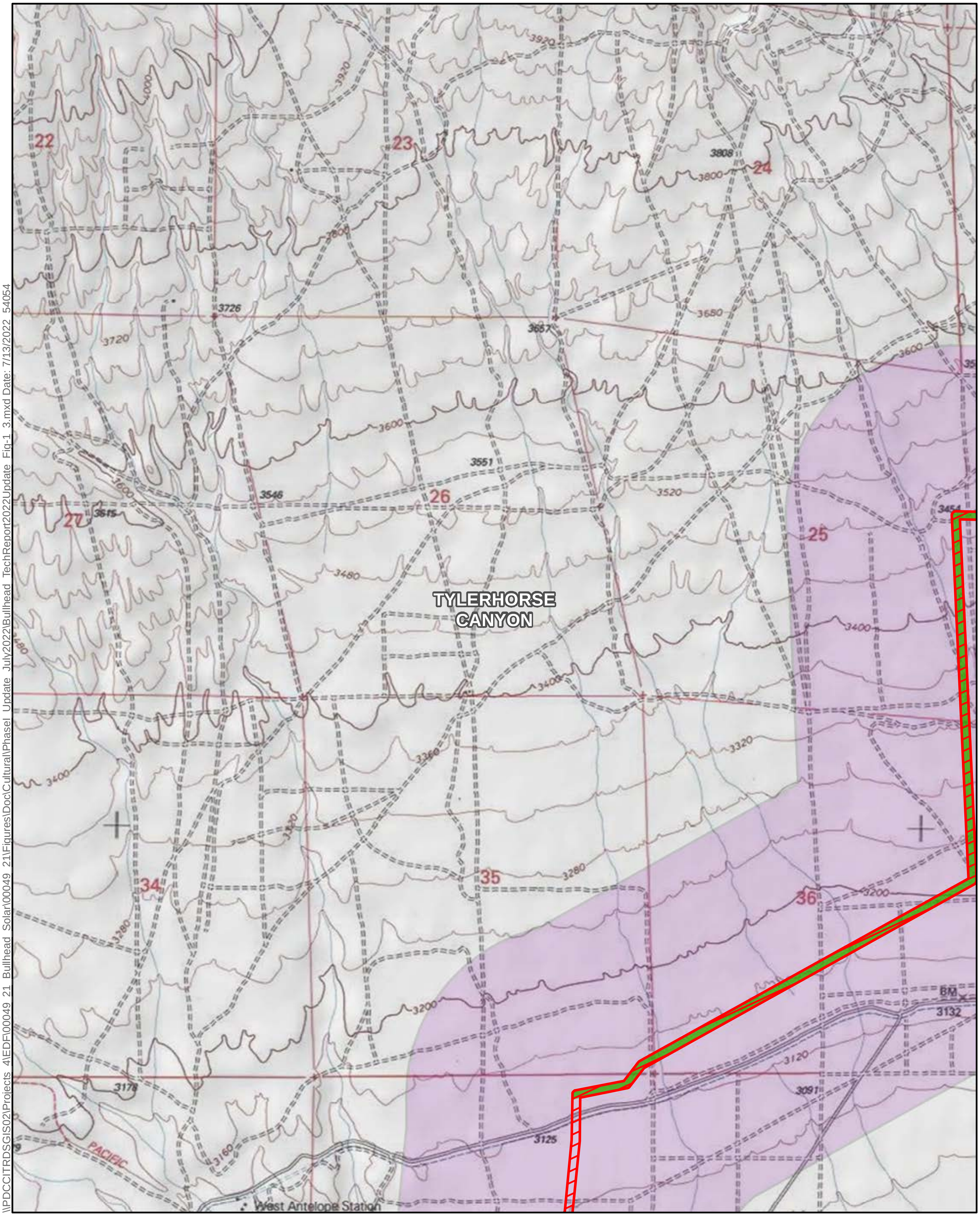

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Feet

Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

- Bullhead Archaeological Study Area
- Not Surveyed for Archaeology (Previously Surveyed for BigBeau)
- Built-Environment Study Area
- USGS Quad Boundary

Index Map

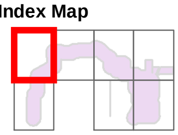

Figure 1-3
Study Location
Sheet 1 of 7

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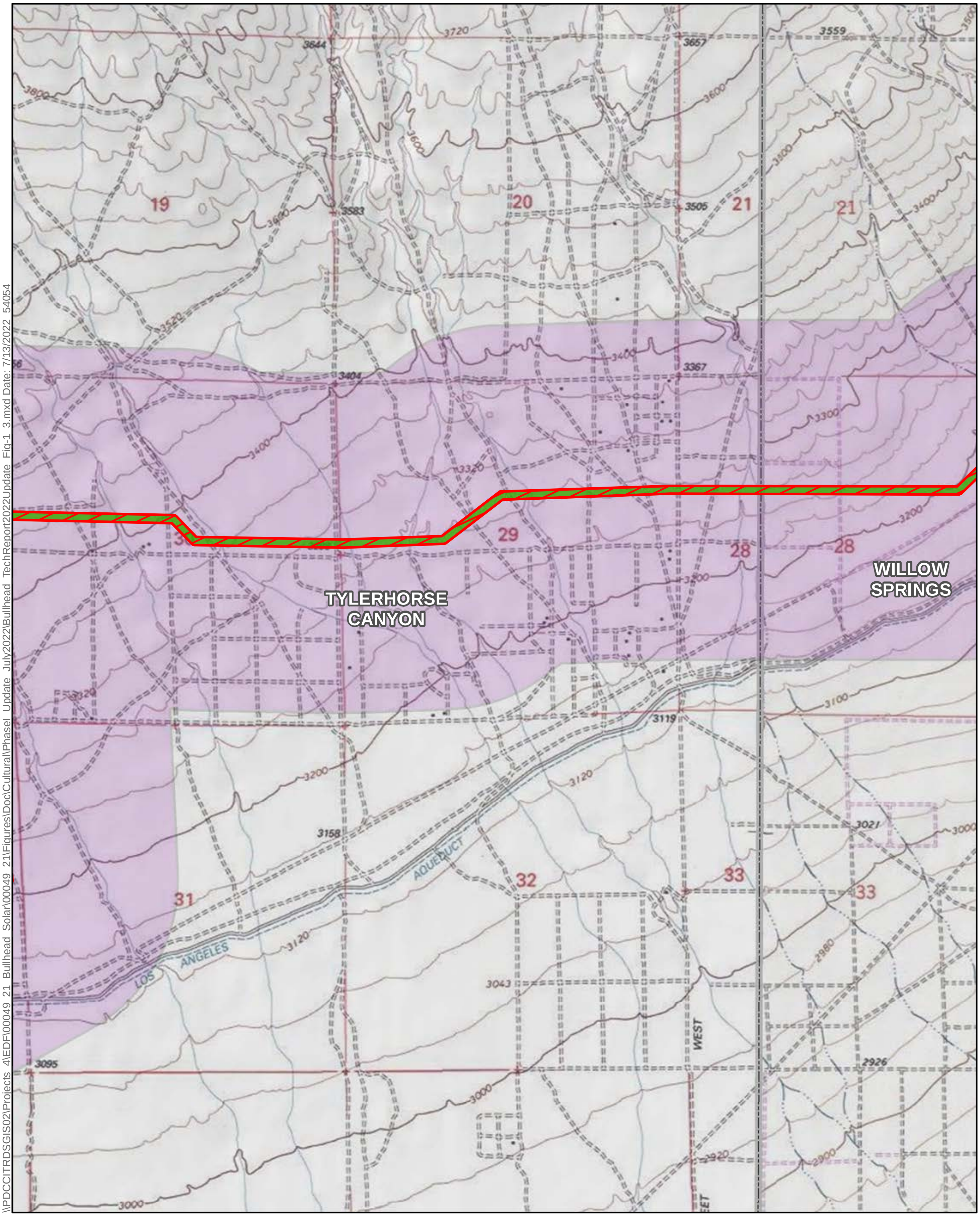

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Feet

Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

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- Built-Environment Study Area
- USGS Quad Boundary

Index Map

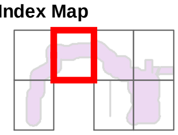

Figure 1-3
Study Location
Sheet 2 of 7

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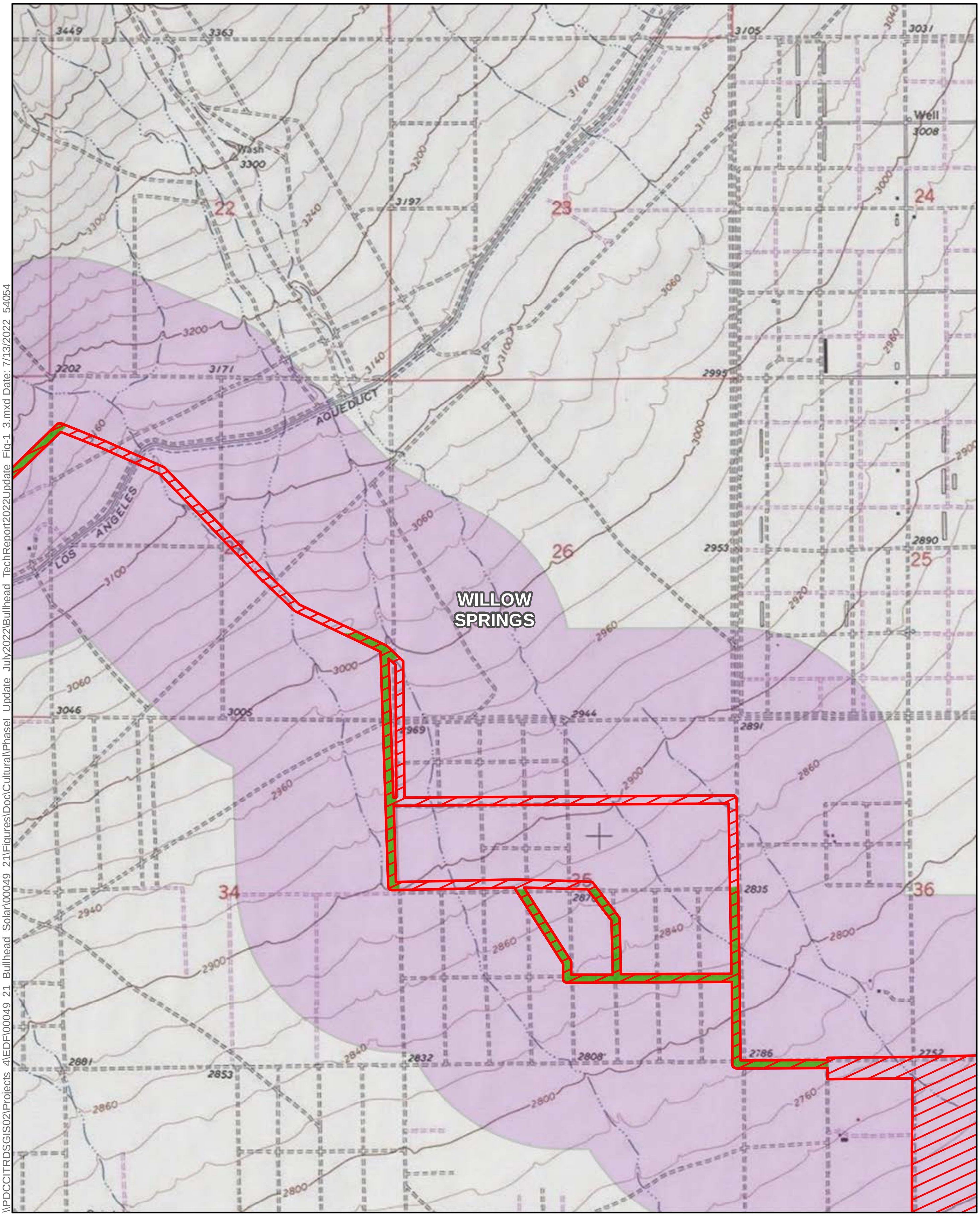

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Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

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- Not Surveyed for Archaeology (Previously Surveyed for BigBeau)
- Built-Environment Study Area
- USGS Quad Boundary

Index Map

Figure 1-3
Study Location
Sheet 3 of 7

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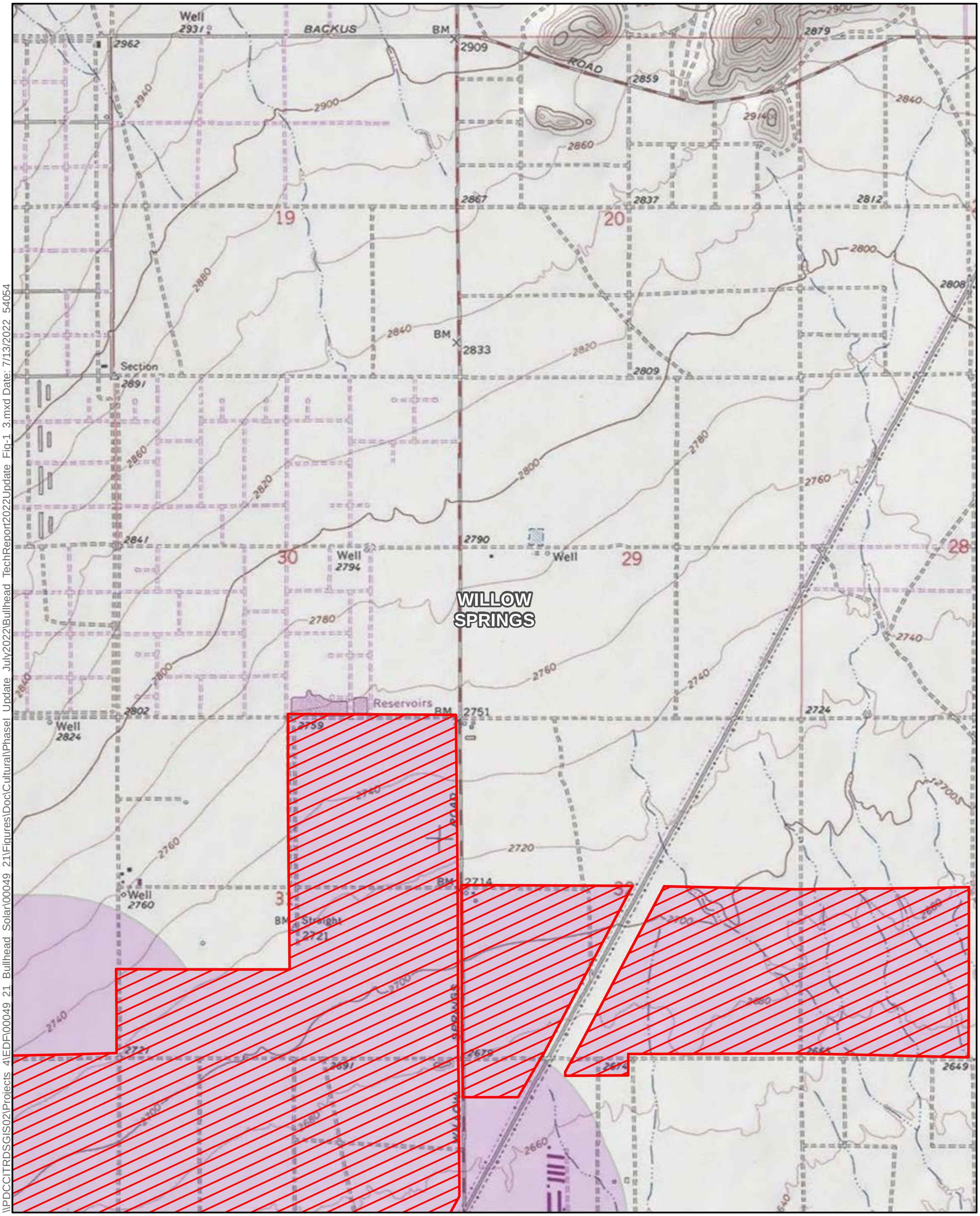

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Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

- Bullhead Archaeological Study Area
- Built-Environment Study Area
- USGS Quad Boundary

Index Map

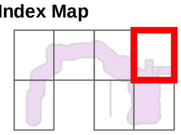

Figure 1-3
Study Location
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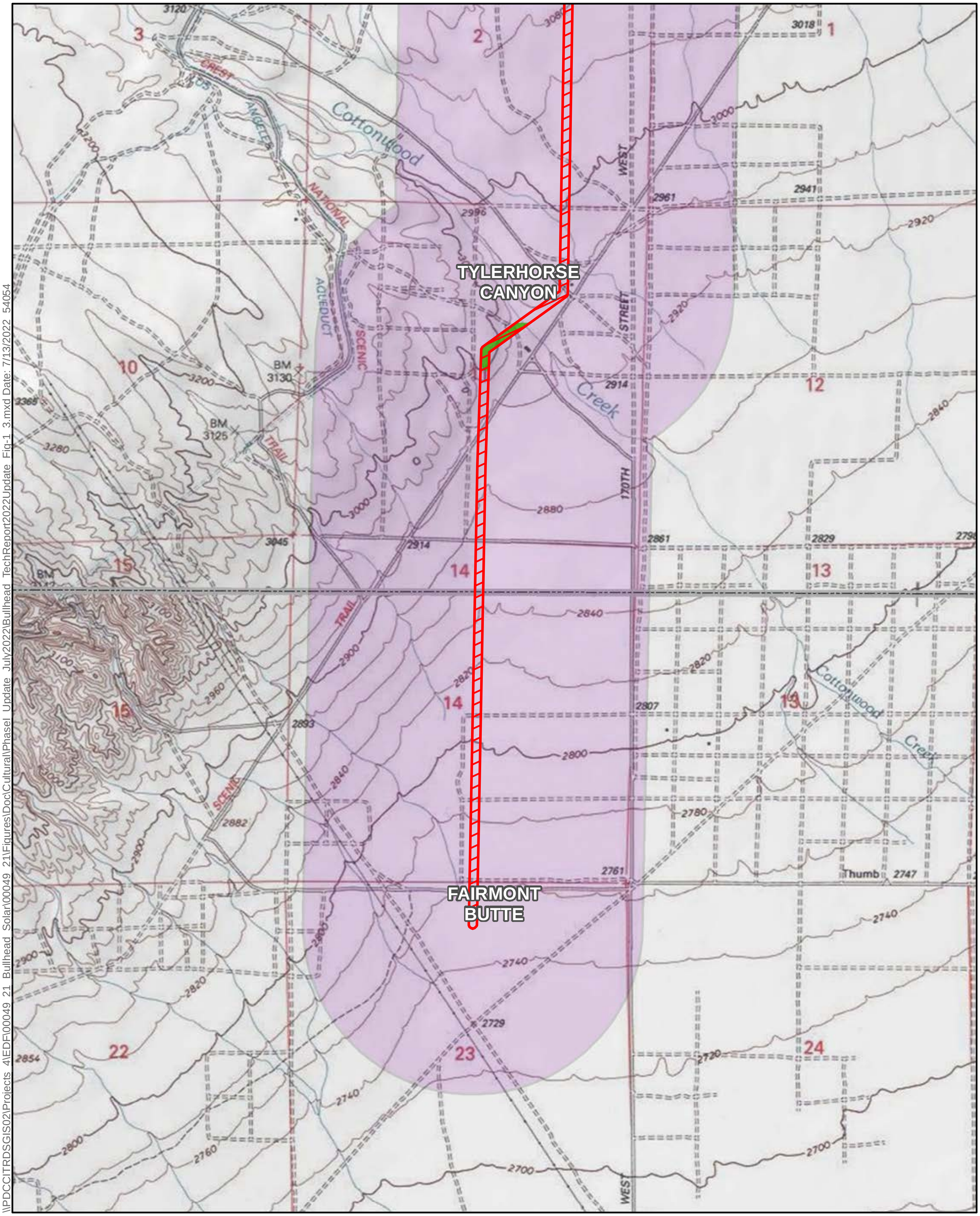

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0 500 1,000 2,000 Feet

Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

- Bullhead Archaeological Study Area
- Not Surveyed for Archaeology (Previously Surveyed for BigBeau)
- Built-Environment Study Area
- USGS Quad Boundary

Index Map

Figure 1-3
Study Location
Sheet 5 of 7

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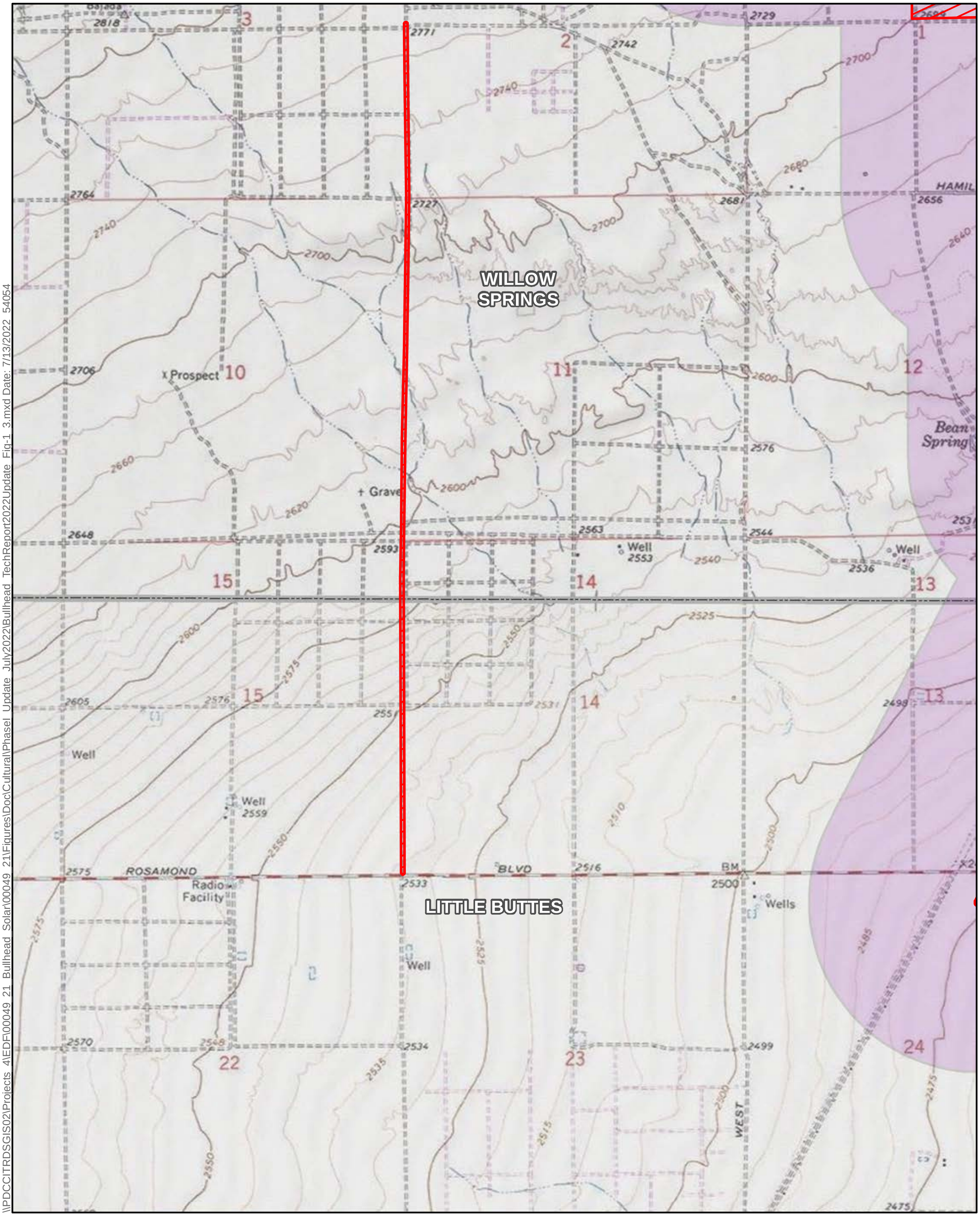

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Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

- Bullhead Archaeological Study Area
- Built-Environment Study Area
- USGS Quad Boundary

Index Map

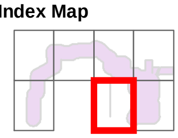

Figure 1-3
Study Location
Sheet 6 of 7

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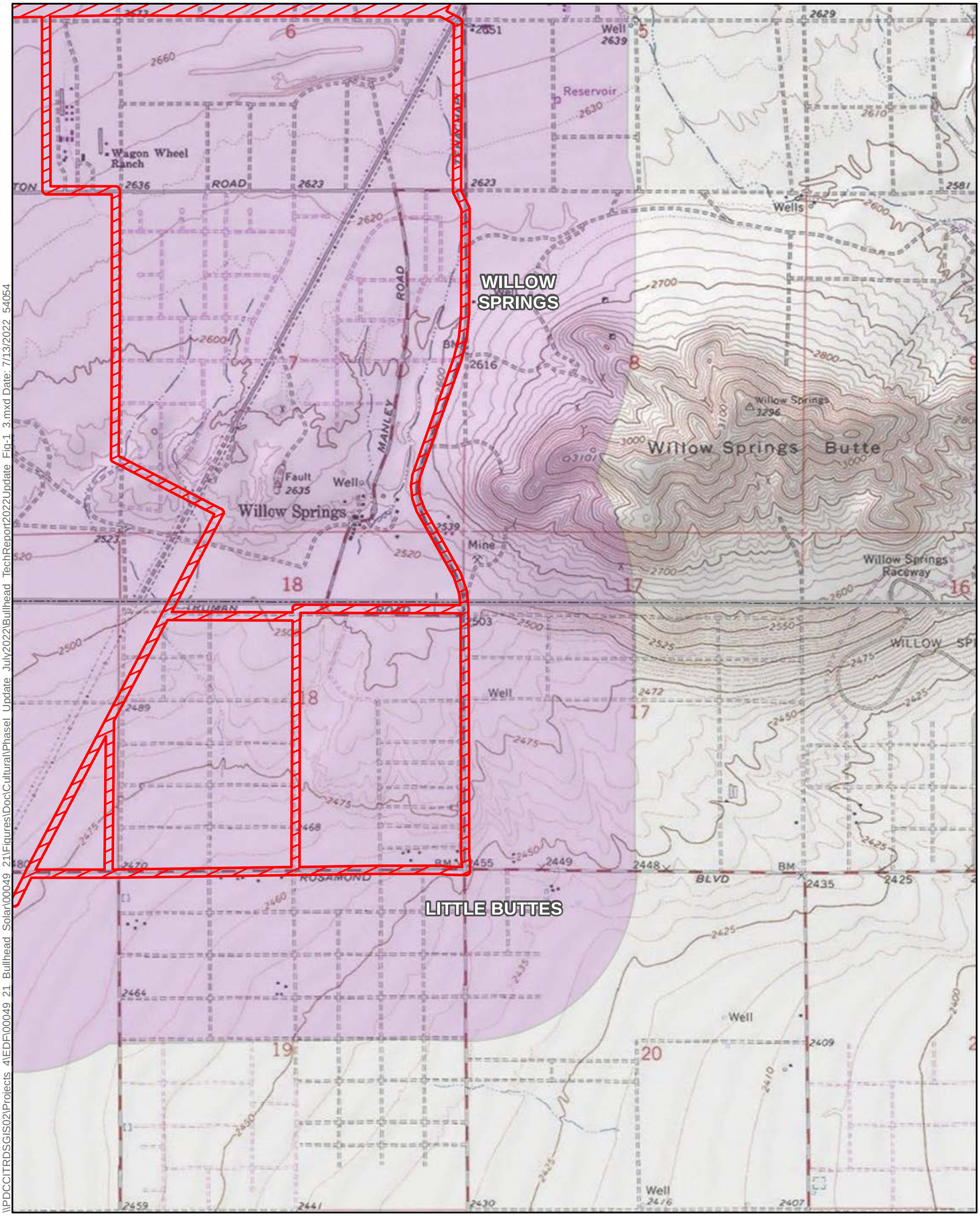

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Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

- Bullhead Archaeological Study Area
- Built-Environment Study Area
- USGS Quad Boundary

Index Map

Figure 1-3
Study Location
Sheet 7 of 7

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Chapter 2
Project Description

EDFR proposes the project to develop up to 270 MW (alternating current) of solar PV capacity derived from tracker technology and up to 270 MW of battery storage. The project includes solar development with associated PV panels, inverters, converters, generators, foundations, transformers, and preferred and optional gen-tie routes to the Rosamond and Whirlwind Substations, only one of which would be constructed. The project also includes laydown yards, a meteorological station, a microwave/communication tower, and a substation.

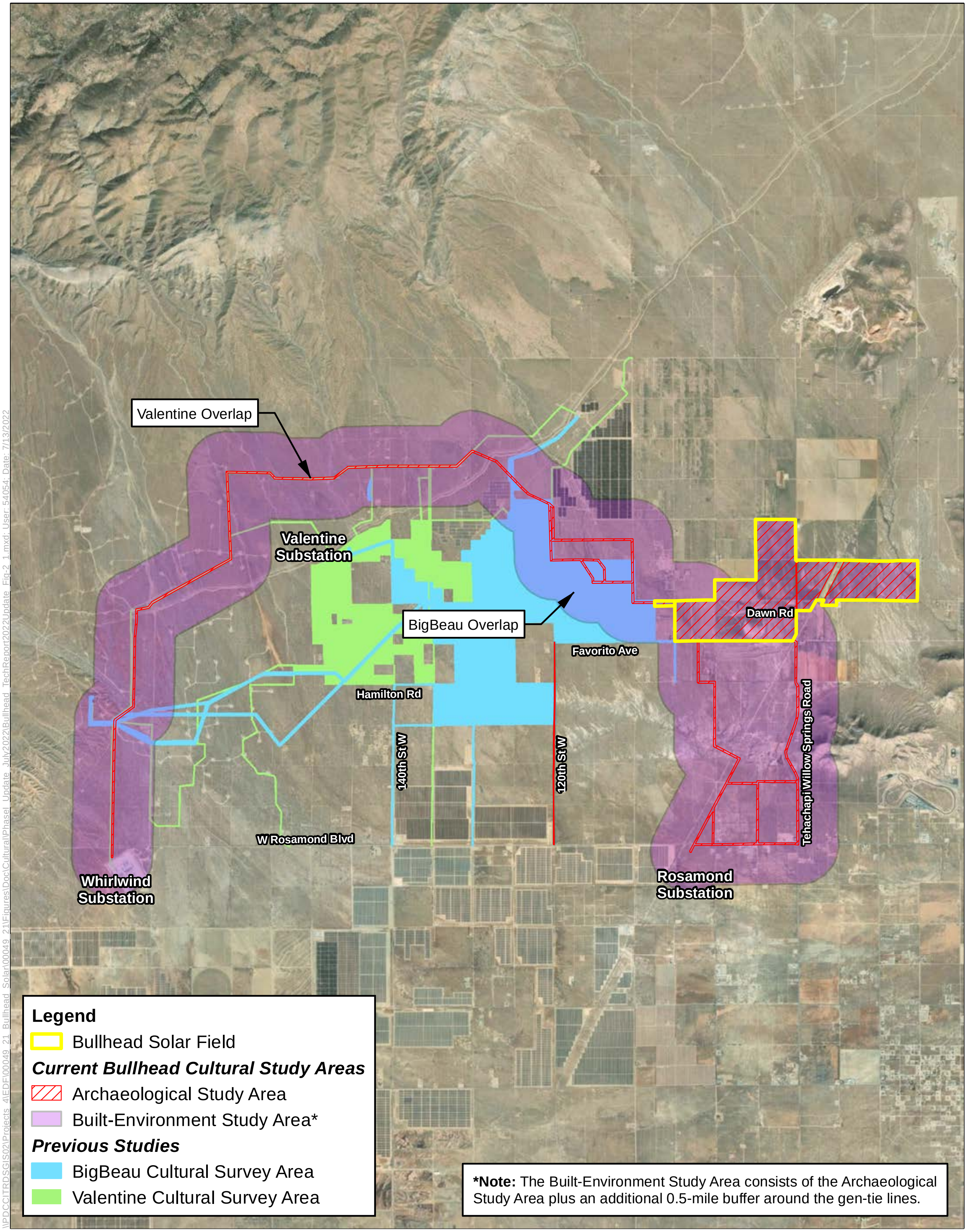
A boundary for the Bullhead solar field has been defined that encompasses approximately 1,359.5 acres of private land (see Bullhead Solar Field on Figure 1-1 in Chapter 1). Should the Kern County (County) Board of Supervisors approve the project, the County would issue Conditional Use Permits (CUPs) and other required approvals on land proposed for development of the solar facilities. The portion of the project subject to the CUPs is approximately 1,349.3 acres; approximately 10 acres are excluded from the CUP boundary, but are included in the solar field boundary for purposes of environmental analysis.

Secondary access to the Bullhead site is provided via 120th Street West through the approved and adjacent BigBeau Solar Project (BigBeau). Approximately 422.4 acres of land permitted in connection with BigBeau will be developed around the same time as the proposed project, and those facilities will use the same interconnection infrastructure as the proposed project. The County Board of Supervisors approved BigBeau and certified an EIR for the project in June 2020. The environmental effects of developing on those lands were evaluated in the BigBeau EIR (SCH # 2019071059), which is hereby incorporated by reference. EDFR will comply with all mitigation measures and conditions of approval applicable to BigBeau for any development those lands.

As shown on Figure 1-1, the Bullhead solar field consists of a solar array area with three locations under consideration for the development of a substation and battery energy storage systems. CUPs are required for the solar generation facilities (e.g., the panels) and associated generation equipment (i.e., inverters, substation, and batteries), as well as the communications tower. These facilities will be located within the CUP boundary. Several project components do not require CUPs and would extend beyond the Bullhead solar field boundary, but would be entirely within the archaeological and built-environment study areas. These components include access roads and gen-tie power lines (both collection and transmission). Figure 1-1 also shows the project components.

EDFR is committed to creating a state-of-the-art solar energy project that would be constructed in a manner that minimizes environmental impacts to the greatest extent feasible. The proposed project includes four options for gen-tie routes, including two deviations to one option and one deviation to another. Only one route would be constructed. Three project optional gen-tie routes—Rosamond Gen-tie Options 1, 2, and 3, including one deviation identified as Rosamond Gen-tie Option 3.1—would travel south from the project boundary and connect to the Rosamond Switching Station. The Rosamond Switching Station is planned to be constructed by Los Angeles Department of Water and Power (LADWP) by December 2025. One optional project gen-tie route—Whirlwind Gen-tie Option 1, including two deviation routes identified as Whirlwind Gen-tie Option 1.1 and Whirlwind Gen-tie Option 1.2—would cross underneath SCE's Tehachapi Renewable Transmission

Project (TRTP) to the east of the project site and connect to the existing Whirlwind Substation. SCE's TRTP 220/500-kV corridor travels through Whirlwind Gen-tie Option 1 and connects SCE's Vincent Substation with SCE's Windhub Substation to the south and north of the project site, respectively. Many of the lands surrounding the site have either been approved for, or are in the planning stages of, development for solar or wind energy.



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Source: ICF, ESRI Basemaps (2019)

Figure 2-1
Aerial Figure

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Chapter 3
Regulatory Setting

3.1 California Environmental Quality Act and Cultural Resources

CEQA requires public agencies to evaluate the implications of their project(s) on the environment. It includes significant historic resources as part of the environment. Public agencies must treat any cultural resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant (CCR Title 14 Section 15064.5). A historic resource is considered significant if it meets the definition of *historical resource* or *unique archaeological resource*, as defined below.

3.1.1 Historical Resources

The term *historical resource* includes, but is not limited to, any object, building, structure, site, area, place, record, or manuscript that is historically or archaeologically significant or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California (PRC § 5020.1(j)). Historical resources may be designated as such through three different processes.

1. Official designation or recognition by a local government pursuant to local ordinance or resolution (PRC § 5020.1(k))
2. A local survey conducted pursuant to PRC Section 5024.1(g)
3. Listing in, or eligibility for listing in, the NRHP (PRC § 5024.1(d)(1))

The process for identifying historical resources is typically accomplished by applying the criteria for listing in the CRHR (CCR Title 14 § 4852), which state that a historical resource must be significant at the local, state, or national level under one or more of the following four criteria:

1. It is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.
2. It is associated with the lives of persons important in our past.
3. It embodies the distinctive characteristics of a type, period, region, or method of construction; represents the work of a master; or possesses high artistic values.
4. It has yielded, or may be likely to yield, information important in prehistory or history.

To be considered a *historical resource* for the purpose of CEQA, the resource must also have integrity, which is the authenticity of a resource's physical identity, as evidenced by the survival of characteristics that existed during the resource's period of significance. Resources, therefore, must retain enough of their historic character or appearance to be recognizable as historical resources and convey the reasons for their significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association. It must also be judged with reference to the particular criteria under which a resource is eligible for listing in the CRHR (CCR Title 14 § 4852(c)).

3.1.2 Unique Archaeological Resources

A *unique archaeological resource* is defined in PRC Section 21083.2 as an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

- Contains information needed to answer important scientific research questions for which there is a demonstrable public interest.
- Has a special and particular quality, such as being the oldest of its type or the best available example of its type.
- Is directly associated with a scientifically recognized important prehistoric or historic event or person.

In most situations, resources that meet the definition of a unique archaeological resource also meet the definition of historical resource. As a result, it is current professional practice to evaluate cultural resources for significance according to their eligibility for listing in the CRHR. For the purposes of this CEQA cultural resources study, a resource is considered significant if it meets the CRHR eligibility (significance and integrity) criteria. Individual resource assessments of eligibility are provided in this report.

Even without a formal determination of significance and nomination for listing in the CRHR, the lead agency can determine that a resource is potentially eligible for such listing to aid in determining whether a significant impact would occur. The fact that a resource is not listed in the CRHR, or has not been determined eligible for such listing, or included in a local register of historic resources does not preclude an agency from determining that a resource may be a historical resource for the purposes of CEQA.

3.1.3 Thresholds of Significance

According to CEQA, a project that causes a substantial adverse change in the significance of a historical resource or an archaeological resource has a significant effect on the environment (CCR Title 14 § 15064.5; PRC § 21083.2). CEQA defines a *substantial adverse change* as (CCR Title 14 § 15064.5(b)):

- Physical demolition, destruction, relocation, or alteration of a resource or its immediate surroundings such that the significance of the resource would be materially impaired; or
- Demolition or material alteration in an adverse manner of the physical characteristics of a historical resource that convey its historical significance and justify its inclusion in, or eligibility for inclusion in, the CRHR; or
- Demolition or material alteration in an adverse manner of the physical characteristics that account for its inclusion in a local register of historical resources pursuant to Section 5020.1(k) of the PRC or its identification in a historical resource survey meeting the requirements of Section 5024.1(g) of the PRC, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or

- Demolition or material alteration in an adverse manner of the physical characteristics of a historical resource that convey its historical significance and justify its eligibility for inclusion in the CRHR, as determined by the lead agency.

PRC Section 5097.5 prohibits excavation or removal of any "vertebrate paleontological site […] or any other archaeological, paleontological or historical feature situated on public lands, except with express permission of the public agency having jurisdiction over such lands." *Public lands* are defined to include lands owned by or under the jurisdiction of the state or any city, county, district, authority, or public corporation or any agency thereof. Section 5097.5 states that any unauthorized disturbance or removal of archaeological, historical, or paleontological materials or sites located on public lands is a misdemeanor.

3.1.4 Public Resources Code and Health and Safety Code

Provisions for the treatment of human remains can be found in the California PRC. These provisions, as detailed in PRC Sections 5097.9 through 5097.994, explain the actions to be taken when Native American remains are found. Section 7050.5 of the California Health and Safety Code states that anyone who knowingly disinters, disturbs, or willfully removes any human remains in or from any location, other than a cemetery, without the authority of law is guilty of a misdemeanor, except in those circumstances described in Section 5097.99 of the PRC. Under these provisions, if a county coroner determines that remains found during excavation or disturbance of land are Native American, the coroner must contact the Native American Heritage Commission (NAHC) within 48 hours. The NAHC must determine and notify a most likely descendant, who shall complete inspection of the site within 24 hours of notification and may recommend scientific removal and non-destructive analysis of human remains and items associated with Native American burials.

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Chapter 4
Environmental Setting

4.1 Natural Setting

The study area is at the northwestern edge of the Antelope Valley, southeast of the Tehachapi Mountain foothills and approximately 11 miles west of the Rosamond Hills. Rosamond Lake, a large Pleistocene-age dry lakebed, is approximately 11 miles southeast of the project area. This lakebed is a remnant of ancient Lake Thompson, which receded approximately 8,000 years before present (B.P.), after the waning of the glacial climate in western North America. The study area includes 11 vegetation communities/land cover types of which the following are dominant: Creosote Bush Scrub, Active/Inactive Agriculture, Joshua Tree Woodland, Rubber Rabbitbrush Scrub, Desert Saltbush Scrub, and Disturbed Habitat. It includes creosote bush, white bursage, buckwheat, Joshua trees, saltbush scrub, and other scrub species. Saltbush scrub, with occasional areas of creosote bush scrub, forms the dominant vegetation in the project area, which is within an alluvial plain with mountains to the north and south. The Antelope Valley is fed by numerous rivers, creeks, and seasonal drainages. Granite-derived alluvium makes up the dominant soil type in the project area. The study area is in the northwestern portion of the Mojave Desert Geomorphic Province. This portion of the Mojave Desert is defined by block-faulted mountain ranges and intervening valleys with broad alluvial fans along the transition of the ranges and valleys. South of the study area lie the San Gabriel Mountains, consisting of Mesozoic granitic rocks and minor Cenozoic volcanic rocks. The Tehachapi Mountains, consisting of Mesozoic metamorphic and granitic rocks, are north of the study area. The study area is within a broad alluvial fan consisting of recent alluvium that is underlain at depth by Quartz monzonite granitic rocks. The geology of the proposed solar array area consists primarily of Young Alluvial Fan Deposits (Qyf) with small areas of Undifferentiated Surficial Deposits (Qsu). Both deposits are of Middle to Late Holocene age (8,000 years or less) and estimated to be less than 5 meters thick (Mason et al. 2019). Soils are made up primarily of Cajon loamy sands and DeStazo sandy loams, with lesser areas of other similar soil types. The geology of the study area consists primarily of Quaternary alluvium. Aeolian processes generated by the area's frequently high winds also shaped the landscape. Nearby sources of volcanic rock include Gem Hill near Rosamond, Middle Buttes and Willow Springs Mountain, all within 3 miles of the project site; and Soledad Mountain, Rosamond Hills, and Fairmount Butte, within 12 miles of the project site. All of these formations would have provided suitable tool stone for prehistoric use. Given the proximity to water, lithic resources, vegetal and animal resources, and the geologic setting of the project area, it is considered to have high archaeological sensitivity.

The project area does not include any incorporated municipalities but Rosamond Gen-tie Option 1 traverses the western edge of the community of Willow Springs. The community of Rosamond is approximately 7 miles to the east and slightly south. The largely undeveloped study area is crossed by numerous unpaved roads and a recently constructed transmission line. A major early twentieth-century industrial project, the Los Angeles Aqueduct, intersects with the Whirlwind Gen-tie Option 1 line, which would run overhead of the aqueduct, which is below ground in this area. Some residential structures are within the project area. Several of the parcels have been subject to intensive agricultural production, resulting in moderate surface disturbances and impacts on cultural resources.

4.2 Prehistoric Setting

Prehistoric occupation of the western Mojave Desert follows a timeline similar to that of the Los Angeles basin and coast, although there is a strong influence from the western Great Basin, of which the Mojave Desert is a part. In addition, there are noticeable differences between the Los Angeles basin and Mojave Desert, such as adaptation due to climate and landscape changes that occurred over time. During the late Pleistocene and early Holocene (12,000–10,000 B.P.), sea levels rose, flooding Southern California coastal river valleys and forming lagoons and estuaries. At the same time, the extensive pluvial lakes that occupied the basins in the interior regions of the basin-and-range province, including the Mojave Desert, began to dry. The Colorado River alternately drained into the Salton Basin and the Gulf of California, causing Lake Cahuilla to fill and evaporate numerous times. A warm, dry trend during the Holocene period further evaporated pluvial lakes and raised surface sea temperatures along the coast. Although warmer overall, wet and dry climatic trends fluctuated during the Holocene period, causing the formation of small, ephemeral lakes in the interior basins after periods of relative drought. Modern desert flora and fauna were in place during the early Holocene and well established by the middle Holocene. Presented below is a summary of widely accepted archaeological interpretations regarding prehistoric human habitation of the Mojave Desert and wider overall region (Sutton 1996).

4.2.1 Late Pleistocene (circa > 12,000 B.P.)

Over the last century, a relatively small number of archaeological finds in Southern California have been attributed to the Late Pleistocene period. Cairn burials, cleared circles, basic tools, and rock alignments in the Colorado Desert were hypothesized to date from 12,000 to 50,000 B.P., and controversial cut marks were reported on mammoth bones (Miller et al. 1991). Three Mojave Desert sites—Calico Hills (Simpson 1980), China Lake (Davis 1982), and Manix Lake (Simpson 1958, 1960, 1964)—were or are purported to have cultural materials that were more than 10,000 years old. The primary evidence for claims of great antiquity at these sites and others in Southern California is the similarity of rudimentary “tools” to Paleolithic tools from the Old World, the relative patination and/or embeddedness of the artifacts, the questionable radiocarbon dates, and the equally questionable associations of “tools” and Pleistocene fauna (Bamforth and Dorn 1988; Payen 1982). Claims of antiquity have been further eroded by more reliable dating methods (Taylor et al. 1985). Thus far, claims for occupation of the California desert area prior to about 12,000 B.P. are unsubstantiated.

4.2.2 Early Holocene (circa 12,000–7000 B.P.)

The Paleoindian period (circa 12,000–10,000 B.P.) is represented in the general project vicinity by widely distributed fluted (e.g., Clovis) points, primarily from the central Mojave Desert (Sutton 1996). Early desert populations were thought to have hunted primarily large fauna along the shores of pluvial lakes; lacustrine resources were also used to some extent (Erlandson 1994; Warren and Crabtree 1986). In the latter part of the Early Holocene (circa 10,000–7000 B.P.), the adaptive strategy continued in a similar fashion, consisting of generalized hunting and gathering, with a focus on wetland resources. Sites from this period, known as the Lake Mohave period, provided a tool kit containing crescents, knives, scrapers, gravers, and perforators as well as temporally diagnostic Lake Mohave and Silver Lake projectile points. Early research efforts in the Mojave Desert described Lake Mohave period sites on remnant Pleistocene geological surfaces adjacent to ancient lakes and streams, creating an obvious interpretative bias toward a lacustrine focus and big-game hunting (Basgall 1993). More recent work has illustrated that these sites occur in a wide variety of settings, with faunal materials dominated by small and medium-size animal remains (Basgall et al. 1994). Early descriptions of desert lakes, running streams, more productive terrestrial vegetation, and abundant fauna are largely exaggerated. Although there may have been more effective moisture than today, the cyclic hydrologic pattern was established by about 10,000–8500 B.P. (Basgall et al. 1994). Sites at lakeshores also may be indicative of diverse ecological adaptation, providing access to terrestrial, shoreline, and lake ecotones (Sutton 1996).

4.2.3 Middle Holocene/Altithermal (circa 7000–4000 B.P.)

The Middle Holocene, or Altithermal, also known in the U.S. southwest/west as the Pinto period, is viewed as a time of extensive environmental and cultural change in Southern California. Ground stone plant processing technologies appear in the archaeological record, hunting and fishing technologies diversified, and resource bases changed (Moratto 1984). This period of marked aridity was thought to have caused significant changes in settlement and subsistence practices and even abandonment of some desert areas (Wallace 1962), but more recent evidence points to considerable local, regional, and temporal variability in mid-Holocene thermal maxima throughout Southern California (Carbone 1991; Hall 1992). In the Mojave Desert, environment, as a cause of cultural change, has been de-emphasized (McGuire and Hall 1988) because modern floral and faunal populations have persisted since the end of the Pleistocene. Occupation of the Mojave Desert was continuous but perhaps erratic (Sutton 1996). The sites that do occur in the Mojave Desert during this time have been identified along dry lake shores or streambeds (Warren 1984; Warren and Crabtree 1986); with the exception of the Stahl Site (Schroth 1994), they tend to be surface manifestations.

Pinto projectile points, as well as a flake industry similar to that of the Lake Mohave tool complex, were considered diagnostic artifact types (Warren 1984). However, more recent excavation data from the Pinto basin and Stahl sites indicate that Pinto points may not be useful as a chronometric index, except as generalized dart points (circa 10,000–2000 B.P.) (Schroth 1994). Early archaeological evidence pointed to a primary focus on large mammals and little use of plant resources such as small, hard seeds (Warren and Crabtree 1986). Milling stones occur infrequently at Mojave Desert sites, which have material remains typical of temporary camps, consistent with a subsistence strategy of diversified hunting and gathering (Sutton 1996; Wallace 1962; Warren 1984). Recent excavation data illustrate dietary diversity, probable use of hammerstones to process plant resources, and more complete processing of animals (McGuire and Hall 1988; Sutton 1993; Sutton et al. 2007). Faunal remains from Pinto period sites include artiodactyls, reptiles, lagomorphs, and freshwater mussels (Sutton 1996). Warren (1984) proposed that a high degree of mobility would have ensured flexibility, allowing populations to respond to seasonal climatic changes. Subsequent studies at Fort Irwin have illustrated that the exploitation of peripheral areas, as well as fertile areas, provided a subsistence base broad enough to ensure the availability of resources during both dry and wet periods (McGuire and Hall 1988).

4.2.4 Late Holocene (circa 4000 B.P.–contact)

During the Late Holocene, technology and subsistence practices continued to diversify, and economic and population expansion, along with resource intensification, occurred in most areas of Southern California (McDonald 1992; Sutton 1996; Sutton et al. 2007). The role of the environment with respect to cultural changes remains an issue of debate.

During the Gypsum period (4000–1500 B.P.) of the Middle and Late Holocene, a minor lacustrine phase called the "little pluvial" is evidenced by multiple lacustrine episodes that may have formed more often and endured longer (Enzel et al. 1992). There may also have been an increase in groundwater and minor expansion of the riparian zones surrounding springs (McGuire and Hall 1988). Warren (1984; Warren and Crabtree 1986) noted that these changes may have enabled development of new patterns of subsistence and settlement, which persisted through subsequent drier times. The diversity in site types and artifact assemblages illustrates exploitation of a wide range of resources within a generalized mobile subsistence strategy. Large mammals may have continued to make up a major portion of the diet (McGuire and Hall 1988; Warren and Crabtree 1986), but plant food resources increased in importance, as evidenced by the appearance of the mortar and pestle, probably used for processing mesquite pods in the desert (Warren 1984) and acorns in the foothills (Moratto 1984). Site assemblages during the Gypsum period are characterized by flaked stone tools, bifaces, cores, and debitage, almost exclusively made of microcrystalline materials such as jasper and chalcedony. Artifacts typical of this period include medium- to large-stemmed, as well as notched, projectile points (Gypsum series, Elko series, and Humboldt concave base) that exhibit affinities with Great Basin point types (McGuire and Hall 1988; Warren and Crabtree 1986). Usually, very few projectile points are recovered and most are "spent," indicating long retention and use. Bifaces are generally made of local materials, although late-stage bifaces are more often extra-local materials. The large bifacial core is a principal transportable artifact form for tool and flake manufacture. Grinding tools are frequent but not an abundant site component.

The smaller Rose Spring point, which seems to be related to southwestern point types, appears late in the Gypsum period in the Mojave Desert and is believed to indicate the advent of the bow and arrow (Rogers 1966; Yohe 1998). Split-twig figurines and petroglyphs found in the central Mojave Desert are associated with the appearance of the bow and arrow (Warren 1984) and, together with pit houses and Basketmaker III ceramics found in the eastern Mojave, indicative of influences from northern Arizona (Warren 1984). Contact with the Pacific Coast is evidenced by the geographically widespread, yet rare, occurrence of shell beads and ornaments in the California deserts, Great Basin, and southwest (Warren 1984). However, some desert sites have numerous beads, especially in the Coachella Valley and Anza Borrego State Park.

During the Saratoga Springs period (1500–800 B.P.), following the introduction of the bow and arrow (circa 1500 B.P.), technological and economic developments in Southern California persisted and expanded in the form of Anasazi influences from the east and Yuman (or Patayan) influences from the lower Colorado River Valley (Warren 1984; Yohe 1998). By the end of the Saratoga Springs period, Anasazi influences had disappeared from the Mojave Desert and were replaced by Shoshonean connections. This western expansion of Uto-Aztecan speakers, ancestral to the Luiseño and Gabrielino from the desert areas to the coastal areas, is thought to have occurred sometime between circa 1400 B.P. and 600 B.P. (Moratto 1984). Flaked stone artifact assemblages closely resemble their predecessors, but Rose Spring, cottonwood triangular, and finally desert side-notched arrow points appear in the cultural record. Arrow points, milling stones, mortars, pestles, ceramics, obsidian and other important tool stones, and ornamental and ritual objects made of shell, bone, and stone are commonly found at sites dating to this period (Warren and Crabtree 1986; Sutton 1996; Sutton et al. 2007).

The Late Prehistoric period (800 B.P.–contact) began with the decline of Anasazi influences and the continued diversification and expansion of Numic-speaking groups across the Great Basin, Takic-speaking groups into Southern California, and the Hopi across the southwest (Sutton 1996). The groups that emerged are most easily discussed in terms of linguistic affinities with historical populations. Archaeological correlations are less definitive because all of these groups shared a similar material culture and settlement pattern in the deserts and inland Southern California (Warren and Crabtree 1986). Far more late-period sites are obvious in Southern California compared with earlier periods. Although this may be due in part to sampling error or depositional processes, it appears that there was a large population influx or increase during this last period of prehistory. Resources were exploited more intensively, populations consolidated, and the range of foraging territory decreased. These changes appear to be widespread throughout California. In the deserts, this is evidenced in part by the use of local lithic materials in the manufacture of tools, which show increasing degrees of specialization. In addition, site occupation during this period was lengthier and more regular than during previous periods (McGuire and Hall 1988). Desert subsistence continued to focus around hunting and gathering a diverse variety of animal and plant resources, including small mammals (McGuire and Hall 1988). Large late-prehistoric villages in the general project vicinity include sites in the Antelope Valley, at Oro Grande (Rector et al. 1983), and on Las Flores Ranch along the Mojave River (de Barros 1990; Smith 1963; Sutton and Schneider 1996).

4.3 Ethnographic Context

The project vicinity extends across the ethnographic traditional use areas of several Native American groups, including the Kitanemuk and Desert Serrano/Vanyume. The southern extent of the ethnographically documented traditional use area for the Kawaiisu is slightly north of the project area but is also discussed. Each of these groups represents highly effective, mobile hunter-gatherer groups that were loosely organized into small patrilineal clans. Given their large cultural use areas, they often shared boundaries, languages, and natural resources with neighboring tribes. Although largely interrelated, the following discussion addresses highlights from each of these groups.

4.3.1 Kitanemuk

The Kitanemuk, a small group located principally in the Tehachapi Mountains, spoke a Serrano language of the Takic family. The Kitanemuk were primarily mountain dwellers settled along the Tejon Creek, and during cooler seasons would range into the arid lowlands of the Antelope Valley (Johnson 2016).

Kitanemuk families were organized into patrilineal bands with bilocal residence patterns. Social rankings and prestige systems were well developed. Each village had administrative elites, including a chief, a ceremonial manager, two messengers, and shamans, diviners, and other ritualists (Blackburn and Bean 1978).

The general ecological adaptations and subsistence technology of the Kitanemuk differed little from that of their neighbors to the north and west, although little historical information is available on the group. Some Kitanemuk were apparently assimilated into Missions San Fernando, San Gabriel, and possibly Ventura (San Buenaventura) but many returned to their former homes after the missions were secularized (Johnson 2016). Some were residents during the 1850s at the Sebastian Military Reserve at Tejon and later Fort Tejon and the Tule River Reservation (Blackburn and Bean 1978; Johnson 2016).

4.3.2 Desert Serrano

Spanish explorers to the mountainous areas east of Los Angeles provided the name "Serrano" (meaning "mountaineer" or "highlander") to the indigenous people they encountered in this region of the Transverse Ranges. However, a group related to the Serrano lived north of the mountainous region for which the Serrano name is derived. This related group, known as the Desert Serrano and referred to as the Vanyume by early ethnographers, occupied a significant portion of the western Mojave Desert, from the San Bernardino Mountains east of Cajon Pass to areas northward and beyond the Mojave River (Kroeber 1925; Sutton and Earle 2017). The eastern boundary extended to nearly the Providence Mountains (Bean and Smith 1978). It should also be noted that some accounts indicate that villages of the Serrano extended into this area as well, reaffirming the relationship between the Desert Serrano and the Serrano proper.

The name Serrano is regularly used to describe a group of languages in the Takic family of the Uto-Aztecan stock. Although little linguistic information is available on the Desert Serrano, it is understood that the Desert Serrano spoke a dialect of the Serrano language (Shipley 1978; Bean and Smith 1978; Sutton and Earle 2017). The Serrano were organized into autonomous localized lineages that occupied specific territories. Because settlement was determined by the availability of water, most Desert Serrano lived in small villages situated near water sources, principally the Mojave River. Individual family dwellings consisted of circular domed structures with willow frames that were covered in thatched tule (Bean and Smith 1978; Sutton and Earle 2017).

The Desert Serrano were primarily hunters and gatherers. Principal game included deer, mountain sheep, antelope, rabbits, birds, and other small mammals. The primary staples depended on the location of each hamlet, but each supplemented its diet with various other roots, bulbs, and shoots (Sutton and Earle 2017). Early travelers like Jedediah Smith observed that the Desert Serrano processed acorns and pine nuts to make an edible "mush." The presence of acorns and pine nuts suggests that an active trade network or gathering area was present to have such staples along the Mojave River at the time of his crossing in 1826. Technologically, they were known to utilize shell, wood, bone, stone, and plant fibers to make a variety of implements (Bean and Smith 1978; Sutton and Earle 2017).

4.3.3 Kawaiisu

The core area of the Kawaiisu was along the western boundary of the Mojave Desert, extending into the Tehachapi and Paiute Mountains. However, the Kawaiisu also incorporated a larger gathering area for resource procurement beyond that of the core area. This expanded boundary included areas as far eastward as the Amargosa River and southward to the Mojave River (Park et al. 1938; Zigmond 1986). The extended procurement area included elevation changes in excess of 7,500 feet, providing even greater natural resource diversity for the Kawaiisu.

Linguistically, the Kawaiisu represent the westernmost branch of the southern Numic division of the Uto-Aztecan language family. Kroeber (1925) and Lamb (1958) suggest that there is sufficient evidence to classify Kawaiisu as its own separate language from the rest of the southern Numic (Miller 1986). Their location along the foothills of the Mojave Desert places them with non-Numic speakers to the south and north as well as non-Uto-Aztecan speakers to the west. Such regional language diversity is likely to have also factored in Kawaiisu language development.

Kawaiisu winter structures were circular in shape, often made of willow, with vertical forked and transverse poles. The structures were lined with brush and bark or tule matting. Summer structures were flat-roofed ramada-style structures that provided shade and ventilation for the occupants.

Subsistence for the Kawaiisu was varied, owing to the regional topographic variance of their territory. Floral subsistence included, but was not limited to, juniper (*Juniperus* spp.), pine (*Pinus* spp.), oak (*Quercus* spp.), Joshua tree (*Yucca brevifolia*), yucca (*Yucca* spp.), wild celery (*Vallisneria americana*), and mariposa lily (*Calochortus* spp.). Furthermore, their hunting provided a variety of game, including deer, rodents, rabbits, birds, and insects.

Material culture included juniper bows, twined and coiled basketry, obsidian blades, awls, small stone bowls, flutes made from elderberry (*Sambucus* spp.) wood, and oval and Y-shaped cradles. Clothing consisted of tanned animal skins. Women had pierced ears and tubular nose plugs. Both men and women were commonly tattooed on the hands, arms, and face (Zigmond 1986).

4.4 Historic Period

4.4.1 Spanish Period

After two previous expeditions, the Spanish entered California in 1769 to colonize the region. Military commander Gaspar de Portolá and Franciscan priest Junípero Serra led this contingent. Serra, who would become father president of the California missions, founded Mission San Diego de Alcalá in July 1869. The following year, Portolá lead an overland expedition that traveled north from San Diego in search of Monterey Bay. En route, the Portolá expedition camped along the San Gabriel River near what would become the first San Gabriel Mission site and subsequently on the banks of the Los Angeles River in proximity to a Gabrielino village near what is now downtown Los Angeles. One of the travelers, Spanish missionary Father Juan Crespí, named the second site Nuestra Senora de la Reina de Los Angeles de la Porciuncula (Our Lady of the Queen of the Angels of Porciuncula), which would later became the location of the pueblo of Los Angeles (Engelhardt 1927:3; County of Los Angeles 2009).

In Southern California, Spanish colonization efforts focused on areas south of the Transverse Ranges; the newcomers made limited forays into the Antelope Valley. The first European exploration of the Antelope Valley took place in 1772, when Captain Pedro Fages, the acting governor of Alta California, led a party into the region from San Diego while pursuing Spanish army deserters. Traveling from the east 4 years later, Father Francisco Garcés crossed the Mojave Desert and passed through the Antelope Valley. He stopped at Willow Springs, a convenient watering stop for travelers. No settlement or other travel by Europeans is known to have occurred in the western Antelope Valley until the 1820s (Hoover et al. 2002:125; ICF 2015:2.1).

4.4.2 Mexican Period

In 1821, California became a territory of Mexico and remained so until the late 1840s. During the 1820s and 1830s, Mexico maintained a tenuous grip on California as increasing numbers of newcomers, many of them Americans, entered the territory by land or sea. Among these were fur trappers Jedediah Smith, Kit Carson, and Ewing Young, all of whom passed through the Antelope Valley. Day-to-day life did not change substantially during this period until secularization of the mission system, beginning in 1833. Although some large land grants were made to individuals prior to secularization, those made following secularization thoroughly redistributed the missions' large grazing holdings to officials, former soldiers, and some politically connected Anglo-American newcomers to the region. Provisions in Spanish law for ensuring that Native Americans would receive mission lands proved of little or no practical benefit to most of California's indigenous peoples during the secularization process (Bean and Rawls 2003:62–70; ICF 2015:2.1).

After secularization of the missions, economic necessity, or coercion, forced many among the region's Native American population to work on Mexican ranchos. Indigenous peoples living farther from rancho lands maintained their traditional ways of life for a longer period of time. As the ranchos multiplied and spread inland, more and more indigenous groups were forced to acculturate or move east, farther into the backcountry. Exploitation of native labor intensified during the Mexican period. These laborers were now on ranchos with grazing lands that encompassed their former territories. Economic production on the ranchos benefited Hispanic *Californios* and Euro-American newcomers to the region almost exclusively. Although many acculturated Native Americans who were ensconced within the rancho economy lived similarly to European peasants, a small number of Native Americans associated with the San Fernando Mission did petition for and receive modest land grants. Other Native Americans in Southern California resisted acculturation, lived away from the ranchos, and limited their contact with Mexican society. Native Americans from the interior frequently raided ranchos during these decades (Bean and Rawls 2003:68; Johnson 1997:258–260; Sandos 1997:211–212, 216).

4.4.3 American Period

Euro-American settlement of the Antelope Valley did not occur until the latter nineteenth century. Prior to that, the establishment of Fort Tejon, sheep and cattle grazing in the region, and the development of stage lines and roads to service the mines increased travel through the valley. The Butterfield Overland Mail began stagecoach operations through the region during the 1850s, with Willow Springs providing a stop for water once again. Beginning in the 1860s, a limited number of people began to settle near springs and other water resources. Mining activity in and around the valley brought some settlers and increased travel through the valley. By the end of the 1860s, four roads served the valley: Soledad Road; Mojave Road; a road through San Francisquito Canyon, used mainly by cattlemen and miners; and Fort Tejon Road (later Barrel Springs Road) (Gardiner 2002:13–14).

Water sources and railroad development led to the creation of the first communities in the vicinity of the project area. During the early 1870s, the Southern Pacific Railroad constructed a railroad line between Sacramento and Los Angeles via the San Joaquin and Antelope Valleys. Workers building south from Tehachapi Pass and north from Los Angeles completed the line at Lang Station in Soledad Canyon in 1876. Stations along the Southern Pacific line evolved into the project vicinity's first communities. Railroads subsequently constructed through the valley included the Atchison, Topeka &Santa Fe Railway; the Los Angeles & Independence Railroad; the Antelope Valley Line; and the Union Pacific (Lone Pine branch). Located approximately 9 miles east and slightly south of the project area and named for the daughter of a Southern Pacific official, Rosamond was initially the largest of the valley's railroad station settlements.

Situated approximately 11 miles south of Rosamond, Lancaster is thought to have been named for a Southern Pacific employee (Gardiner 2002:14–15). There, a well completed in 1884 demonstrated the availability of groundwater. Langley Wicks, who had earlier attempted and failed to establish a

Scottish colony at Willow Springs, purchased land and began to run real estate advertisements in English newspapers. Soon Lancaster had a post office, a hotel, newspapers, a school, and multiple churches. James P. Ward bought out Wicks in 1888 and grew the first alfalfa produced in the area, which he shipped to Los Angeles in 1890 (Gardiner 2002:14–15, 18–19).

Following the arrival of the railroad, the next major industrial-era development to shape the history of the western Antelope Valley was construction of the Los Angeles Aqueduct. Developed by LADWP and designed by engineer William Mulholland, the Los Angeles Aqueduct transported water more than 200 miles, from the Owens Valley south to Los Angeles. The City of Los Angeles began construction of the project in 1908 by creating more than 1,000 miles of new roads, pipelines, and electricity and telephone lines in preparation for construction of the aqueduct itself. Completed in 1913, the Los Angeles Aqueduct was the largest aqueduct in the world for a time. It consisted of nearly 250 miles of canals, tunnels, siphons, and other water conveyance features. Because steel pipe had to be shipped from the east, its use was limited to 12 miles of the route where canyon-spanning siphons were constructed. The City of Los Angeles purchased 4,000 acres of clay- and limestone-rich land near the Mojave Desert town of Monolith and established a facility that produced 1,000 barrels of Portland cement per day for the project. The aqueduct system also included Haiwee, Fairmont, Bouquet Canyon, and Dry Canyon reservoirs as well as two reservoirs in the San Fernando Valley where water from Owens Valley entered the local distribution system (Kahrl 1979:32; Schwarz 1991:18–20, 22–23).

Homesteaders frequently pursued mining and agriculture in the Antelope Valley region into the 1930s, although mining declined thereafter. In its place, the military rose in importance during World War II. The U.S. Army conducted flight training operations at War Eagle Field south of Rosamond, while the U.S. Navy built an airfield and training facility in the town of Mojave. The federal government also established Muroc Army Airfield east of Rosamond. Later renamed Edwards Air Force Base, it continues to operate as a hub for U.S. test flights and aircraft development to this day (ICF 2015:2.2).

Willow Springs

Ezra Hamilton purchased 160 acres encompassing Willow Springs in 1894. Initially he used the land to raise silkworms and used the spring on his property to provide water for his Lida Mine (discussed below) to the north of Willow Springs. Willow Springs had earlier served as a principle Antelope Valley station on the stage route between Fort Tejon and the Tehachapi Pass prior to the arrival of the railroad, and Native American travelers had made use of the spring prior to the arrival of Europeans (Hoover et al. 2002:131).

After the turn of the century, Hamilton invested approximately $40,000 to remake Willow Springs into a destination for people suffering from pulmonary disease. In 1904 he opened a sanitarium that eventually included 27 stone buildings. In association with the resort, Hamilton constructed a grocery store, garage, blacksmith shop, ice and cold storage plant, public hall and theater, swimming pool, and school. The Willow Springs resort outlived Hamilton, who died in 1914, but closed several years later. The Rosamond School District took over the school at Willow Springs and locals put other buildings to new uses (Varney 1990:74–76).

4.4.4 Mining and Oil Drilling

One of the most powerful economic magnets that drew settlers to the Antelope Valley was mining. Between 1880 and 1950, entrepreneurs explored and extracted minerals (e.g., copper, gold, silver) as well as oil, clay, mud, and borate. Numerous mining districts were established, including the Kramer, Kramer Hills, El Paso, Mojave, Oro Grande, Randsburg, and Rosamond districts. Because of the proximity to residences, homestead claims frequently came into conflict with mineral claims, which required intervention by USGS and additional field surveys. Extensive mud and clay mining took place at the dry Rosamond Lake and other dry lakebeds, mainly to produce bentonite clay for refining petroleum products. Borax mining also flourished north and east of Rogers Dry Lake (Edwards Air Force Base 2009:126; Tetra Tech and Jones & Stokes 2004:52–53).

The most notable mining activity in the vicinity of the study area focused on gold. Ezra Hamilton, who owned the Los Angeles–based East Side Pottery Company, originally came to the Antelope Valley to mine clay but, to his good fortune, discovered gold in clay deposits. At Tropico Hill, east of Willow Springs Butte, Hamilton established the Lida Mine in the mid-1890s. Hamilton later sold the mine, and the resulting Tropico Mining Company operated successfully for many years and expanded to include a mill. Two Canadian-born brothers, Clifford and Cecil Burton, worked at the mine and mill and eventually acquired the operation (Hoover et al. 2002:135–136; Settle 1967:69; Varney 1990:73–74).

After the purchase of the Tropico Mine, mining activities began to increase in the area. The Burtons improved the mill and soon thereafter began to process ore from other mines as well. During the 1930s, the price of gold increased dramatically. Approximately 400 mines sent ore to the Burtons' mill for processing. The brothers also extracted deeper Tropico Mine deposits to increase their profits. One such mine was the Cactus Queen, at Soledad Mountain, northeast of the study area. George Holmes had developed Soledad Mountain's Silver Queen (also known as the Gold Queen) mine during the boom of the 1930s. During that time, investors made approximately $6 million from the Silver Queen mine. Holmes eventually sold the mine to a South African interest for $3.5 million. Federal restrictions on mining activity during World War II and subsequent inflation ended the mining boom and forced the closure of the Burtons' Tropico operations, though intermittent mining activity has taken place there since, including at the Cactus Queen (Hoover et al. 2002:135–136; Settle 1967:69–71; Varney 1990:73–74).

The discovery of oil north of Muroc buoyed the hopes of petroleum speculators, who drilled wells in the vicinity of today's Edwards Air Force Base and other parts of the Antelope Valley. In 1922, the *International Petroleum Reporter* described drilling activities conducted north and northeast of Lancaster by the Great Angeles Oil Corporation, the Antelope Oil and Gas Company, and the LA-Kern Oil Syndicate. Test wells were drilled in the Willow Springs area during the early 1930s as well. Drilling efforts in the central and western Antelope Valley ultimately proved far less successful than those undertaken in western Kern County, the latter of which generated an oil bonanza (*Bakersfield Californian* 1932, 1933; Edwards Air Force Base 2009:126; GLO 1935; *International Petroleum Reporter* 1922:45).

4.4.5 Aqueduct Labor Camps in the Mojave

The City of Los Angeles' construction of the Los Angeles Aqueduct was both a major endeavor and a turning point for the Antelope Valley. The aqueduct was in large part built by human labor. Along its route, the City of Los Angeles built temporary camps to house workers, managing personnel and livestock during construction. All told, “57 camps were established along the line of work, most of them in the mountains” (City of Los Angeles 1916:18). Camp sizes and the duration of their occupation varied along the route, depending on the construction needs specific to the adjacent area.

The project site was within the Mojave Division of the aqueduct during most of the construction period. Here, the Los Angeles Aqueduct consisted mainly of approximately 70 miles of cut-and-cover tunnel construction. As the 1916 final construction report explained, “steam shovels excavated the necessary trench about 12 feet wide and 10 feet deep, in which the aqueduct was built, the cover being kept below the surface of the ground so as to offer no obstruction to the occasional ‘cloudbursts’ which at rare intervals run down the desert slopes” (City of Los Angeles 1916:75–76). Crews maintained concreting operations within a distance of 500 feet from the farthest points of excavation (City of Los Angeles 1916:174).

Construction of the aqueduct in the southwestern portion of the Mojave Division differed from that in other areas in a number of ways. A Southern Pacific branch line was constructed from Mojave to the north, leaving the valley segment south of Mojave without railroad service. As a consequence, construction materials and labor camp provisions had to be hauled into the South Antelope Valley section of the Mojave Division, first by traction engines, which proved too expensive to maintain, and later by mule teams (City of Los Angeles 1911:35–36, 1916:90). The Bureau of the Los Angeles Aqueduct’s 1911 annual report noted that water supply shortages in the Mojave Division occurred during the summer. To compensate for these shortages, “large, corrugated iron tanks” were built to store materials for concrete construction and well drilling along the aqueduct alignment west of Mojave (City of Los Angeles 1911:35–36).

Mojave Division work was characterized as “light work” compared with construction of massive siphons and tunnels through mountainous terrain. As a result, the aqueduct camps in the South Antelope Valley section had a more temporary character than the larger mountain camps. The desert camps in southwest Antelope Valley relocated along the aqueduct line as required by the progress of construction (City of Los Angeles 1916:256). Aqueduct planners provisioned these camps with tents as well as buildings that were designed for impermanence (e.g., offices, dwellings, bunk houses), the latter of which “could be taken down in sections, loaded on wagons, and expeditiously erected again at some other point” (City of Los Angeles 1916:89).

Social organization of the camps in the South Antelope Valley section most likely reflected occupational hierarchy. The Engineering Division stationed a clerk at each camp to manage pay checks, timecards, supplies, and camp finances; the larger camps beyond southwestern Antelope Valley were managed by a foreman or superintendent. Stewards employed by the Medical Department, which maintained a hospital in Mojave, regularly visited the smaller camps to inspect for sanitary conditions and administer medical care. Chief steam shovel operator John Anderson was responsible for hiring and managing the shovel crews. Wages for better-paid workers, most of whom were native-born whites, ranged from $3.50 day to $160 per month for concrete foremen, $70 to $175 per month for clerks, and $130 to $205 per month for shovel operators. At the lowest level, of both the pay scale and the social hierarchy, were laborers who earned $2.00 to 2.50 a day. Foreign-born workers dominated the laborer ranks (City of Los Angeles 1916:255–256; ICF 2015:2.4; Van Bueren 2002:30).

Working and living conditions proved difficult, particularly for laborers in an environment marked by bitter cold during winters, brutal heat in summers, and heavy winds in both seasons. As Medical

Department Chief Dr. Raymond Taylor explained, "the open ditch work on the job was very largely done by crews of Greeks, Bulgarians, Serbians, some Montenegrins, and some Mexicans. American men just wouldn't work out in the open in the temperatures that existed in the summertime. In the winter it was just as windy and bitter cold as it was hot in the summer" (Taylor 1982:117). Provisioning the camps with adequate food proved challenging. Workers were charged 25 cents for each meal. After the commissary service was subcontracted to D.J. Desmond in 1908, food quality suffered because of Desmond's poor planning. Largely a consequence of chronic ice shortages and insufficiently refrigerated food, the poor quality of meals eventually led to a formal investigation and public controversy. It also contributed to labor strife, which culminated in a strike led by the Western Federation of Miners; by February 1911, approximately 75 percent of the aqueduct workers had participated in the strike (City of Los Angeles 1916:255–256; Hoffman 1980:334; Van Bueren 2002:34, 40).

Given the difficult conditions, managers had to deal with high rates of workforce turnover, particularly among the ranks at the bottom of the social hierarchy. Near-constant labor shortages allowed many aqueduct workmen to leave for the summer months and work elsewhere. After completing less grueling seasonal labor in more climatically appealing regions, they returned to the aqueduct project months later and were promptly rehired. Joining the immigrant workforce were native-born, hard-drinking transient men who often did not stay on the job for very long (Van Bueren 2002:34). Taylor recalled that many laborers arrived on the job "half starved to death or just recovering from a good big drunk," and consumed "tremendous" amounts of food during their first meals. Taylor also noted that laborers would often work "until they got what they called a stake and then go to town and blow it on a big drunk if somebody didn't get it away from them the first night" (ICF 2015:2.4–2.5).

Construction of the cut-and-cover tunnel through the southwestern Antelope Valley was completed by 1912. Steam shovels and other heavy pieces of equipment were transported to other segments of the aqueduct that were still under construction (City of Los Angeles 1916:21). The rest of the Los Angeles Aqueduct was completed in 1913 and today remains an important part of Southern California water infrastructure (City of Los Angeles 1916:26).

4.4.6 Homesteading and Agriculture

Beyond the Antelope Valley railroad stops that developed into towns and eventually into cities, most settlement in the region involved homesteading lands for ranching and agriculture. Ethno-religious groups, prohibitionists, and utopian socialists also established agricultural colonies in the region during the late nineteenth and early twentieth centuries. Some newcomers homesteaded lands with the primary goal of becoming successful ranchers or farmers, while other homesteaders undertook requisite improvement of lands strategically in an effort to supplement their mining endeavors (Edwards Air Force Base 2009:123; Tetra Tech and Jones & Stokes 2004:53).

Homesteading claims in the western Antelope Valley region began primarily after 1900 as a consequence of several factors. Having received transfers of significant land grants in 1903 from the federal government, the Southern Pacific Railroad launched heavy land-sale promotions during the 1910s, which attracted settlers from the east and from Europe. Rising land prices in Los Angeles and other urbanizing areas of Southern California enhanced the appeal of homesteading in the Antelope Valley for some southland residents. These factors, along with amendments to the Desert Land Act—which made provisions for absentee ownership, reduced irrigation and cultivation requirements, and shrank requisite periods of residency—generated a boom in homesteading activity that lasted from the 1910s through the mid-1930s (Edwards Air Force Base 2009:123; Tetra Tech and Jones & Stokes 2004:53–54). However, not all homesteads were successful. Numerous claims filed after 1910 were never patented because of homesteaders' failure to improve lands adequately. Although Southern Pacific Railroad and other Antelope Valley land promoters presented the region as exceptionally fertile, settlers often confronted difficult climatic conditions, including frequent high winds during multiple seasons, flooding, intermittent drought, and, at times, excruciating heat (Edwards Air Force Base 2009:123; Tetra Tech and Jones & Stokes 2004:53–54).

Homesteading in the Antelope Valley largely came to an end in the 1930s. Prevailing drought conditions worsened locally and across the nation during that decade. In addition, the Great Depression made it increasingly difficult for prospective settlers to accumulate capital for necessary improvements. As a result, during that time, many Antelope Valley settlers abandoned their homesteads, and the longstanding emphasis on promoting private use and development gave way to a new emphasis on conservation and preservation by the National Park Service, U.S. Forest Service, and Bureau of Land Management. In 1935, the federal government stopped accepting new "homestead" or "desert lands" entries, although small 5-acre homestead tracts could be purchased until 1950, and homesteaders with valid claims prior to 1935 could continue to improve their land (Tetra Tech and Jones & Stokes 2004:54).

Across the vicinity of the project, agricultural activity increased after World War II. From 1953 to 1956, land cultivated with crops in the Kern County portion of the Antelope Valley increased from 26,000 to more than 41,000 acres (with 23,732 acres irrigated), mostly in areas west of Rosamond and around Cantil. Alfalfa fields made up the majority of cultivated land across the larger Antelope Valley, followed by dry-land grains. During the 1950s, Antelope Valley farmers devoted limited acreage to irrigated forage crops, vegetables, almonds, apples, peaches, and other fruits. Field crops such as alfalfa and grain, as well as irrigated pastureland, dominated agricultural activity in the Kern County portion of the Antelope Valley, accounting for 34,978 acres in 1957. Alfalfa fields for hay and seed made up 90 percent of that acreage. In terms of livestock, sheep grazing was the most prominent activity in the Kern County portion of the valley during the 1950s. At this time, agriculture accounted for 97 percent of Antelope Valley water use. Although groundwater depletion had led some farmers to abandon acreage by the late 1950s, pumping for irrigation remained economically feasible in most of the valley's farming areas (DWR 1959:36–49).

The mainstay of agriculture in the project vicinity, Antelope Valley alfalfa production went into decline after the 1950s. Rising electricity costs for pumping depleted groundwater supplies and made alfalfa farming more difficult over time. Valley land planted in alfalfa declined from 38,525 acres in 1950 to 8,810 acres in 1987. Between 1953 and 1988, total groundwater pumped annually in the valley declined from 480,000 acre-feet to 69,000 acre-feet. Although land in the project vicinity continued to be cultivated during the 1970s, crop farming in the Rosamond and Willow Springs areas declined dramatically thereafter (DWR 1959:49; Templin et al. 1995:1–2, 7, 16, 64).

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Chapter 5
Methods

5.1 Introduction

The effort to identify cultural resources in the project area included cultural resources record searches of previous cultural resource investigations and recorded sites; background research; a review of literature relevant to the prehistory, ethnography, and history of the project area vicinity; and a pedestrian survey of the project area.

5.2 Records Search and Other Research

Cultural resources and heritage resources record searches for the project area were conducted by staff members at the Southern San Joaquin Valley Information Center on March 1, 2021. The record search included a review of all recorded historic and prehistoric archaeological sites as well as recorded built-environment resources within 0.5 mile (0.8 kilometer) of the originally proposed project site, of which the current project site is a subset (Appendix B). In addition, the NRHP (National Park Service 2010) and documents and inventories from the State Historic Preservation Office (SHPO), including the CHLs (SHPO 2010a), California Points of Historical Interest (SHPO 2010b), Listing of National Register Properties (SHPO 2010c), and Inventory of Historic Structures (SHPO 2010d), were consulted. Historic maps, including USGS quadrangle maps and aerial photographs from Nationwide Environmental Title Research Online at www.historicaerials.com, were also examined (Nationwide Environmental Title Research 2019). Appendix B includes the Confidential Records Search and Department of Parks and Recreation (DPR) forms that covered the larger, original study area. This technical report has been updated to reflect the smaller study area based on the May 2022 refined site boundary.

In addition to reviewing site records yielded by the record searches, architectural historians conducted research using historic topographic maps, historic aerial photographs, and Kern County Assessor data accessed through the subscription service, ParcelQuest (ParcelQuest 2019). This research provided for architectural historians to identify properties with buildings and structures 45 years old or older prior to conducting the built-environment reconnaissance survey of the study area, and, in some cases, to confirm that buildings and structures observed in the study area during the survey are 45 years old or older, or less than 45 years old.

5.3 Native American Coordination

On February 17, 2021, ICF requested a Sacred Lands File search from the NAHC to determine if there are Native American cultural resources in the immediate vicinity of the main project area as it was then defined. ICF received a response from the NAHC on March 12, 2021, stating that the Sacred Lands File search found no Native American cultural resources in the immediate vicinity. The NAHC also provided a list of 20 Native American groups and individuals who may have knowledge of cultural resources in the study area. On April 27, 2021, ICF mailed letters to each of the contacts, identifying the project location and requesting input. As of July 25, 2021, three responses have been received. Shana Powers, Cultural Director of the Santa Rosa Rancheria Tachi Yokut, responded by email that the project is outside the tribe's area of concern and recommended contacting the Tejon Indian Tribe or another local tribe. Jill McCormick, Historic Preservation Officer for the Quechan Indian Tribe, responded via email on May 4, 2021, that the tribe has no comments and defers to more local tribes. A follow-up email with project information was sent to the Tejon Indian Tribe on July 7, 2021.

Ryan Nordness, Cultural Resources Analyst for the San Manuel Band of Mission Indians, stated that the project area exists within Serrano ancestral territory and is therefore of interest to the tribe. However, due to the nature and location of the project and given the Cultural Resources Management department's present state of knowledge, San Manuel Band of Mission Indians does not have any concerns with the project's implementation, as planned, at this time. The tribe also provided cultural resources and tribal cultural resources mitigation measures that they requested be included as part of the project and its permits or plans. Documentation of coordination with Native American groups and individuals is provided in Appendix C.

5.4 Pedestrian Survey

The survey effort included an intensive archaeological pedestrian survey of the archaeological study area, which was conducted by qualified ICF archaeologists between June 1 and June 4, June 7 and June 11, and July 6 and July 8, 2021. Patrick McGinnis, MA, RPA, who meets the Secretary of the Interior's Professional Qualifications Standards for Archaeology (36 Code of Federal Regulations Part 61), led the survey. As described in Section 1.1.1, a total of 1,608.0 acres were surveyed for the project. In surveyed areas, archaeologists checked all visible ground surfaces, bedrock outcrops, and rodent burrows as well as natural or human-made exposures within the project area. Transects were completed in 15-meter intervals. Isolates were recorded as one to five artifacts within 30 meters of each other, while sites were recorded as more than five artifacts within 30 meters of each other. The vegetation was characterized by species, all of which were associated with the Mojave Desert, such as Joshua tree, creosote bush, and white bursage (Webb et al. 2009). These species did not hinder visibility, with most of the project area having between 80 and 100 percent visibility (see Plate 5-1 and Plate 5-2, below).

An Apple iPad equipped with an integrated global positioning system, a submeter antenna, and the ArcGIS Collector application were used to track the survey transects and coverage and record any cultural resources that were identified within the project area. A Trimble GeoX unit was used for additional submeter accuracy when recording cultural resources. Notes regarding resource details were collected to meet or exceed site recordation guidelines, based on the California Office of Historic Preservation's *California Archaeological Inventory Handbook for Completing an Archaeological Site Record*. Photographs were taken using the iPad and/or digital cameras. All project photographs are housed on ICF secure servers.

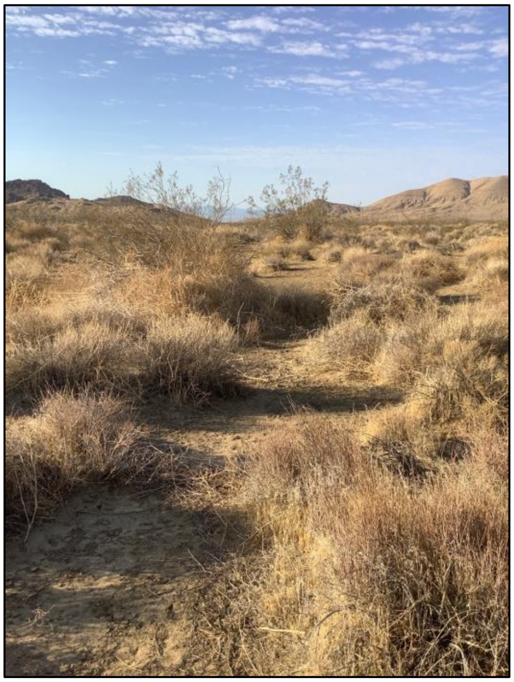

Plate 5-1. Overview of Archaeological Study Area with Typical Vegetation in Undisturbed Area, View North

Plate 5-2. Overview of Archaeological Study Area in Agricultural Land, View North

5.5 Built-Environment Reconnaissance Survey

Katrina Castaneda and Stephanie Hodal, both of whom meet the Secretary of the Interior's Professional Qualifications Standards for Architectural Historian (36 Code of Federal Regulations Part 61), undertook a reconnaissance survey of the built-environment study area on June 8, 2021. The purpose of the survey was to identify properties containing intact built resources 45 years old or older. The architectural historians recorded such buildings and structures from the public right-of-way using digital photography. Linear resources were noted and recorded with limited photographs but not surveyed in their entirety within the study area. A number of the residential properties known through desktop research to contain built resources 45 years old or older could not be recorded effectively due to the resources' limited visibility from the public right-of-way or due to intervening vegetation that completely blocked them from view. To the extent feasible, architectural historians will access these properties and record the built-environment resources during the Phase II built-environment resource survey for the project. Linear resources within the built-environment study area will also be recorded in greater detail at that time.

Chapter 6
Results

6.1 Introduction

ICF revisited and, when possible, identified and confirmed the location and condition of previously recorded cultural resources within the archaeological and built-environment study areas. Within the archaeological study area, of the 16 previously recorded archaeological resources (including Willow Springs), 9 were reidentified, one was located in the gen-tie corridor for Whirlwind Gen-tie Option 1 (P-15-020456), one was observed immediately adjacent to the archaeological study area (P-15-019593), and six were not reidentified (P-15-012235, -012259, -015234, -018720, -019570, -019573). Additionally, 27 new archaeological sites and 51 new isolates were identified. Within the built-environment study area, of the four previously recorded built-environment resources (not including Willow Springs), all were reidentified. Additionally, 21 new built-environment resources were identified. Resources were not evaluated for eligibility for listing in the CRHR during this survey effort. Confidential Appendix A, Figure 1 depicts the location of each resource in relation to the archaeological and built-environment study areas.[1] DPR 523 forms with site records can be found in confidential Appendix B. Upon review and concurrence with this report, ICF personnel will submit site records with temporary designations to the Southern San Joaquin Valley Information Center for issuance of permanent primary numbers/trinomials.

6.2 Records Search Results

A total of 84 cultural studies have been conducted within the records search area, as defined in Section 1.1, *Purpose of the Study*. A total of 44 cultural studies overlap the archaeological study area, with an additional 18 studies overlapping the larger built-environment study area (62 total studies total). Table 1 in confidential Appendix B contains a list of the cultural studies that have been previously conducted within the records search area.

Results of the records search indicate that 250 previously recorded resources are located within the records search area. As this report addresses two separate archaeological and built-environment study areas, resources specific to each of the study areas are divided into two sections below: previously recorded archaeological resources within the archaeological study area, and previously recorded built resources within the built-environment study area.

[1] The maps in the appendices cover the larger archaeological and built-environment study areas effective prior to May 2022. However, this report only addresses the resources associated with the updated project boundary.

6.3 Previously Recorded Cultural Resources

6.3.1 Previously Recorded Archaeological Sites in the Archaeological Study Area

A total of nine previously recorded archaeological sites have been identified within or immediately adjacent to the archaeological study area. Most of the previously recorded archaeological sites are prehistoric lithic reduction sites or historic-era refuse scatters. Table 6-1 identifies these resources. Previously recorded isolates are discussed separately in Section 6.3.2, *Previously Recorded Isolates in the Archaeological Study Area*, below.

Table 6-1. Previously Recorded Archaeological Sites in the Archaeological Study Area

Site Number	Time Period	Description	2021 Survey Results	Evaluation
P-15-000129/ CA-KER-129/H*	Multicomponent	Willow Springs/ CHL No. 130	No archaeological components observed in the current survey.	No archaeological subsurface evaluation or built-environment analysis has been completed.
P-15-002539/CA-KER-2539	Prehistoric	Large lithic scatter	Updated site boundary and extended south due to newly identified extensive lithic scatter.	No subsurface evaluation has been completed.
P-15-002821/ CA-KER-2821/H	Prehistoric	Bean Spring Archaeological Complex	Three loci relocated in the survey area.	Previously evaluated and found eligible for listing on the CRHR. No subsurface evaluation has been completed.
P-15-012793/CA-KER-7214H	Historic-era	Aqueduct camp and refuse scatter	Relocated as previously recorded, but southern third has been destroyed by construction of a substation.	No subsurface evaluation has been completed.
P-15-018292/CA-KER-9985	Historic-era	Historic-era refuse scatter	Relocated and extended site boundary south.	No subsurface evaluation has been completed.
P-15-018676/CA-KER-10199/H	Multicomponent	Historic-era refuse scatter with prehistoric lithic scatter that has been collected	Relocated as previously recorded.	No subsurface evaluation has been completed.
P-15-019544	Prehistoric	Small flake scatter	Relocated and extended site boundary west.	No subsurface evaluation has been completed.
P-15-019545/CA-KER-10709	Historic-era	Historic-era refuse scatter	Relocated as previously recorded.	No subsurface evaluation has been completed.
P-15-019546/CA-KER-10710	Prehistoric	Lithic scatter extended	Relocated one cryptocrystalline silicate flake and recorded a new rhyolite flake.	No subsurface evaluation has been completed.

* P-15-000129/CA-KER-129/H is both an archaeological site and a built-environment resource.

P-15-000129/CA-KER-129/H, Willow Springs (CHL No. 130)

Willow Springs consists of the remains of a large prehistoric habitation and the remains of the historic townsite of Willow Springs. The two occupation areas overlap and are centered around Willow Springs, a formerly perennial spring. The Rosamond fault scape trends southwest through the project area and is a natural aquitard for groundwater moving south from the Tehachapi Mountains (Whitley et al. 2020). The scarp created a series of springs and seeps along its length, including Willow Springs and Bean Spring. Willow Springs included seven flowing water sources as late as 1911 (Whitley et al. 2020). Willow Springs was one of a number of springs in the western Mojave Desert that provided a reliable source of water and other natural resources for the Native American inhabitants of the area. Willow Springs has been identified as a possible village complex from the Rose Spring period dating from 1500–800 B.P. (Haenzel 1965). The site was noted during the historic period by Spanish missionary Father Francisco Garcés in 1776 on his journey across the Mojave Desert and was reportedly a campsite for John C. Fremont and Kit Carson in 1844. A large population of Kitanemuk or possibly Desert Serrano was reported to have been removed from Willow Springs (and possibly Bean Spring) to Mission San Fernando in 1811 and today both groups recognize the importance of the springs to their ancestors (Sutton 1980). The Kitanemuk referred to Willow Springs as *Panukavea* (Whitley et al. 2020).

The first permanent historic settlement came as a stage stop for freight wagons on the Los Angeles-Havilah and Inyo stage lines from 1864–1872 but was later bypassed by the railroad in 1876 (Perkins 1959). Ezra Hamilton purchased 160 acres encompassing Willow Springs in 1894. Initially he used the land to raise silkworms and used the spring on his property to provide water for his Lida Mine (Hoover et al. 2002:131). After the turn of the century, Hamilton invested approximately $40,000 to remake Willow Springs into a destination for people suffering from pulmonary disease. In 1904 he opened a sanitarium that eventually included 27 stone buildings. In association with the resort, Hamilton constructed a grocery store, garage, blacksmith shop, ice and cold storage plant, public hall and theater, swimming pool, and school.

It remains unclear whether buildings and structures on private properties near the Willow Springs CHL plaque have any direct association with the historic context of the Willow Springs CHL. The site was originally recorded by Price in 1954 and covers approximately 30 acres, which would encompass the remains of historic-era structures and the surrounding area. The site was recorded as consisting of multiple temporary camps, milling features, rock cairns, and midden near springs (Mason et al. 2019). The site was last updated in 1992 and only a single prehistoric artifact was identified at that time, although it should be noted that the site form mentions that the entire site was not surveyed and the survey was of limited duration. The authors also hypothesized that although much of the prehistoric site may have been destroyed by later development there are probably intact deposits present in the area (Greene and Knight 1992). The survey for the project covered a small portion of the recorded site boundary (1.6 acres) of which a little over half is under the paved surface of Tehachapi Willow Springs Road (90th Street West) (Plate 6-1). No archaeological artifacts or features were identified within CA-KER-129/H within the project area.

Plate 6-1. P-15-000129 Overview, View West

Previous Evaluation

Willow Springs is listed as CHL No. 130 (circa 1934). It is important as the site of prehistoric habitation and for its historical association with the development of the western Mojave Desert. The site has been identified by local tribes as an important resource and potential tribal cultural resource. As such, the site may be eligible for the CRHR/NRHP under Criteria 1/A and 4/D for its association with important events in the history and prehistory of Southern California and for its potential to yield additional important information regarding the history and prehistory of the region. However, Willow Springs has not been formally evaluated for listing in the CRHR. CHL Nos. 770 and above are automatically listed on the CRHR. If not previously evaluated for and listed in the CRHR, CHL Nos. 1 to 769 need to be formally evaluated for CRHR eligibility to determine if they qualify as historical resources under CEQA (SHPO 2020).

P-15-002539/CA-KER-2539

Site P-15-002539 was recorded by Adella Schroth and M. Q. Sutton in 1989 as a prehistoric artifact scatter measuring approximately 100 by 100 meters. The site is bisected by a dirt road and the northern half of the site has been highly disturbed by human-made ponds. Artifacts included two stone bowl fragments, a core, and flakes.

ICF revisited the site in 2021 for the current survey and relocated the southern portion of the site and extended the site boundary 155 meters south and east. The portion of the site north of the dirt road was not part of the survey area. The bowl fragment in the southern portion of the site was not relocated, but over 300 lithic flakes were newly recorded in the extended site boundary. Approximately 80 percent of the flakes are rhyolite and 20 percent were cryptocrystalline silicate (CCS).

A number of diagnostic artifacts were observed including an obsidian projectile point, a rhyolite secondary flake with a worked edge, a chert utilized flake, a quartzite core, a rhyolite metate fragment, a rhyolite biface fragment, a rhyolite mano fragment, a chert biface fragment, a rhyolite core/hammerstone, a rhyolite flake with a utilized edge, and three rhyolite cores.

P-15-002821/CA-KER-2821/H, Bean Spring Archaeological Complex

P-15-002821 is the Bean Spring Archaeological Complex. Bean Spring is approximately 0.75 mile to the west of Willow Springs. The spring is formed by the same processes that created Willow Springs. The site is a large prehistoric occupation site with a historic-age ranch complex and subsumes the area of a number of previously recorded archaeological sites. The site covers an area of 371 acres and appears to have undefined limits on its east and west sides. The Bean Spring complex subsumes the previously recorded sites CA-KER-2819, CA-KER-2820, CA-KER-4047, CA-KER-4048, CA-KER-4049, and CA-KER-4050 into one large complex with an additional 14 individual loci (A through N). The complex is now identified as CA-KER-2821/H. It is possible that if the area between Bean Spring and Willow Springs were intensively surveyed the sites would overlap. The natural setting of the site is Creosote Bush Scrub and Joshua Tree Woodland habitat within a series of terraced, stable ridgelines and shallow washes along which artifacts have been distributed (Way et al. 2009). The site has at least 22 discrete loci and has been tested and found to have deposits to at least 60 centimeters deep (Mason et al. 2019). Site components include midden, shells, beads, ground stone, lithic tools, hearth features, and debitage. Radiocarbon dates suggest occupation from as early as 8000–9000 B.P. Lithic materials from wide-ranging sources may be indicative of an extensive trade network. Historic-era components include pre-1950s can scatters, household debris, concrete pads, and barbed wire fences. Only a very small portion of the site (5.5 acres) intersects with the project area. Three loci were previously recorded within the survey area (Locus F, Locus G, and Locus U).

Locus F consists of a large midden deposit and lithic scatter with three lithic cores, one rhyolite flake tool, and a rhyolite biface. This locus has been heavily disturbed by modern refuse disposal, off-roading, and vehicular activities on established dirt roads. The entirety of Locus F is within the survey area and was found as previously recorded. No new artifacts were observed.

Locus G consists of a low-density lithic scatter containing approximately six rhyolite flakes. It is in a minor drainage. The entirety of Locus G is within the survey area and was found as previously recorded. No new artifacts were observed.

Locus U was previously recorded as a moderately dense lithic scatter with hearth features and groundstone on a small ridge. There are approximately 200 flakes (90 percent rhyolite, 10 percent CCS) that are primarily secondary flakes, three fire-affected rock concentrations, two biface fragments (CCS and rhyolite), two mano fragments, and a Sierra Pelona schist metate fragment. Only Feature 3, one of the dispersed hearth features with five rhyolite flakes, was within the survey area and was found as previously recorded.

Previous Evaluation

P-15-002821 was evaluated by Pacific Legacy in 2009 (Way et al. 2009), which recommended the site as a historical resource eligible for listing on the CRHR under Criterion 4 for its archaeological data potential. The site was evaluated through excavation of a number of shovel test pits (STPs), shovel scraps, and excavated test units at multiple loci. The site has the potential to address several significant research domains important for understanding Native American cultures in California including cultural chronology, flaked stone technology, groundstone technology, and settlement and subsistence. Intact features and subsurface deposits identified during testing and data recovery work suggest that the site retains integrity. The site was also recommended to qualify as a unique archaeological resource as defined in PRC Section 21083.2.

P-15-012793/CA-KER-7214H

Site P-15-012793 was recorded by Pacific Legacy, Inc. in 2010 as a large historic-era refuse scatter measuring 1,143 by 726 feet. The site was described as consisting of approximately 150 cans, several concentrations of colorless glass, three wood posts, a square cistern-like feature, and a shallow pit with a berm. This site is in an open alluvial plain with sparse, seasonal grasses and creosote scrub.

The current pedestrian survey relocated the site, but the southern third of the site has been destroyed by the installation of a new electrical substation. All of the site north of the substation is as previously recorded, including a dispersed can scatter, colorless glass, and a shallow pit. The site conditions are the same as they were in 2010, with the exception of the installation of the substation in the southern third of the site. The topography surrounding the site is characterized by flat desert terrain and low, sparse seasonal grasses, with ground visibility between 90 and 100 percent across the site. The vegetation community is characterized by species associated with the Mojave Desert. This site has not been previously tested for subsurface components.

P-15-018292/CA-KER-9985

Site P-15-018292 was recorded by SWCA Environmental Consultants in 2015 as a historic-era refuse scatter that measures 535.4 by 147.9 feet. The site is in a broad alluvial valley and consists of a dispersed refuse scatter including metal cans; milk glass, amethyst, aqua, colorless, and sun-colored amethyst glass fragments; and four stamped brick fragments.

The pedestrian survey relocated the site as previously recorded and extended the site south by 55 feet to include aqua insulator fragments, sun-colored amethyst glass fragments, and an additional two stamped brick fragments (Plate 6-2).

The site conditions are similar to those in 2015 with low, sparse seasonal grasses. The only exceptions are that a gen-tie line has been constructed to the north of the site and 170th Street West has been constructed to the east of the site. The topography surrounding the site is characterized by flat desert terrain that has been disturbed by recent gen-tie and road construction, along with alluvial wash. Ground visibility was between 90 and 100 percent across the site. This site has not been previously tested for subsurface components.

Plate 6-2. P-15-018292 Stamped Bricks, Plan View

P-15-018676/CA-KER-10199/H

Site P-15-018676 was recorded by POWER Engineers, Inc. in 2014 as a multicomponent site including a large, multi-episodic historic-era refuse scatter and a dispersed prehistoric lithic scatter. The site condition was noted as poor, as it has been affected by sheet wash erosion and access to and construction of transmission lines within the site boundary. The historic-era components consist of hundreds of cans, including hole-in-top, steel beer, sanitary, meat, oil, coffee, juice, and bi-metal pull-tab cans. Also observed were numerous bottle bases, ceramics, and miscellaneous items including bailing wire, milled lumber, a bucket, and more. Artifacts date between the 1920s and 1960s; however, the majority date between 1945 and the 1960s. The prehistoric component consists of eight chert and rhyolite secondary flakes. The site was updated in 2017 by ASM Affiliates, Inc. which found the site as previously recorded. All prehistoric components were collected at that time.

ICF revisited the site in 2021 for the project and found the site as previously recorded. Some cans appear to have scattered just outside of the site boundary, but all other components are as previously recorded. No prehistoric artifacts were observed in the survey area.

The topography surrounding the site is characterized by flat desert terrain that has been disturbed by transmission line construction and access with ground visibility between 90 and 100 percent across the site. The vegetation community is characterized by low, seasonal grasses. This site has not been previously tested for subsurface components.

P-15-019544

Site P-15-019544 was recorded by ASM Affiliates, Inc. in 2017 as a low-density, prehistoric lithic scatter. The site was described as being in poor condition and consisting of five flakes (four rhyolite and one obsidian) in within an 18- by 9-meter area. It is in a previously plowed agricultural field that is occasionally used for sheep grazing.

The pedestrian survey relocated all rhyolite flakes and extended the site but did not observe the obsidian flake inside the previous site boundary. An obsidian flake, a rhyolite biface, an edge-modified unifacial tool, and 17 additional flakes were observed to the west of the previously recorded site and the site boundary was expanded. The site boundary now measures 157 by 52 meters. All flakes are tertiary and approximately half of the flakes are CCS or chert, and the other half are rhyolite.

The site conditions are the same as they were in 2017, with low, sparse seasonal grasses. The topography surrounding the site is characterized by flat desert terrain that has been severely disturbed by agricultural plowing and grazing, with ground visibility between 90 and 100 percent across the site. This site has not been previously tested for subsurface components.

P-15-019545/CA-KER-10709

Site P-15-019545 was recorded by ASM Affiliates, Inc. in 2017 as a sparse, historic-era refuse scatter measuring 364 by 107.5 feet. The site was described as consisting of cans, bed springs, kitchen utensils, and assorted bottle bases. The site components date between the early 1900s and mid-1970s. This site is along a fence line in a plowed field on open alluvial plain with sparse, seasonal grasses and creosote scrub.

The pedestrian survey relocated the site as previously recorded. A dirt access road and fence line delineate the eastern boundary of the site and another dirt road delineates the northern boundary of the site. The surrounding area has little to no vegetation due to previous agricultural plowing from use of the parcel as sheep grazing land. The site appears to have been previously disturbed by these activities. This site has not been previously tested for subsurface components.

P-15-019546/CA-KER-10710

Site P-15-019546 was recorded by ASM Affiliates, Inc. in 2017 as a low-density, prehistoric lithic scatter. The site was described as being in poor condition and consisting of four CCS interior flakes within a 23- by 6-meter area. It is in a previously plowed agricultural field that is occasionally used for sheep grazing.

The current pedestrian survey relocated one CCS flake and also recorded a new tertiary rhyolite flake in the previously recorded site boundary. The site conditions are the same as they were in 2017, with low, sparse seasonal grasses. The topography surrounding the site is characterized by flat desert terrain that has been severely disturbed by agricultural plowing and grazing, with ground visibility between 90 and 100 percent across the site. This site has not been previously tested for subsurface components.

6.3.2 Previously Recorded Isolates in the Archaeological Study Area

Seven isolates were previously recorded in the archaeological study area. All of the previously recorded isolates were recorded or updated between 2017 and 2021. Updated DPR forms were created for isolates that were not relocated. Updated DPR forms were not created for the other previously recorded isolates due to their recent recordation or updates within the past 4 years and because no changes were noted during the current survey effort. Table 6-2 lists the previously recorded isolates and the 2021 pedestrian survey results.

Table 6-2. Isolates in the Archaeological Study Area

Isolate Number	Time Period	Description	2021 Survey Results
P-15-012235	Historic-era	One isolated can	Not reidentified
P-15-012259	Prehistoric	Rhyolite interior flake	Not reidentified
P-15-015234	Prehistoric	Three rhyolite flakes in road shoulder	Not reidentified
P-15-019570	Prehistoric	Multidirectional rhyolite core	Not reidentified
P-15-019573	Prehistoric	Rhyolite flake	Not reidentified
P-15-019593	Prehistoric	Rhyolite flake	Reidentified outside of project area
P-15-020456	Historic-era	Two church key opened beverage cans	In BigBeau project area

P-15-012235

P-15-019573 consists of a single metal can that was first recorded by Sapphos Environmental, Inc. in 2005. The isolate was in an area just east of 170th Street West. ICF attempted but failed to find the isolate during the 2021 survey effort. The artifact is in an area subject to multiple disturbances including its location in an alluvial fan, where it may be subject to water erosion and movement.

P-15-012259

P-15-019573 consists of a single prehistoric rhyolite interior flake that was first recorded by Sapphos Environmental, Inc, in 2005. The isolate was in an area just east of 170th Street West. ICF attempted but failed to find the isolate during the 2021 survey effort. The artifact is in an area subject to multiple disturbances including agricultural use and its location in an alluvial fan, where it may be subject to water erosion and movement.

P-15-015234

P-15-015234 consists of three prehistoric rhyolite flakes in the graded shoulder of Tehachapi Willow Springs Road. These isolates were first recorded by Compass Rose Archaeological, Inc. in 2008. ICF attempted but failed to find the isolate during the 2021 survey effort. The artifact is in an area subject to multiple disturbances including grading and improvements associated with Tehachapi Willow Springs Road and vehicular activities.

P-15-019570

P-15-019573 consists of a single prehistoric rhyolite interior flake that was first recorded by Sapphos Environmental, Inc. in 2005. The isolate was in an area just east of 170th Street West. ICF attempted but failed to find the isolate during the 2021 survey effort. The artifact is in an area subject to multiple disturbances including agricultural use and its location in an alluvial fan, where it may be subject to water erosion and movement.

P-15-019573

P-15-019573 consists of a single prehistoric rhyolite flake that was first recorded by ASM Affiliates, Inc. in 2017. The flake measures 10 centimeters long by 5 centimeters wide by 1 centimeter thick.

The isolate was in a previously plowed field that is also used for sheep grazing. ICF attempted but failed to find the isolate during the 2021 survey effort. The artifact is in an area subject to multiple disturbances including agricultural use and its location in an alluvial fan, where it may be subject to water erosion and movement.

P-15-019593

P-15-019593 consists of a single prehistoric rhyolite flake that was first recorded by ASM Affiliates, Inc. in 2017. The flake measures 2.2 centimeters long by 1.9 centimeters wide by 0.1 centimeter thick. ICF reidentified the flake in 2021 as previously recorded, just west of an access road. The area has been affected by runoff from the Tehachapi Mountains, off-road vehicular traffic, and historic and modern refuse. No other prehistoric artifacts were identified near the flake.

P-15-020456

P-15-020456 consists of two church key opened beverage cans that were first recorded by Environmental Intelligence, LLC in 2017. The isolate was in an access road for a gen-tie line. ICF did not attempt to relocate these cans, as they were in the previously surveyed gen-tie line corridor for BigBeau.

6.3.3 Previously Recorded Built Resources in the Built-Environment Study Area

Through the records search and other desktop research, architectural historians confirmed that five previously recorded resources are present within the built-environment study area that constitute intact built resources or may include intact built resource elements under additional investigation. Table 6-3 lists those resources. Four are physically discernable, intact resources that architectural historians observed in the field. The other, Willow Springs, is a CHL. It remains unclear whether the Willow Springs CHL consists of a place with associated built resources, or if private properties in the vicinity of the CHL plaque identifying the landmark contain buildings or structures associated with the designated CHL. A description of Willow Springs is provided above in Section 6.3.1, *Previously Recorded Archaeological Sites in the Archaeological Study Area*.

Table 6-3. Previously Recorded Potential and Known Built Resources in the Built-Environment Study Area

Site Number	Resource Name	Year Built	Property Type	Previous Evaluation
P-15-018681	LADWP Owens Gorge 230 kV Transmission Line	1950–1952	Long-distance electricity transmission line	Previously evaluated as not eligible for the NRHP or CRHR
P-15-017243/ P-54-005027/ P-19-196876/ P-10-006255	SCE Vincent (Big Creek No. 3) 220-kV Transmission Line(Antelope-Magunden No. 2 220-kV Transmission Line today)	1925–1927	Long-distance electricity transmission line	Contributor to the NRHP-listed Big Creek Hydroelectric System Historic District, and therefore automatically listed in the CRHR
P-15-017582/ P-	SCE Big Creek No. 4 220-kV Transmission Line	1949–1951	Long-distance electricity	Previously evaluated as not eligible for the NRHP or CRHR

Site Number	Resource Name	Year Built	Property Type	Previous Evaluation
19-196876/ P-20-003145	(Antelope-Mesa 500-kV Transmission Line today)		transmission line	
P-15-003549H	First Los Angeles Aqueduct	1907–1913	Long-distance water conveyance system	Determined eligible for the NRHP with SHPO concurrence; listed in the CRHR
P-15-000129	Willow Springs, CHL No. 130	Not known	Historic place	Not evaluated for the NRHP or CRHR

6.4 Newly Identified Cultural Resources

6.4.1 New Archaeological Sites

The 2021 pedestrian survey identified 27 new sites in the archaeological study area. Table 6-4 lists and describes the new sites.

Table 6-4. New Archaeological Sites in the Archaeological Study Area

Site Number	Era	Description
BH-S-001	Historic-era	Historic-era refuse scatter
BH-S-002	Prehistoric	Large lithic scatter
BH-S-003	Prehistoric	Small lithic scatter with nine rhyolite tertiary flakes and one CCS flake
BH-S-004	Historic-era	Historic-era refuse scatter
BH-S-005	Prehistoric	Lithic scatter with a biface and mano fragment
BH-S-006	Prehistoric	Sparse lithic scatter with one core fragment and a projectile point
BH-S-008	Prehistoric	Small lithic scatter with three rhyolite flakes and one CCS primary flake with a modified edge
BH-S-009	Historic-era	Historic-era refuse scatter; cans in drainage
BH-S-011	Prehistoric	Small lithic scatter with seven rhyolite flakes
BH-S-012	Prehistoric	Large lithic processing area
BH-S-013	Prehistoric	Small lithic scatter including six rhyolite flakes
BH-S-102	Prehistoric	Lithic scatter with one projectile point and two bifaces
BH-S-107	Historic-era	Historic-era refuse scatter
BH-S-108	Prehistoric	Small lithic scatter with five rhyolite tertiary flakes
BH-S-109	Historic-era	Historic-era refuse deposit
BH-S-110	Prehistoric	Large lithic scatter with multiple projectile points
BH-S-111	Prehistoric	Lithic scatter including three rhyolite flakes, one chert flake, and one rhyolite biface fragment

Site Number	Era	Description
BH-S-114	Prehistoric	Deflated hearth with associated lithic scatter
BH-S-115	Prehistoric	Lithic scatter with four rhyolite flakes, one chert flake, and one rhyolite hammerstone
BH-S-123	Historic-era	Historic-era refuse scatter
BH-S-134	Prehistoric	Low-density flake scatter
BH-S-140	Prehistoric	Lithic scatter including five rhyolite flakes and one chert flake
BH-S-144	Prehistoric	Lithic scatter with approximately 80 flakes including rhyolite, jasper, and chert
BH-S-202	Prehistoric	Large, dispersed lithic scatter with two loci
BH-S-207	Prehistoric	Primary lithic reduction site in alluvial wash
BH-S-211	Prehistoric	Lithic scatter with 19 rhyolite flakes
BH-S-212	Prehistoric	Lithic scatter with one obsidian point and two rhyolite flakes

BH-S-001

BH-S-001 is a refuse scatter measuring approximately 115 by 63 feet in the shoulder of Tehachapi Willow Springs Road. This site contains approximately 200 historic artifacts including cans, glass, and fragments of a dinner plate dating to 1927. It is unlikely that a subsurface component exists. The site lacks features and was likely the result of a single dump episode. The site is in a rural desert environment and the topography surrounding the site is characterized by flat desert terrain, with ground visibility between 90 and 100 percent across the site. The vegetation community is characterized by species associated with the Mojave Desert.

Artifact types include solder dot cans, paint cans, sanitary cans, church key open cans, meat tins, a Copenhagen metal cap, enamelware, pull-top cans, chicken wire, and a tobacco lid. Colors of glass identified include amber, colorless, milk, cobalt, and sun-colored amethyst. Additional artifacts include a glass Vicks vapor rub container dating to the 1960s, fragments from a wooden pen, and white ware ceramic fragments of a tea pot and plate. The maker's mark on the plate indicates "Homer Laughlin/Made in U.S.A./E 7 N 5." Homer Laughlin China Company started in the early 1870s and continues to make mass-produced dinnerware sets today. The fragment identified on site comes from a plate mass-produced in May 1927 by Newell Potters in West Virginia. No features were identified at the site.

The site lacks physical integrity and is in poor condition. No features outside of the concentrations were observed. Because of its proximity to an active road, the site has most likely been affected by modern looting or littering. Cans at the site have bullet holes. The area is also subject to intense rain and winds. Therefore, the site has most likely been affected by wind and water disturbances. This site most likely represents a single roadside dumping episode from the mid-twentieth century.

BH-S-002

BH-S-002 is a lithic scatter of at least 75 artifacts dispersed over nearly 11 acres near Willow Springs. Various material types were represented on site including rhyolite, CCS, obsidian, quartzite, and basalt. No formal tools were identified on the site, which spans a block between

Truman Road on the north and Felsite Road on the south. The surface assemblage contains a variety of material types, suggesting it was a multi-use lithic tool production and retouch site.

Because of its proximity to an active road, the site has most likely been affected by modern looting or littering. Well established off-road vehicle trails are to the east of the site, which has most likely caused disturbances to the site. The area is also subject to intense rain and winds.

BH-S-003

BH-S-003 is a sparse lithic scatter containing nine rhyolite flakes and one flake of CCS material (Plate 6-3). The site measures 42 by 18 meters. Most of the flakes are tertiary, suggesting this may represent a lithic reduction area. The site is between a residence (9678 Dawn Road, Rosamond, CA 93560) and Lloyd's Landing Airport, 135 meters south of Dawn Road. Raw materials were likely gathered on site or procured from the known prehistoric lithic quarries in the nearby Rosamond Hills. The predominance of tertiary flakes and the limited number of cultural materials observed suggest that this assemblage may reflect a single-use lithic reduction site. A lack of features and other material types further points to a brief, expedient use of this site.

Plate 6-3. BH-S-003 Rhyolite Flake, Plan View

Because of its proximity to an active residence, former airfield, and agricultural lands, the site has most likely been affected by modern looting or littering. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-004

BH-S-004 is a possibly historic-era refuse scatter consisting of trash dating from the late 1960s to early 1970s including beverage cans, gallon buckets, steel cable, and glass bottles. The site measures 19 by 14 feet and is in the corner of two perpendicular dirt roads. Artifacts of the small scatter appear contemporaneous and are likely from a single dump episode, most likely an expedient dumping location. The site is about 100 feet south of Favorito Avenue in a flat and featureless part of the desert characterized by creosote scrub vegetation and nonnative grasses.

A 7-Up bottle was observed in the assemblage that dates from the late 1960s to the early 1970s. The bottle has "7-UP" embossed sideways along the body of the bottle and "No Deposit No Return" embossed along the shoulder. An observed Pepsi can dates between 1967 and 1972. A broken Nesbitt's bottle and a Canada Dry pull-top can date to the early 1970s. Additional artifacts include pull-tab bi-metal cans, steel cable, four steel gallon containers, and a metal speaker. Bottle glass fragments include green, colorless, amber, and aqua.

Because of its proximity to two active dirt access roads and nearby agricultural lands, the site has most likely been affected by modern vehicular activities, looting, or littering. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-005

BH-S-005 is a moderately dense lithic scatter that measures 145 by 61 meters on both sides of a chicken wire fence line. The site contains two rhyolite bifaces, a granite mano fragment, and approximately 50 flakes, which are mostly rhyolite. Most observed flakes are tertiary, with some secondary. One of the bifaces is broken at the base and has use wear on one edge. This biface measures 6.5 centimeters by 4.1 centimeters by 1.1 centimeters. The other rhyolite biface measures 4.1 centimeters by 4 centimeters by 0.4 centimeter. This site appears to be a single-use lithic reduction site using local materials.

Because of its proximity to an active residence and dirt access road, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-006

BH-S-006 is a sparse prehistoric lithic scatter containing one obsidian projectile point, a core fragment, six obsidian flakes, and five rhyolite flakes. This site measures 64 by 54 meters and is south of Favorito Avenue and west of a dirt access road for a nearby active residence. The obsidian projectile point measures 3.5 centimeters by 2 centimeters by 0.25 centimeter and appears to be a Rose Springs Stemmed point (Plate 6-4). The multidirectional core fragment measures 5 by 3.5 by 2.75 centimeters. This site appears to be a single-use lithic reduction site using a combination of local materials and Coso obsidian, which is sourced from the Coso volcanic fields approximately 80 miles north of this site.

Plate 6-4. BH-S-006 Obsidian Projectile Point, Plan View

The site is on a desert alluvial wash with patches of seasonal grasses and loose surface gravels. Because of its proximity to an active residence and dirt access road, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-008

BH-S-008 is a small lithic scatter containing three rhyolite flakes and one chert secondary flake with a modified edge. The chert flake with a modified edge measures 3.8 centimeters by 2.9 centimeters by 1 centimeter. The site measures 29 by 12 meters and is in a desert alluvial plain that has been extensively disturbed by agriculture and sheep grazing. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-009

BH-S-009 is a historic-era refuse deposit identified in a drainage containing two matchstick and about 20 sanitary cans from the 1930s to 1960s. The site measures 48 by 16 feet and has been highly affected by water erosion and modern disturbances in this area. The sanitary cans have various openings including church key, rotary-open, and knife cut. This site has been highly disturbed by water erosion from the drainage and surrounding alluvial wash. Additionally, this area has been used for agricultural purposes, which may have further affected this site.

BH-S-011

BH-S-011 consists of seven rhyolite flakes in a 20- by 19-meter area. Six flakes are tertiary and one is a primary flake. The site appears to be an expedient lithic reduction station. This site is on an alluvial desert plain with loosely compacted sand. Vegetation includes bursage, thistle, and creosote. Disturbances include sheep grazing, power pole installation, dirt access roads, and private residences to the north and south.

BH-S-012

BH-S-012 is a large, dispersed lithic processing site with multiple reduction stations in a relatively undisturbed parcel adjacent to a large drainage. This site measures 76 by 49 meters and is situated on a knoll covered in desert pavement. Lithic materials identified include rhyolite and CCS. Materials were likely sourced locally from quarries in nearby Rosamond Hills. Seven features were observed during the survey. Feature (F) 1 includes two secondary and two tertiary rhyolite flakes; two primary, six secondary, and two tertiary tuff flakes; and one secondary CCS flake. F2 includes three secondary and three tertiary rhyolite flakes and one secondary CCS. F3 includes two primary, five secondary, and six tertiary rhyolite flakes. F4 includes one primary, three secondary, and four tertiary flakes. F5 includes two primary, two secondary, and three tertiary flakes. F6 includes a rhyolite biface; three primary, three secondary, and four tertiary rhyolite flakes; and one tertiary CCS flake. F7 includes one primary, two secondary, and one tertiary rhyolite flakes.

The area is subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby CCS and rhyolite sources in the Rosamond

Hills (approximately 4 miles east–northeast of BH-S-012), and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-012).

BH-S-013

BH-S-013 is a small lithic scatter in the eastern margins of a dry seasonal drainage that measures 14 by 8 meters. The surface expression contains six rhyolite flakes that may point to a single- or limited-use activity area where a larger core was reduced for transport, tool production, or retouch. The six flakes include one primary, one secondary, and four tertiary flakes. The area is subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-102

BH-S-102 is a lithic scatter containing one obsidian projectile point, one rhyolite point, two bifaces (one rhyolite, one chert), one obsidian flake, and over 30 flakes of rhyolite and chert. Eight flakes appear to have utilized edges and most of the flakes are tertiary, with two secondary flakes. Over 90 percent of the material types are rhyolite, with chert the second most prevalent material type and obsidian last. The site measures 48 by 27 meters and is in a disturbed and featureless area adjacent to Lloyd's Landing Airstrip and Patrick Place. Raw materials are mostly locally sourced and were likely gathered on site or procured from the known prehistoric lithic quarries in the nearby Rosamond Hills. Observed obsidian is Coso obsidian, which is sourced from the Coso volcanic fields approximately 80 miles north of this site.

Because of its proximity to an active residence and dirt access road, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-107

BH-S-107 is a small historic refuse scatter consisting of cans, bottle bases, glass shards, and unidentified metal fragments next to an abandoned two-track road near Lloyd's Landing Airstrip close to the intersection of Dawn Road and Patrick Place. The site measures 57 by 42 feet and is 15 meters west of a dry seasonal wash. The resource is the result of a single dump episode sometime after the mid-1970s, although some of the artifacts date much earlier.

The site consists of olive, amber, colorless bottle bases, and glass fragments. Corroded metal artifacts include one meat tin, one solder dot milk can, and one fruit can with church key opening. Two bottle bases (one colorless and one olive) have embossing and appear to date to the late 1950s to mid-1970s. The first colorless bottle base reads "DI GIORGIO WINE CO./DI GIORGIO/ CALIF./184E 4/(L)/REFILLING PROHIBITED." The second colorless bottle base reads "UNITED VINTNER INC/[Hazel Atlas maker's mark]/REFILLING/PROHIBITED/O-I 8." The olive-green bottle base reads "FLAVOR – GUARD/57/REFILLING/PROHIBITED/GALLO BOTTLE." The amber bottle base has an "L" in a circle as a maker's mark.

Because of its location in a highly disturbed cleared area and its proximity to an active residence and dirt access road, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-108

BH-S-108 is a small lithic scatter consisting of five rhyolite tertiary flakes, suggesting it is a single core reduction or retouch activity area. The site measures 17 by 13 meters. Soils consist of loamy sand on 0 to 5 percent slopes. Vegetation in the area consists of creosote, saltbush, Russian thistle, and other members of the creosote scrub community. Visibility on the site is good (approximately 90 percent).

Because of its proximity to agricultural land, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby chert and rhyolite sources in the Rosamond Hills (approximately 4 miles east-northeast of BH-S-108) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-108). No early-stage reduction flakes or single reduction loci were identified, and no temporally diagnostic artifacts or dateable materials were identified. A lack of features or other material types suggests that the site was only inhabited on a short-term basis; however, site features or other material types, if previously present on the surface, would have been destroyed by agricultural activity.

BH-S-109

BH-S-109 is a historic domestic refuse scatter in a heavily disturbed area north of Favorito Avenue. The scatter contains approximately 150 cans, various glass bottles and fragments (red, colorless, cobalt, and amber), miscellaneous metal, dinnerware, and other household refuse. Most artifacts date from the 1930s to the 1960s and appear to be a single opportunistic dumping episode, most likely from the nearby dirt road just south of the site.

Artifacts include a milk of magnesia bottle, a grease tube, a pressed red glass vessel, a colorless glass ink bottle, what looks like a child's ceramic art project, light bulbs, a steel kitchen scoop, a Bayer aspirin bottle, hinges, a white saucer, ceramic transferware, a Band Aid tin, lighter fluid cans, sanitary cans, matchstick filler cans, beverage cans, key wind cans, juice concentrate cans, condensed milk cans, meat tins, and a powder tin. Makers' marks include Owens Illinois, Knox Glass, Latchford-Marble Glass Company, and Consolidated Glassworks that date to 1920, 1936, 1941–1953, 1952, and generally the 1930s.

Vegetation in the area consists of creosote, saltbush, Russian thistle, and other members of the creosote scrub community. Visibility on the site is good (approximately 90 percent).

Because of its proximity to agricultural land, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-110

BH-S-110 is a large prehistoric scatter containing more than 500 lithic artifacts made into a variety of forms from an array of materials including obsidian, rhyolite, chalcedony, basalt, and chert. The rhyolite and CCS materials come in a wide variety of colors. Flaked stone artifacts include projectile points (three) (Plate 6-5), utilized flakes (more than 10), bifacial tools, debitage, and cores. Two groundstone metate fragments (one vesicular basalt and one granite) were also located on site. The assemblage is dispersed across a stable terrace that is elevated about 2 meters from the ground surface below, less than 50 meters from a residence. Aerial imagery suggests a creek once skirted the western side of the landform. Clusters of broken rock around the site appear to be fire affected and may be deflated hearth features; further testing will determine the presence or absence of thermal features. There is a main concentration measuring 83 meters east to west by 50 meters north to south. The artifacts radiate out in all directions from this concentration, with the density of artifacts dropping with distance. The overall site dimensions are 265 meters east to west by 190 meters north to south. No specific activity locations such as single reduction loci or food processing areas are apparent. The artifacts are well dispersed, with all lithic materials mixed in together. The landform has been subjected to erosion and sheet flows, which have probably moved some of the artifacts although not to an extent to be considered secondary deposition. The site exhibits some tire scars across the land and narrow and currently unused dirt roads run east to west through the site. Given the proximity to a residence, it is likely that some opportunistic collecting has taken place; however, no evidence of looting pits was identified. The site is within creosote scrub habitat with some Joshua trees present. Overall site integrity is good. This sprawling and diverse prehistoric artifact scatter is likely to produce more information, as some artifacts like the metates were identified partially buried and the geomorphology of the immediate area suggests there is some sediment deposition.

Plate 6-5. BH-S-110 Obsidian Projectile Point, Plan View

Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby chert and rhyolite sources in the Rosamond Hills (approximately 4 miles east-northeast of BH-S-110) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-110). The site has not been evaluated and further testing and evaluation work is recommended for this archaeological site.

BH-S-111

BH-S-111 is a small prehistoric lithic scatter consisting of a rhyolite biface fragment (Plate 6-6), three rhyolite flakes, and one chert flake. The scatter measures 30 by 15 meters and is in an area that has been grazed with modern disturbances related to disking for agriculture. The rhyolite biface fragment measures 4.2 centimeters by 5.1 centimeters by 0.5 centimeter.

Plate 6-6. BH-S-111 Rhyolite Biface, Plan View

Because of its location in agricultural land, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby chert and rhyolite sources in the Rosamond Hills (approximately 4 miles east-northeast of BH-S-111), and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-111). No early-stage reduction flakes or single reduction loci were identified, and no temporally diagnostic artifacts or dateable materials were identified. A lack of features or other material types suggests that the site was only inhabited on a short-term basis; however, site features or other material types, if previously present on the surface, would have been destroyed by agricultural activity.

BH-S-114

BH-S-114 is a small lithic scatter and possible deflated thermal feature about 50 meters south of site ICF-BH-110. The site measures 45 by 24 meters. Lithic artifacts on site consist of one rhyolite and three chert flakes and the possible hearth feature is made of what appears to be a cluster of fire-cracked and fire-affected basalt rocks.

Because of its location in agricultural land, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby basalt and rhyolite sources in the Rosamond Hills (approximately 4 miles east-northeast of BH-S-114) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-114). No early-stage reduction flakes or single reduction loci were identified, and no temporally diagnostic artifacts or dateable materials were identified. The presence of a possible deflated hearth feature points toward a temporary camp site with some lithic processing occurring.

BH-S-115

BH-S-115 is a small lithic scatter measuring 57 by 33 meters containing four rhyolite flakes, one chert flake, and one rhyolite hammerstone (Plate 6-7). The scatter was identified in the scar of an old two-track road leading to a residence off Tehachapi Willow Springs Road, 50 meters east of larger prehistoric site BH-S-110.

Plate 6-7. BH-S-115 Rhyolite Hammerstone, Plan View

Because of its proximity to an active residence and dirt access road, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby chert and rhyolite sources in the Rosamond Hills (approximately 4 miles east-northeast of BH-S-115) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-115). No early-stage reduction flakes or single reduction loci were identified, and no temporally diagnostic artifacts or dateable materials were identified. A lack of features or other material types suggests that the site was only inhabited on a short-term basis; however, site features or other material types, if previously present on the surface, would have been destroyed by agricultural activity.

BH-S-123

BH-S-123 is a small historic refuse scatter consisting of 11 sanitary cans, five solder dot cans, a mason jar, and a razor blade holder. These artifacts appear to date to the early 1900s and this site appears to represent an opportunistic dumping episode. The resource was identified in an area that has been affected by agriculture about 420 feet north of McConnell Avenue.

Extreme disturbance from agricultural activity precludes a meaningful interpretation of the surface expression of BH-S-123. Cans appear to have been windblown and affected by intense agricultural activities in this parcel. This parcel has underground and aboveground asbestos irrigation pipes that have affected the entire parcel.

BH-S-134

BH-S-134 is a low-density scatter of rhyolite flakes in a highly disturbed agricultural field. The surface expression contains 11 rhyolite flakes, which may point to a single- or limited-use activity area where a larger core was reduced for transport, tool production, or retouch. The site measures 39 by 31 meters and is most likely not in situ due to agricultural plowing.

The site is within a large agricultural field with a center-pivot irrigation system. Sediments consist of alluvial loamy sand on 0 to 5 percent slopes. Vegetation within the agricultural field consists almost entirely of hay. Visibility on the site is good (approximately 90 percent). The site is highly disturbed from several decades of agricultural activity.

Extreme disturbance from agricultural activity precludes a meaningful interpretation of the surface expression of BH-S-134. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby chert and rhyolite sources in the Rosamond Hills (approximately 4 miles east-northeast of BH-S-134) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-134). No early-stage reduction flakes or single reduction loci were identified, and no temporally diagnostic artifacts or dateable materials were identified. A lack of features or other material types suggests that the site was only inhabited on a short-term basis; however, site features or other material types, if previously present on the surface, would have been destroyed by agricultural activity.

BH-S-140

BH-S-140 is a sparse prehistoric lithic scatter covering an approximately 1,350-square-meter area. The site consists of five rhyolite flakes and one chert flake, all within the late stages of reduction. No features or other artifact types are present within the site.

The site is within a large agricultural field with a center-pivot irrigation system. Sediments consist of alluvial loamy sand on 0 to 5 percent slopes. Vegetation within the agricultural field consists almost entirely of hay. Visibility on the site is good (approximately 90 percent). The site is highly disturbed from several decades of agricultural activity.

Extreme disturbance from agricultural activity precludes a meaningful interpretation of the surface expression of BH-S-140. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby chert and rhyolite sources in the Rosamond Hills (approximately 4 miles east-northeast of BH-S-140) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-140). No early-stage reduction flakes or single reduction loci were identified, and no temporally diagnostic artifacts or dateable materials were identified. A lack of features or other material types suggests that the site was only inhabited on a short-term basis; however, site features or other material types, if previously present on the surface, would have been destroyed by agricultural activity.

BH-S-144

BH-S-144 is a prehistoric lithic scatter that measures 265 by 35 meters covering an approximately 5,850-square-meter area (1.4 acres). The site is within a large agricultural field. Sediments consist of alluvial loamy sand on 2 to 9 percent slopes. Vegetation within the agricultural field consists largely of Russian thistle (tumbleweed) and low desert grasses. Visibility on the site is good (approximately 80 percent). The site is highly disturbed from several decades of agricultural activity.

This site consists of approximately 80 flakes. Material types consist of rhyolite and CCS (chert and jasper); over 95 percent of the flakes are rhyolite. Most flakes are in the late stages of reduction, but a few secondary flakes are present. No features or other artifact types are present within the site.

Extreme disturbance from agricultural activity precludes a meaningful interpretation of the surface expression of BH-S-144. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools. Lithic materials within the site would have been easily accessible and abundant due to the nearby CCS and rhyolite sources in the Rosamond Hills (approximately 4.5 miles east-northeast of BH-S-144) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-144). A lack of features or other material types suggests that the site was only inhabited on a short-term basis; however, site features or other material types, if previously present on the surface, may have been destroyed by agricultural activity.

BH-S-202

BH-S-202 is a large, dispersed prehistoric lithic scatter measuring 270 by 115 meters covering an approximately 15,800-square-meter area (4 acres). The site is along a rise on the eastern side of a desert wash within a large alluvial plain. Soils consist of loamy sand on 0 to 5 percent slopes. Vegetation in the area consists of Joshua trees, creosote, saltbush, Russian thistle, and other members of the creosote scrub community. Visibility on the site is good (approximately 80 percent). The site appears to be moderately disturbed through the effects of natural erosion and from vehicle traffic on the unpaved Dawn Road through the southern edge of the site. The site is subject to erosional activity from adjacent washes and drainages and from alluvial deposition from the hills above the site to the south (Willow Springs Butte and Tropico Hill area).

BH-S-202 is a large lithic scatter consisting of over 100 rhyolite flakes and 18 CCS flakes (17 chert and one jasper). All stages of lithic reduction took place at the site with a focus on later stage reduction. Of the rhyolite flakes, over 90 percent are in the late stages of reduction, with only a few flakes in the secondary stages of reduction. No rhyolite primary flakes or cores were observed. Of the CCS flakes, approximately 70 percent are in the late stages of reduction; about 20 percent of the CCS flakes are secondary flakes and 10 percent are primary. Seven flakes exhibit use wear, all of which are rhyolite. It is likely that some expedient tool production and tool manufacture or retouch took place at the site. The archaeological team did not identify distinct reduction loci, and materials appear to be randomly dispersed across the site. No features were identified at the site.

BH-S-202 represents a locus of lithic assaying and the production and/or retouch of expedient tools. Raw materials were likely gathered on site or nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby CCS and rhyolite sources in the Rosamond Hills (approximately 1–2 miles east-northeast of BH-S-202) and rhyolite sources at Fairmont Butte (approximately 13 miles southwest of BH-S-202). All stages of lithic reduction are represented at the site, with debitage consistent with later stage lithic reduction seen in much higher numbers. It is unknown whether portions of the site have been destroyed by water erosion. Tool manufacture or retouch is evident through the presence of later stage debitage and utilized flakes. No single reduction loci were identified, and the site contains a scattered mix of two different locally acquired material types. A lack of features or other material types suggests that the site was only inhabited on a short-term basis.

BH-S-207

BH-S-207 is a primary lithic reduction site covering an approximately 1,650-square-meter area. This site is a prehistoric lithic scatter consisting of approximately 23 flakes, three cores, and one bifacial flake. All artifacts are rhyolite except for the biface, which is made of chert. Of the flakes, approximately 57 percent are in their primary stage of reduction, 17 percent are in their secondary stage, and 26 percent are in their tertiary stage. One of the rhyolite tertiary flakes exhibits utilization along one edge. No features are present within the site.

The site is within an alluvial wash. Vegetation in the area consists of Joshua trees, creosote, saltbush, Russian thistle, and other members of the creosote scrub community. Visibility on the site is good (approximately 90 percent). The site appears to be moderately disturbed through the effects of natural erosion. The site is subject to erosional activity from adjacent washes and drainages and from alluvial deposition from the hills above the site to the south (Willow Springs Butte and Tropico Hill area).

BH-S-207 represents a locus of lithic assaying and the production and/or retouch of expedient tools. Raw materials were likely gathered on site or nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby CCS and rhyolite sources in the Rosamond Hills (approximately 1–2 miles east-northeast of BH-S-207) and rhyolite sources at Fairmont Butte (approximately 13 miles southwest of BH-S-207). All stages of lithic reduction are represented at the site, with early stage more prevalent. It is unknown whether portions of the site have been destroyed by water erosion. Tool manufacture or retouch is evident through the presence of later stage debitage and utilized flakes. A lack of features and lack of material type diversity suggest that the site was only inhabited on a short-term basis.

BH-S-211

BH-S-211 is a lithic reduction site covering an approximately 330-square-meter area. The site is within an alluvial drainage. This site consists of 18 rhyolite flakes, all in the late stages of reduction. One of the rhyolite tertiary flakes is worked on one side. No features or other artifact types are present within the site. Vegetation in the area consists of Joshua trees, creosote, saltbush, Russian thistle, and other members of the creosote scrub community. Sediments consist of sandy loam on 5 to 9 percent slopes. Visibility on the site is good (approximately 90 percent). The site appears to be moderately disturbed through the effects of natural erosion. The site is subject to erosional activity from adjacent washes and drainages and from alluvial deposition from the hills above the site to the south (Willow Springs Butte and Tropico Hill area).

BH-S-211 represents a locus of lithic assaying and the production and/or retouch of expedient tools. Raw materials were likely gathered on site or nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby rhyolite sources in the Rosamond Hills (approximately 1–2 miles east-northeast of BH-S-211) and at Fairmont Butte (approximately 13 miles southwest of BH-S-211). It is possible that portions of the site have been disturbed by water erosion, as this site is on an alluvial wash. Tool manufacture or retouch is evident through the presence of late stage debitage and a utilized flake. A lack of features and lack of material type diversity suggest that the site was only inhabited on a short-term basis.

BH-S-212

BH-S-212 is a small, sparse lithic scatter measuring 24 by 10 meters, covering an approximately 150-square-meter area. The site is on a low rise adjacent to a desert wash. Vegetation in the area consists of Joshua trees, creosote, saltbush, Russian thistle, and other members of the creosote scrub community. Sediments consist of loamy sand on 0 to 5 percent slopes. Visibility on the site is good (approximately 90 percent). The site appears to be moderately disturbed through the effects of natural erosion. The site is subject to erosional activity from adjacent washes and drainages and from alluvial deposition from the hills above the site to the south (Willow Springs Butte and Tropico Hill area).

The site consists of one obsidian projectile point (Plate 6-8) and two rhyolite flakes (one with a utilized edge). The projectile point measures 2.25 by 2.5 by 1.5 centimeters. It is small and triangular with concave sides and a flat bottom, and appears to be a Lake Mohave projectile point. The material appears to be Coso obsidian, sourced from the Coso volcanic fields approximately 80 miles north of this site. The rhyolite flakes suggest that BH-S-212 is a single-use lithic reduction location, but it is unknown if a subsurface component exists. No features or other artifact types are present within the site.

Plate 6-8. BH-S-212 Obsidian Projectile Point, Plan View

6.4.2 Newly Recorded Isolates

Fifty-one isolates were newly identified within the archaeological study area during the current survey effort. Traditionally, isolated artifacts or features are not considered eligible for the CRHR because recordation of isolated artifacts and features has exhausted their research potential. As such, the isolated cultural materials identified during this survey were not considered for their potential to meet the eligibility requirements of the CRHR, in accordance with Section 15064.5(a)(2) of the State CEQA Guidelines, and found not to qualify as historical resources for the purposes of CEQA. The current evaluation has assigned a California Office of Historic Preservation 6Z status code to the isolates, and no further action is recommended for these resources. California DPR forms have been completed for all isolated artifacts identified during this project. Table 6-5 lists the newly recorded isolates.

Table 6-5. Newly Recorded Isolates in the Archaeological Study Area

Temporary Number	Era	Description
BH-ISO-001	Prehistoric	One rhyolite unifacial scraper
BH-ISO-002	Prehistoric	One banded rhyolite tertiary flake
BH-ISO-004	Prehistoric	One rhyolite pressure flake
BH-ISO-006	Prehistoric	One chalcedony tertiary flake and one tuff secondary flake
BH-ISO-007	Prehistoric	One CCS secondary flake
BH-ISO-009	Prehistoric	One CCS scraper and one secondary rhyolite flake
BH-ISO-010	Prehistoric	One rhyolite core hammerstone
BH-ISO-011	Prehistoric	One rhyolite tertiary flake
BH-ISO-012	Prehistoric	One rhyolite secondary flake
BH-ISO-014	Prehistoric	One rhyolite tested cobble
BH-ISO-103	Prehistoric	One rhyolite secondary flake
BH-ISO-104	Prehistoric	One rhyolite tertiary flake
BH-ISO-105	Prehistoric	One hole-in-cap can and one Coca-Cola bottle
BH-ISO-106	Historic-era	One rhyolite tertiary flake
BH-ISO-107	Prehistoric	One banded rhyolite biface and one white rhyolite flake
BH-ISO-112	Prehistoric	One rhyolite tertiary flake
BH-ISO-113	Prehistoric	One rhyolite tertiary flake
BH-ISO-116	Prehistoric	One obsidian tertiary flake
BH-ISO-117	Prehistoric	One banded rhyolite tertiary flake
BH-ISO-118	Prehistoric	Two pink rhyolite tertiary flakes and one secondary rhyolite flake
BH-ISO-119	Prehistoric	One pink rhyolite tertiary flake
BH-ISO-121	Prehistoric	One rhyolite tertiary flake
BH-ISO-122	Prehistoric	One white chert tertiary flake
BH-ISO-124	Prehistoric	One rhyolite tertiary flake
BH-ISO-125	Prehistoric	One chert biface
BH-ISO-126	Prehistoric	One white, opaque chert flake
BH-ISO-127	Prehistoric	One purple rhyolite tertiary flake
BH-ISO-129	Prehistoric	One obsidian, two rhyolite, and one chert flakes

Temporary Number	Era	Description
BH-ISO-130	Prehistoric	One banded rhyolite core
BH-ISO-131	Prehistoric	One banded rhyolite core
BH-ISO-133	Prehistoric	One rhyolite tool, One rhyolite flake, and one chert flake
BH-ISO-135	Prehistoric	Three rhyolite tertiary flakes
BH-ISO-140	Prehistoric	One bifacially flaked, large rhyolite flake
BH-ISO-141	Prehistoric	One reddish rhyolite tertiary flake
BH-ISO-142	Prehistoric	One rhyolite tertiary flake and one white tuff core fragment
BH-ISO-144	Prehistoric	Lithic scatter including three rhyolite flakes and one quartz pressure flake
BH-ISO-146	Prehistoric	One banded rhyolite tertiary flake
BH-ISO-147	Prehistoric	Three rhyolite tertiary flakes, one with a modified edge
BH-ISO-148	Prehistoric	One purple-banded rhyolite and one orange chert flake
BH-ISO-149	Prehistoric	One rhyolite banded tertiary flake
BH-ISO-150	Prehistoric	Two rhyolite tertiary flakes
BH-ISO-151	Prehistoric	One tertiary chert flake
BH-ISO-201	Prehistoric	One rhyolite core
BH-ISO-205	Prehistoric	One rhyolite flake with multiple scars
BH-ISO-209	Prehistoric	One rhyolite secondary flake and one rhyolite tertiary flake with multiple flake scars
BH-ISO-210	Prehistoric	One rhyolite tertiary flake
BH-ISO-212	Prehistoric	One rhyolite tertiary flake and one rhyolite secondary flake
BH-ISO-213	Prehistoric	One small, light-colored rhyolite tested cobble
BH-ISO-214	Prehistoric	One piece of rhyolite angular waste with tuff cortex
BH-ISO-215	Prehistoric	One rhyolite tertiary flake
BH-ISO-216	Prehistoric	One rhyolite core

BH-ISO-001

BH-ISO-001 consists of an isolated prehistoric rhyolite unifacial scraper. The artifact measures 8.5 by 3.4 by 1.6 centimeters and exhibits flake scars on the dorsal margin. An unnamed creek is 110 meters northeast of the isolate. The isolate is in a desert environment that appears to be undisturbed by the agricultural activities in the nearby parcels.

BH-ISO-002

BH-ISO-002 consists of one banded rhyolite tertiary flake measuring 3.5 centimeters by 4.75 centimeters by 0.5 centimeter. The flake is near Longspur Drive in an area that has been heavily disturbed by development, agriculture, and grazing.

BH-ISO-004

BH-ISO-004 consists of one rhyolite pressure flake measuring 0.7 by 0.5 by 0.1 centimeter. The flake was identified in a heavily disturbed area near a dirt runway called Lloyd’s Landing Airport.

BH-ISO-006

BH-ISO-006 consists of one chalcedony tertiary flake and one tuff secondary flake. The chalcedony flake measures 2.5 centimeters by 2.25 centimeters by 0.5 centimeter, and the tuff flake 5 by 3.5 by 2 centimeters. The tuff flake has 10 percent cortex and contains evidence of bifacial modification. The flakes were identified in a flat, disturbed area.

BH-ISO-007

BH-ISO-007 consists of one chert secondary flake with approximately 1 percent cortex, measuring 3.25 centimeters by 3 centimeters by 0.6 centimeter. The flake is in an area that has been grazed but retains some native creosote scrub vegetation.

BH-ISO-009

BH-ISO-009 consists of one isolated CCS scraper and one rhyolite secondary flake south of lithic processing site BH-S-012. The scraper measures 5 centimeters by 3 centimeters by 1 centimeter and the flake scars are primarily on the margins. The rhyolite secondary flake has cortex on approximately 10 percent of the flake and measures 4.5 centimeters by 3 centimeters by 1 centimeter. The surrounding area is less disturbed than nearby agricultural parcels and a nearby drainage suggests the area is affected by alluvial runoff.

BH-ISO-010

BH-ISO-010 consists of one rhyolite core hammerstone that measures 8.2 by 7.4 by 1.9 centimeters. The artifact was identified north of Dawn Road in an expansive, flat area that has been affected by agricultural and grazing activities.

BH-ISO-011

BH-ISO-011 consists of one rhyolite tertiary flake measuring 4.25 by 4.5 by 1.5 centimeters. The flake was identified in a previously agricultural area north of a residence on Dawn Road. Some native scrub exists in the vicinity, but vegetation is dominated by nonnative grasses.

BH-ISO-012

BH-ISO-012 consists of one rhyolite secondary flake measuring 6 centimeters by 3.5 centimeters by 1 centimeter. The flake was identified east of a drainage and an unnamed dirt road north of Dawn Road.

BH-ISO-014

BH-ISO-014 consists of an isolated rhyolite tested cobble south of large lithic processing site BH-S-012. The tested cobble retains approximately 5 percent cortex with three potential multidirectional flake scars. The artifact measures 8.5 by 6.5 by 4.75 centimeters. The area has not been plowed and is characterized by native shrubs and low-lying hills with an incised drainage 45 meters to the east.

BH-ISO-103

BH-ISO-103 consists of one rhyolite secondary flake in an alluvial setting near the base of low-lying hills. The flake measures roughly 3 centimeters by 2 centimeters by 1 centimeter and is situated in an area that has been graded for a northwest-/southeast-trending dirt road.

BH-ISO-104

BH-ISO-104 consists of one rhyolite tertiary flake identified in a previously graded road in a disturbed area between a residence and agricultural field. The flake measures 2 centimeters by 0.75 centimeter by 0.25 centimeter.

BH-ISO-105

BH-ISO-105 consists of one hole-in-cap can and one Coca-Cola bottle. The colorless glass bottle reads "53-24/Bishop Calif/MC/D-937." The can is a hole in cap with a solder dot and reads "FC Co./CHICAGO." The historic isolates were identified near a dirt access road along an agricultural field.

BH-ISO-106

BH-ISO-106 consists of one rhyolite tertiary flake measuring 3.1 centimeters by 2.6 centimeters by 0.3 centimeter. The flake was identified in a disturbed area near an abandoned access road.

BH-ISO-107

BH-ISO-107 consists of one banded rhyolite biface and one white rhyolite flake. The biface measures 4.5 centimeters by 2.8 centimeters by 1 centimeter and the majority of the multidirectional flaking is on the dorsal side. The flake measures 3.7 centimeters by 1.5 centimeters by 0.6 centimeter. The isolates are situated in an alluvial setting near hills and may be a result of secondary deposition.

BH-ISO-112

BH-ISO-112 consists of one red-banded rhyolite tertiary flake measuring 4.25 centimeters by 2.75 centimeters by 0.5 centimeter. The flake is near a residence and LADWP access easement with related modern impacts evident in the vicinity.

BH-ISO-113

BH-ISO-113 consists of one rhyolite tertiary flake measuring 4 centimeters by 2.5 centimeters by 1 centimeter. Relative to nearby isolates the vicinity is less disturbed and characterized by native scrub and nonnative grasses. A small drainage passes the isolate 4 meters to the west and an abandoned access road is nearby.

BH-ISO-116

BH-ISO-116 consists of one obsidian tertiary flake measuring roughly 2 centimeters by 1.25 centimeters by 0.2 centimeter. The flake is in a less-disturbed area (relative to nearby isolates) southwest of a large lithic scatter, BH-S-110.

BH-ISO-117

BH-ISO-117 consists of one tan and red-banded rhyolite tertiary flake. The flake measures 2.5 centimeters by 2.7 centimeters by 0.2 centimeter. The flake was observed in a berm in a heavily disturbed, flat area that was previously used as agricultural land dominated by nonnative grasses. This area is a highly disturbed, previously plowed agricultural parcel that still contains asbestos underground and aboveground pipes.

BH-ISO-118

BH-ISO-118 consists of two pink rhyolite tertiary flakes and one secondary rhyolite flake. The flake measures 4.7 centimeters by 1.4 centimeters by 0.2 centimeter. The flakes are west of Tehachapi Willow Springs Road in an area that has been affected by historic grazing. An old two-track road bisects the western portion of the scatter. This area is a highly disturbed, previously plowed agricultural parcel that still contains asbestos underground and aboveground pipes.

BH-ISO-119

BH-ISO-119 consists of one pink-banded rhyolite tertiary flake measuring 4 centimeters by 2.5 centimeters by 1 centimeter south of Champagne Avenue. This area is a highly disturbed, previously plowed agricultural parcel that still contains asbestos underground and aboveground pipes.

BH-ISO-121

BH-ISO-121 consists of one rhyolite tertiary flake measuring 3.2 centimeters by 2.5 centimeters by 0.5 centimeter. The flake was identified in a flat and featureless area affected by grazing, approximately 50 meters southeast of a large lithic scatter, site P-15-002539/CA-KER-2539. This area is a highly disturbed, previously plowed agricultural parcel that still contains asbestos underground and aboveground pipes.

BH-ISO-122

BH-ISO-122 consists of one tertiary flake made of white chert with red veins. The flake measures 3.75 centimeters by 2.5 centimeters by 1 centimeter. This area is a highly disturbed, previously plowed agricultural parcel that still contains asbestos underground and aboveground pipes.

BH-ISO-124

BH-ISO-124 consists of one rhyolite tertiary flake measuring 4 centimeters by 3 centimeters by 0.5 centimeter. The flake is situated approximately 75 meters due south of a chert biface (BH-ISO-125). This area is a highly disturbed, previously plowed agricultural parcel that still contains asbestos underground and aboveground pipes.

BH-ISO-125

BH-ISO-125 consists of a white chert biface measuring approximately 6 by 4.5 by 2 centimeters. Most flakes have been removed from a single edge and mostly on the dorsal side. The biface was identified on a flat, low-lying terrace above less-stable alluvium in previous agricultural land.

BH-ISO-126

BH-ISO-126 consists of one opaque white chert flake measuring roughly 3.5 centimeters by 2.5 centimeters by 0.5 centimeter. The flake was identified 45 meters south of a large lithic scatter, site P-15-002539/CA-KER-2539. This area is a highly disturbed, previously plowed agricultural parcel that still contains asbestos underground and aboveground pipes.

BH-ISO-127

BH-ISO-127 consists of one purple tertiary rhyolite flake measuring 3.5 centimeters by 3 centimeters by 0.5 centimeter. The flake is in a flat, featureless area approximately 130 meters south of a large lithic scatter (P-15-002539/CA-KER-2539). This area is a highly disturbed, previously plowed agricultural parcel that still contains asbestos underground and aboveground pipes.

BH-ISO-129

BH-ISO-129 consists of four flakes, including one obsidian bifacial thinning or microflake, two rhyolite tertiary flakes, and one chert thinning flake. All flakes are less than 5 centimeters in length. The scatter is approximately 300 meters north of Mc Connell Avenue in a flat and featureless parcel. This area is a highly disturbed, previously plowed agricultural parcel that still contains asbestos underground and aboveground pipes.

BH-ISO-130

BH-ISO-130 consists of one multidirectional, purple-banded rhyolite core that measures 7 by 5.2 by 4 centimeters. This area is a highly disturbed, previously plowed agricultural parcel that still contains asbestos underground and aboveground pipes.

BH-ISO-131

BH-ISO-131 consists of one banded rhyolite core in the center of a disturbed parcel, east of a dirt road. This area is a highly disturbed, previously plowed agricultural parcel that still contains asbestos underground and aboveground pipes.

BH-ISO-133

BH-ISO-133 consists of one rhyolite expedient tool, one rhyolite flake, and one unifacially worked chert flake. The rhyolite tool was observed in the back dirt of an animal burrow. All three artifacts are less than 5 centimeters in length and were identified within or immediately adjacent to a road that encircles an agricultural field. The area has been heavily disturbed by agricultural plowing and vehicular disturbances.

BH-ISO-135

BH-ISO-135 consists of three rhyolite tertiary flakes of the same maroon-purple–banded material. All flakes are smaller than 5 centimeters. The flakes were identified near the center of a highly disturbed agricultural circle between Dawn Road and Favorito Avenue and south of site BH-S-134.

BH-ISO-140

BH-ISO-140 consists of one large bifacially worked rhyolite flake in the center of a north-south-trending dirt road. The flake measures 6.1 by 5 by 1.5 centimeters and has flake scars on a single edge.

BH-ISO-141

BH-ISO-141 consists of one rhyolite tertiary flake identified in the berm of Favorito Avenue and along a fence line. The small flake measures 2.1 centimeters by 1.3 centimeters by 0.1 centimeter. The surrounding area has been used for agricultural plowing and has been highly disturbed by these activities and use of the nearby dirt road.

BH-ISO-142

BH-ISO-142 consists of one rhyolite tertiary flake and one white tuff core fragment. The flake measures 2.9 centimeters by 1.6 centimeters by 0.3 centimeter. The core fragment measures 7.2 by 5.1 by 3.2 centimeters. Located south of Dawn Road, the area has been heavily affected by activities related to agriculture and grazing and evidence of tilling characterizes the landscape in the vicinity.

BH-ISO-144

BH-ISO-144 is a sparse prehistoric lithic scatter that measures 60 by 25 meters covering an approximately 840-square-meter area. The site consists of one rhyolite core, one rhyolite flake, and one quartz flake. Both flakes are in the late stages of reduction.

BH-ISO-146

BH-ISO-146 consists of one banded rhyolite tertiary flake identified in the berm of an unnamed dirt road. The flake measures 2.7 centimeters by 1.5 centimeters by 0.2 centimeter. The vicinity has been plowed and heavily disturbed and lacks native scrub vegetation.

BH-ISO-147

BH-ISO-147 consists of three tertiary flakes, including one with a modified edge. The edge-modified flake measures 4.8 centimeters by 2.9 centimeters by 0.5 centimeter and has multidirectional flakes on a single edge. The isolates are west of 100th Street West in a large, flat area that has been heavily affected by agriculture, grazing, and grading.

BH-ISO-148

BH-ISO-148 consists of two tertiary flakes, one of purple-banded rhyolite and the other orange chert. Both flakes measure less than 5 centimeters. The flakes were identified in an area that has been plowed and are south of a large previously recorded lithic scatter (P-15-019544).

BH-ISO-149

BH-ISO-149 consists of one banded rhyolite tertiary flake about 25 meters west of 100th Street West and about 55 meters north of Favorito Avenue. The flake measures 2.8 centimeters by

2.5 centimeters by 0.2 centimeter. The area has been graded and heavily disturbed and is dominated by nonnative grasses.

BH-ISO-150

BH-ISO-150 consists of two rhyolite tertiary flakes that were observed about 10 meters north of Favorito Avenue. The flake measures 3.8 centimeters by 2.1 centimeters by 0.3 centimeter. The area has been graded and is heavily disturbed from agriculture and grazing activities.

BH-ISO-151

BH-ISO-151 consists of one tertiary chert flake measuring 2 centimeters by 1.5 centimeters by 0.5 centimeter. The isolate was identified in a disturbed area near a dirt road.

BH-ISO-201

BH-ISO-201 consists of one multidirectional rhyolite core identified north of a dirt access road in an otherwise relatively undisturbed area. The core measures 10.2 by 7.5 by 4.5 centimeters.

BH-ISO-205

BH-ISO-205 consists of one tertiary rhyolite flake with multiple flake scars. The flake measures 4.2 by 3.3 by 1.5 centimeters. The artifact was identified near a dirt road and a small drainage.

BH-ISO-209

BH-ISO-209 consists of one rhyolite tertiary flake and one rhyolite secondary flake. The primary flake measures 3.6 centimeters by 1.6 centimeters by 0.4 centimeter. The secondary flake has multiple flake scars and measures 7 by 4 by 2.4 centimeters. Both were observed at the base of a low hill on an alluvial fan with few modern disturbances in the area.

BH-ISO-210

BH-ISO-210 consists of one tertiary rhyolite flake measuring 4.9 centimeters by 3.5 centimeters by 0.6 centimeter. The flake was identified in a relatively undisturbed area. Historic topographic maps show that this parcel, which is dense with prehistoric deposits, was not graded for agriculture like adjacent parcels.

BH-ISO-212

BH-ISO-212 consists of one rhyolite tertiary and one rhyolite secondary flake. The secondary flake measures 3 centimeters by 2 centimeters by 0.7 centimeter and the tertiary flake measures 2 centimeters by 2.5 centimeters by 0.1 centimeter. The flakes are situated approximately 50 meters east of a drainage basin and near other lithic activity areas. This area has not been used for agricultural purposes and there are few disturbances beside erosion.

BH-ISO-213

BH-ISO-213 consists of one small, tested cobble of light-colored rhyolite measuring 3.8 by 2.3 by 2.9 centimeters. The artifact was identified in a flat, exposed area north of Dawn Road on an alluvial fan with few modern disturbances in the area.

BH-ISO-214

BH-ISO-214 consists of one piece of rhyolitic angular waste with tuff measuring 6 by 4 by 2.3 centimeters. It is situated in a flat area adjacent to a drainage on an alluvial fan with few modern disturbances in the area.

BH-ISO-215

BH-ISO-215 consists of one rhyolite tertiary flake measuring 3.5 centimeters by 2.5 centimeters by 0.5 centimeter. The flake is about 40 meters south of a rhyolite core isolate on the western edge of a drainage on an alluvial fan with few modern disturbances in the area.

BH-ISO-216

BH-ISO-216 consists of one rhyolite core measuring 11 by 8 by 6.5 centimeters. The core was identified in close proximity to a drainage on an alluvial fan with few modern disturbances in the area.

6.4.3 Newly Identified Built-Environment Resources in the Built-Environment Study Area

Architectural historians performed desktop research and conducted a reconnaissance survey of the built-environment study area on June 8, 2021. They identified 21 built resources within the study area containing buildings and/or structures 45 years old or older that have not been previously evaluated. Table 6-6 lists those resources. Desktop research consisted of Kern County Assessor information available through the subscription database, ParcelQuest, and historical information gleaned from historic USGS topographic maps and historic aerial photographs. The Kern County Assessor does not provide year-built information for multiple properties that architectural historians determined to contain built resources 45 years or older through desktop research using historic topographic maps and aerial photos. In the case of one property, surveying architectural historians were able to establish a "circa" date through a combination of topographic map and aerial photo research and visual observation of the built resources on the property from the public right-of-way. In other cases of built resources identified through desktop research, however, surveying architectural historians could not make such visual observations from the public right-of-way.

To the extent possible based on the reconnaissance survey, Table 6-6 indicates the significance potential of the newly identified built resources within the study area in terms of "low," "moderate," and "high" ratings. These potential significance ratings should be considered provisional, based on limited research and initial observation during reconnaissance survey, and subject to change at the Phase II level of investigation, including intensive-level survey and more in-depth property-specific research, depending on available information, to support formal historical resource evaluation. In some cases, a significance potential rating cannot be provided at this time because architectural historians could not clearly observe or photograph buildings or structures from the public right-of-way. To the extent possible, access to such properties will be arranged for the Phase II intensive-level survey.

Table 6-6. Newly Identified Built Resources in the Built-Environment Study Area

Newly Identified Built-Environment Resource	Year Built/ NA[1]/VI[2]	Property Type	Significance Potential Rating: Low, Moderate, High, or NA[3]
6195 105th Street	1964	Residential	NA
6149 105th Street	1968	Residential	Low
APN 346-032-55-00-4 (no address available)	NA/VI	Agricultural	Low
8715 Favorito Avenue	1970	Residential	NA
5488 Tehachapi Willow Springs Road	NA/VI	Residential, Agricultural	NA
10145 Hamilton Road	NA/VI	Residential	NA
10085 Hamilton Road	1940	Residential	NA
10057 Hamilton Road	1951	Residential	NA
4040 Manly Road (Willow Springs)	1903	Residential, Agricultural	High
4050 Manly Road	1935	Residential	NA
3045 90th Street West #A&B	1956	Residential	Low
9009 Rosamond Boulevard	1959	Commercial, Residential	Low
2973 95th Street	1942	Residential	Low
9580 W. Rosamond Boulevard	1955	Residential	Low
9650 W. Rosamond Boulevard	1952	Residential	Low
9668 W. Rosamond Boulevard	1921	Residential	Low
9714 W. Rosamond Boulevard	1919	Residential	Low
2860 100th Street	1940	Residential	Low
8738 Rosamond Boulevard	1944	Residential	Low
2655 95th Street	1955	Residential	Low
LADWP 500-kV Pacific Intertie Transmission Line	circa 1965–1970	Long-Distance Electricity Transmission Line	High

[1] NA ("not available") in this column refers to properties for which Kern County Assessor records do not provide year-built information.
[2] VI, "visibility issues," refers to surveyed properties with buildings and/or structures 45 years old or older that had limited visibility or are entirely blocked from visibility by vegetation from the public right-of-way.
[3] NA ("not available") in this column indicates buildings and/or structures with limited or no visibility from the public right-of-way that effectively prohibited discernment of significance potential.

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Chapter 7
Conclusions

ICF conducted an archaeological record search, literature reviews, research, and an intensive pedestrian survey of cultural resources in the study area to determine if cultural resources are present and conducted a preliminary analyses of the project's potential impacts on such resources. The records search and research identified 16 archaeological resources in the archaeological study area consisting of 9 archaeological sites (including Willow Springs) and 7 archaeological isolate artifacts.

The archaeological study area addressed in this report totals approximately 1,734.9 acres. An intensive pedestrian archaeological survey was conducted of 1,608.0 acres within the current archaeological study area; 126.9 acres within the archaeological study area were previously surveyed evaluated in for the BigBeau and Valentine solar projects, which are now under construction, or were part of the of Whirlwind Gen-tie Option 1 which would collocate on a second circuit of the existing (AVTL) corridor, and was not resurveyed for the current project. The cultural resources surveys identified an additional 78 archaeological resources in the archaeological study area, consisting of 27 new archaeological sites and 51 new isolated artifacts.

ICF architectural historians conducted a reconnaissance-level survey for built-environment resources in the built-environment study area. The built-environment analysis resulted in the reidentification of the four previously recorded built resources (not including Willow Springs), and the identification of 21 new built-environment resources within the built-environment study area.

In summary, based on the records search results, surveys, and analyses, there are 119 cultural resources in the archaeological and built-environment study areas (including offsite linear feature corridors), consisting of 35 archaeological sites, 58 archaeological isolate artifacts, 25 built-environment resources, and one multicomponent built-environment/archaeological site (Willow Springs), as depicted in Table 7-1, below.

Table 7-1. Cultural Resources in the Archaeological and built-environment study areas and CRHR Eligibility Status

	Previously Evaluated	Unevaluated /Requires Evaluation	Total # of Resources	CRHR Eligible Resources
Archaeological Resources within the Archaeological Study Area				
Archaeological Sites	1	34	35*	1
Isolated Artifacts	58	0	58	
Built Resources within the Built-Environment Study Area				
Built-Environment Resources	4	21	25	2
Multicomponent Resources within the Study Area Overlap				
Multicomponent Built-Environment/Archaeological	0	1	1	
Total	64	55	119	3

* Count does not include P-15-000129/CA-KER-129/H (Willow Springs), see "Multicomponent Built-Environment/Archaeological."

7.1 Archaeological Resources

A total of 94 archaeological resources were identified in the archaeological study area, including those that were not relocated during the survey (Table 7-2). Of these, 58 resources are isolated artifacts. Isolates lack association and context with other archaeological materials and therefore by definition lack the characteristics that would make them eligible for the CRHR.

Table 7-2. Summary of Archaeological Resources within the Archaeological Study Area

Resource Type	Age	Quantity
Previously Recorded		
Site	Historic-era	3
	Multicomponent	2
	Prehistoric	4
Isolate	Historic-era	2
	Prehistoric	5
Newly Recorded		
Site	Historic-era	6
	Prehistoric	21
Isolate	Historic-era	1
	Prehistoric	50
Total		94

Thirty-five archaeological sites were identified in the archaeological study area, with an additional multicomponent built-environment/archaeological site (Willow Springs), bringing the total number of sites with an archaeological component to 36. One archaeological site has been previously evaluated for its eligibility for listing in the CRHR and has been found eligible: P-15-002821/CA-KER-2821/H (Bean Spring Complex).

One previously recorded site, Willow Springs, is CHL No. 130 (P-15-000129/CA-KER-129/H). It remains unclear whether buildings and structures on private properties near the CHL plaque have any direct association with the historic context of the Willow Springs CHL. The Willow Springs CHL has not been evaluated for NRHP or CRHR eligibility. CHL Nos. 770 and above are automatically listed on the CRHR. If not previously evaluated for and listed in the CRHR, CHL Nos. 1 to 769 need to be formally evaluated for CRHR eligibility to determine if they qualify as historical resources under CEQA (SHPO 2020).

7.2 Built-Environment Resources

The record search and other research provided for identification of four intact, previously recorded built resources within the built-environment study area. One of these, the SCE Vincent (Big Creek No. 3) 220-kV Transmission Line (P-15-017243) is a contributor to the NRHP- and CRHR-listed Big Creek Hydroelectric System Historic District. Therefore, the transmission line qualifies as a historical resource under CEQA.

Two built resources within the study area, the SCE Big Creek No. 4 220-kV Transmission Line (P-20-003145) and the LADWP Owens Gorge 230-kV Transmission Line (P-15-018681), were previously evaluated and found not eligible for listing in the NRHP or the CRHR. It is unclear whether the SHPO ever concurred with these two evaluations. One built resource previously identified within the study area, the First Los Angeles Aqueduct (P-15-003549), was previously evaluated and found eligible for the NRHP through the Section 106 of the National Historic Preservation Act process. The resource is also listed in the CRHR.

Desktop research and the built-environment reconnaissance survey resulted in identification of 21 properties with built resources that have not been previously recorded or evaluated. Architectural historians assigned these resources the following provisional significance potential ratings: low, moderate, high, and NA ("not available" indicating buildings and/or structures with limited or no visibility from the public right-of-way that prohibited discernment of significance potential). Six properties were assigned NA ratings. Architectural historians assigned low significance potential ratings to 12 properties. Two properties, the Willow Springs Company property at 4040 Manly Road and the LADWP 500-kV Pacific Intertie Transmission Line, were assigned high significance potential ratings. The Willow Springs Company property earned a high significance potential rating because of its concentration of buildings featuring mortared-stone construction that appear to be associated with the sanitarium complex that Ezra Hamilton opened in 1904. Because elements of this complex may have been constructed earlier, they may have historical associations with the Willow Springs CHL. The LADWP 500-kV Pacific Intertie Transmission Line received a high significance potential rating because elements of the Pacific Intertie system developed by other utilities in California have been determined eligible for the NRHP and the CRHR.

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Chapter 8
Recommendations

8.1 Formally Evaluate or Update Existing Records for Archaeological Resources in the Archaeological Study Area

The records search, desktop research, and intensive pedestrian survey conducted by archaeologists resulted in identification of 36 archaeological sites within the archaeological study area. One of the 36 archaeological sites (Bean Spring Complex) has been previously evaluated for its eligibility for listing in the CRHR. The remaining 35 archaeological sites have not been evaluated and, if unavoidable during construction of the project, will require additional work to determine whether the resources contain subsurface deposits and/or information that would make them eligible resources. Protection and avoidance of the archaeological sites is the preferred method of treatment whenever possible. For sites that cannot be avoided and have the potential to contain a subsurface component, eligibility determinations may require the acquisition of additional data, such as through subsurface testing. A Phase II program of mapping, subsurface excavation via shovel scrapes, STPs, and test excavation units was conducted in October and November 2021 to assess the potential significance of the sites and their potential to contain information that would increase our understanding of history and/or prehistory under the CRHR. If, after testing and/or evaluation of the archaeological resources, it is determined that they are eligible for the CRHR, then mitigation measures such as avoidance or data recovery will need to be implemented to avoid significant impacts on eligible or listed resources.

Additionally, the Rosamond Gen-tie Option 1 line runs along the edge of the recorded boundary of Willow Springs and the Rosamond Gen-tie Option 2 line runs along the eastern edge of the Bean Spring Complex. The Bean Spring Complex is eligible for listing in the CRHR, and the Willow Springs is likely eligible, although it has never been formally evaluated. However, it is unknown whether deposits contributing to the significance of these resource areas actually exist within the portion of the project area that intersects with the mapped boundaries of the two resources. During recording of resources explicit boundaries are not always identified, especially on older resources such as Willow Springs, which was recorded prior to the advent of geographical information systems. Therefore, it is recommended that a subsurface exploration of the archaeological study area where it intersects with the boundaries of the Bean Spring Complex and Willow Springs be conducted to identify if such deposits exist within this area. If excavation of the resources does not identify significant deposits within the project area, then the archaeologists will redefine the boundaries of the resource(s) to reflect this and update DPRs and recommend that the project impacts on the resource(s) be considered less than significant with mitigation.

Archaeologists have prepared DPR 523A and 523B forms for the new archaeological sites and new isolated artifacts within the study area. DPR forms will also be prepared to update the previously recorded archaeological sites including the Bean Spring Complex and Willow Springs when those sites are accessible.

The DPR forms will include formal evaluations to determine if any of the resources are eligible for the CRHR and therefore qualify as historical resources under CEQA. For any resource determined CRHR eligible, archaeologists will undertake analysis to determine if the project would have a significant impact on a historical resource. All impact analysis will be included in the Phase II cultural resources technical study.

8.2 Formally Evaluate or Update Existing Records for Built Resources in the Built-Environment Study Area

The records search, desktop research, and reconnaissance survey conducted by architectural historians resulted in identification of four previously recorded built resources, one historic-era site designated as a CHL, and 21 newly identified built resources.

One of the four previously identified built resources, the SCE Vincent (Big Creek No. 3) 220-kV Transmission Line (P-15-017243), qualifies as a historical resource under CEQA because it is a contributor to an NRHP-listed historic district, the Big Creek Hydroelectric System Historic District. The record for this resource will be formally updated during the Phase II investigation. The update will determine if the portion of the transmission line within the study area retains historic integrity. If the portion of the transmission line in the study area is judged to retain historic integrity, architectural historians will analyze the project's potential impacts on the resource.

The record for one resource in the study area previously evaluated and found eligible for the NRHP and the CRHR, the Los Angeles Aqueduct (P-15-003549), will also be updated as part of the Phase II investigation. It remains unclear whether the SHPO ever concurred with the previous NRHP evaluation of the Los Angeles Aqueduct or if the resource is actually listed in the CRHR. Architectural historians will prepare a formal update of the existing record. The update will assess the historic integrity of the portion of the aqueduct within the study area. The update will affirm with the previous eligibility determination if available evidence supports such a conclusion or evaluate the resource as CRHR ineligible if available evidence does not support the earlier eligibility determinations. If the update concludes that the aqueduct is eligible for the CRHR, architectural historians will analyze the project's potential impacts on the resource.

Records for the two resources in the study area previously evaluated and found ineligible for NRHP and CRHR listing, the SCE Big Creek No. 4 220-kV Transmission Line (P-20-003145) and the LADWP Owens Gorge 230-kV Transmission Line (P-15-018681), will also be updated as part of the Phase II investigation. The updates will address any alterations to the portions of these transmission lines within the built-environment study area since their construction. It is anticipated that the updates will affirm the previous evaluations and that available evidence will support a finding of ineligibility. However, if available evidence contradicts a previous finding, architectural historians will prepare an update finding the resource eligible for the CRHR and thereby qualifying it as a historical resource under CEQA. If architectural historians find a resource CRHR-eligible, they will analyze the project's potential impacts on the CRHR-eligible resource or resources.

The record for the Willow Springs CHL No. 130 (P-15-000129) will also be updated as part of the Phase II investigation to determine if it is eligible for CRHR listing as a built-environment resource.

If architectural historians find during the intensive-level survey that there are no intact and significant built-environment resources and archaeologists do not find intact subsurface deposits directly associated with the CHL in the study area, the update will document this and find the CHL ineligible for the CRHR. If architectural historians identify significant intact built resources directly associated with the CHL, they will update the record to document those resources and find the Willow Springs CHL eligible for CRHR listing. If the Willow Springs CHL is found CRHR-eligible, architectural historians and archaeologists, if appropriate, will analyze the project's potential impacts on the resource.

Architectural historians will prepare DPR 523A and 523B forms for the 21 newly identified built-environment resources within the study area. The DPR forms will include formal evaluations to determine if the any of the resources are eligible for the CRHR and therefore qualify as historical resources under CEQA. For any resource found CRHR-eligible, architectural historians will undertake analysis to determine if the project would have a significant impact on a historical resource. All impact analysis will be included in the Phase II cultural resources technical study.

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Chapter 9
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Chapter 10
Personnel

Table 10-1 provides a complete list of the key contributors to this report and their respective roles.

Table 10-1. List of Key Contributors

Name	Qualifications	Role and Responsibilities
Authors		
Patrick McGinnis[2]	MA	Author
Rachel Droessler[2]	PhD	Author
Timothy Yates[1]	PhD	Author
Field Crew		
Timothy Yates[1]	PhD	Built-environment field director
Patrick McGinnis[2]	MA	Archaeological principal investigator and field director
Stephen Bryne[2]	MA	Archaeological field director
Rachel Droessler[2]	MA	Archaeological field director
Lauren Downs[2]	MA	Archaeological co-field director
Katherine Synski[2]	MA	Field technician
Peter Pham	BA	Field technician
Shannon Smith	BA	Field technician
Hector Galvez	BA	Field technician
Specialists		
Rachel Droessler[2]	MA	GIS map and figure production, laboratory technician, historic artifact analysis
Karen Crawford[2]	MA	Quality assurance/quality control
Timothy Yates[1]	PhD	Historian
Tamar Love Grande	MA	Editor and Publications Specialist
Project Management		
Patrick McGinnis[2]	MA	Task lead

Notes:
[1] Federally qualified professional historian (36 Code of Federal Regulations 61).
[2] Federally qualified professional archaeologist (36 Code of Federal Regulations 61).

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Please note that the maps and DPR forms in the following appendices cover the larger study area effective prior to May 2022. However, the updated body of the Bullhead Solar Cultural Resources Phase I Technical Report (dated August 2022) addresses the resources associated with the updated project boundary.

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Appendix A
Confidential Figures

Confidential appendix available upon request by a qualified county or contracting archaeologist.

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Appendix B
Confidential Records Search and DPR Forms

Confidential appendix available upon request by a qualified county or contracting archaeologist.

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Appendix C
Native American Outreach

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NATIVE AMERICAN HERITAGE COMMISSION

NAHC HEADQUARTERS
1550 Harbor Boulevard
Suite 100
West Sacramento,
California 95691
(916) 373-3710
nahc@nahc.ca.gov
NAHC.ca.gov

March 12, 2021

Rachel Droessler

ICF

Via Email to: Rachel.Droessler@icf.com

Re: Bullhead Solar Project, Kern County

Dear Ms. Droessler:

A record search of the Native American Heritage Commission (NAHC) Sacred Lands File (SLF) was completed for the information you have submitted for the above referenced project. The results were negative. However, the absence of specific site information in the SLF does not indicate the absence of cultural resources in any project area. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Attached is a list of Native American tribes who may also have knowledge of cultural resources in the project area. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated; if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call or email to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from tribes, please notify me. With your assistance, we can assure that our lists contain current information.

If you have any questions or need additional information, please contact me at my email address: Nancy.Gonzalez-Lopez@nahc.ca.gov.

Sincerely,

Nancy Gonzalez-Lopez

Nancy Gonzalez-Lopez
Cultural Resources Analyst

Attachment

Native American Heritage Commission
Native American Contacts List
March 12, 2021

Big Pine Paiute Tribe of the Owens Valley
James Rambeau, Sr., Chairperson
P.O. Box 700 — Paiute - Shoshone
Big Pine ,CA 93513
j.rambeau@bigpinepaiute.org
(760) 938-2003
(976) 938-2942 Fax

Big Pine Paiute Tribe of Owens Valley
Sally Manning, Environmental Director
P.O. Box 700 — Paiute
Big Pine ,CA 93513
s.manning@bigpinepaiute.org
(760) 938-2003
(760) 938-2942 Fax

Big Pine Paiute Tribe of the Owens Valley
Danelle Gutierrez THPO
P.O. Box 700 — Paiute
Big Pine ,CA 93513
d.gutierrez@bigpinepaiute.org
(760) 938-2003, ext. 228
(760) 938-2942 Fax

Chumash Council of Bakersfield
Julio Quair, Chairperson
729 Texas Street — Chumash
Bakersfield ,CA 93307
chumashtribe@sbcglobal.net
(661) 322-0121

Coastal Band of the Chumash Nation
Mariza Sullivan, Chairman
P. O. Box 4464 — Chumash
Santa Barbara ,CA 93140
cbcntribalchair@gmail.com
(805) 665-0486

Fernandeno Tataviam Band of Mission Indians
Jairo F. Avila, THPO
1019 Second St., Suite 1 — Fernandeno Tataviam
San Fernando ,CA 91340
jairo.avila@tataviam-nsn.us
(818) 837-0794 Office
(818) 837-0796 Fax

Kern Valley Indian Community
Julie Turner, Secretary
P.O. Box 1010 — Kawaiisu Tubatulabal
Lake Isabella ,CA 93240
(661) 340-0032 Cell

Kern Valley Indian Community
Robert Robinson, Chairperson
P.O. Box 1010 — Tubatulabal Kawaiisu
Lake Isabella ,CA 93240
bbutterbredt@gmail.com
(760) 378-2915 Cell

Kern Valley Indian Community
Brandy Kendricks
30741 Foxridge Court — Kawaiisu Tubatulabal
Tehachapi ,CA 93561
krazykendricks@hotmail.com
(661) 821-1733
(661) 972-0445

Kitanemuk & Yowlumne Tejon Indians
Delia Dominguez, Chairperson
115 Radio Street — Yowlumne Kitanemuk
Bakersfield ,CA 93305
2deedominguez@gmail.com
(626) 339-6785

This list is current as of the date of this document and is based on the information available to the Commission on the date it was produced.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code,Section 5097.94 of the Public Resources Code, or Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans Tribes for the proposed:
Bullhead Solar Project, Kern County.

.

Native American Heritage Commission
Native American Contacts List
March 12, 2021

Quechan Tribe of the Fort Yuma Reservation
Jordan D. Joaquin, President
P.O.Box 1899 — Quechan
Yuma, AZ 85366
tribalsecretary@quechantribe.com
(760) 572-0213

Quechan Tribe of the Fort Yuma Reservation
Virgil S. Smith, Vice President
P.O. Box 1899 — Quechan
Yuma, AZ 85366
tribalsecretary@quechantribe.com
(760) 572-0213

Quechan Tribe of the Fort Yuma Reservation
Jill McCormick, Historic Preservation Officer
P.O. Box 1899 — Quechan
Yuma, AZ 85366
historicpreservation@quechantribe.com
(760) 572-2423

Quechan Tribe of the Fort Yuma Reservation
Manfred Scott, Acting Chairman Kw'ts'an
P.O. Box 1899 — Quechan
Yuma, AZ 85366
scottmanfred@yahoo.com
(928) 750-2516

San Fernando Band of Mission Indians
Donna Yocum, Chairperson
P.O. Box 221838 — Fernandeno, Tataviam, Serrano, Vanyume, Kitanemuk
Newhall, CA 91322
ddyocum@comcast.net
(503) 593-0933
(503) 574-3308

San Manuel Band of Mission Indians
Jessica Mauck, Director-CRM Dept.
26569 Community Center Drive — Serrano
Highland, CA 92346
jmauck@sanmanuel-nsn.gov
(909) 864-8933

Santa Rosa Rancheria Tachi Yokut Tribe
Leo Sisco, Chairperson
P.O. Box 8 — Tache, Tachi, Yokut
Lemoore, CA 93245
(559) 924-1278
(559) 924-3583 Fax

Santa Ynez Band of Chumash Indians
Kenneth Kahn, Chairperson
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Santa Ynez, CA 93460
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Tejon Indian Tribe
Octavio Escobedo III, Chairperson
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Tejon Indian Tribe
Colin Rambo, CRM Tech
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(484) 515-4790 Cell

This list is current as of the date of this document and is based on the information available to the Commission on the date it was produced.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code,Section 5097.94 of the Public Resources Code, or Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans Tribes for the proposed: Bullhead Solar Project, Kern County.

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Native American Heritage Commission
Native American Contacts List
March 12, 2021

Tubatulabals of Kern Valley
Robert L. Gomez, Jr., Tribal Chairperson
P.O. Box 226 — Tubatulabal
Lake Isabella ,CA 93240
(760) 379-4590
(760) 379-4592 Fax

Tule River Indian Tribe
Neil Peyron, Chairperson
P.O. Box 589 — Yokuts
Porterville ,CA 93258
neil.peyron@tulerivertribe-nsn.gov
(559) 781-4271
(559) 781-4610 Fax

Wuksache Indian Tribe/Eshom Valley Band
Kenneth Woodrow, Chairperson
1179 Rock Haven Ct. — Foothill Yokuts, Mono, Wuksache
Salinas ,CA 93906
kwood8934@aol.com
(831) 443-9702

yak tityu tityu yak tiłhini - Northern Chumash Tribe
Mona Olivas Tucker, Chairwoman
660 Camino Del Rey — Chumash
Arroyo Grande ,CA 93420
olivas.mona@gmail.com
(805) 489-1052 Home
(805) 748-2121 Cell

This list is current as of the date of this document and is based on the information available to the Commission on the date it was produced.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code,Section 5097.94 of the Public Resources Code, or Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans Tribes for the proposed:
Bullhead Solar Project, Kern County.

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April 28, 2021

Tejon Indian Tribe
Octavio Escobedo III, Chairperson
P.O. Box 640
Arvin, CA 93203

Subject: Bullhead Solar Project, Rosamond, Kern County

Dear Chairperson Escobedo:

I'm writing to inform you that ICF is conducting cultural resource studies to provide support for the construction of a solar project in Kern County, California. The proposed Bullhead Solar Project (project) would develop up to 170 megawatts (MW) (alternating current or "AC") of solar photovoltaic (PV) capacity derived from tracker technology and up to 130 MW of battery storage. The project includes solar development with associated PV panels, inverters, converters, generators, foundations, transformers, and preferred and optional generation-tie (gen-tie) routes to the Rosamond and Whirlwind substations, only one of which would be constructed. The project also includes laydown yards, a meteorological station, microwave/communication tower, a substation, and a temporary concrete batch plant.

The proposed project encompasses a study area of approximately 1,905 acres of private land. A larger study area has been provided for evaluation to ensure that all lands potentially affected by the proposed project are included in the analysis. Should the Kern County (County) Board of Supervisors approve project, the County would issue Conditional Use Permits (CUPs) and other required approvals on land proposed for development of the solar facilities. The Project area is located on the Tylerhorse Canyon, Willow Springs, Fairmount Butte and Little Buttes USGS 7.5' topographic maps and shown on the attached maps.

A records search completed at the Southern San Joaquin Valley Information Center (SSJVIC) in March 2021 indicated that twenty-four (24) cultural resources have been previously recorded within the project areas. Three (3) are built resources, ten (10) are described as historic period sites/isolates, seven (7) are described as prehistoric period sites/isolates and four (4) are described as multi-component sites containing both prehistoric and historic features. The Native American Heritage Commission completed a search of the Sacred Lands File which failed to indicate the presence of Native American Sacred Lands in the area. The NAHC identified you as a person who may have concerns or knowledge of cultural resources in the project area. Any information you might be able to share about the project area would greatly enhance the study and would be most appreciated. The majority of the project area is undeveloped, and a pedestrian survey is planned for the near future. This consultation is part of ICF's information gathering effort and is not part of AB52 consultation process.

If you have any information or recommendations regarding the project area or project, please address them to me so that I can incorporate them into our report. As required by State law, all site data and other culturally sensitive information will not be released to the general public and will be kept strictly confidential. I can be reached at 858-444-3947, or by email at Patrick.McGinnis@icf.com.

Sincerely,

Patrick McGinnis,
Senior Archaeologist

Encl. Figure 1 –Project Location

Legend

Gentie Options

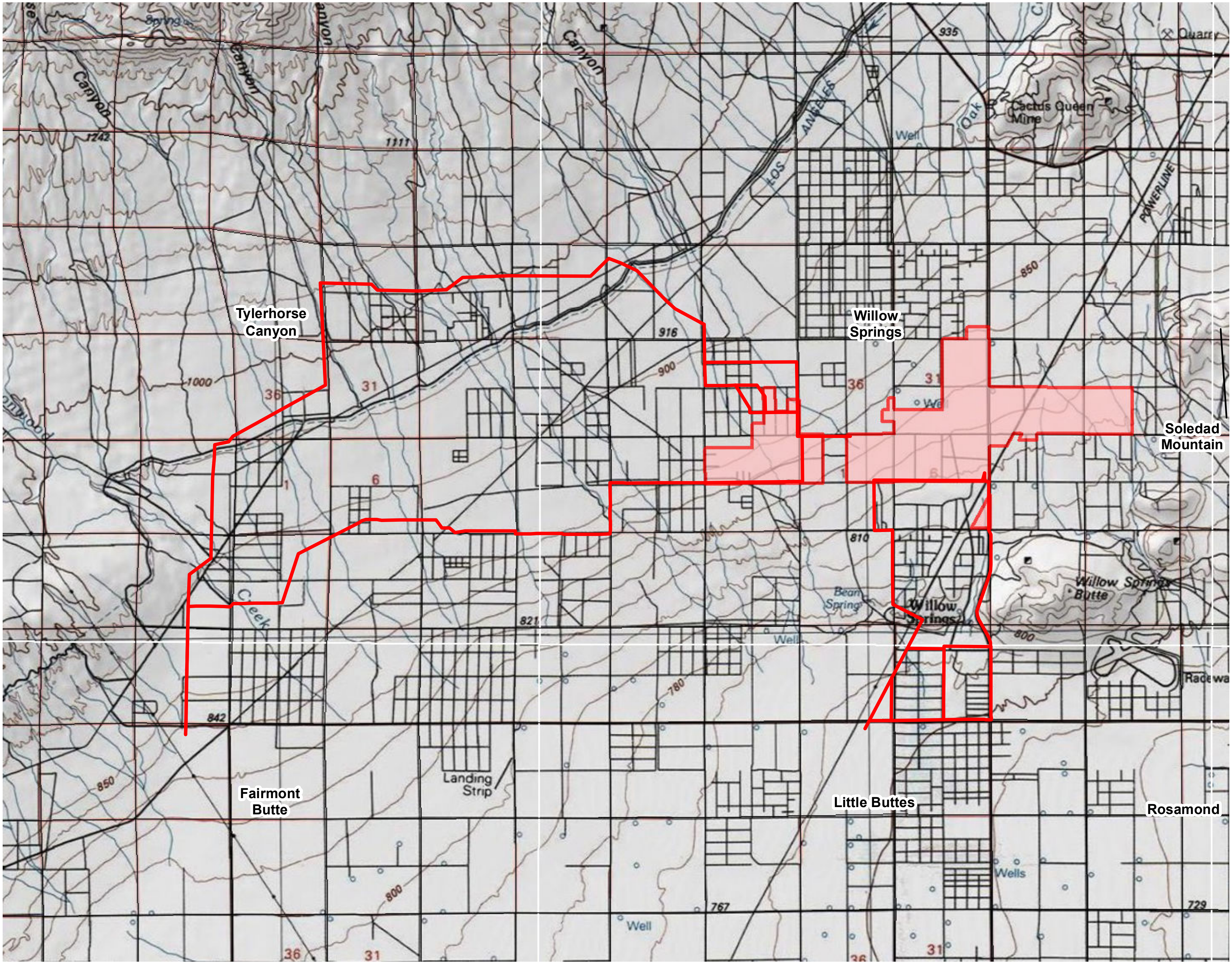
Bullhead Boundary

N

0 4,000 8,000 Feet

1:85,000

NAHC Map
Bullhead Solar Project



\\PDCCITRDSGIS2\working\Droessler_Rachel\Bullhead\Bullhead_NAHC_Map.mxd; User: 38710; Date: 4/27/2021

From:	Shana Powers
To:	McGinnis, Patrick
Cc:	Samantha McCarty; Maria Gonzales; colin.rambo@tejontribe.net
Subject:	Bullhead Solar Project
Date:	Monday, May 24, 2021 11:23:27 AM

Dear Patrick,

Thank you for contacting the Santa Rosa Rancheria about the proposed solar project. The Tribe is concerned about this project's potential adverse effects on cultural resource. As this is outside of Santa Rosa Rancheria's area of concern, we recommend reaching out to the Tejon Tribe or another local Tribe. Thank you.

Sincerely,

Shana Powers
Cultural Director
SPowers@tachi-yokut-nsn.gov
Office: (559)924-1278 Ext: 4093
Cell: (559)423-3900

From: Quechan Historic Preservation Officer
To: McGinnis, Patrick
Subject: Bullhead Solar Project, Rosamond, Kern County
Date: Tuesday, May 4, 2021 3:05:43 PM

This email is to inform you that we have no comments on this project. We defer to the more local Tribes and support their decisions on the project.

Thank you,
H. Jill McCormick, M.A.

Quechan Indian Tribe
Historic Preservation Officer
P.O. Box 1899
Yuma, AZ 85366-1899
Office: 760-572-2423
Cell: 928-261-0254
E-mail: historicpreservation@quechantribe.com

From: Ryan Nordness
To: McGinnis, Patrick
Subject: RE: Bullhead Solar Project, Rosamond, Kern County
Date: Tuesday, May 11, 2021 5:45:41 PM
Attachments: image8a7b19.PNG

Hello Patrick,

Thank you for contacting the San Manuel Band of Mission Indians (SMBMI) regarding the above referenced project. SMBMI appreciates the opportunity to review the project documentation, which was received by our Cultural Resources Management Department on May 7th, 2021, pursuant to CEQA (as amended, 2015) and CA PRC 21080.3.1. The proposed project area exists within Serrano ancestral territory and, therefore, is of interest to the Tribe. However, due to the nature and location of the proposed project, and given the CRM Department's present state of knowledge, SMBMI does not have any concerns with the project's implementation, as planned, at this time. As a result, SMBMI requests that the following language be made a part of the project/permit/plan conditions:

CUL MMs

In the event that cultural resources are discovered during project activities, all work in the immediate vicinity of the find (within a 60-foot buffer) shall cease and a qualified archaeologist meeting Secretary of Interior standards shall be hired to assess the find. Work on the other portions of the project outside of the buffered area may continue during this assessment period. Additionally, the San Manuel Band of Mission Indians Cultural Resources Department (SMBMI) shall be contacted, as detailed within TCR-1, regarding any pre-contact and/or historic-era finds and be provided information after the archaeologist makes his/her initial assessment of the nature of the find, so as to provide Tribal input with regards to significance and treatment.

If significant pre-contact and/or historic-era cultural resources, as defined by CEQA (as amended, 2015), are discovered and avoidance cannot be ensured, the archaeologist shall develop a Monitoring and Treatment Plan, the drafts of which shall be provided to SMBMI for review and comment, as detailed within TCR-1. The archaeologist shall monitor the remainder of the project and implement the Plan accordingly.

If human remains or funerary objects are encountered during any activities associated with the project, work in the immediate vicinity (within a 100-foot buffer of the find) shall cease and the County Coroner shall be contacted pursuant to State Health and Safety Code §7050.5 and that code enforced for the duration of the project.

TCR MMs

The San Manuel Band of Mission Indians Cultural Resources Department (SMBMI) shall be contacted, as detailed in CR-1, of any pre-contact and/or historic-era cultural resources discovered during project implementation, and be provided information regarding the nature of the find, so as to provide Tribal input with regards to significance and treatment. Should the find be deemed significant, as defined by CEQA (as amended, 2015), a cultural resources Monitoring and Treatment Plan shall be created by the archaeologist, in coordination with

SMBMI, and all subsequent finds shall be subject to this Plan. This Plan shall allow for a monitor to be present that represents SMBMI for the remainder of the project, should SMBMI elect to place a monitor on-site.

Any and all archaeological/cultural documents created as a part of the project (isolate records, site records, survey reports, testing reports, etc.) shall be supplied to the applicant and Lead Agency for dissemination to SMBMI. The Lead Agency and/or applicant shall, in good faith, consult with SMBMI throughout the life of the project.

Note: San Manuel Band of Mission Indians realizes that there may be additional tribes claiming cultural affiliation to the area; however, San Manuel Band of Mission Indians can only speak for itself. The Tribe has no objection if the agency, developer, and/or archaeologist wishes to consult with other tribes in addition to SMBMI and if the Lead Agency wishes to revise the conditions to recognize additional tribes.

Please provide the final copy of the project/permit/plan conditions so that SMBMI may review the included language. This communication concludes SMBMI's input on this project, at this time, and no additional consultation pursuant to CEQA is required unless there is an unanticipated discovery of cultural resources during project implementation. If you should have any further questions with regard to this matter, please do not hesitate to contact me at your convenience, as I will be your Point of Contact (POC) for SMBMI with respect to this project.

Respectfully,
Ryan Nordness

Ryan Nordness
CULTURAL RESOURCE ANALYST
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O: (909) 864-8933 x50-2022
Internal: 50-2022
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26569 Community Center Dr Highland California 92346
SAN MANUEL
BAND OF MISSION INDIANS

Appendix F.2:
Phase II Cultural Resources Technical Report

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PHASE II CULTURAL RESOURCES TECHNICAL REPORT
BULLHEAD SOLAR PROJECT

PREPARED FOR:

EDF Renewables
1999 Harrison Street, Suite 675
Oakland, CA 94612

PREPARED BY:

ICF
49 Discovery, Suite 250
Irvine, CA 92618
Contact: Patrick McGinnis (858) 444-3947

August 2022

ICF. 2022. *Phase II Cultural Resources Technical Report, Bullhead Solar Project*. August. (104036.0.002.) Prepared for EDF Renewables, Oakland, CA.

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Acronyms and Abbreviations

BESS	battery energy storage system
BigBeau	BigBeau Solar Project
B.P.	before present
CARIDAP	California Archaeological Resource Identification and Data Acquisition Program
CCR	California Code of Regulations
CCS	cryptocrystalline silicate
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CHL	California Historical Landmarks
CRHR	California Register of Historical Resources
CUP	Conditional Use Permit
EDFR	EDF Renewables
EHT	effective hydration temperature
F	Feature
gen-tie	generation-tie
GPS	global positioning system
kV	kilovolt
LADWP	Los Angeles Department of Water and Power
MNI	minimum numbers of individuals
MURR	University of Missouri Research Reactor
MW	megawatt
NAHC	Native American Heritage Commission
PRC	Public Resources Code
project	Bullhead Solar Project
PV	photovoltaic
quad	quadrangle map
SCE	Southern California Edison
SHARD	Sonoma Historic Artifact Research Database
SHPO	State Historic Preservation Office
SR-	State Route
SS	surface scrape
SSJVIC	Southern San Joaquin Valley Information Center
STP	shovel test pit
USGS	U.S. Geological Survey
XRF	X-ray fluorescence

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Chapter 1
Introduction

1.1 Introduction

EDF Renewables (EDFR) proposes the Bullhead Solar Project (project) to develop up to 270 megawatts (MW) (alternating current) of solar photovoltaic (PV) capacity derived from tracker technology and up to 270 MW of battery storage. The project includes solar development with associated PV panels, battery storage units, inverters, converters, generators, foundations, transformers, and optional generation-tie (gen-tie) routes to the Rosamond Switching Station and the Whirlwind Substation, only one of which would be constructed. The project also includes laydown yards, a meteorological station, a microwave/communication tower, substation and battery energy storage system (BESS) (Figure 1-1, Conceptual Site Plan).

The archaeological study area defined for the project are generally located in southern Kern County (County), central California (see Figure 1-2, Project Vicinity Map). The project site land is controlled via lease or fee simple ownership (or in final negotiations thereof) by EDFR. The project site is south of the Tehachapi Mountains on lands that gradually slope downward from the northwest to the southeast. It is approximately 52 miles southeast of the city of Bakersfield, 19 miles south of the city of Tehachapi, 8 miles northwest of the community of Rosamond, and 2 miles north of the community of Willow Springs. Other communities in the vicinity of the project site include Mojave in Kern County and the cities of Lancaster, Palmdale, and Neenach in Los Angeles County, which are roughly 12 miles northeast, 17 miles southeast, 24 miles southeast, and 18 miles southwest of the project, respectively. Edwards Air Force Base is 22 miles east of the project's eastern boundary.

The project site is approximately 12 miles southwest of State Route (SR-) 58 and approximately 34 miles east of Interstate (I-) 5. SR-14 (Antelope Valley Freeway) is approximately 7 miles to the east of the site, and SR-138 (West Avenue D) is approximately 9 miles to the south in Los Angeles County. The project site is generally bounded by Favorito Avenue to the south, Champagne Avenue to the north, 110th Street West to the west, and 80th Street West to the east. The project site is bisected by Tehachapi Willow Springs Road.

The Bullhead solar field can be found within the Willow Springs, California, U.S. Geological Survey 7.5-minute topographic quadrangle map (quad). Rosamond Gen-tie Options 1, 2, and 3 are in the Willow Springs and Little Buttes quads; and Whirlwind Gen-tie Option 1 is in the Willow Springs and Tylerhorse Canyon quads. Proposed access roads that would be used to access the site fall within the Willow Springs and Little Buttes quads (see Figure 1-3 for the archaeological study area overlaid on USGS topographic maps). This area of the County is recognized by the National Renewable Energy Laboratory as having solar and wind resources that are suitable for renewable energy development. The proposed project is also in an area of low population density and traversed by a network of dirt roads.

1.1.1 Purpose of the Study

This study was prepared to support the preparation of an environmental impact report for the project. It summarizes the results of the Phase II testing and evaluation of archaeological resources within the project's archaeological study area. The archaeological study area consists of the Bullhead solar field, a 50-foot (15.2-meter) corridor surrounding proposed access routes, and a 125-foot (38-meter) corridor around proposed gen-tie routes. It encompasses all areas where surface and subsurface activities are anticipated as part of the project. Since the initial cultural resources analyses in 2021, the Bullhead site plan (Bullhead solar field, gen-tie routes, and access routes) have been refined to a smaller footprint. This report reflects the current May 2022 site boundary. Table 1-1 defines the terms used to describe specific geographic areas for this study and their current acreages. It should be noted as part of these analyses, ICF cultural resources personnel arranged a records search through the California Historical Resources Inventory System at the Southern San Joaquin Valley Information Center (SSJVIC). This geographic area defined for the records search consisted of the originally larger proposed project site and a 0.5-mile buffer. The records search area remains static; a new records search was not conducted for the smaller, updated site plan as its footprint is completely within the previously conducted records search area.

Table 1-1. Study Areas Defined for the Project

Area	Delineation	Purpose	Original Acreage	Current Acreage
Records search area	Originally proposed project site and a 0.5-mile buffer	The geographic area submitted to SSJVIC to complete the records search	28,667.8	Does not change
Archaeological study area	Bullhead solar field, a 50-foot corridor surrounding proposed access routes, 125-foot corridor around proposed gen-tie routes	The geographic area in which the project may have the potential to impact archaeological resources	3,487.3	1,734.9

As stated above, this report reviews potential impacts on identified cultural resources and proposes management recommendations for those in accordance with the California Environmental Quality Act (CEQA; California Public Resources Code [PRC] § 21000 *et seq*., as amended) and implementing guidelines (California Code of Regulations [CCR], Title 14 § 15000 et. seq.) and supports the preparation of an environmental impact report for the project.

Staff at the SSJVIC conducted a cultural resources record search of the defined records search area for the project, as defined in Table 1-1 above. The SSJVIC provided the results to ICF on March 1, 2021. The record search results indicated that a total of 84 cultural studies have been conducted within the records search area, 44 of which included a portion of the archaeological study area. Additionally, the results indicated that 250 previously recorded resources are within the records search area; 16 of these are archaeological resources which intersect the archaeological study area. Of the 16 resources, 9 were previously recorded as archaeological sites and 7 as isolates.

Qualified archaeologists conducted a pedestrian survey of approximately 2,516.0 acres between June 1–June 4, June 7–June 11, and July 6–July 8, 2021, which was based on the original larger project footprint. Portions of the archaeological study area were able to be excluded from the archaeological survey as they were either recently surveyed and evaluated as part of the BigBeau and Valentine solar projects, or were part of the of Whirlwind Gen-tie Option 1 which would collocate on a second circuit of the existing Antelope Valley Transmission Line corridor (see Figure

1-1). During the archaeological survey effort, 27 newly identified archaeological sites and 51 new identified isolates were recorded in the current archaeological study area. The majority of the newly recorded archaeological resources are prehistoric lithic reduction sites, isolated prehistoric lithic flakes, and historic-era trash deposits. The results of the archaeological survey are documented in the Phase I report for the project (ICF 2022).

The Phase I survey identified 34 sites and one multicomponent archaeological and built-environment resource (Willow Springs) within the archaeological study that require evaluation to determine if the resources are eligible for listing on the California Register of Historical Resources (CRHR). During the analysis and pre-field work for the Phase II testing, sites BH-S-114 and BH-S-115 were subsumed into BH-S-110, and an additional resource, BH-S-303, was "upgraded" from an isolate to a site, bringing the total number of resources requiring testing and evaluation to 34 (including Willow Springs). For the current Phase II program, ICF was able to test and evaluate a total of 30 archaeological resources. The remaining four resources are within the proposed gen-tie routes and were not tested during the current Phase II effort. They will require either evaluation or subsurface investigation for identification of potential significant deposits within portions of the sites that intersect the archaeological study area at a later date.

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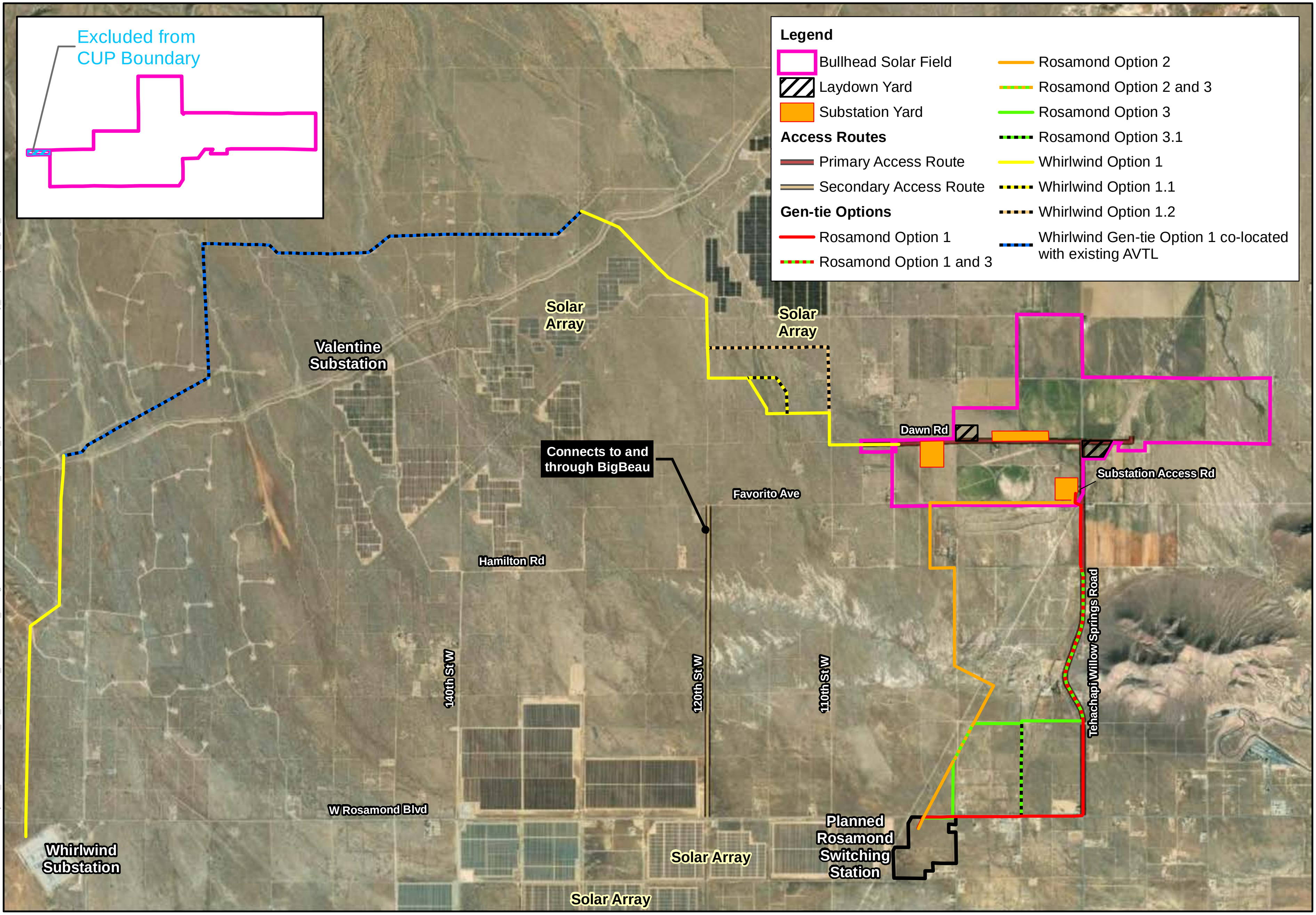

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Source: EDF 2022, USGS-ESRI Imagery 2019

Figure 1-1
Conceptual Site Plan

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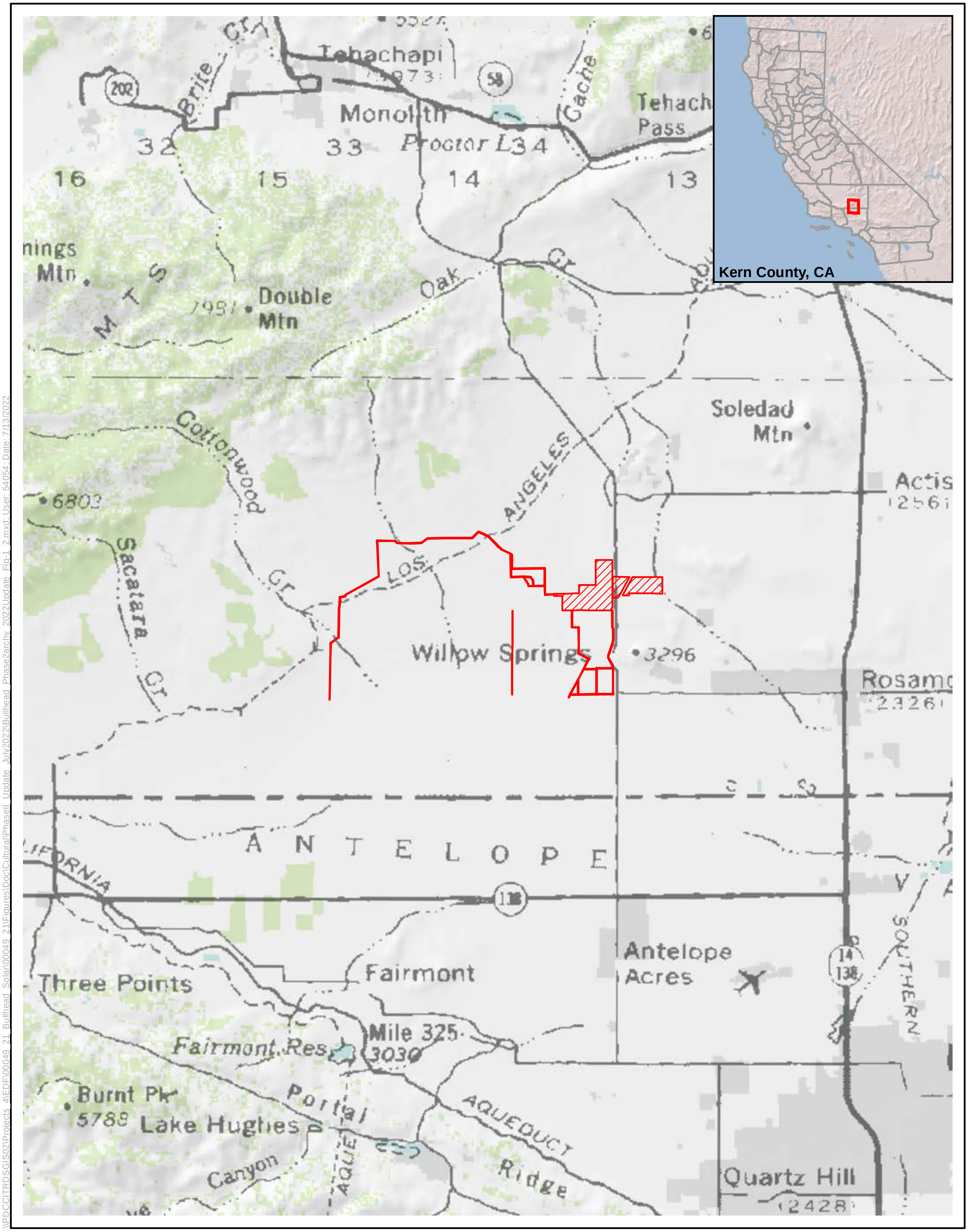

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Source: USGS-ESRI Imagery, 2019

Legend
Archaeological Study Area

Figure 1-2
Project Vicinity

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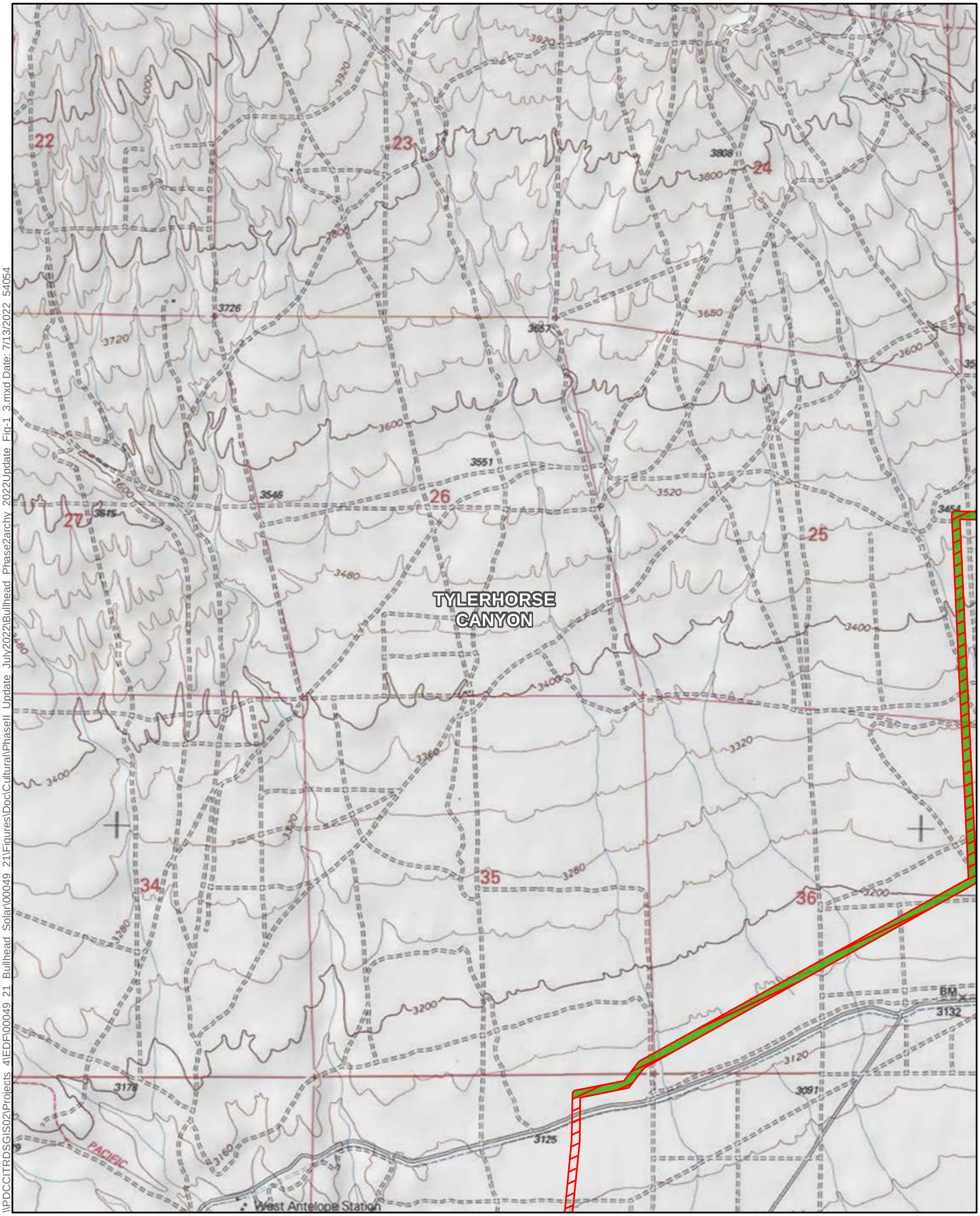

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Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

Archaeological Study Area

Not Surveyed for Archaeology (Previously Surveyed for BigBeau)

USGS Quad Boundary

Index Map

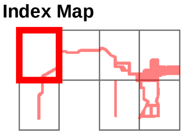

Figure 1-3
Study Location
Sheet 1 of 7

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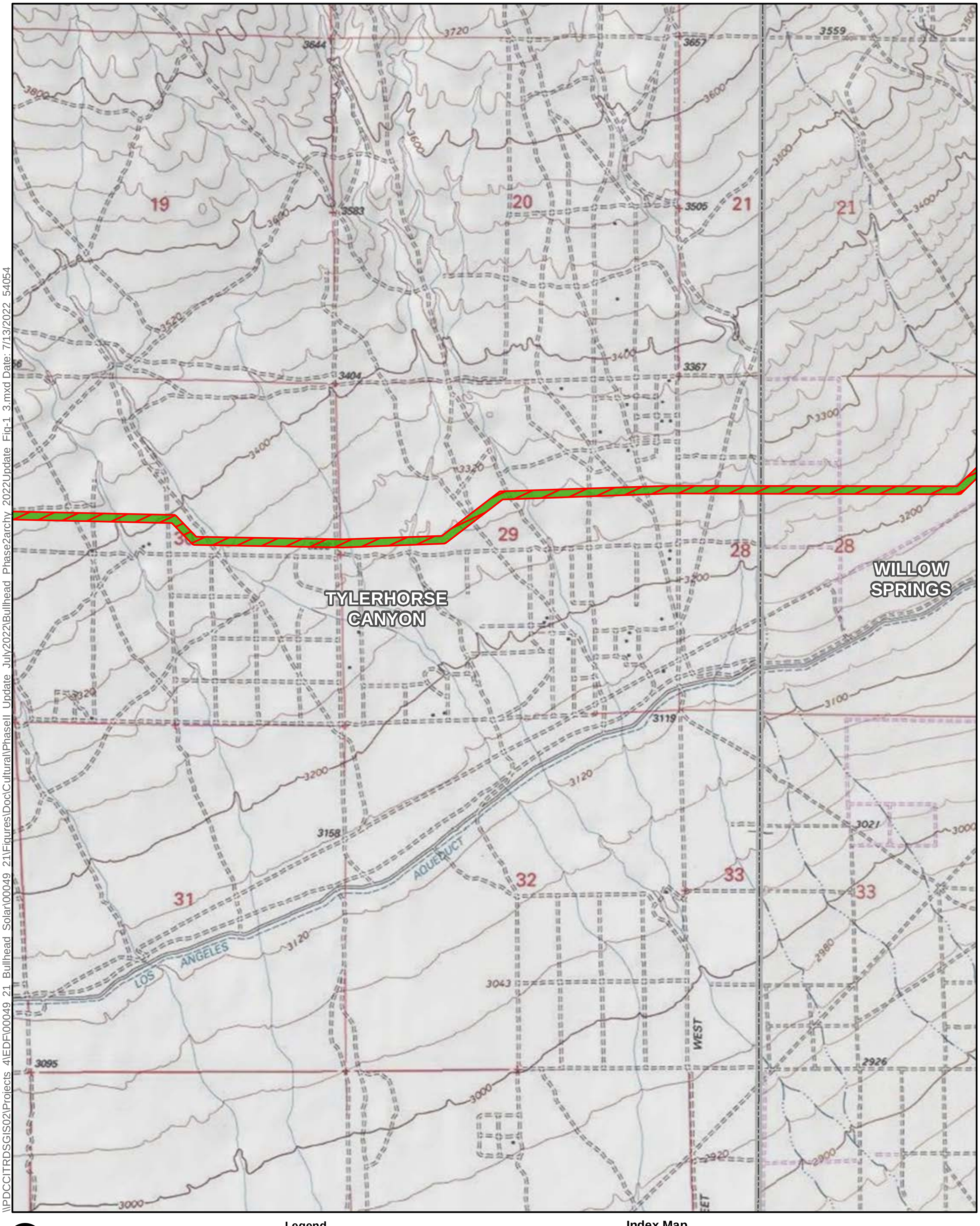

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Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

- Archaeological Study Area
- Not Surveyed for Archaeology (Previously Surveyed for BigBeau)
- USGS Quad Boundary

Index Map

Figure 1-3
Study Location
Sheet 2 of 7

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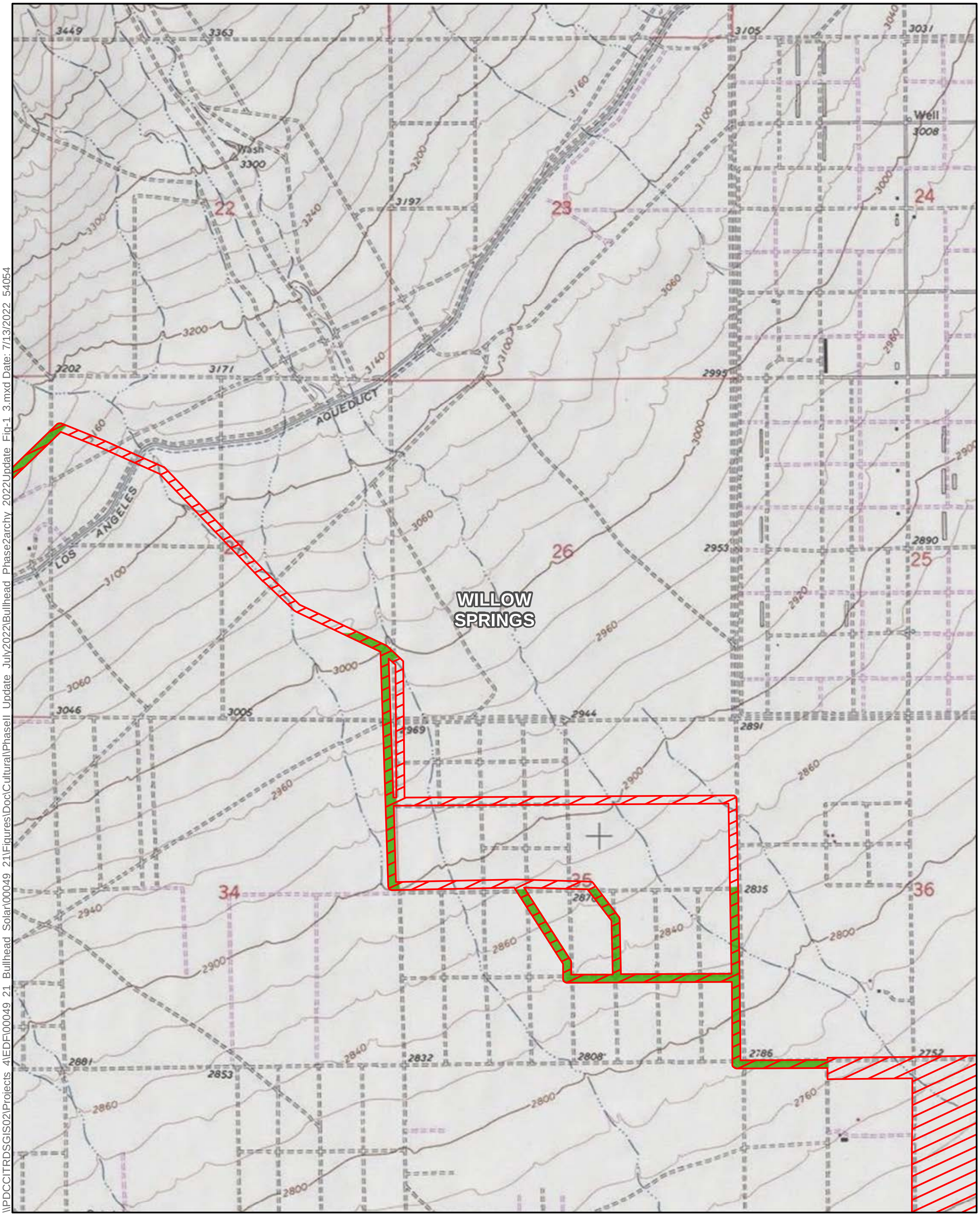

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Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

- Archaeological Study Area
- Not Surveyed for Archaeology (Previously Surveyed for BigBeau)
- USGS Quad Boundary

Index Map

Figure 1-3
Study Location
Sheet 3 of 7

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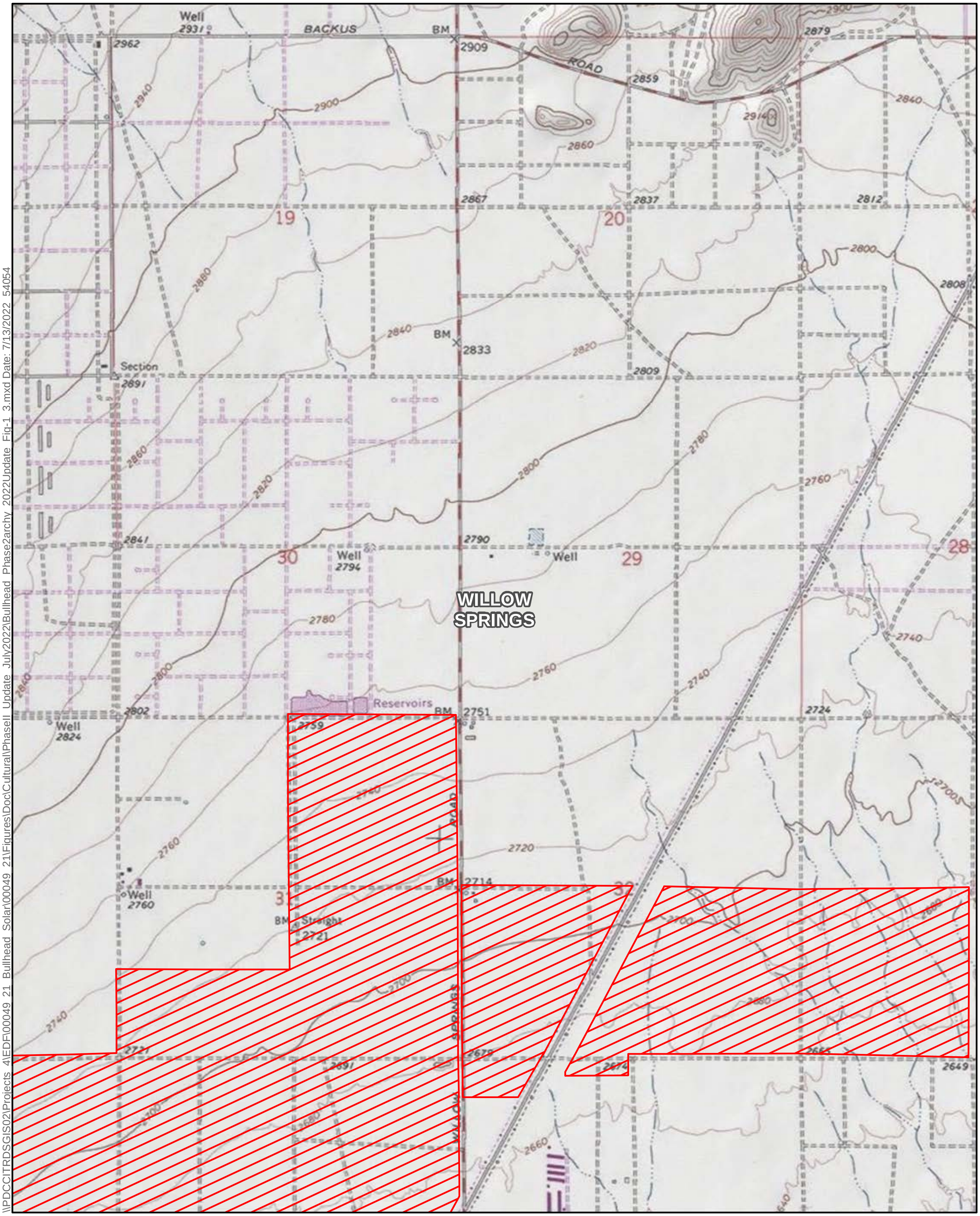

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Archaeological Study Area

USGS Quad Boundary

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Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Index Map

Figure 1-3
Study Location
Sheet 4 of 7

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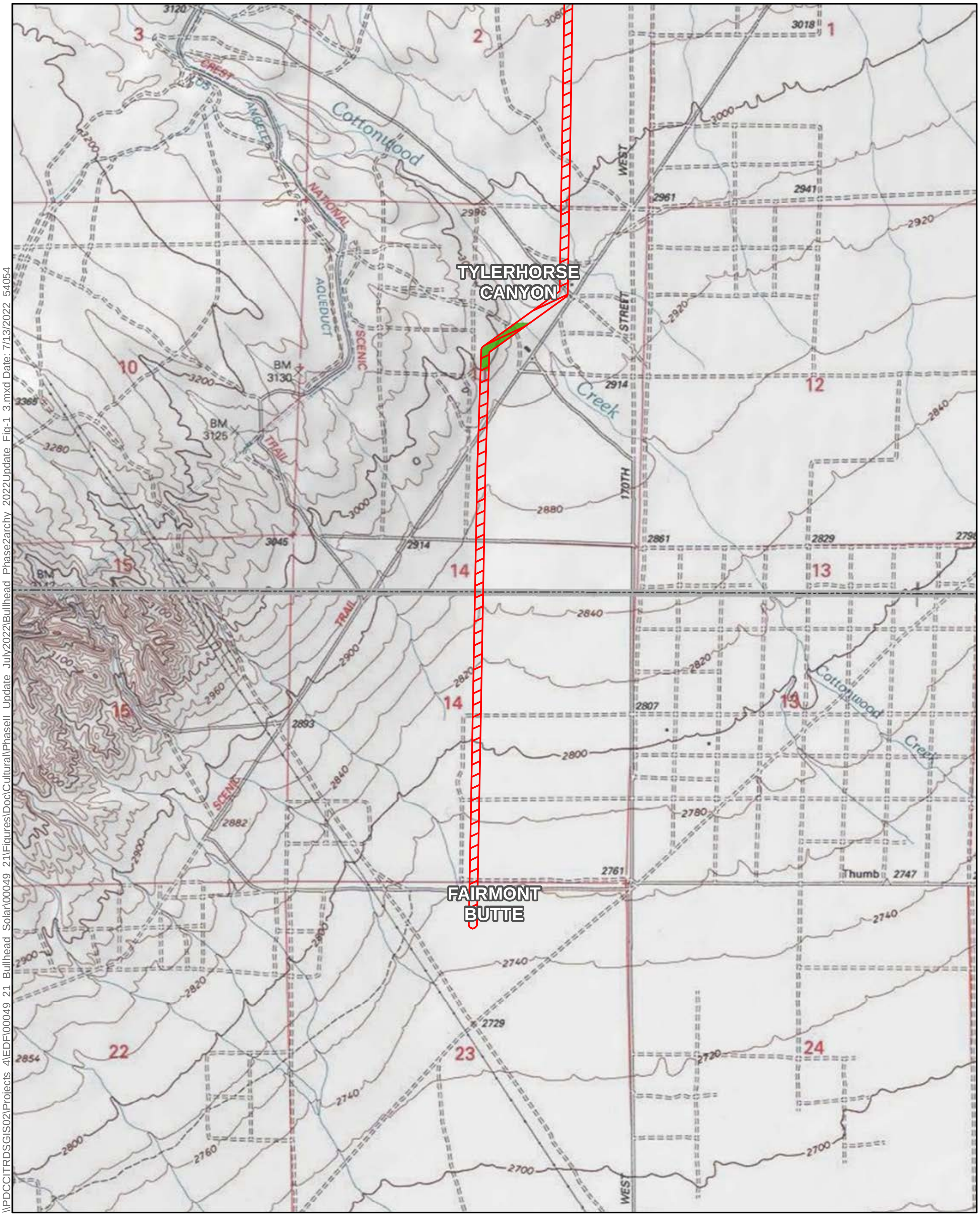

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Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

Archaeological Study Area

Not Surveyed for Archaeology (Previously Surveyed for BigBeau)

USGS Quad Boundary

Index Map

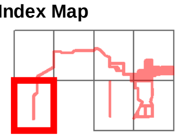

Figure 1-3
Study Location
Sheet 5 of 7

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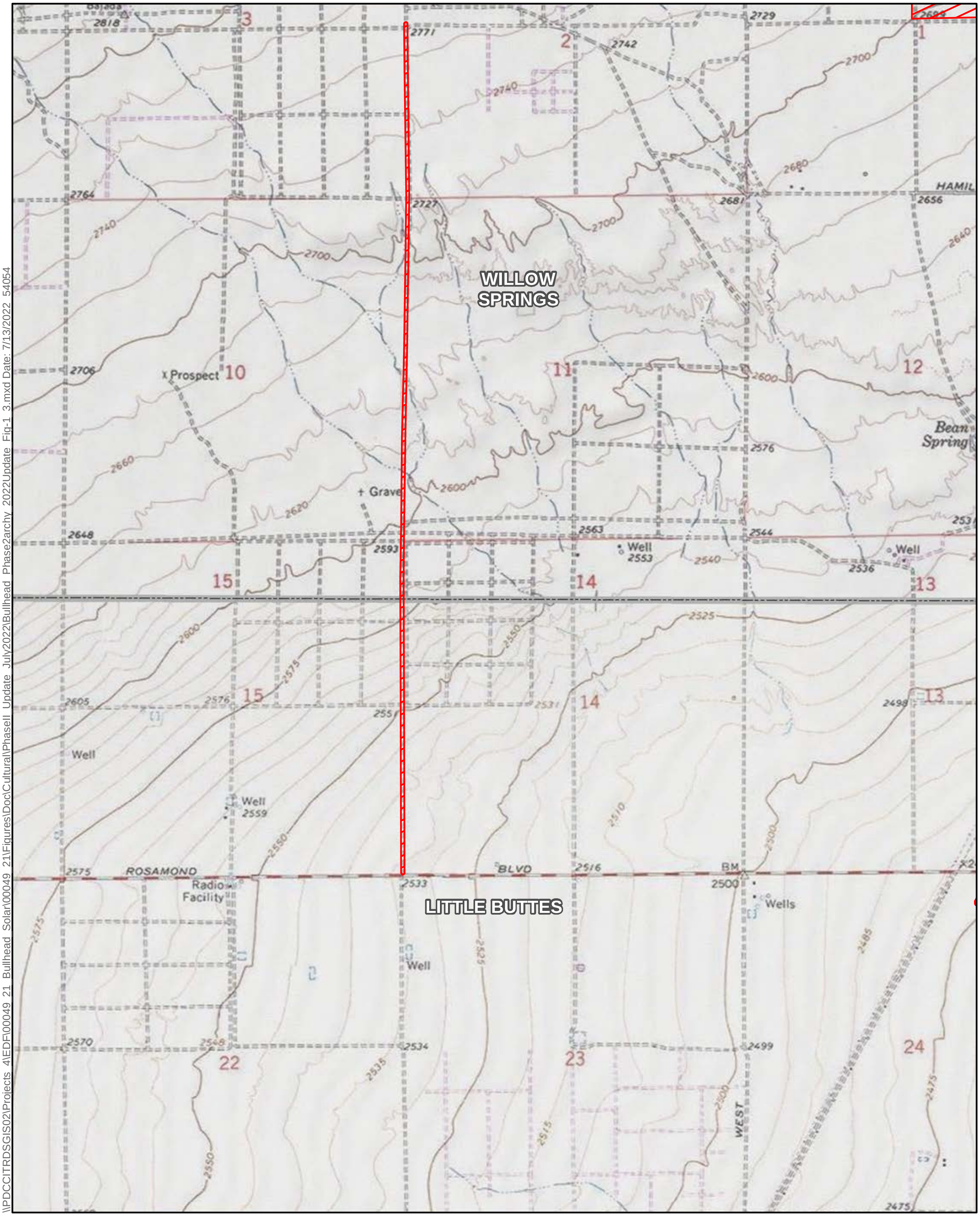

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Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

Archaeological Study Area

USGS Quad Boundary

Index Map

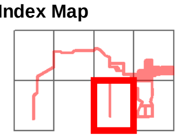

Figure 1-3
Study Location
Sheet 6 of 7

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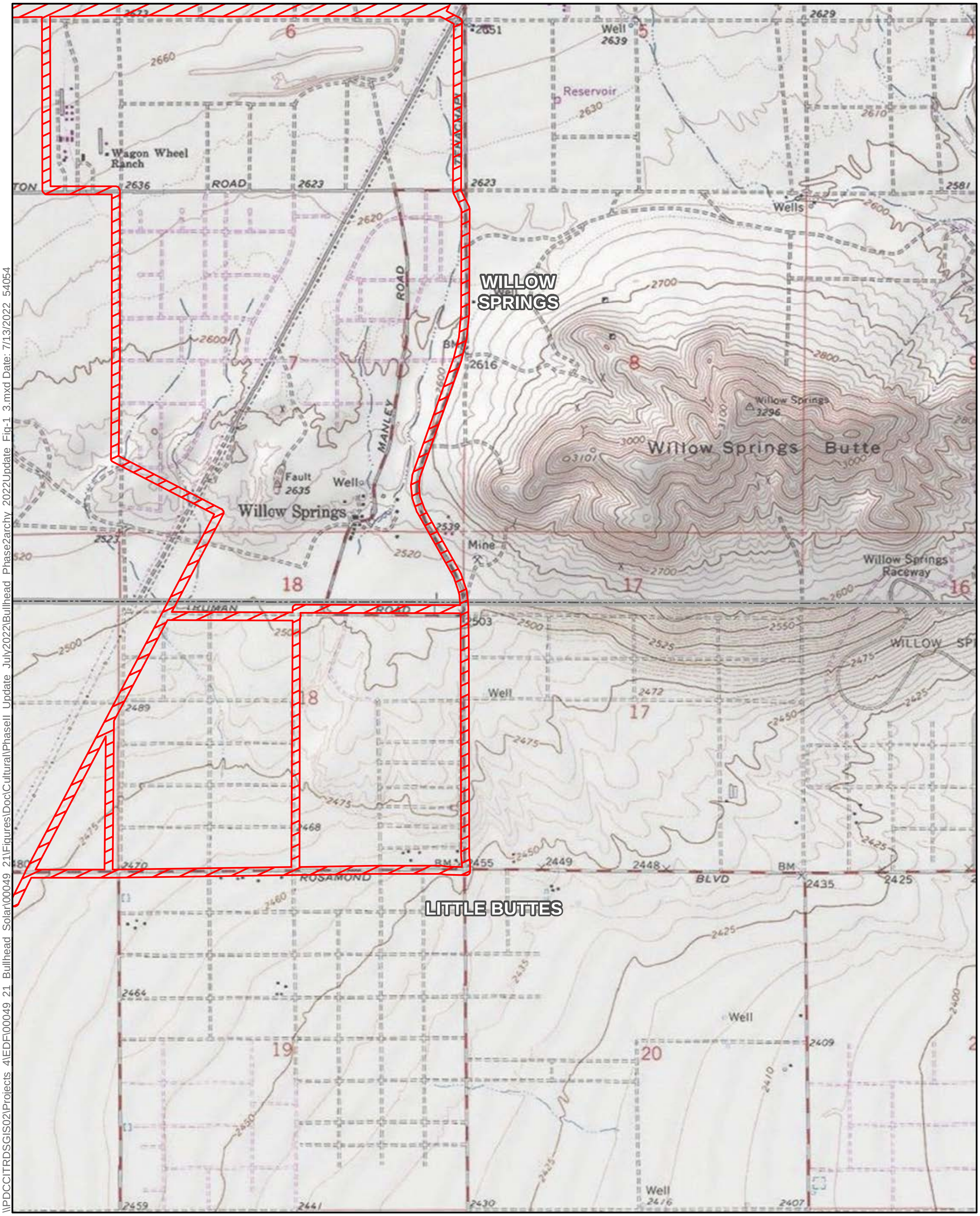

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Source: USGS Topo Map 7.5-minute Tylerhorse Canyon, Willow Springs, Fairmont Butte, and Little Buttes Quadrangles

Legend

Archaeological Study Area

USGS Quad Boundary

Index Map

Figure 1-3
Study Location
Sheet 7 of 7

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Chapter 2
Project Description

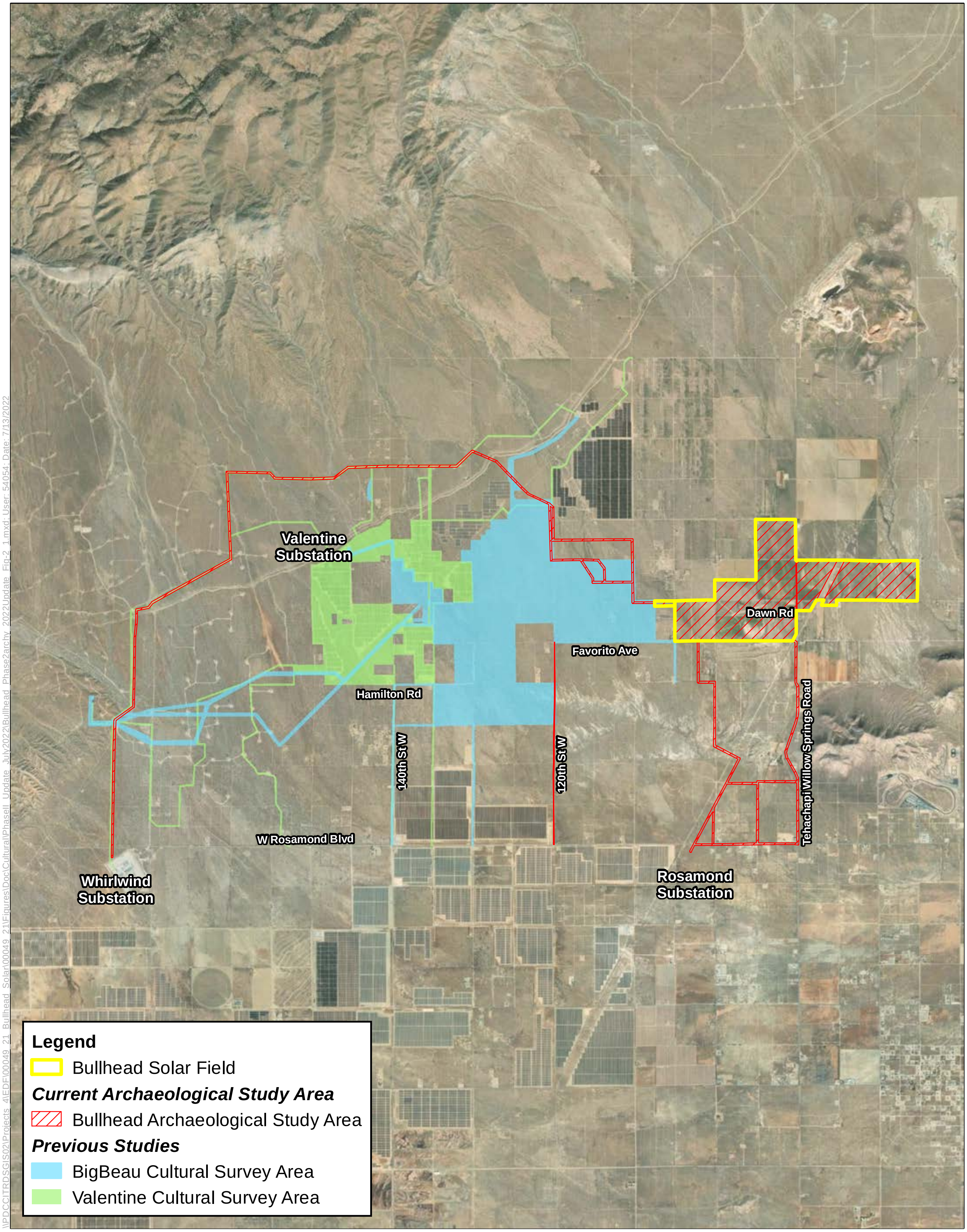
EDFR proposes the project to develop up to 270 MW (alternating current or "AC") of solar PV capacity derived from tracker technology and up to 270 MW of battery storage. The project includes solar development with associated PV panels, inverters, converters, generators, foundations, transformers, and preferred and optional generation-tie (gen-tie) routes to the Rosamond and Whirlwind Substations, only one of which would be constructed. The project also includes laydown yards, a meteorological station, a microwave/communication tower, and a substation.

A boundary for the Bullhead solar field has been defined that encompasses approximately 1,359.5 acres of private land (see Bullhead Solar Field on Figure 1-1 in previous chapter). Should the County Board of Supervisors approve the project, the County would issue Conditional Use Permits (CUPs) and other required approvals on land proposed for development of the solar facilities. The portion of the project subject to the CUPs is 1,349.3 acres; approximately 10 acres are excluded from the CUP boundary, but are included in the solar field boundary for purposes of environmental analysis. Secondary access to the Bullhead site is provided via 120th Street West through the approved and adjacent BigBeau Solar Project (BigBeau). Approximately 422.4 acres of land permitted in connection with BigBeau will be developed around the same time as the proposed project, and those facilities will use the same interconnection infrastructure as the proposed project. The County Board of Supervisors approved BigBeau and certified an EIR for the project in June 2020. The environmental effects of developing on those lands were evaluated in the BigBeau EIR (SCH # 2019071059), which is hereby incorporated by reference. EDFR will comply with all mitigation measures and conditions of approval applicable to BigBeau for any development those lands.

As shown on Figure 1-1 in the previous chapter, the Bullhead solar field consists of a solar array area with three locations under consideration for the development of a substation and BESS. CUPs are required for the solar generation facilities (e.g., the panels) and associated generation equipment (i.e., inverters, substation, and batteries), as well as the communications tower. Therefore, these facilities will be located within the CUP boundary. Several project components do not require CUPs and would extend beyond the Bullhead solar field boundary, but would be entirely within the archaeological and built-environment study areas. These components include access roads and gen-tie power lines (both collection and transmission). Figure 1-1 (in previous chapter) also shows the project components.

EDFR is committed to creating a state-of-the-art solar energy project that would be constructed in a manner that minimizes environmental impacts to the greatest extent feasible. The proposed project includes four options for gen-tie routes, including two deviations to one option and one deviation to another. Only one route would be constructed. Three project optional gen-tie routes—Rosamond Gen-tie Options 1, 2, and 3, including one deviation identified as Rosamond Gen-tie Option 3.1—would travel south from the project boundary and connect to the Rosamond Switching Station. The Rosamond Switching Station is planned to be constructed by Los Angeles Department of Water and Power (LADWP) by December 2025. One optional project gen-tie route—Whirlwind Gen-tie Option 1, including two deviation routes identified as Whirlwind Gen-tie Option 1.1 and Whirlwind Gen-tie Option 1.2—would cross underneath Southern California Edison's (SCE's) Tehachapi Renewable Transmission Project to the east of the project site and connect to the existing Whirlwind Substation. SCE's Tehachapi Renewable Transmission Project 220/500-kilovolt (kV) corridor travels through

Whirlwind Gen-tie Option 1 and connects SCE's Vincent Substation with SCE's Windhub Substation to the south and north of the project site, respectively. Many of the lands surrounding the site have either been approved for, or are in the planning stages of, development for solar or wind energy.



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Source: ICF, ESRI Basemaps (2019)

Figure 2-1
Aerial Figure

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Chapter 3
Regulatory Setting

3.1 California Environmental Quality Act and Cultural Resources

CEQA requires public agencies to evaluate the implications of their project(s) on the environment. It includes significant historical resources as part of the environment. Public agencies must treat any cultural resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant (CCR Title 14 § 15064.5). A *historical resource* is considered significant if it meets the definition of *historical resource* or *unique archaeological resource*, as defined below.

3.1.1 Historical Resources

The term *historical resource* includes, but is not limited to, any object, building, structure, site, area, place, record, or manuscript that is significant historically or archaeologically or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California (PRC § 5020.1(j)). Historical resources may be designated as such through three different processes.

1. Official designation or recognition by a local government pursuant to local ordinance or resolution (PRC § 5020.1(k))
2. A local survey conducted pursuant to PRC Section 5024.1(g)
3. Listing in, or eligibility for listing in, the NRHP (PRC § 5024.1(d)(1))

The process for identifying historical resources is typically accomplished by applying the criteria for listing in the CRHR (CCR Title 14 § 4852), which state that a historical resource must be significant at the local, state, or national level under one or more of the following four criteria:

1. It is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.
2. It is associated with the lives of persons important in our past.
3. It embodies the distinctive characteristics of a type, period, region, or method of construction; represents the work of a master; or possesses high artistic values.
4. It has yielded, or may be likely to yield, information important in prehistory or history.

To be considered a historical resource for the purpose of CEQA, the resource must also have *integrity*, which is the authenticity of a resource's physical identity, as evidenced by the survival of characteristics that existed during the resource's period of significance. Resources, therefore, must retain enough of their historic character or appearance to be recognizable as historical resources and convey the reasons for their significance. Integrity is evaluated with regard to the retention of location, design, setting, materials, workmanship, feeling, and association. It must also be judged with reference to the particular criteria under which a resource is eligible for listing in the CRHR (CCR Title 14 § 4852(c)).

3.1.2 Unique Archaeological Resources

A *unique archaeological resource* is defined in PRC Section 21083.2 as an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

- Contains information needed to answer important scientific research questions for which there is a demonstrable public interest.
- Has a special and particular quality, such as being the oldest of its type or the best available example of its type.
- Is directly associated with a scientifically recognized important prehistoric or historic event or person.

In most situations, resources that meet the definition of a unique archaeological resource also meet the definition of historical resource. As a result, it is current professional practice to evaluate cultural resources for significance according to their eligibility for listing in the CRHR. For the purposes of this CEQA cultural resources study, a resource is considered significant if it meets the CRHR eligibility (significance and integrity) criteria. Individual resource assessments of eligibility are provided in this report.

Even without a formal determination of significance and nomination for listing in the CRHR, the lead agency can determine that a resource is potentially eligible for such listing to aid in determining whether a significant impact would occur. The fact that a resource is not listed in the CRHR, or has not been determined eligible for such listing, or included in a local register of historic resources does not preclude an agency from determining that a resource may be a historical resource for the purposes of CEQA.

3.1.3 Thresholds of Significance

According to CEQA, a project that causes a substantial adverse change in the significance of a historical resource or an archaeological resource has a significant effect on the environment (CCR Title 14 § 15064.5; PRC § 21083.2). CEQA defines a *substantial adverse change* as (CCR Title 14 § 15064.5(b)):

A. Physical demolition, destruction, relocation, or alteration of a resource or its immediate surroundings such that the significance of the resource would be materially impaired; or

B. Demolition or material alteration in an adverse manner of the physical characteristics of a historical resource that convey its historical significance and justify its inclusion in, or eligibility for inclusion in, the CRHR; or

C. Demolition or material alteration in an adverse manner of the physical characteristics that account for its inclusion in a local register of historical resources pursuant to PRC Section 5020.1(k) or its identification in a historical resource survey meeting the requirements of PRC Section 5024.1(g), unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or

D. Demolition or material alteration in an adverse manner of the physical characteristics of a historical resource that convey its historical significance and justify its eligibility for inclusion in the CRHR, as determined by the lead agency.

PRC Section 5097.5 prohibits excavation or removal of any “vertebrate paleontological site […] or any other archaeological, paleontological or historical feature situated on public lands, except with express permission of the public agency having jurisdiction over such lands.” *Public lands* are defined to include lands owned by or under the jurisdiction of the state or any city, county, district, authority, or public corporation or any agency thereof. PRC Section 5097.5 states that any unauthorized disturbance or removal of archaeological, historical, or paleontological materials or sites located on public lands is a misdemeanor.

3.1.4 Public Resources Code and Health and Safety Code

Provisions for the treatment of human remains can be found in the California PRC. These provisions, as detailed in PRC Sections 5097.9 through 5097.994, explain the actions to be taken when Native American remains are found. Section 7050.5 of the California Health and Safety Code states that anyone who knowingly disinters, disturbs, or willfully removes any human remains in or from any location, other than a cemetery, without the authority of law is guilty of a misdemeanor, except in those circumstances described in PRC Section 5097.99. Under these provisions, if a county coroner determines that remains found during excavation or disturbance of land are Native American, the coroner must contact the Native American Heritage Commission (NAHC) within 48 hours. The NAHC must determine and notify a most likely descendant, who must complete inspection of the site within 24 hours of notification and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials.

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Chapter 4
Environmental Setting

4.1 Natural Setting

The study area is at the northwestern edge of the Antelope Valley, southeast of the Tehachapi Mountain foothills, and approximately 11 miles west of the Rosamond Hills. The archaeological study area does not include any incorporated municipalities, but Rosamond Gen-tie Option 1 traverses the western edge of the community of Willow Springs. The community of Rosamond is approximately 7 miles to the east and slightly south. The largely undeveloped study area is crossed by numerous unpaved roads and a recently constructed transmission line. A major early twentieth-century industrial project, the Los Angeles Aqueduct, intersects with Whirlwind Gen-tie Option 1, which would run overhead of the aqueduct, which is belowground in this area. Some rural residential structures are within the archaeological study area, mostly in the center. Additionally, several of the parcels within the eastern and center of the archaeological study area previously have been subject to intensive agricultural production, resulting in moderate surface disturbances and impacts on cultural resources.

Rosamond Lake, a large, dry, Pleistocene-age lakebed, is approximately 11 miles southeast of the archaeological study area. This lakebed is a remnant of ancient Lake Thompson, which receded approximately 8,000 years before present (B.P.), after the waning of the glacial climate in western North America. The project area is located adjacent to and on the banks of this former Pleistocene lake. Lake Thompson included modern dry lakes Rosamond, Buckhorn, and Rogers. In the Pleistocene era, the lake was 710 meters above sea level and covered 950 square kilometers, but it desiccated in the Holocene.

The study area includes 11 vegetation communities/land cover types, of which the following are dominant: creosote bush scrub, active/inactive agriculture, Joshua tree woodland, rubber rabbitbrush scrub, desert saltbush scrub, and disturbed habitat. These communities include creosote bush, white bursage, buckwheat, Joshua trees, saltbush scrub, and other scrub species. Saltbush scrub, with occasional areas of creosote bush scrub, forms the dominant vegetation in the archaeological study area, which is within an alluvial plain with mountains to the north and south. The Antelope Valley is fed by numerous rivers, creeks, and seasonal drainages.

During prehistoric times, the archaeological study area was home to pronghorn antelope, kit fox, jackrabbit, rabbit, squirrels, vole, rats, desert tortoise, iguana, and quail. Lynx, coyote, gray fox, and other animals were found both in the mountains and on the valley floor in the Western Mojave (Mason et al. 2018). During periods when standing water was present, avian species, including ducks, geese, egret, and heron, would likely have been present. Pronghorn antelope and jackrabbits had the potential to provide large amounts of meat as a result of communal hunting using drives and brush corrals. Pronghorn antelope were present in the Antelope Valley grasslands in prehistoric and historic time, but were all but extinct in the valley by the turn of the twentieth century. Jackrabbits are known to be active during the late afternoon and night and spend most daylight hours resting. Resting spots tend not to be reused and are most often located in shade during hot months. In the Mojave Desert, resting spots are sometimes extended into shallow burrows when no other shade is available (Mason et al. 2019). Jackrabbits are reported to be attracted to seasonal water features in the Mojave Desert.

4.1.1 Geology and Soils

Granite-derived alluvium makes up the dominant soil type in the archaeological study area. The study area is in the northwestern portion of the Mojave Desert Geomorphic Province. This portion of the Mojave Desert is defined by block-faulted mountain ranges and intervening valleys with broad alluvial fans along the transition of the ranges and valleys. South of the study area lie the San Gabriel Mountains, consisting of Mesozoic granitic rocks and minor Cenozoic volcanic rocks. The Tehachapi Mountains, consisting of Mesozoic metamorphic and granitic rocks, are north of the study area. Nearby sources of volcanic rock include Rosamond Hills, Gem Hill near Rosamond, Middle Butte, and Willow Springs Mountain, all within 3 miles of the project site, and Soledad Mountain and Fairmont Butte, within 12 miles of the project site. All of these formations would have provided suitable tool stone for prehistoric use. Given the proximity to water, lithic resources, vegetal and animal resources, and the geologic setting of the archaeological study area, it is considered to have high archaeological sensitivity.

The study area is within a broad alluvial fan consisting of recent alluvium that is underlain at depth by Quartz monzonite granitic rocks. The geology of the proposed solar array area consists primarily of young alluvial fan deposits (Qyf) with small areas of undifferentiated surficial deposits (Qsu). Both deposits are of Middle to Late Holocene age (8,000 years B.P. or younger) and estimated to be less than 5 meters thick (Mason et al. 2019). Soil types found in the archaeological study area are listed in order of percentage in Table 4-1 and a geological map can be found in Confidential Appendix A.

Table 4-1. Geologic Formations

Geologic Formation Symbol	Percent of Archaeological Study Area	Geologic Formation Characteristic
Qyf	83	Young alluvial fan deposits
Qsu	6	Undifferentiated surficial deposits, including colluviums, slope wash, talus deposits, and other surface deposits of all ages, from the late to middle Pleistocene era
Qof	6	Old alluvial fan deposits
Qf	4	Alluvial fan deposits
Qw	1	Alluvial wash deposits
Qya	<1	Young alluvial valley deposits
Qvof	<1	Very old alluvial fan deposits
Qoa	<1	Old alluvial valley deposits
Qa	<1	Alluvial valley deposits
Qyw	<1	Young Alluvial Wash Deposits
Tv	<1	Tertiary age formations of volcanic origin

Soils are composed primarily of Cajon loamy sands and DeStazo sandy loams, with lesser areas of other similar soil types. The geology of the study area consists primarily of Quaternary alluvium. Aeolian processes generated by the area's frequently high winds also shaped the landscape.

Most of the soils west of Willow Springs consist of alluvial fans and terraces. These soils are very deep and well drained, derived from granitic rock, and dispersed alluvially. These soils comprise the Adelanto Association of soils, which have a surface layer of brown to light-brown loamy sand to gravelly sandy loam. Below this layer is a light-brown to reddish-brown sandy loam and heavy sandy loam. Certain areas contain gravels throughout the matrices (USDA Soil Conservation Service 1970).

Soils in the southern part of the archaeological study area can be placed in the Sunrise Association of soils, which include fairly level, moderately well-draining soils that have a light-brown to yellowish-white loamy fine sand to loam surface layer. A white caliche layer is generally 10 to 39 inches below the top layer of loamy sands. *Caliche* is a crust or layer of hard subsoil that forms in or on desert soils. This association was formed from granitic rock and dispersed as alluvium (USDA Soil Conservation Service 1970).

Caliche is noted as being as thick as 2 feet in places around Rosamond, and many caliche strips mark the traces of faults or run along lakes, such as Rosamond Lake (Roberts 1951). Caliche forms from calcareous water combined with constant, rapid surface evaporation in a dry region (Blake 1902; Bachman and Machette 1977).

4.2 Prehistoric Setting

Prehistoric occupation of the western Mojave Desert follows a timeline similar to that of the Los Angeles basin and coast, although there is a strong influence from the western Great Basin, of which the Mojave Desert is a part. In addition, there are noticeable differences between the Los Angeles basin and Mojave Desert, such as adaptation due to climate and landscape changes that occurred over time. During the late Pleistocene and early Holocene (12,000–10,000 B.P.), sea levels rose, flooding southern California coastal river valleys and forming lagoons and estuaries. At the same time, the extensive pluvial lakes that occupied the basins in the interior regions of the basin-and-range province, including the Mojave Desert, began to dry. The Colorado River alternately drained into the Salton Basin and the Gulf of California, causing Lake Cahuilla to fill and evaporate numerous times. A warm, dry trend during the Holocene period further evaporated pluvial lakes and raised surface sea temperatures along the coast. Although warmer overall, wet and dry climatic trends fluctuated during the Holocene period, causing the formation of small, ephemeral lakes in the interior basins after periods of relative drought. Modern desert flora and fauna were in place during the early Holocene and well established by the middle Holocene. Presented below is a summary of widely accepted archaeological interpretations regarding prehistoric human habitation of the Mojave Desert and wider overall region (Sutton 1996).

4.2.1 Late Pleistocene (Circa > 12,000 B.P.)

Over the last century, a relatively small number of archaeological finds in southern California have been attributed to the Late Pleistocene period. Cairn burials, cleared circles, basic tools, and rock alignments in the Colorado Desert were hypothesized to date from 50,000 to 12,000 B.P., and controversial cut marks were reported on mammoth bones (Miller et al. 1991). Three Mojave Desert sites—Calico Hills (Simpson 1980), China Lake (Davis 1982), and Manix Lake (Simpson 1958, 1960, 1964)—were or are purported to have cultural materials that were more than 10,000 years old. The primary evidence for claims of great antiquity at these sites and others in southern California is the similarity of rudimentary “tools” to Paleolithic tools from the Old World, the relative patination and/or embeddedness of the artifacts, the questionable radiocarbon dates, and the equally questionable associations of "tools" and Pleistocene fauna (Bamforth and Dorn 1988; Payen 1982). Claims of antiquity have been further eroded by more reliable dating methods (Taylor et al. 1985). Thus far, claims for occupation of the California desert area prior to about 12,000 B.P. are unsubstantiated.

4.2.2 Early Holocene (Circa 12,000–7000 B.P.)

The Paleoindian period (circa 12,000–10,000 B.P.) is represented in the general project vicinity by widely distributed fluted (e.g., Clovis) points, primarily from the central Mojave Desert (Sutton 1996). Early desert populations were thought to have hunted primarily large fauna along the shores of pluvial lakes; these populations also used lacustrine resources to some extent (Erlandson 1994; Warren and Crabtree 1986). In the latter part of the Early Holocene (circa 10,000–7000 B.P.), the adaptive strategy continued in a similar fashion, consisting of generalized hunting and gathering with a focus on wetland resources. Sites from this period, known as the *Lake Mohave period*, provided a tool kit containing crescents, knives, scrapers, gravers, and perforators, as well as temporally diagnostic Lake Mohave and Silver Lake projectile points. Early research efforts in the Mojave Desert described Lake Mohave period sites on remnant Pleistocene geological surfaces adjacent to ancient lakes and streams, creating an obvious interpretative bias toward a lacustrine focus and big-game hunting (Basgall 1993). More recent work has determined that these sites occur in a wide variety of settings, with faunal materials dominated by small and medium-size animal remains (Basgall et al. 1994). Early descriptions of desert lakes, running streams, more productive terrestrial vegetation, and abundant fauna are largely exaggerated (Sutton 1996). Although there may have been more effective moisture than today, the cyclic hydrologic pattern was established by about 10,000–8500 B.P. (Basgall et al. 1994). Sites at lakeshores also may be indicative of diverse ecological adaptation, providing access to terrestrial, shoreline, and lake ecotones (Sutton 1996).

4.2.3 Middle Holocene/Altithermal (Circa 7000–4000 B.P.)

The Middle Holocene, or Altithermal, also known in the U.S. southwest/west as the Pinto period, is viewed as a time of extensive environmental and cultural change in southern California. Ground-stone plant-processing technologies appear in the archaeological record, hunting and fishing technologies diversified, and resource bases changed (Moratto 1984). This period of marked aridity was thought to have caused significant changes in settlement and subsistence practices and even abandonment of some desert areas (Wallace 1962), but more recent evidence points to considerable local, regional, and temporal variability in mid-Holocene thermal maxima throughout southern California (Carbone 1991; Hall 1992). In the Mojave Desert, environment as a cause of cultural change has been de-emphasized (McGuire and Hall 1988) because modern floral and faunal populations have persisted since the end of the Pleistocene. Occupation of the Mojave Desert was continuous, but perhaps erratic (Sutton 1996). The sites that do occur in the Mojave Desert during this time have been identified along dry lake shores or streambeds (Warren 1984; Warren and Crabtree 1986); with the exception of the Stahl Site (Schroth 1994), they tend to be surface manifestations.

Pinto projectile points, as well as a flake industry similar to that of the Lake Mohave tool complex, were considered diagnostic artifact types (Warren 1984). However, more recent excavation data from the Pinto basin and Stahl sites indicate that Pinto points may not be useful as a chronometric index, except as generalized dart points (circa 10,000–2000 B.P.) (Schroth 1994). Early archaeological evidence pointed to a primary focus on large mammals and little use of plant resources such as small, hard seeds (Warren and Crabtree 1986). Milling stones occur infrequently at Mojave Desert sites, which contain material remains typical of temporary camps, consistent with a subsistence strategy of diversified hunting and gathering (Sutton 1996; Wallace 1962; Warren 1984). Recent excavation data illustrate dietary diversity, probable use of hammerstones to process plant resources, and more complete processing of animals (McGuire and Hall 1988; Sutton 1993; Sutton et al. 2007). Faunal remains from Pinto period sites include artiodactyls, reptiles, lagomorphs, and freshwater mussels (Sutton 1996). Warren (1984) proposed that a high degree of mobility would have ensured flexibility, allowing populations to respond to seasonal climatic changes. Subsequent studies at Fort Irwin have illustrated that the exploitation of peripheral and fertile areas provided a subsistence base broad enough to ensure the availability of resources during both dry and wet periods (McGuire and Hall 1988).

4.2.4 Late Holocene (Circa 4000 B.P.–Contact)

During the Late Holocene, technology and subsistence practices continued to diversify, and economic and population expansion, along with resource intensification, occurred in most areas of southern California (McDonald 1992; Sutton 1996; Sutton et al. 2007). The role of the environment with respect to cultural changes remains an issue of debate.

During the Gypsum period (4000–1500 B.P.) of the Middle and Late Holocene, a minor lacustrine phase called the *little pluvial* is evidenced by multiple lacustrine episodes that may have formed more often and endured longer (Enzel et al. 1992). There may also have been an increase in groundwater and minor expansion of the riparian zones surrounding springs (McGuire and Hall 1988). Warren (1984; Warren and Crabtree 1986) noted that these changes may have enabled development of new patterns of subsistence and settlement, which persisted through subsequent drier times. The diversity in site types and artifact assemblages illustrates exploitation of a wide range of resources within a generalized mobile subsistence strategy. Large mammals may have continued to comprise a major portion of the population’s diet (McGuire and Hall 1988; Warren and Crabtree 1986), but plant food resources increased in importance, as evidenced by the appearance of the mortar and pestle, likely used for processing mesquite pods in the desert (Warren 1984) and acorns in the foothills (Moratto 1984). Site assemblages during the Gypsum period are characterized by flaked-stone tools, bifaces, cores, and debitage, almost exclusively composed of microcrystalline materials, such as jasper and chalcedony. Artifacts typical of this period include medium- to large-stemmed, as well as notched, projectile points (i.e., Gypsum series, Elko series, and Humboldt concave base) that exhibit affinities with Great Basin point types (McGuire and Hall 1988; Warren and Crabtree 1986). Usually, very few projectile points are recovered, and most are “spent,” indicating long retention and use. Bifaces are generally made of local materials, although late-stage bifaces are more often extra-local materials. The large bifacial core is a principal transportable artifact form for tool and flake manufacture. Grinding tools are frequent, but not an abundant site component.

The smaller Rose Spring point, which seems to be related to southwestern point types, appears late in the Gypsum period in the Mojave Desert and is believed to indicate the advent of the bow and arrow (Rogers 1966; Yohe 1998). Split-twig figurines and petroglyphs found in the central Mojave Desert are associated with the appearance of the bow and arrow (Warren 1984) and, together with pit houses and Basketmaker III ceramics found in the eastern Mojave, are indicative of influences from northern Arizona (Warren 1984). Contact with the Pacific Coast is evidenced by the geographically widespread, yet rare, occurrence of shell beads and ornaments in California deserts, Great Basin, and the southwest (Warren 1984). However, some desert sites contain numerous beads, especially in Coachella Valley and Anza Borrego State Park.

During the Rose Spring period, also known as the Saratoga Springs period (1500–800 B.P.), following the introduction of the bow and arrow (circa 1500 B.P.), technological and economic developments in southern California persisted and expanded in the form of Anasazi influences from the east and Yuman (or Patayan) influences from the lower Colorado River Valley (Warren 1984; Yohe 1998). By the end of the Rose Spring period, Anasazi influences had disappeared from the Mojave Desert, replaced by Shoshonean connections. This western expansion of Uto-Aztecan speakers, ancestral to the Luiseño and Gabrielino from the desert areas to the coastal areas, is thought to have occurred sometime between circa 1400 B.P. and 600 B.P. (Moratto 1984). Flaked-stone artifact assemblages closely resemble their predecessors, but Rose Spring, cottonwood triangular, and desert side-notched arrow points appear in the cultural record. Arrow points, milling stones, mortars, pestles, ceramics, obsidian, and other important tool stones and ornamental and ritual objects made of shell, bone, and stone are commonly found at sites dating to this period (Warren and Crabtree 1986; Sutton 1996; Sutton et al. 2007).

The Late Prehistoric period (800 B.P.–contact) began with the decline of Anasazi influences and the continued diversification and expansion of Numic-speaking groups across the Great Basin, Takic-speaking groups into southern California, and Hopi across the southwest (Sutton 1996). The groups that emerged are discussed most easily in terms of linguistic affinities with historical populations. Archaeological correlations are less definitive because all of these groups shared a similar material culture and settlement pattern in the deserts and inland southern California (Warren and Crabtree 1986). Far more late-period sites are obvious in southern California compared with earlier periods. Although this may be due in part to sampling error or depositional processes, it appears that there was a large population influx or increase during this last period of prehistory. Resources were exploited more intensively, populations consolidated, and the range of foraging territory decreased. These changes appear to be widespread throughout California. In the deserts, this theory is evidenced in part by the use of local lithic materials in the manufacture of tools, which show increasing degrees of specialization. In addition, site occupation during this period was lengthier and more regular than previous periods (McGuire and Hall 1988). Desert subsistence continued to focus on hunting and gathering a diverse variety of animal and plant resources, including small mammals (McGuire and Hall 1988). Large, late-prehistoric villages in the general project vicinity include sites in the Antelope Valley, at Oro Grande (Rector et al. 1983), and on Las Flores Ranch, along the Mojave River (de Barros 1990; Smith 1963; Sutton and Schneider 1996).

4.3 Ethnographic Context

The project vicinity extends across the ethnographic traditional use areas of several Native American groups, including the Kitanemuk and Desert Serrano/Vanyume. The southern extent of the ethnographically documented traditional use area for the Kawaiisu is slightly north of the archaeological study area, but is also discussed. Each of these groups represents highly effective, mobile, hunter-gatherer groups loosely organized into small, patrilineal clans. Given their large cultural use areas, these clans often shared boundaries, languages, and natural resources with neighboring tribes. Although largely interrelated, the following discussion addresses highlights from each of these groups.

4.3.1 Kitanemuk

The Kitanemuk, a small group principally in the Tehachapi Mountains, spoke a Serrano language of the Takic family. The Kitanemuk were primarily mountain dwellers who settled along the Tejon Creek; during cooler seasons, they would range into the arid lowlands of the Antelope Valley (Johnson 2016).

Kitanemuk families were organized into patrilineal bands with bilocal residence patterns. Social rankings and prestige systems were well developed. Each village had administrative elites, including a chief, a ceremonial manager, two messengers, and shamans, diviners, and other ritualists (Blackburn and Bean 1978).

The general ecological adaptations and subsistence technology of the Kitanemuk differed little from that of their neighbors to the north and west, although little historical information is available about the group. Some Kitanemuk were apparently assimilated into Missions San Fernando, San Gabriel, and possibly Ventura (San Buenaventura), but many returned to their former homes after the missions were secularized (Johnson 2016). Some were residents during the 1850s at the Sebastian Military Reserve at Tejon and later Fort Tejon and the Tule River Reservation (Blackburn and Bean 1978; Johnson 2016).

4.3.2 Desert Serrano

Spanish explorers to the mountainous areas east of Los Angeles provided the name *Serrano* (meaning “mountaineer” or “highlander”) to the indigenous people they encountered in this region of the Transverse Ranges. However, a group related to the Serrano lived north of the mountainous region for which the Serrano name is derived. This related group, known as the Desert Serrano and referred to as the Vanyume by early ethnographers, occupied a significant portion of the western Mojave Desert, from the San Bernardino Mountains east of Cajon Pass to areas northward and beyond the Mojave River (Kroeber 1925; Sutton and Earle 2017). The eastern boundary nearly extended to the Providence Mountains (Bean and Smith 1978). It should also be noted that some accounts indicate that villages of the Serrano extended into this area as well, reaffirming the relationship between the Desert Serrano and the Serrano proper.

The name *Serrano* is regularly used to describe a group of languages in the Takic family of the Uto-Aztecan stock. Although little linguistic information is available on the Desert Serrano, it is understood that the Desert Serrano spoke a dialect of the Serrano language (Shipley 1978; Bean and Smith 1978; Sutton and Earle 2017). The Serrano were organized into autonomous localized lineages that occupied specific territories. Because settlement was determined by the availability of water, most Desert Serrano lived in small villages situated near water sources, principally the Mojave River. Individual family dwellings consisted of circular, domed structures with willow frames covered in thatched tule (Bean and Smith 1978; Sutton and Earle 2017).

The Desert Serrano were primarily hunters and gatherers. Principal game included deer, mountain sheep, antelope, rabbits, birds, and other small mammals. The primary staples depended on the location of each hamlet, but each supplemented its diet with various other roots, bulbs, and shoots (Sutton and Earle 2017). Early travelers like Jedediah Smith observed that the Desert Serrano processed acorns and pine nuts to make an edible “mush.” The presence of acorns and pine nuts suggests that an active trade network or gathering area was present to have such staples along the Mojave River at the time of his crossing in 1826. Technologically, the Desert Serrano were known to utilize shell, wood, bone, stone, and plant fibers to make a variety of implements (Bean and Smith 1978; Sutton and Earle 2017).

4.3.3 Kawaiisu

The core area of the Kawaiisu was along the western boundary of the Mojave Desert, extending into the Tehachapi and Paiute Mountains. However, the Kawaiisu also incorporated a larger gathering area for resource procurement beyond that of their core area. This expanded boundary included areas as far eastward as the Amargosa River and southward to the Mojave River (Park et al. 1938; Zigmond 1986). The extended procurement area included elevation changes in excess of 7,500 feet, providing even greater natural resource diversity for the Kawaiisu.

Linguistically, the Kawaiisu represent the westernmost branch of the southern Numic division of the Uto-Aztecan language family. Kroeber (1925) and Lamb (1958) suggest that there is sufficient evidence to classify Kawaiisu as its own separate language from the rest of the southern Numic (Miller 1986). Their location along the foothills of the Mojave Desert places the Kawaiisu with non-Numic speakers to the south and north, as well as non-Uto-Aztecan speakers to the west. Such regional language diversity likely factored into Kawaiisu language development.

Kawaiisu winter structures were circular in shape, often made of willow, with vertical forked and transverse poles, and lined with brush and bark or tule matting. Summer structures were flat-roofed, ramada-style structures that provided shade and ventilation for the occupants.

Subsistence for the Kawaiisu was varied, owing to the regional topographic variance of their territory. Floral subsistence included, but was not limited to, juniper, pine, oak), Joshua tree, yucca, wild celery), and mariposa lily . Furthermore, their hunting provided a variety of game, including deer, rodents, rabbits, birds, and insects.

Material culture included juniper bows, twined and coiled basketry, obsidian blades, awls, small stone bowls, flutes made from elderberry wood, and oval and Y-shaped cradles. Clothing consisted of tanned animal skins. Women had pierced ears and tubular nose plugs. Both men and women were commonly tattooed on the hands, arms, and face (Zigmond 1986).

4.4 Historic Period

4.4.1 Spanish Period

After two previous expeditions, the Spanish entered California in 1769 to colonize the region. Military commander Gaspar de Portolá and Franciscan priest Junípero Serra led this contingent. Serra, who would become father-president of the California missions, founded Mission San Diego de Alcalá in July 1869. The following year, Portolá led an overland expedition that traveled north from San Diego in search of Monterey Bay. En route, the Portolá expedition camped along the San Gabriel River, near what would become the first San Gabriel Mission site, and subsequently on the banks of the Los Angeles River in proximity to a Gabrielino village near what is now downtown Los Angeles. One of the travelers, Spanish missionary Father Juan Crespí, named the second site Nuestra Senora de la Reina de Los Angeles de la Porciuncula (Our Lady of the Queen of the Angels of Porciuncula), which would later become the location of the pueblo of Los Angeles (Engelhardt 1927:3; County of Los Angeles 2009).

In southern California, Spanish colonization efforts focused on areas south of the Transverse Ranges; the newcomers made limited forays into the Antelope Valley. The first European exploration of the Antelope Valley took place in 1772, when Captain Pedro Fages, the acting governor of Alta California, led a party into the region from San Diego while pursuing Spanish army deserters. Traveling from the east 4 years later, Father Francisco Garcés crossed the Mojave Desert and passed through the Antelope Valley. He stopped at Willow Springs; a convenient watering spot for travelers. No settlement or other travel by Europeans is known to have occurred in the western Antelope Valley until the 1820s (Hoover et al. 2002:125; ICF 2015:2.1).

4.4.2 Mexican Period

In 1821, California became a territory of Mexico and remained so until the late 1840s. During the 1820s and 1830s, Mexico maintained a tenuous grip on California as increasing numbers of newcomers, many of them Americans, entered the territory by land or sea. Among these were fur trappers Jedediah Smith, Kit Carson, and Ewing Young, all of whom passed through the Antelope Valley. Day-to-day life did not change substantially during this period until secularization of the mission system, beginning in 1833. Although some large land grants were made to individuals prior to secularization, those made following secularization thoroughly redistributed the missions' large grazing holdings to officials, former soldiers, and some politically connected Anglo-American newcomers to the region. Provisions in Spanish law for ensuring that Native Americans would receive mission lands proved of little or no practical benefit to most of California's indigenous peoples during the secularization process (Bean and Rawls 2003:62–70; ICF 2015:2.1).

After secularization of the missions, economic necessity—or coercion—forced many among the region's Native American population to work on Mexican ranchos. Indigenous peoples living farther from rancho lands maintained their traditional ways of life for a longer period of time. As the ranchos multiplied and spread inland, more and more indigenous groups were forced to acculturate or move east, farther into the backcountry. Exploitation of native labor intensified during the Mexican period, with laborers now on ranchos with grazing lands that encompassed their former territories. Economic production on the ranchos benefited Hispanic Californios and Euro-American newcomers to the region almost exclusively. Although many acculturated Native Americans ensconced within the rancho economy lived similarly to European peasants, a small number of Native Americans associated with the San Fernando Mission petitioned for and received modest land grants. Other Native Americans in southern California resisted acculturation, lived away from the ranchos, and limited their contact with Mexican society. Native Americans from the interior frequently raided ranchos during these decades (Bean and Rawls 2003:68; Johnson 1997:258–260; Sandos 1997:211–212, 216).

4.4.3 American Period

Euro-American settlement of the Antelope Valley did not occur until the latter nineteenth century. Prior to that, the establishment of Fort Tejon, sheep and cattle grazing in the region, and the development of stage lines and roads to service the mines increased travel through the valley. The Butterfield Overland Mail began stagecoach operations through the region during the 1850s, with Willow Springs once again providing a stop for water. Beginning in the 1860s, a limited number of people began to settle near springs and other water resources. Mining activity in and around the valley brought some settlers and increased travel through the valley. By the end of the 1860s, four roads served the valley: Soledad Road; Mojave Road; a road through San Francisquito Canyon, used mainly by cattle owners and miners; and Fort Tejon Road (later Barrel Springs Road) (Gardiner 2002:13–14).

Water sources and railroad development led to the creation of the first communities in the vicinity of the archaeological study area. During the early 1870s, the Southern Pacific Railroad constructed a railroad line between Sacramento and Los Angeles, via the San Joaquin and Antelope Valleys. Workers building south from Tehachapi Pass and north from Los Angeles completed the line at Lang Station in Soledad Canyon in 1876. Stations along the Southern Pacific line evolved into the project vicinity's first communities. Railroads subsequently constructed through the valley included the Atchison, Topeka & Santa Fe Railway, the Los Angeles & Independence Railroad, the Antelope Valley Line, and the Union Pacific (Lone Pine branch). Approximately 9 miles east and slightly south of the archaeological study area, Rosamond, named for the daughter of a Southern Pacific official, was initially the largest of the valley's railroad station settlements.

Approximately 11 miles south of Rosamond, Lancaster is thought to have been named for a Southern Pacific employee (Gardiner 2002:14–15). There, a well completed in 1884 demonstrated the availability of groundwater. Langley Wicks, who had earlier attempted and failed to establish a Scottish colony at Willow Springs, purchased land and began to run real estate advertisements in English newspapers. Soon Lancaster had a post office, a hotel, newspapers, a school, and multiple churches. James P. Ward bought out Wicks in 1888 and grew the first alfalfa produced in the area, which he shipped to Los Angeles in 1890 (Gardiner 2002:14–15, 18–19).

Following the arrival of the railroad, the next major industrial-era development to shape the history of the western Antelope Valley was the construction of the Los Angeles Aqueduct. Developed by the LADWP and designed by engineer William Mulholland, the Los Angeles Aqueduct transported water more than 200 miles, from the Owens Valley south to Los Angeles. The City of Los Angeles began construction of the project in 1908 by building more than 1,000 miles of new roads, pipelines, and electricity and telephone lines in preparation for construction of the aqueduct. Completed in 1913, the Los Angeles Aqueduct was the largest aqueduct in the world for a time, consisting of nearly 250 miles of canals, tunnels, siphons, and other water-conveyance features. Because steel pipe had to be shipped from the east, the aqueduct's use was limited to 12 miles of the route where canyon-spanning siphons were constructed. The City of Los Angeles purchased 4,000 acres of clay- and limestone-rich land near the Mojave Desert town of Monolith and established a facility that produced 1,000 barrels of Portland cement per day for the project. The aqueduct system also included Haiwee, Fairmont, Bouquet Canyon, and Dry Canyon reservoirs, as well as two reservoirs in the San Fernando Valley, where water from Owens Valley entered the local distribution system (Kahrl 1979:32; Schwarz 1991:18–20, 22–23).

Homesteaders frequently pursued mining and agriculture in the Antelope Valley region into the 1930s, although mining declined thereafter. In its place, the military rose in importance during World War II. The U.S. Army conducted flight training operations at War Eagle Field, south of Rosamond, and the U.S. Navy built an airfield and training facility in the town of Mojave. The federal government also established Muroc Army Airfield east of Rosamond. Later renamed Edwards Air Force Base, it continues to operate as a hub for U.S. test flights and aircraft development to this day (ICF 2015:2.2).

Willow Springs

Ezra Hamilton purchased 160 acres encompassing Willow Springs in 1894. Initially, he used the land to raise silkworms and the spring on his property to provide water for his Lida Mine (discussed below), to the north of Willow Springs. Willow Springs had earlier served as a principle Antelope Valley station on the stage route between Fort Tejon and the Tehachapi Pass, prior to the construction of the railroad, and Native American travelers had made use of the spring prior to the arrival of Europeans (Hoover et al. 2002:131).

After the turn of the century, Hamilton invested approximately $40,000 to remake Willow Springs into a destination for people suffering from pulmonary disease. In 1904, he opened a sanitarium that eventually included 27 stone buildings. In association with the resort, Hamilton constructed a grocery store, garage, blacksmith shop, ice and cold storage plant, public hall and theater, swimming pool, and school. The Willow Springs resort outlived Hamilton, who died in 1914, but closed several years later. The Rosamond School District took over the school at Willow Springs, and locals put other buildings to new uses (Varney 1990:74–76).

4.4.4 Mining and Oil Drilling

Mining was one of the most powerful economic magnets that drew settlers to the Antelope Valley. Between 1880 and 1950, entrepreneurs explored and extracted minerals (e.g., copper, gold, silver), as well as oil, clay, mud, and borate. Numerous mining districts were established, including the Kramer, Kramer Hills, El Paso, Mojave, Oro Grande, Randsburg, and Rosamond districts. Due to the mines' proximity to residences, homestead claims frequently came into conflict with mineral claims, which required USGS intervention and additional field surveys. Extensive mud and clay mining took place at the dry Rosamond Lake and other dry lakebeds, mainly to produce bentonite clay for refining petroleum products. Borax mining also flourished north and east of Rogers Dry Lake (Edwards Air Force Base 2009:126; Tetra Tech and Jones & Stokes 2004:52–53).

The most notable mining activity in the vicinity of the study area focused on gold. Ezra Hamilton, who owned the Los Angeles-based East Side Pottery Company, originally came to the Antelope Valley to mine clay, but, to his good fortune, discovered gold in clay deposits. At Tropico Hill, east of Willow Springs Butte, Hamilton established the Lida Mine in the mid-1890s. Hamilton later sold the mine, and the resulting Tropico Mining Company operated successfully for many years, expanding to include a mill. Two Canadian-born brothers, Clifford and Cecil Burton, worked at the mine and mill and eventually acquired the operation (Hoover et al. 2002:135–136; Settle 1967:69; Varney 1990:73–74).

After the purchase of the Tropico Mine, mining activities began to increase in the area. The Burtons improved the mill and soon thereafter began to process ore from other mines, as well. During the 1930s, the price of gold increased dramatically. Approximately 400 mines sent ore to the Burtons' mill for processing. The brothers also extracted deeper Tropico Mine deposits to increase their profits. One such mine was the Cactus Queen, at Soledad Mountain, northeast of the study area. George Holmes had developed Soledad Mountain's Silver Queen (also known as the Gold Queen) mine during the boom of the 1930s. During that time, investors made approximately $6 million from the Silver Queen mine. Holmes eventually sold the mine to a South African interest for $3.5 million. Federal restrictions on mining activity during World War II and subsequent inflation ended the mining boom and forced the closure of the Burtons' Tropico operations, although intermittent mining activity has taken place there since, including at the Cactus Queen (Hoover et al. 2002:135–136; Settle 1967:69–71; Varney 1990:73–74).

The discovery of oil north of Muroc buoyed the hopes of petroleum speculators, who drilled wells in the vicinity of today's Edwards Air Force Base and other parts of the Antelope Valley. In 1922, the *International Petroleum Reporter* described drilling activities conducted north and northeast of

Lancaster by the Great Angeles Oil Corporation, the Antelope Oil and Gas Company, and the Los Angeles–Kern Oil Syndicate. Test wells also were drilled in the Willow Springs area during the early 1930s. Drilling efforts in the central and western Antelope Valley ultimately proved far less successful than those undertaken in western Kern County, the latter of which generated an oil bonanza (*Bakersfield Californian* 1932, 1933; Edwards Air Force Base 2009:126; GLO 1935; *International Petroleum Reporter* 1922:45).

4.4.5 Aqueduct Labor Camps in the Mojave

The City of Los Angeles's construction of the Los Angeles Aqueduct was both a major endeavor and a turning point for the Antelope Valley. The aqueduct was, in large part, built by human labor. Along its route, the City of Los Angeles built temporary camps to house workers, managing personnel and livestock during construction. All told, "57 camps were established along the line of work, most of them in the mountains" (City of Los Angeles 1916:18). Camp sizes and the duration of their occupation varied along the route, depending on the construction needs specific to the adjacent area.

The project site was within the Mojave Division of the aqueduct during most of the construction period. Here, the Los Angeles Aqueduct consisted mainly of approximately 70 miles of cut-and-cover tunnel construction. As the 1916 final construction report explained, "steam shovels excavated the necessary trench about 12 feet wide and 10 feet deep, in which the aqueduct was built, the cover being kept below the surface of the ground so as to offer no obstruction to the occasional 'cloudbursts' which at rare intervals run down the desert slopes" (City of Los Angeles 1916:75–76). Crews maintained concreting operations within a distance of 500 feet from the farthest points of excavation (City of Los Angeles 1916:174).

Construction of the aqueduct in the southwestern portion of the Mojave Division differed from that in other areas in a number of ways. Southern Pacific constructed a branch line from Mojave to the north, leaving the valley segment south of Mojave without railroad service. As a consequence, construction materials and labor camp provisions had to be hauled into the South Antelope Valley section of the Mojave Division, first by traction engines, which proved too expensive to maintain, and later by mule teams (City of Los Angeles 1911:35–36, 1916:90). The Bureau of the Los Angeles Aqueduct's 1911 annual report noted that water supply shortages in the Mojave Division occurred during the summer. To compensate for these shortages, "large, corrugated iron tanks" were built to store materials for concrete construction and well-drilling along the aqueduct alignment west of Mojave (City of Los Angeles 1911:35–36).

Mojave Division work was characterized as "light work" compared with the construction of massive siphons and tunnels through mountainous terrain. As a result, the aqueduct camps in the South Antelope Valley section had a more temporary character than the larger mountain camps. The desert camps in southwest Antelope Valley relocated along the aqueduct line, as required by the progress of construction (City of Los Angeles 1916:256). Aqueduct planners provisioned these camps with tents and buildings designed for impermanence (e.g., offices, dwellings, bunk houses), the latter of which "could be taken down in sections, loaded on wagons, and expeditiously erected again at some other point" (City of Los Angeles 1916:89).

Social organization of the camps in the South Antelope Valley section most likely reflected occupational hierarchy. The Engineering Division stationed a clerk at each camp to manage pay checks, timecards, supplies, and camp finances; the larger camps beyond southwestern Antelope Valley were managed by a foreperson or superintendent. Stewards employed by the Medical

Department, which maintained a hospital in Mojave, regularly visited the smaller camps to inspect for sanitary conditions and administer medical care. Chief steam shovel operator John Anderson was responsible for hiring and managing the shovel crews. Wages for better-paid workers, most of whom were native-born whites, ranged from $3.50 day to $160 per month for concrete forepersons, $70 to $175 per month for clerks, and $130 to $205 per month for shovel operators. At the lowest level—of both the pay scale and the social hierarchy—were laborers who earned $2.00 to $2.50 a day. Foreign-born workers dominated the laborer ranks (City of Los Angeles 1916:255–256; ICF 2015:2.4; Van Bueren 2002:30).

Working and living conditions proved difficult, particularly for laborers in an environment marked by bitter cold during winters, brutal heat in summers, and heavy winds in both seasons. As Medical Department Chief Dr. Raymond Taylor explained, "the open ditch work on the job was very largely done by crews of Greeks, Bulgarians, Serbians, some Montenegrins, and some Mexicans. American men just would not work out in the open in the temperatures that existed in the summertime. In the winter it was just as windy and bitter cold as it was hot in the summer" (Taylor 1982:117). Provisioning the camps with adequate food proved challenging. Workers were charged 25 cents for each meal. After the commissary service was subcontracted to D.J. Desmond in 1908, food quality suffered because of Desmond's poor planning. Largely a consequence of chronic ice shortages and insufficiently refrigerated food, the poor quality of meals eventually led to a formal investigation and public controversy. It also contributed to labor strife, which culminated in a strike led by the Western Federation of Miners; by February 1911, approximately 75 percent of the aqueduct workers had participated in the strike (City of Los Angeles 1916:255–256; Hoffman 1980:334; Van Bueren 2002:34, 40).

Given the difficult conditions, managers had to deal with high rates of workforce turnover, particularly among the ranks at the bottom of the social hierarchy. Near-constant labor shortages allowed many aqueduct workers to leave for the summer months and work elsewhere. After completing less-grueling seasonal labor in more climatically appealing regions, they returned to the aqueduct project months later and were promptly rehired. Joining the immigrant workforce were native-born, hard-drinking transient men who often did not stay on the job for very long (Van Bueren 2002:34). Taylor recalled that many laborers arrived on the job "half starved to death or just recovering from a good big drunk," and consumed "tremendous" amounts of food during their first meals. Taylor also noted that laborers would often work "until they got what they called a stake and then go to town and blow it on a big drunk if somebody didn't get it away from them the first night" (ICF 2015:2.4–2.5).

Construction of the cut-and-cover tunnel through the southwestern Antelope Valley was completed by 1912. Steam shovels and other heavy pieces of equipment were transported to other segments of the aqueduct that were still under construction (City of Los Angeles 1916:21). The rest of the Los Angeles Aqueduct was completed in 1913 and today remains an important part of southern California water infrastructure (City of Los Angeles 1916:26).

4.4.6 Homesteading and Agriculture

Beyond the Antelope Valley railroad stops that developed into towns and eventually into cities, most settlement in the region involved homesteading lands for ranching and agriculture. Ethno-religious groups, prohibitionists, and utopian socialists also established agricultural colonies in the region during the late nineteenth and early twentieth centuries. Some newcomers homesteaded lands with the primary goal of becoming successful ranchers or farmers, whereas other homesteaders undertook requisite improvement of lands strategically in an effort to supplement their mining endeavors (Edwards Air Force Base 2009:123; Tetra Tech and Jones & Stokes 2004:53).

Homesteading claims in the western Antelope Valley region began primarily after 1900 as a consequence of several factors. Having received transfers of significant land grants in 1903 from the federal government, the Southern Pacific Railroad launched heavy land-sale promotions during the 1910s, which attracted settlers from the east and Europe. Rising land prices in Los Angeles and other urbanizing areas of southern California enhanced the appeal of homesteading in the Antelope Valley for some southland residents. These factors, along with amendments to the Desert Land Act—which made provisions for absentee ownership, reduced irrigation and cultivation requirements, and shrank requisite periods of residency—generated a boom in homesteading activity that lasted from the 1910s through the mid-1930s (Edwards Air Force Base 2009:123; Tetra Tech and Jones & Stokes 2004:53–54). However, not all homesteads were successful. Numerous claims filed after 1910 were never patented because of homesteaders' failures to improve lands adequately. Although Southern Pacific Railroad and other Antelope Valley land promoters presented the region as exceptionally fertile, settlers often faced difficult climatic conditions, including frequent high winds during multiple seasons, flooding, intermittent drought, and, at times, excruciating heat (Edwards Air Force Base 2009:123; Tetra Tech and Jones & Stokes 2004:53–54).

Homesteading in the Antelope Valley largely came to an end in the 1930s, when prevailing drought conditions worsened locally and across the nation. In addition, the Great Depression made it increasingly difficult for prospective settlers to accumulate capital for necessary improvements. As a result, during that time, many Antelope Valley settlers abandoned their homesteads, and the longstanding emphasis on promoting private use and development gave way to a new emphasis on conservation and preservation by the National Park Service, U.S. Forest Service, and Bureau of Land Management. In 1935, the federal government stopped accepting new "homestead" or "desert lands" entries, although small, 5-acre homestead tracts could be purchased until 1950, and homesteaders with valid claims prior to 1935 could continue to improve their land (Tetra Tech and Jones & Stokes 2004:54).

Across the project vicinity, agricultural activity increased after World War II. From 1953 to 1956, land cultivated with crops in the Kern County portion of the Antelope Valley increased from 26,000 to more than 41,000 acres (with 23,732 acres irrigated), mostly in areas west of Rosamond and around Cantil. Alfalfa fields comprised the majority of cultivated land across the larger Antelope Valley, followed by dry-land grains. During the 1950s, Antelope Valley farmers devoted limited acreage to irrigated forage crops, vegetables, almonds, apples, peaches, and other fruits. Field crops such as alfalfa and grain, as well as irrigated pastureland, dominated agricultural activity in the Kern County portion of the Antelope Valley, accounting for 34,978 acres in 1957. Alfalfa fields for hay and seed made up 90 percent of that acreage. In terms of livestock, sheep grazing was the most prominent activity in the Kern County portion of the valley during the 1950s. At this time, agriculture accounted for 97 percent of Antelope Valley water use. Although groundwater depletion had led some farmers to abandon acreage by the late 1950s, pumping for irrigation remained economically feasible in most of the valley's farming areas (DWR 1959:36–49).

The mainstay of agriculture in the project vicinity, Antelope Valley alfalfa production went into decline after the 1950s. Rising electricity costs for pumping depleted groundwater supplies and made alfalfa farming more difficult over time. Valley land planted in alfalfa declined from 38,525 acres in 1950 to 8,810 acres in 1987. Between 1953 and 1988, total groundwater pumped annually in the valley declined from 480,000 acre-feet to 69,000 acre-feet. Although land in the project vicinity continued to be cultivated during the 1970s, crop farming in the Rosamond and Willow Springs areas declined dramatically thereafter (DWR 1959:49; Templin et al. 1995:1–2, 7, 16, 64).

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Chapter 5
Survey Methods and Research

5.1 Introduction

The effort to identify cultural resources in the archaeological study area included cultural resources record searches of previous cultural resource investigations and recorded sites, background research, a review of literature relevant to the prehistory, ethnography, and history of the project vicinity, and a pedestrian survey of the archaeological study area.

5.2 Native American Coordination

On February 17, 2021, ICF requested a Sacred Lands File search from the NAHC to determine if there were Native American cultural resources in the immediate vicinity of the project site. ICF received a response from the NAHC on March 12, 2021, stating that the Sacred Lands File search found no Native American cultural resources in the immediate vicinity. The NAHC also provided a list of 20 Native American groups and individuals who may have knowledge of cultural resources in the study area. On April 27, 2021, ICF mailed letters to each of the contacts, identifying the project location and requesting input. As of July 25, 2021, three responses were received.

Shana Powers, Cultural Director of the Santa Rosa Rancheria Tachi Yokut, responded by email that the project was outside the tribe's area of concern and recommended contacting the Tejon Indian Tribe or another local tribe. A follow-up email was sent to the Tejon Indian Tribe on July 2, 2021, followed by a follow-up phone call later that week. No response was received from the Tejon Indian Tribe.

Jill McCormick, Historic Preservation Officer for the Quechan Indian Tribe, responded via email on May 4, 2021, stating that the tribe has no comments and defers to more local tribes. A follow-up email with project information was sent to the Tejon Indian Tribe on July 7, 2021.

Ryan Nordness, Cultural Resources Analyst for the San Manuel Band of Mission Indians, stated that the project area exists within Serrano ancestral territory and is therefore of interest to the tribe. However, due to the nature and location of the project, and given the Cultural Resources Management department's present state of knowledge, the San Manuel Band of Mission Indians does not have any concerns with the project's implementation, as planned, at this time. The tribe also provided cultural resources and tribal cultural resources mitigation measures that they requested be included as part of the project and its permits or plans. Documentation of coordination with Native American groups and individuals is provided in Appendix C of the Phase I survey report (ICF 2021).

5.3 Records Search and Other Research

Cultural resources and heritage resources record searches for the project area were conducted by staff members at the Southern San Joaquin Valley Information Center on March 1, 2021. The record search included a review of all recorded historic and prehistoric archaeological sites, as well as recorded built-environment resources within 0.5 mile (0.8 kilometer) of the project site. In addition, the NRHP (NPS 2010) and documents and inventories from the State Historic Preservation Office (SHPO), including California Historical Landmarks (CHL) (SHPO 2010a), California Points of Historical Interest (SHPO 2010b), Listing of National Register Properties (SHPO 2010c), and Inventory of Historic Structures (SHPO 2010d), were consulted. Historic maps, including USGS quadrangle maps and aerial photographs from Nationwide Environmental Title Research Online, were also examined (Nationwide Environmental Title Research 2019).

In addition to reviewing site records yielded by the record searches, architectural historians conducted research using historic topographic maps, historic aerial photographs, and Kern County Assessor's data accessed through the subscription service ParcelQuest (ParcelQuest 2019). This research allowed architectural historians to identify properties with buildings and structures 45 years old or older prior to conducting the built-environment reconnaissance survey of the study area, and, in some cases, to confirm that buildings and structures observed in the study area during the survey are 45 years old or older, or less than 45 years old.

5.4 Records Search Results

The records search results confirmation and a records search results map (for previously recorded resources) can be found in confidential Appendix B of the Phase I report. The following is a brief overview of the records search results.

5.4.1 Previously Conducted Cultural Studies

A total of 84 cultural studies have been conducted within the records search area, as defined in Section 1.1.1, *Purpose of the Study*. Of these, 44 cultural studies overlap the archaeological study area. Confidential Appendix B of the Phase I report contains a list of the cultural studies that have been previously conducted within the records search area.

5.4.2 Previously Recorded Archaeological Resources

Results of the records search indicate that 250 previously recorded resources are within the records search area. A total of 16 previously recorded archaeological resources have been previously recorded within the archaeological study area: 9 sites and 7 isolates. Because isolates are generally not eligible for listing in the CRHR, only the previously recorded sites are discussed in this section. Most of the previously recorded archaeological sites are prehistoric lithic-reduction sites or historic-era refuse scatters. Table 5-1 identifies these previously recoded sites and provides a summary of the Phase I survey results and prior evaluation efforts. Resources that have been previously evaluated or were not tested during this current effort due to unavailability of access are discussed below in Table 5-1. Previously recorded sites that have been tested and evaluated as part of this Phase II effort can be found in Section 6.7.2, *Previously Recorded Archaeological Sites*.

Table 5-1. Previously Recorded Archaeological Sites in the Archaeological Study Area

Site Number	Time Period	Description	2021 Survey Results	Evaluation
P-15-000129/ CA-KER-129/H	Multicomponent	Willow Springs/CHL No. 130	No archaeological components observed in the current survey.	No subsurface evaluation has been completed. Unable to access site for present study.
P-15-002539/ CA-KER-2539	Prehistoric	Large lithic scatter	Updated site boundary and extended south due to newly identified extensive lithic scatter.	Evaluated for this study.
P-15-002821/ CA-KER-2821/H	Prehistoric	Bean Spring Archaeological Complex	Three loci relocated in the survey area.	Previously evaluated and found eligible for listing on the CRHR. No subsurface evaluation has been completed. Unable to access site for present study.
P-15-012793/ CA-KER-7214H	Historic-era	Aqueduct camp and refuse scatter	Relocated as previously recorded, but southern third has been destroyed by construction of a substation.	Evaluated for this study.
P-15-018292/ CA-KER-9985	Historic-era	Historic-era refuse scatter	Relocated and extended site boundary south.	Evaluated for this study.
P-15-018676/ CA-KER-10199/H	Multicomponent	Historic-era refuse scatter with prehistoric lithic scatter that has been collected	Relocated as previously recorded.	No subsurface evaluation has been completed. Unable to access site for present study.
P-15-019544	Prehistoric	Small flake scatter	Relocated and extended site boundary west.	Evaluated for this study.
P-15-019545/ CA-KER-10709	Historic-era	Historic-era refuse scatter	Relocated as previously recorded.	Evaluated for this study.
P-15-019546/ CA-KER-10710	Prehistoric	Lithic scatter extended	Relocated one cryptocrystalline silicate flake and recorded a new rhyolite flake.	Evaluated for this study.

Note: Shaded cells represent sites newly evaluated for this study.

P-15-000129/CA-KER-129/H, Willow Springs (CHL No. 130)

Description

Willow Springs consists of the remains of a large prehistoric habitation and the remains of the historic townsite of Willow Springs. The two occupation areas overlap and are centered around Willow Springs, a formerly perennial spring. The Rosamond fault scape trends southwest through the project area and is a natural aquitard for groundwater moving south from the Tehachapi Mountains (Whitley et al. 2020). The scarp created a series of springs and seeps along its length, including Willow Springs and Bean Spring. Willow Springs included seven flowing water sources as late as 1911 (Whitley et al. 2020). Willow Springs was one of a number of springs in the western Mojave Desert that provided a reliable source of water and other natural resources for the Native American inhabitants of the area. Willow Springs has been identified as a possible village complex from the Rose Spring period dating from 1500–800 B.P. (Haenzel 1965). The site was noted during the historic period by Spanish missionary Father Francisco Garcés in 1776 on his journey across the Mojave Desert and was reportedly a campsite for John C. Fremont and Kit Carson in 1844. A large population of Kitanemuk, or possibly Desert Serrano, was reported to have been removed from Willow Springs (and possibly Bean Spring) to Mission San Fernando in 1811 and today both groups recognize the importance of the springs to their ancestors (Sutton 1980). The Kitanemuk referred to Willow Springs as *Panukavea* (Whitley et al. 2020).

The first permanent historic settlement came as a stage stop for freight wagons on the Los Angeles–Havilah and Inyo stage lines from 1864–1872, but the railroad bypassed it in 1876 (Perkins 1959). Ezra Hamilton purchased 160 acres encompassing Willow Springs in 1894. Initially, he used the land to raise silkworms and the spring on his property to provide water for his Lida Mine (Hoover et al. 2002:131). After the turn of the century, Hamilton invested approximately $40,000 to remake Willow Springs into a destination for people suffering from pulmonary disease. In 1904 he opened a sanitarium that eventually included 27 stone buildings. In association with the resort, Hamilton constructed a grocery store, garage, blacksmith shop, ice and cold storage plant, public hall and theater, swimming pool, and school.

It remains unclear whether buildings and structures on private properties near the Willow Springs CHL plaque have any direct association with the historic context of the Willow Springs CHL. The site was originally recorded by Price in 1954 and covers approximately 30 acres, which would encompass the remains of historic-era structures and the surrounding area. The site was recorded as consisting of multiple temporary camps, milling features, rock cairns, and midden near springs (Mason et al. 2019). The site was last updated in 1992, with only a single prehistoric artifact identified at that time, although it should be noted that the site form mentions that the entire site was not surveyed, and the survey was of limited duration. The authors also hypothesized that although much of the prehistoric site may have been destroyed by later development, there are probably intact deposits present in the area (Greene and Knight 1992) (Plate 5-1). No archaeological artifacts or features were identified within CA-KER-129/H within the project area during the survey in July 2021.

Plate 5-1. P-15-000129 Overview, View West

Previous Evaluation

Willow Springs is listed as CHL No. 130 (designated circa 1934). It is important as the site of prehistoric habitation and for its historical association with the development of the western Mojave Desert. The site has been identified by local tribes as an important resource and potential tribal cultural resource. As such, the site may be eligible for the CRHR/NRHP under Criteria 1/A and 4/D for its association with important events in the history and prehistory of southern California and for its potential to yield additional important information regarding the history and prehistory of the region. However, Willow Springs has not been formally evaluated for listing in the CRHR. CHL Nos. 770 and above are automatically listed on the CRHR. If not previously evaluated for and listed in the CRHR, then CHL Nos. 1 to 769 need to be formally evaluated for CRHR eligibility to determine if they qualify as historical resources under CEQA (SHPO 2020).

P-15-002821/CA-KER-2821/H, Bean Spring Archaeological Complex

Description

P-15-002821 is the Bean Spring Archaeological Complex. Bean Spring, approximately 0.75 mile to the west of Willow Springs, was formed by the same processes that created Willow Springs. The site is a large prehistoric occupation site with a historic-age ranch complex and subsumes the area of a number of previously recorded archaeological sites. The site covers an area of 371 acres and appears to have undefined limits on its eastern and western sides. The Bean Spring complex subsumes the previously recorded sites CA-KER-2819, CA-KER-2820, CA-KER-4047, CA-KER-4048, CA-KER-4049, and CA-KER-4050 into one large complex with an additional 14 individual loci (A through N). The complex is now identified as CA-KER-2821/H. It is possible that if the area between Bean Spring and Willow Springs were intensively surveyed, then the sites would overlap.

The natural setting of the site is creosote bush scrub and Joshua tree woodland habitat within a series of terraced, stable ridgelines and shallow washes, along which artifacts have been distributed (Way et al. 2009). The site has at least 22 discrete loci and has been tested and found to have deposits to at least 60 centimeters deep (Mason et al. 2019). Site components include midden, shells, beads, ground stone, lithic tools, hearth features, and debitage. Radiocarbon dates suggest occupation from as early as 9000–8000 B.P. Lithic materials from wide-ranging sources may be indicative of an extensive trade network. Historic-era components include pre-1950s can scatters, household debris, concrete pads, and barbed-wire fences. Only a very small portion of the site (5.5 acres) intersects with the project area. Three loci were previously recorded within the survey area (Locus F, Locus G, and Locus U).

Locus F consists of a large midden deposit and lithic scatter with three lithic cores, one rhyolite flake tool, and a rhyolite biface. This locus has been heavily disturbed by modern refuse disposal, off-roading, and vehicular activities on established dirt roads. The entirety of Locus F is within the survey area and was found as previously recorded. No new artifacts were observed.

Locus G consists of a low-density lithic scatter containing approximately six rhyolite flakes. It is in a minor drainage. The entirety of Locus G is within the survey area and was found as previously recorded. No new artifacts were observed.

Locus U was previously recorded as a moderately dense lithic scatter with hearth features and groundstone on a small ridge. There are approximately 200 flakes (90 percent rhyolite, 10 percent CCS) that are primarily secondary flakes, three fire-affected rock concentrations, two biface fragments (CCS and rhyolite), two mano fragments, and a Sierra Pelona schist metate fragment. Only Feature 3, one of the dispersed hearth features with five rhyolite flakes, was within the survey area and was found as previously recorded.

Previous Evaluation

P-15-002821 was evaluated by Pacific Legacy in 2009 (Way et al. 2009), which recommended the site as a historical resource eligible for listing on the CRHR under Criterion 4 for its archaeological data potential. The site was evaluated through excavation of a number of shovel test pits (STPs), shovel scraps, and excavated test units at multiple loci. The site has the potential to address several significant research domains important for understanding Native American cultures in California, including cultural chronology, flaked-stone and groundstone technology, and settlement and subsistence. Intact features and subsurface deposits identified during testing and data recovery work suggest that the site retains integrity. The site was also recommended to qualify as a unique archaeological resource as defined in PRC Section 21083.2.

P-15-018676/CA-KER-10199/H

Description

POWER Engineers, Inc., recorded Site P-15-018676 in 2014 as a multicomponent site that included a large, multi-episodic, historic-era refuse scatter and a dispersed prehistoric lithic scatter. The site condition was noted as poor because it has been affected by sheet wash erosion and access to and construction of transmission lines within the site boundary. The historic-era components consist of hundreds of cans, including hole-in-top, steel beer, sanitary, meat, oil, coffee, juice, and bi-metal pull-tab cans. Also observed were numerous bottle bases, ceramics, and miscellaneous items, including bailing wire, milled lumber, a bucket, and more. Although artifacts date between the 1920s and 1960s, the majority date between 1945 and the 1960s. The prehistoric component consists of eight chert and rhyolite secondary flakes. ASM Affiliates, Inc., updated the site in 2017, finding the site as previously recorded. All prehistoric components were collected at that time.

ICF revisited the site in 2021 for the project and found the site as previously recorded. Some cans appear to have scattered just outside of the site boundary, but all other components are as previously recorded. No prehistoric artifacts were observed in the survey area.

The topography surrounding the site is characterized by flat desert terrain disturbed by transmission line construction and access, with ground visibility between 90 and 100 percent across the site. The vegetation community is characterized by low, seasonal grasses. This site has not been previously tested for subsurface components and will be tested once access to the site's associated parcel is allowed.

5.5 Pedestrian Survey

Qualified ICF archaeologists conducted an intensive archaeological pedestrian survey of the archaeological study area between June 1–June 4, June 7–June 11, and July 6–July 8, 2021. Patrick McGinnis, MA, RPA, who meets the Secretary of the Interior's Professional Qualifications Standards for Archaeology (36 CFR Part 61), led the survey. As described in Section 1.1.1, *Purpose of the Study*, a total of 1,608.0 acres were surveyed for the project. In surveyed areas, archaeologists checked all visible ground surfaces, bedrock outcrops, and rodent burrows, as well as natural or human-made exposures within the project area. Transects were completed in 15-meter intervals. Isolates were recorded as one to five artifacts within 30 meters of each other, whereas sites were recorded as more than five artifacts within 30 meters of each other. The vegetation was characterized by species, all of which were associated with the Mojave Desert, such as Joshua tree, creosote bush, and white bursage (Webb et al. 2009). These species did not hinder visibility, with most of the survey area having between 80 and 100 percent visibility. For more information, the reader is directed to the Phase I cultural resource survey report for the project (ICF 2022).

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Chapter 6
Research Design

This chapter presents an approach to evaluating archaeological resources for their eligibility for CRHR-listing. It includes a summary of the CRHR eligibility criteria, a summary of the aspects of integrity, a discussion of archaeological site significance—both individually and as contributors to a larger district or landscape—and presents research themes and questions in those instances where an archaeological site is determined eligible for CRHR-listing under Criterion 4. This chapter also provides a quick reference for determining whether an archaeological site retains sufficient significance and integrity to be eligible for the CRHR.

6.1 Evaluating Significance

The CRHR recognizes properties that are significant at the national, state, and local levels. The CEQA Guidelines Section 15064.5(a) of the State CEQA Guidelines provide a definition of *historical resources*. Resources that meet this definition are significant. Historical resources are broadly defined as those cultural resources that are significant under CEQA and may include sites, objects, structures, buildings, etc. Historical resources may be prehistoric or historic in age and may be archaeological resources, built environment resources, tribal cultural resources, or other important historical resources. PRC Sections 5020–5029.5 also contain many important definitions of term used in defining a historical resources.

Properties that are eligible for CRHR-listing are properties that retain their integrity and meet one or more of the four criteria listed below. In addition to these requirements, a property must also have attained an age of at least 50 years old, unless it possesses exceptional significance.

An archaeological resource can be considered for inclusion on the CRHR if it meets at least one of the following criteria (CEQA Guidelines Section 15064.5(a).

1. A resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the CRHR (PRC SS5024.1, Title 14 CCR § 4850 *et seq*.).
2. A resource included in a local register of historical resources, as defined in PRC Section 5020.1(k) or identified as significant in an historical resource survey meeting the requirements of PRC Section 5024.1(g), will be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3. Any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be a historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource shall be considered by the lead agency to be *historically significant* if the resource meets the criteria for listing on the CRHR (PRC SS5024.1, Title 14 § 4852) including the following:
    A) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;

B) Is associated with the lives of persons important in our past;

C) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work Guidelines for Determining Significance 6 Cultural Resources: Archaeological, Historic, and Tribal Cultural Resources of an important creative individual, or possesses high artistic values; or

D) Has yielded, or may be likely to yield, information important in prehistory or history.

4. The fact that a resource is not listed in, or determined eligible for CRHR-listing, not included in a local register of historical resources (pursuant to PRC § 5020.1(k)), or identified in an historical resources survey (meeting the criteria in PRC § 5024.1(g)) does not preclude a lead agency from determining that the resource may be an historical resource as defined in PRC Section 5020.1(j) or 5024.1.

Archaeological sites may be historic or prehistoric in age. As treated by CEQA, archaeological sites may qualify as historical resources or tribal cultural resources or both. CEQA provides additional guidance specific to archaeological sites. The determination as to whether an archaeological site qualifies as a historical resource or a unique archaeological resource should be based on the evidence gathered and presented for each specific site and made by a trained professional archaeologist. CEQA Guidelines Section 15064.5I(2) makes it clear that if an archaeological site is determined to be an historical resource, then the limitations on mitigation contained in CEQA Statute Section 21083.2 do not apply, and instead mitigation should be guided by CEQA Guidelines Section 15126.4.

Archaeological sites are frequently evaluated for their CRHR eligibility under Criterion 4. Evaluating archaeological sites under this criterion requires the development of a research design to determine whether the site has the capability address important research questions (Little et al. 2000). Although less common, both precontact and historical archaeological sites may also be evaluated under Criteria 1, 2, and 3. Evaluating an archaeological site under Criteria 1 and 2 may require additional methods of inquiry, such as historical documentary research, interviews, and consultation. This information is used to establish whether the archaeological site not only conveys chronological association with an event, trend, or person—something that, by itself, does not merit CRHR eligibility—but that the site illustrates the specific importance of the event, trend, or person (Little et al. 2000; CEQA Guidelines § 15064.5(a)).

Although evaluating archaeological sites under Criterion 3 is uncommon, it is a particularly important consideration in instances where a site may be part of a larger district or landscape. In such instances, although an archaeological site may or may not be eligible for CRHR-listing individually, it may still retain the necessary information and associations to contribute to the significance of a larger district or landscape. To evaluate whether an archaeological site contributes to the significance of a larger district or landscape, one must first establish the context in which the district or landscape is significant, and then determine whether the individual archaeological site in question embodies one or more of the larger resource's themes of significance.

6.2 Evaluating Integrity

Eligible historical resources and historical or archaeological districts must retain key character-defining features, or *integrity*, to convey their significance as a resource. *Integrity* refers to a property's ability to convey its significance. To convey this significance, a historical resource must have enough intact physical characteristics or features to communicate its significance under one or more of the CRHR criteria. NRHP guidelines recognize seven aspects, or qualities, that define integrity and these qualities are relevant to discussion of integrity for CRHR eligibility as well. The Secretary of the Interior defines these aspects as follows (36 CFR 60).

- **Location**. Is the location/site where the resource was originally constructed?
- **Design**. Is the design in its original form, plan, and style of the property intact?
- **Setting**. Have the physical surroundings of a property been compromised?
- **Materials**. Are the physical components used in construction of the property still present?
- **Workmanship**. Is there evidence of craftsmanship?
- **Feeling**. Is the property able to express a sense of time?
- **Association**. Is the "direct link" evident between the property and an important event or person?

For archaeological sites considered significant under Criterion 4, integrity of location, materials, and association are generally most crucial. This is because, to address important research topics, archaeological deposits usually must be in their original location, retain stratigraphic associations, and contain adequate quantities and types of materials in suitable condition to address important research topics. Under all of the CRHR eligibility criteria, however, any or all of the aspects of integrity may be required, depending on how the significance of the archaeological site is established.

6.3 Research Themes and Questions

For an archaeological site to be considered eligible under CRHR Criterion 4, it must "have yielded or may be likely to yield, information important to history or prehistory." To establish whether an archaeological site meets this threshold, one must first establish the historic context, or contexts, with which to evaluate the resource. Once this has been established, the information that the archaeological site yields, or has the potential to yield, must be evaluated against a series of historic, context-appropriate research themes and questions (Little et al. 2000).

The unevaluated archaeological sites analyzed in this document range from precontact to historic in age. The *XpressWest High-Speed Train Project Archaeological Resources Technical Report, San Bernardino County, California* (ICF 2020) presents the historic context in which these resources should be evaluated. Based on the information presented in that historic context, this section presents research themes, questions, and data requirements for both precontact and historical archaeological sites in the Mojave Desert region. The research themes presented are tailored toward addressing the research potential of the unevaluated archaeological sites on a regional scale.

6.3.1 Prehistoric/Precontact Period

The following important research themes for precontact archaeological sites are presented in this section this section: site formation processes, chronology, technology and subsistence, settlement patterning, and trade and exchange. Following a discussion of each theme, a series of research questions and data requirements are presented.

Site Formation Processes

Understanding the horizontal extents, vertical depth, and integrity of archaeological deposits is a critical factor in being able to evaluate their research potential. Determining the integrity of archaeological deposits and features is a key component to determining eligibility for an archaeological site. Numerous natural and human-induced impacts can affect an archaeological site. Natural processes, such as erosion, deposition, and bioturbation, and human-induced processes, such as plowing, agricultural planting and cultivation, cattle grazing, grading, and mining, and prehistoric alterations, such as site maintenance, all affect the depositional context of archaeological materials. Through these various processes, archaeological materials can be moved both horizontally and vertically, and their original depositional contexts and, thus, their spatial relationships, can be altered. It is critical to understand the nature of disturbance to a site because important information cannot always be gleaned solely from individual artifacts, but from their spatial relationships within an archaeological context.

Documenting and understanding the geomorphic setting of a particular site is key to understanding site structure and can be important in assessing a site's integrity. The location of a site within a particular geomorphic context can have bearing on its depositional or erosional environment. For example, sites in areas with low deposition or nondeposition will tend to have mixed deposits, regardless of their age. Sites adjacent to drainages can be subject to rapid deposition (i.e., burying archaeological deposits) or erosion (i.e., transporting archaeological materials). Sites located at the foot of slopes or hillsides represent colluvial depositional environments, where sites can often be buried. Desert pavement surfaces, formed by centuries of wind deflation, are found throughout the project area and are often the locations where archaeological sites are easily identified on the surface.

There has been much discussion regarding the development of desert pavement surfaces and the geomorphic processes relating to the presence of archaeological sites on such surfaces (Ahlstrom and Roberts 2001; Bullard et al. 2008; Stone 1991; Wells 1992). Whether sites located on these surfaces may have subsurface expressions, or whether desert pavements represent the accumulation of thousands of years of occupation with no subsurface component, is a topic that is pertinent not only to our understanding of archaeological materials, but also to how archaeological sites have been evaluated. It is common for researchers to discount the potential for sites with surficial expressions on desert pavement surfaces to have a subsurface component. Furthermore, the perceived lack of potential for such sites to contain a subsurface component has often been used as justification that such sites are not likely to be eligible for inclusion on the CRHR (Ahlstrom and Roberts 2001). Research on some sites has, in fact, shown that subsurface archaeological components have been found below pavement surfaces (Ahlstrom and Roberts 2001; Bullard et al. 2008). Understanding the implications of this research will have bearing on how archaeological sites are interpreted and evaluated for their potential inclusion on the CRHR.

”he horizontal relationships between artifacts and groups of artifacts or features within a site can provide distinct value in the interpretation of activities and the nature of occupation at a site. This is especially true when activities or temporal components can be isolated within a site. Discrete features or artifact concentrations, such as single-reduction stone-tool production loci, are extremely useful in analyzing behavioral sequences within a site (Hintzman and Garfinkel 2011; McGinnis and Droessler 2015; Wilke and Schroth 1989). However, artifact accumulations can be the signature of multiple occupations over many years or the result of single or short-term habitations. Focus on the horizontal structure of a site at the expense of considering the potential vertical distribution of materials is also problematic and requires an understanding of the geoarchaeological aspects of the site and, potentially, the use of subsurface testing for confirmation (Ahlstrom and Roberts 2001; Schroedl 2006).

Research Questions

- Have natural or human-induced processes created post-depositional impacts on the site? If so, have the post-depositional effects moved or mixed archaeological deposits on the site?
- Are buried deposits present on the site? If so, are the deposits representative of discrete temporal or behavioral episodes or representative of a particular type of use?
- Are archaeological deposits found underlying desert pavement surfaces? What are the depositional and temporal attributes of such sites? What does the presence of buried deposits (if found) below desert pavements say about the age of the pavement surfaces or post depositional processes, such as desert pavement "healing" (Ahlstrom and Roberts 2001)?
- If there is a vertical dimension to the archaeological deposit, are there intrusive (i.e., nonnative) materials mixed into these deposits as a result of post-depositional impacts? How severe is such mixing, and does it affect the sites ability to address research questions?
- Are there distinct artifact concentrations indicative of distinct loci of human activity?
- Are there intact constructed features?

Data Requirements

Sites must be assessed for their geomorphic stability and to determine whether they have been affected by post-depositional processes and the extent to which such processes may hamper a site's ability to address research questions. The horizontal and vertical extents of sites should be determined and the nature of disturbance to archaeological deposits understood. Identifying and documenting buried archaeological deposits—especially archaeological features such as hearths, roasting pits, storage pits, and structural remains—is an important facet of understanding site-formation processes.

Chronology

Dating of archaeological sites is a necessary prerequisite for addressing higher-order generalizations and most research domains discussed herein. The knowledge of when a site was occupied provides a basis for further inquiry regarding changes in land use over time and making assessments about a site's research potential. As such, chronology is the foundation on which explanations of prehistory are built. Understanding the precision of archaeologically derived dates is important because both absolute and/or relative dating methods may be the means by which sites are placed into larger regional chronological sequences.

If the appropriate materials are available from an archaeological site, absolute dating methods provide the most accurate means for developing a chronological sequence. *Absolute dating*, using techniques such as radiocarbon dating, is preferable in that it provides an independent measure of a site's age. *Relative dating* methods, such as obsidian hydration, are an alternative means for assessing the age of a site, but they are necessarily dependent on other forms of data and not an appropriate proxy of a site's age alone. In an ideal situation, relative dates are used in combination with absolute dates to refine the chronological placement of a site.

An additional relative dating technique uses temporally diagnostic artifacts, such as projectile points, ceramic types, and shell beads. In lieu of the materials required for absolute dating (e.g., carbon, wood, bone, shell), relative dating using temporally diagnostic artifacts can be an effective, if less-precise, method of placing a deposit, or the site as a whole, into a larger regional context. In the Mojave Desert, such relative dating has largely been the basis for the development and refinement of cultural chronologies using artifact types, such as projectile points, as temporal markers (Sutton et al. 2007). However, some have argued that morphological changes may be more related to rejuvenation than cultural preference over time and hence serve as poor temporal markers (Flenniken and Wilke 1989).

Chronological issues contribute not only to understanding at the site level, but also the more important regional context. Understanding the age of a site can contribute to research questions pertaining to population movement and settlement systems, ethnic affiliation, paleoenvironmental reconstruction, resource exploitation over time, and refinement of cultural chronologies.

Research Questions

- How old are sites within the project area? Do sites belong to a particular time period (e.g., Paleoindian, Lake Mojave, Pinto, Gypsum, Rose Spring periods), or are they occupied for multiple chronological episodes?
- How long were sites occupied or used? Do sites have a single component, or are recurring episodes of activity represented?
- Does the chronological placement of the site contribute to questions regarding the relationships between different time periods in the established cultural sequences for the region?
- Does the chronological placement of the site and the group of sites in the region contribute to our understanding of population movements?
- Can the site yield information that relates to established artifact typologies, such as for lithics and ceramics?
- How ancient are the landforms on which the sites are found? Does the study of the local geomorphology provide any clues to the dating of the sites, their various loci, and cultural features?

Data Requirements

Ideally, organic materials would be present that can be dated using absolute methods, such as radiocarbon dating. Suitable materials include charcoal, wood, marine shell, faunal bone, carbonized plant remains, or organically rich soil present at sites. In cases where materials conducive to absolute dating techniques are not available, other materials that are temporally diagnostic, such as projectile points, ceramics, and shell and glass beads, can provide relative dates. Additionally, materials such as obsidian for hydration and sourcing or ceramics for chemical constituent analysis or thermoluminescence dating can provide relative dating for archaeological sites. Features such as hearths, roasting pits, house floors, refuse dumps, and storage pits are the ideal locations for determining the dates of specific activities at a site and often yield dateable materials, such as carbonized remains. Sites containing materials or features with dateable materials would provide important contributions for the chronology research domain.

The presence of stratified deposits within sites is useful for placing them within regional chronologies; however, they are relatively rare in the Mojave Desert region. Bioturbation and the natural processes of erosion and deposition make defining such deposits problematic. At sites with subsurface components, identifying stratigraphically distinct deposits is critical for contextualizing archaeological materials.

Technology and Subsistence

The materials that compose an archaeological site can provide information regarding the lifeways of the people that occupied it, including site function, occupational duration and history, cultural affiliation, the environment being occupied, and how its occupants were intrinsically linked to its resources, ceremonial and spiritual aspects, and interactions with other populations. The material remains left behind, including artifacts and features, and the associations between these materials reflect the strategies past populations employed to interact with their environment and each other. Studying the technology used, the procedures for resource extraction, the presence and function of ritual activities, and the patterning of activities within a site and a larger region are at the core of archaeological research. Analyzing the technology and subsistence practices of a site's occupants provides insight into human behavior through the tangible remains left behind. It is important to understand how the technology and subsistence practices at a site relate to the larger regional context and move research away from a focus on the individual site to that of a larger cultural landscape.

Subsistence strategies represent the previous occupants of a site's direct interaction with the environment and other populations. Features and artifacts reflect the methods employed by past occupations to exploit locally available resources. The ecofactual remains (i.e., faunal and floral remains) disposed of at sites can provide insight into the nature of adaptation to changing environmental conditions and the place of an individual site within a larger settlement pattern. The intrusion of nonnative species of plants and animals during the historic period initiated a period of substantial environmental change that may be reflected in the archaeological record at sites within the project area. Traditional diets, practices of resource extraction, and settlement patterning were all affected by the influx of new plant and animal species and are a critical domain of research that can be identified through modified technology, introduction of new materials, and resources.

Archaeological sites consisting of flaked-stone artifacts and waste products from their manufacture are the most common types of sites in the region. Often termed *lithic scatters*, these types of sites have been documented and studied for many years in the Mojave Desert region. *Quarries, assays,* and *prospects* are all terms that have been applied to the locations where Native American peoples acquired, tested, and processed locally available lithic materials (Byrd et al. 2009; Hintzman and Garfinkel 2011; Wilke and Schroth 1989). Desert pavement surfaces and outcrops of various lithic material types are found within and adjacent to the project area. The nature in which native peoples procured, manufactured, and discarded flaked-stone implements is related to multiple factors, including availability to source materials, quality of materials, the function of finished products, the nature of settlement, and other factors (Bamforth 1990; Beck et al. 2002; Eerkens et al. 2007). As such, documenting the nature of lithic technology at sites can provide data pertinent to questions about subsistence practices, settlement patterns, territoriality, trade and tribal interaction, chronology, and many other research avenues.

Trends in toolstone preference have been said to be tied to particular temporal periods (Basgal and Hall 1991). For example, in the Mojave, it has been argued that through time, a shift occurred from harder toolstones, such as basalt, rhyolite, quartz, quartzite, and other igneous materials, toward more fine-grained and siliceous materials, such as CCSs like chalcedony, jasper, chert, and obsidian (Basgall 1993; Sutton et al. 2007). Most of these materials, with the exception of obsidian, are widely available in this region; however, local outcrops or concentrations of the materials may have bearing on where particular types of sites are found. Nonlocal materials, such as obsidian, signal trade and exchange with people in other regions. Additionally, morphological features of tool forms also appear to have changed through time from those fashioned with percussion flaking in the earlier periods (Lake Mojave and Pinto) to more flake-based forms using pressure flaking in the later temporal periods. Some have argued that the shift in tool production technology may, in fact, be related to the reduction in size of bifaces and projectiles through time as a consequence of the introduction of the bow and arrow (Allen 1986; Binning et al. 1986, 2009; Delacorte 1999; Yohe 1998).

Groundstone tools were often cached or left in situ at locations where mobile groups might return seasonally, due to the high cost in transport of such items. Milling tools may be indicators of locations that were visited frequently or inhabited on a more permanent basis. Additionally, the presence and types of milling tools identified at sites may indicate the processing of particular types of plants or animals that were procured locally. The types of milling equipment identified at sites may have temporal implications, as well. Reconstruction of land use strategies and the broad cultural patterns in the prehistoric Mojave Desert appear to support a late intensification of seed and nut processing. Early on, in the Late Pleistocene and early Holocene, little to no ground stone or milling equipment is identified in the archaeological record. During the early Archaic, milling equipment becomes a dominant part of archaeological site furniture (Sutton et al. 2007).

Research Questions

- What types and proportions of flaked-stone artifacts are present at the site, and what activities do these artifacts represent? What types of raw materials are used for stone tools at the site? Are materials locally available, or do they reflect interaction and trade on a regional level? Can nonlocal materials be sourced?
- Is the flaked stone assemblage at a site related to stone-tool manufacture or maintenance? Are there shifts in stone-tool technology over time at the site?
- Is the use and/or production of bifaces present? If so, what production stages are present? Are expedient core/flake technologies present? If so, what stages of production are present?
- What can be inferred about prehistoric settlement and mobility patterns from the toolstone assemblages?
- Can we discern toolstone preference (i.e., shifts in flaked stone assemblage lithology) changes over time? Can we identify shifts in lithic technology, reduction strategy, and tool forms that show change over time?
- If milling equipment is discovered in association with a site, what foodstuffs were processed using this milling equipment? Can we discern the age of these implements, and to what cultural period do they relate?

Data Requirements

Research questions relating to technology can be addressed through the presence of the remnants of the flaked-stone reduction process sufficient to reconstruct the sequence and nature of reduction and the type of technology employed. The presence of intact, flaked lithic-reduction sites allows for analysis and reconstruction of reduction methods and sequences. The presence of flaked lithic or groundstone tools in undisturbed contexts allows for possible interpretations of mobility patterns and chronological placement of the site or site component. If flaked lithic or groundstone tools retain patterns of wear or residues, this may be indicative of the function of the tool (Newman et al. 1993; Yohe 1992), its use within the site, and the site's function within a larger regional landscape.

Settlement Patterning

Understanding how past human populations interacted with their environment and settled on the landscape is a critical part of archaeological research. Through such research, the relationships between humans and the physical aspects of the environment, the relationships with neighboring populations, and the relationships between humans and biological and geological resources are better understood. An important goal of such research is to move beyond an emphasis on site-specific data to settlement patterning on a regional level. In this framework, individual archaeological sites are viewed in relation to their function within a larger settlement system, and an attempt is made to understand the context and range of activities at a site, and, therefore, the contribution of a specific activity locus to a larger cultural system.

Prehistoric settlement patterning in the Mojave Desert has received much attention in literature since the inception of scientific archaeological study of the region (Basgall et al. 1994; Bettinger and Baumhoff 1982; Rogers 1929; Steward 1938; Sutton 1996, 2007; Sutton et al. 2017; Warren 1984, among many others). There is general agreement about the nature of Paleoindian or late Pleistocene settlement in this region being represented by small, highly mobile nomadic groups likely exploiting resources from a variety of locales as part of a seasonal round (Allen and Burns 2013; Sutton 1996, 2017; Sutton et al. 2007; Warren 1984). Settlement patterning later in time is not as clear and has been a subject of much debate. However, models of settlement patterning have largely been tied to paleoclimatic reconstructions that consider such issues as the filling and desiccation of numerous ancient lakes that dot the landscape of the Mojave, the locations of springs and perennial water sources, and the seasonal availability of resources.

Most researchers agree that the pattern of small, mobile foraging groups continued into later times; however, there is debate about the variable degree of sedentism seen at "base camps" or more long-term habitations. For example, Byrd et al. (2009:137) argue that Gypsum Period populations were tied to "larger, more centrally located base camps," and Sutton et al. (2007) tie changes in settlement and procurement strategies to climatic alterations, such as the Medieval Climatic Anomaly. The archaeological evidence suggests that, by the late Gypsum period, the central and eastern Mojave Desert was used by groups whose core territory centered on the resources available within proximity to the Mojave Sink and the surrounding area. With the broad range of the project area, it is likely that multiple resource exploitation areas and/or logistical base camps may be intersected on the desert floor, along the foothills, near dry lakes, or in mountain pass areas. Resource gathering and processing sites would be expected at those locations. Additionally, groups with greater residential mobility may have established temporary residences within the survey area, as evidenced by the locations of known ethnohistoric villages. Distinguishing among these site types is difficult, but site composition and structure and the presence of floral and faunal remains are important data sets in consideration of these issues.

Additionally, climatic variability is important in understanding changing land use in the Mojave Desert. Paleoenvironmental data suggest that the latest period of prehistory (circa 800 to 200 B.P.) was particularly prone to decadal to century-long variability in precipitation, with two particularly significant drought cycles occurring during the Medieval Climatic Anomaly (Jones et al. 1999; Stine 1994; Sutton 2017 et al.; Sutton et al. 2007). It might be expected, therefore, that sites in the survey area could show increased utilization during relatively mesic environmental conditions and reduced use during more arid periods. Most settlement pattern studies in the Mojave Desert start with the premise that prehistoric site distributions primarily reflect the organization of subsistence activities. However, in marginal environments, it is important to also consider nonsubsistence activities (Cleland 2004). For example, much of the project area is located along a known travel corridor that eventually connects the Colorado River with the desert to the west.

Research Questions

- What types of archaeological sites are represented in the project area and the larger region, and how do they relate to overall settlement systems identified in past research?
- What is the duration of occupation at sites in the project area? Were sites occupied on a short-term or long-term basis? Are sites represented by a single occupation or were they the results of multiple occupations/uses over a long period of time?
- Is there evidence that the occupation/use of a specific site is related to seasonal occupation of an area for such purposes as resource extraction related to seasonal availability?
- Are there elements to archaeological sites or deposits that can be tied to specific ethnic groups, such as ceramic types or introduced artifact forms/technologies?
- What subsistence-related activities, if any, are represented at each site?
- To what degree can the archaeological remains in the survey area aid in the classification of regional settlement and mobility systems with respect to mobility type, frequency, and range?
- Is there evidence of nonsubsistence functions, such as ceremonial or ritual activity and/or mortuary practices?

Data Requirements

Identification and analysis of materials from stratigraphically intact deposits with chronometric data to identify discreet occupation episodes and activity loci would be necessary to identify the placement of a specific site within a larger settlement pattern context. Paleoenvironmental data for reconstructing available biotic resources and providing the environmental backdrop for understanding how past human populations adapted to climatic issues is also required for this research issue. Technological data in the form of formal tools, temporally and behaviorally diagnostic artifacts, and the identification of features that can assist in the determination of site type is critical for this research domain. It also requires the identification of archaeological materials related to subsistence to assist in the reconstruction of diet and seasonality of site occupation. Geoarchaeological analysis to determine the level of post-depositional disturbance or lack thereof is crucial to being able to determine the context of materials at a site and the function of the site within a specific temporal and environmental framework. Finally, data on the distribution of archaeological sites in the larger region outside of the project area are necessary for discussions of settlement patterning beyond a local level.

Exchange and Mobility

For Native American populations in southern California, trade and exchange was a critical strategy with economic and social aspects and implications. Trade was an adaptive strategy and a means to acquire goods that were not readily available within an individual group's territory. Exchange of goods among ethnic groups worked to create and maintain social alliances and networks and bolster a group's standing in the region. Long- and short-distance trade was practiced throughout California, including between inland and coastal populations and with groups in the interior deserts. The presence of trade items can be indicative of interactions with specific ethnic groups. Trade items can also provide temporal data because particular styles of artifacts or materials may have been available during specific times, such as obsidian from Obsidian Butte that was available during the Late Prehistoric Period.

It is widely accepted that much of the project area followed ancient trade routes that roughly paralleled the course of the Mojave River (Warren and Crabtree 1986). With the exception of a few locations, most of the previously recorded prehistoric sites within the project area consist of lithic scatters of varying sizes and may have limited potential for addressing questions for this topic. Most materials identified on these sites are from locally available sources; however, some material types, such as obsidian, arrived via extensive trade and exchange networks. Additionally, some ceramic types found at sites in the Mojave are known to have been manufactured in the lower Colorado River area, and some may have even had ancestral Puebloan origins (Burns and Olson 2013; Leonard and Drover 1980; Rogers 1929; Sutton 2017 et al.). Marine shell beads from the Pacific coast, found on numerous sites in the Mojave Desert, are indicative of a substantial trade network involving multiple tribal entities (Allen and Burns 2013; Sutton et al. 2007; Sutton 2017 et al.; Warren 1984). Chemical analyses of shell beads have been conducted as a means to identify their likely point of origin (Allen and Burns 2013; Eerkens et al. 2005, 2010), pointing to the value of these artifacts as temporally and ethnically diagnostic tools.

The overarching goal of the analysis of trade and exchange is understanding the nature of regional interactions between populations, the nature of social networks, and the distribution networks in operation within the region's overall economic system.

Research Questions

- What materials were locally available on a specific site, and what materials are indicative of trade? What are the proportions of locally available materials versus nonlocal materials?
- What are the sources of nonlocal materials, such as obsidian, ceramics, marine shell, and steatite? Are there patterns evident in the proportions of such materials, and do these patterns change over time?
- In what forms were nonlocal materials traded? Were materials provided in raw form, or were nonlocal materials traded as complete artifacts?
- Does the presence of nonlocal materials represent long-distance trade and exchange, or is it indicative of the presence of different cultural groups in the area?
- Is there evidence of an ancestral Puebloan or Lower Colorado presence?

Data Requirements

The presence of nonlocal materials, such as obsidian or other nonlocal lithics, marine shell, nonlocal ceramic types, or other exotic materials, is necessary for addressing this research question, as is the presence of nonlocal or nonnative plant or animal species. Recovery of nonlocal materials for analysis, such as X-ray fluorescence (XRF), chemical constituent, radiocarbon dating, seriation, and faunal analyses, is necessary, preferably from intact and dated stratigraphic contexts.

6.3.2 Historic Period

The following important research themes for historical archaeological sites are presented in this section, including land use and settlement, and mining. Following a discussion of each theme, a series of research questions and data requirements are presented.

Land Use and Settlement

The Mojave Desert is a harsh environment. This theme has run throughout this report and is key to understanding land use in the project area. That vast portions of the project area are wholly undeveloped attests to the difficulty of settling permanently in the region. However, despite the impediments, people still settled the area and tried to eke out a living. In some cases, this took the form of agriculture, and, in others, it was ranching. Towns and communities, such as Barstow, Calico, Yermo, Baker, developed largely in relation to mining and railroad enterprises, providing services for travelers and moving freight in small and large quantities. These towns and communities also provided services for those traveling by vehicles. At the same time, numerous attempts were made to farm the land and raise livestock, although most were unsuccessful.

Research Questions

- What types of settlements are seen within the project area? Were farming or ranching viable options, and, if so, what is the archaeological signature of small-scale farming or ranching operations? Do archival sources provide documentation of small-scale settlements in the project area?
- What is the relationship between homesteads and resources such as water and transportation routes?
- What are the archaeological signatures of homesteads or small-scale farms or ranches? Does evidence of this type of activity exist within the project area? Can the socioeconomic status of such locations be determined through the material remains left at these sites? Does the archaeological material provide insights into the ethnicity of the settlers that occupied these sites?

Data Requirements

Features such as structural foundations, well heads, refuse dumps, or livestock-related or farming infrastructure, such as irrigation systems, are necessary to identify the nature of settlements within the project area. Because the proposed project is linear in shape and limited in width, it may be necessary to conduct archival research to tie particular features to larger settlements on the outlying landscape. Clear associations between refuse dumps and trash scatters and homesteads, ranching/farming, or mining operations must be determined to address the research questions.

Historic period refuse is ubiquitous along transportation routes and in rural areas and differentiating “wildcat” dumping from refuse disposal in primary contexts is critical.

Mining

Mining is another important theme in the history of the Mojave Desert. Large and small-scale mining was conducted throughout the region and very near the project area. Although some Euroamericans likely moved into the Mojave on their way to the gold fields of the north, mining expanded in the region from the 1860s through the 1880s, and camps were established (Norris and Carrico 1978). Towns such as Rosamond and Willow Springs arose from small camps and were tied to large mining operations. The development of wagon roads and railroad systems allowed for the transportation of important goods to local mines, thereby allowing for their expansion. Workers performed mining and prospecting activity primarily in the high desert and mountain areas of the Mojave, but small-scale mining operations persisted for many years.

Research Questions

- What types of materials were mined? Are particular technologies or methods evident that might help to identify the type of mining that took place at the site?
- During what time period was the mine being worked? Was the mine abandoned, and then later reworked?
- Are the techniques and technology used onsite common for the time period the site was occupied?
- Is the mining operation that of an individual or part of a much larger enterprise?
- What is the relationship of the mining operation to that of larger towns and communities, such as Barstow, Yermo, Calico, Baker, or the Mountain Pass area?
- Is it possible to distinguish ethnic affiliations of the miners that worked on the site?

Data Requirements

Features such as mining adits, prospect pits, shafts, equipment mounts, camp sites, cairns, claim markers, mining technology, refuse dumps, or structural remains are key to identifying archaeological sites as mining-related. The existence of such features may be sufficient to address questions about technology or the type of mining that took place at a particular site, but archival research is key for gathering more specific information. Questions relating to the place of mining in the local economy, the individuals running the mining operation, dates it was in operation, and more broad questions about the nearby mining towns of Rosamond and Willow Springs will also rely on more detailed archival research to tie archaeological components to these larger research issues. Temporally and behaviorally diagnostic artifacts are required to determine the type of mining and the era in which it was conducted. To meet significance criteria, mining sites would need to have integrity and contextual information to tie them to important persons or events or provide information not available from extant archival resources.

6.4 Guide for Evaluating Archaeological Resource Eligibility

The purpose of this plan is to outline a process for testing and evaluating the historical and precontact archaeological sites identified during an earlier archaeological inventory of the project. In addition to considering individual archaeological sites, this plan must also consider whether individual archaeological sites contribute to the significance of larger historic districts or landscapes. This section provides a reference for evaluating archaeological site significance—both individually and as part of a larger district or landscape—based on the information presented earlier in this chapter.

6.4.1 Individual Eligibility

This section identifies the criteria that would need to be met for an archaeological site to be individually eligible for the CRHR under each criterion. Additional considerations relating to historical archaeological resources are also presented.

Criterion 1

- The archaeological site must be attributable to a significant event or broad pattern in history.
- The site must illustrate the importance of a significant event or trend. Chronological association is not sufficient for establishing significance.
- The site must retain sufficient integrity to convey its association with the significant trend or association. In other words, the site must be recognizable as being from the period during which the event or broad pattern of history occurred and convey its association with the significant period or event.

Criterion 2

- The archaeological site must be attributable to a significant person in our past.
- The site must illustrate the significant person's important achievement or achievements. Simply being associated with a significant person is not sufficient for establishing significance.
- The site must retain sufficient integrity to convey its association with a significant person's important achievement or achievements. In other words, the site must be recognizable as being associated with the significant person and convey its association a significant person's achievement or achievements.

Criterion 3

Archaeological sites may be individually eligible for CRHR-listing under Criterion 3 for embodying a distinct characteristic of a type, period, or method of construction, represent the work of a master, and possess high artistic value. Examples of such sites may include well-preserved ruins of buildings and structures, petroglyphs and pictographs, and earthworks. However, none of the archaeological sites described in this document are anticipated to include contents that would warrant consideration for individual eligibility under Criterion C. It is likely that some of the individual archaeological sites identified in this document may be part of a "significant and distinguishable entity whose components may lack individual distinction" and, therefore, may contribute to the significance of a large historic district or landscape. This is discussed in greater detail in Section 6.4.2, *Contributes to an Eligible District or Landscape*, below.

Criterion 4

- The archaeological site must contain chronologically and functionally diagnostic artifacts and features.
- The site must retain its original stratigraphy or sufficient stratigraphy to differentiate periods of use.
- The site's archaeological contents must be able to address historic, context-appropriate research themes and questions.
- For historical archaeological sites only: The contents of the archaeological site must add to the body of existing archaeological and historical knowledge in a way that cannot be accomplished through archival research alone.

6.4.2 Contributes to an Eligible District or Landscape

As indicated above, it is likely that some of the individual archaeological sites identified in this document may be part of a "significant and distinguishable entity whose components may lack individual distinction" and, thus, may contribute to the significance of a district or landscape. An archaeological site does not need to be individually eligible for CRHR-listing for it to contribute to the significance of a district or landscape: it only needs to embody one or more of the larger resource's themes of significance. As a result, for the purposes of this study, an archaeological site would contribute to the significance of a district or landscape if it:

- Contains sufficient information to determine site age and function and/or interviews or historical documentation tie the site to a district or landscape
- Clearly embodies one or more of a district or landscape's themes of significance
- Retains sufficient integrity to convey its association with a district or landscape

6.5 Field Methods

This section presents the methods and procedures that ICF archaeologists followed to perform archaeological field testing and laboratory analysis. It also includes procedures for curation preparation. All archaeological field and laboratory efforts were supervised by a principal investigator that meets the Secretary of the Interior's professional standards for an archaeologist (36 CFR Part 61) and is qualified to hold a cultural resources use permit from the Bureau of Land Management's Barstow and Needles field offices. The specific ways that the methods and procedures presented in this chapter were used during archaeological testing are outlined in Section 6.6, *Approach and Goals of Testing Program*, below.

6.5.1 Close Interval Intensive Pedestrian Survey

Intensive pedestrian survey was used to determine the surface extent of archaeological deposits more precisely and surface-exposed archaeological features and diagnostic artifacts at all archaeological sites. Intensive pedestrian survey consisted of archaeologists walking across the archaeological site and carefully inspecting the ground surface using 2-meter-wide parallel transects. In instances where the survey identified archaeological features or chronologically and/or functionally diagnostic artifacts, they were flagged and given an alphanumeric designation and their location logged using a portable global positioning system (GPS) unit with submeter accuracy. Chronologically and/or functionally diagnostic artifacts were then collected for laboratory analysis. In instances where artifact concentrations and features were visible on the ground surface, they were photographed, and the location and direction of each photograph was documented on a standard photograph log.

6.5.2 Shovel Test Pits (STPs)

STPs were used to determine whether buried archaeological deposits were present in instances where archaeological sites were located on Holocene-aged landforms, define the nature and extent of buried archaeological deposits when present, and determine landform age in instances where age is unknown. In instances where STPs were used to perform archaeological testing and evaluation, the ICF principal investigator determined the appropriate number, locations, and depth, depending on the known distribution of archaeological deposits, specific research needs, and logistical considerations at each archaeological site. In general, STPs were 40–44 centimeters round and extended to a depth of no less than 50 centimeters below the ground surface. In instances where archaeological deposits extended to depths greater than 50 centimeters, STPs were excavated to a depth of 20 centimeters below the deepest extent of archaeological deposits. All excavated sediments were dry screened through 1/8-inch (3 millimeter) hardware cloth onsite.

If possible, STPs were excavated in stratigraphic intervals; however, in most instances, stratigraphy was not visible, or stratigraphic intervals exceed 10 centimeters in thickness. In these instances, STPs were excavated in arbitrary 10-centimeter intervals. Each stratigraphic or arbitrary interval was given a sequential alphanumeric designation.

On completion of each STP level, ICF archaeologists recorded information about the depth, stratigraphy, sedimentary composition, archaeological contents, and other notable factors on standard field documentation forms and took relevant overview and detail photographs. All recovered artifacts were collected and separately bagged by the stratigraphic and/or arbitrary level from which they were collected.

On completion of each STP, ICF archaeologists visually inspected the sedimentary composition and stratigraphy of unit sidewalls and recorded this information in a standard unit summary documentation form. Archaeologists took STP overview photographs were taken, recorded the location of the STP using a GPS unit with submeter accuracy, and then backfilled the STP. All STPs were completed on the same day that they were started, and none were left open overnight.

6.5.3 Shovel Scrapes

Shovel scrapes or *surface scrapes* (SS) were used in large lithic scatter and prehistoric habitation sites. Shovel scrapes were used to determine whether subsurface material was shallowly buried and resulting from post-depositional movement of artifacts and sediments or representing an intact cultural component. The purpose of using SSs is to cover a larger area and recover artifacts to supplement the site assemblage. Soil is excavated using a flat shovel by scraping and cutting the top 10–20 centimeters of sediment as efficiently as possible. Although precise location data is lost due to the nature of this technique, the purpose of the scrape is to increase the sample size of the site's assemblage, assuming that little information will be lost given that artifacts in this environment are likely not in their original position, although still in the vicinity (Harmon 2015).

Each SS was 3 by 3 meters and excavated to a depth of 10–20 centimeters. Shovel scrapes were used on these sites because they cover a larger percentage of the site and give a more accurate picture of site composition than a standard STP.

6.5.4 Artifact Collection

All recovered diagnostic artifacts were collected and separately bagged by the stratigraphic and/or arbitrary level from which they were collected. If present, the following samples were collected for special studies:

- Bulk soil and ash samples
- Faunal remains
- Datable organic material

At the end of each day, all collected artifacts were transported from the field and placed under lock and key. Once fieldwork was complete, all artifacts were housed at the ICF San Diego laboratory until they were ready to be provided to a curation facility.

Field Discard Policy

- Materials less than 50 years old were not collected.
- Historical materials lacking clear associations with their original context were not collected.
- Fire-modified rock was examined, counted, and then returned to the field.

6.6 Approach and Goals of Testing Program

As discussed above, several types of archaeological sites have been identified based on such attributes as artifact content and diversity, size, inferred function, and duration and complexity of the artifact assemblage. Below we will present a generalized approach to the testing for each of these site types, and, where necessary, we provide details for sites that require more specific methods.

6.6.1 Large Lithic-reduction Sites

Three archaeological sites (BH-S-002, BH-S-012, and BH-S-144) were identified as Large lithic-reduction sites. One of these sites, BH-S-002, is within a gen-tie alternative on private property that was unavailable for survey; this site will be evaluated at a later date. For all large lithic-reduction sites, a combination of intensive-level pedestrian survey, artifact collection and detailed analysis, excavation of test units, and geoarchaeological assessments were conducted. For all sites in this category, additional studies were conducted to aid in making a recommendation for whether the site is eligible for CRHR-listing. To determine whether a site can address the research questions presented in Section 6.3, *Research Themes and Questions*, it was necessary to conduct testing that would inform onsite formation processes, site structure and content, potential impacts, vertical dimensions, and geoarchaeological context. To do so, a similar strategy was employed at each site, with some variation depending on factors such as the overall site size, the presence or absence of features, and the density of archaeological materials.

At each of the sites in this grouping, the process followed these steps with the level of effort varying at each location.

Close interval intensive pedestrian survey was conducted within the known boundaries of sites within the project area. During normal pedestrian surveys for the Phase I study, surveys were conducted at intervals of 10 to 15 meters between archaeological technicians. Within the currently known site boundaries, archaeologists conducted pedestrian surveys at close intervals to identify artifacts that may not have been visible during the initial inventory surveys. Using the techniques described earlier in this chapter, specific classes of artifacts were flagged, and concentrations identified. All flagged artifacts were mapped and diagnostically collected so that distributions could be documented for later analysis. Artifacts were collected and analyzed by the appropriate specialist. All collected materials were analyzed at a location to be at the ICF laboratory and will be curated at a curation facility meeting federal standards.

Test excavations were conducted at all sites to determine whether a subsurface component existed and provide locations for geoarchaeological assessments. Test excavation units were placed subjectively, based on the results of close interval pedestrian survey and at the discretion of the Principal Investigator. Test excavation units included 40-centimeter-round STPs and 3- by 3-meter SS units, depending on the size of the site and density of artifacts. STPs were excavated to a minimum depth of 50 centimeters, two sterile levels, or until Pleistocene-age soils were encountered. Shovel scrape units were excavated to a minimum 10-centimeters deep and a maximum of 20 centimeters, based on the recovery of artifacts. All excavated soils were dry-screened through 1/8-inch mesh in the field. Recovered diagnostic artifacts were bagged and tagged in the field, with their provenance recorded on the bags and location recorded using a GPS with submeter accuracy. In cases where sites covered large areas, test excavation units were placed subjectively near areas of the greatest concentration of artifacts as these area were most likely to possess subsurface deposits. Excavations conformed to standard archaeological practice in the region and worked toward identifying whether sites contained archaeological deposits capable of addressing important research questions. Questions that can be addressed with material culture include those pertaining to technology and subsistence, exchange and mobility, chronology, and other research themes presented in this document. Obsidian associated with archaeological deposits was collected, and samples were submitted for the appropriate dating technics.

Geoarchaeological assessments were made at each site, where possible, using test excavations that exposed pertinent stratigraphic profiles related to archaeological deposits. In some cases, excavation units were placed in locations important for understanding the geoarchaeological context of archaeological deposits, whether subsurface components exist at sites, and the level of disturbance through post-depositional process (natural or human-induced). Geoarchaeological assessments worked toward understanding the nature of these lithic quarry sites within desert pavement and other Holocene-age depositional environments. Stratigraphic profiles were developed for sites, where possible, and interpreted against archaeological deposits to determine whether individual sites maintain depositional integrity and could inform research questions relating to site-formation processes.

6.6.2 Prehistoric Habitation Sites

Five sites (BH-S-110, BH-S-202, P-15-000129, P-15-002539, P-15-002821) are identified as prehistoric habitation sites within or immediately adjacent to the project area. Two of these sites (P-15-000129, Willow Springs, and P-15-002821, Bean Spring) have been recommended eligible either in the past, by previous researchers, or as part of ICF's Phase I study. Additional studies at these two sites, therefore, will not be conducted to aid in making an eligibility determination, but to determine whether intact archaeological deposits are present within the boundaries of the project area. Both Willow Springs and Bean Springs intersect the project area within gen-tie alternatives on private property that was not accessible at the time of the survey and will be tested at a later date. Constituents outside of the project area at these sites point to their eligibility for the CRHR and include a variety of artifact and feature types, indications of semipermanent or permanent occupation, ceremonial or religious features, the presence of inhumations or cremations, and the overall ability to address eligibility criteria. The process for additional studies at these sites is similar in terms of methods employed, but the goals of the testing program at these sites are different.

Subsurface testing excavations were conducted at all prehistoric habitation sites, except for the Willow Springs and Bean Springs sites, to determine whether a subsurface component existed. Test excavation units were placed subjectively, based on the results of close interval pedestrian survey and at the discretion of the Principal Investigator. Test excavation units includes 40-centimeter-round STPs and 3- by 3-meter SS units, depending on the size of the site and density of the artifacts. STPs were excavated to a minimum depth of 50 centimeters, two sterile levels, or until Pleistocene-age soils were encountered. Shovel scrape units were excavated to a minimum 10-centimeters deep and a maximum of 20 centimeters, based on the recovery of artifacts. All excavated soils were dry-screened through 1/8-inch mesh in the field. Recovered diagnostic artifacts were bagged and tagged in the field, with their provenance recorded on the bags and location recorded using a GPS with submeter accuracy. In cases where sites covered large areas, test excavation units were placed subjectively near areas of the greatest concentration of artifacts because these areas were most likely to possess subsurface deposits. Excavations conformed to standard archaeological practice in the region and worked toward identifying whether sites contained archaeological deposits capable of addressing important research questions. Questions that can be addressed with material culture include those pertaining to technology and subsistence, exchange and mobility, chronology, and other research themes presented in this document. Unfortunately, datable materials such as charcoal, ash, and shell were not identified at any of the sites. However, obsidian was collected and samples submitted for the appropriate dating techniques.

6.6.3 Sparse Lithic Scatters

Using the guidelines set forth in the California Archaeological Resource Identification and Data Acquisition Program (CARIDAP): Sparse Lithic Scatters (Jackson et al. 1988), ICF has identified 17 sites (BH-S-003, BH-S-005, BH-S-006, BH-S-008, BH-S-011, BH-S-013, BH-S-102, BH-S-108, BH-S-111, BH-S-134, BH-S-140, BH-S-207, BH-S-211, BH-S212, BH-S-303, P-15-019544 and P-15-019546) that may be considered sparse lithic scatters. Using the data collected during the initial survey, none of the 17 sites identified as sparse lithic scatters have been recommended individually as containing data sufficient to recommend them as eligible for CRHR-listing. However, each of the sites were also evaluated and considered for potential eligibility for the purposes of the project as contributors to an archaeological district. The potential identification of a subsurface component and the detailed analysis of artifacts as identified in the CARIDAP program was the goal of the testing program at these sites. The size of each site varied, but, by definition, as part of the CARIDAP program, sparse lithic scatters are less than 10,000 square meters and have artifact densities of less than three artifacts per square meter.

Methods for studying sparse lithic scatters were nearly identical to those identified for large lithic-reduction sites, but on a smaller scale. In general, sparse lithic scatters were excavated with STPs near concentrations of artifacts, and only those sites with a diverse surface assemblage included SSs to increase the potential number of recovered artifacts.

Close interval intensive level pedestrian survey was conducted within the known boundaries of sites within the project area. During normal pedestrian surveys for the Phase I study, surveys were conducted at intervals of 10 to 15 meters between archaeological technicians. Within the currently known site boundaries, archaeologists conducted pedestrian surveys at close intervals to identify artifacts that may not have been visible during the initial inventory surveys. Using the techniques described earlier in this chapter, specific classes of artifacts were flagged, and concentrations identified. All flagged artifacts were mapped, and diagnostic artifacts collected so that distributions could be documented for later analysis. Artifacts were collected and analyzed by the appropriate specialist. All collected materials were analyzed at the ICF laboratory and curated at a curation facility meeting federal standards.

Test excavations were conducted at all sites to determine whether a subsurface component existed and provide locations for geoarchaeological assessments. The number and location of STPs was determined based on guidelines set forth in the CARIDAP (Jackson et al. 1988) and placed judgmentally based on the results of close interval pedestrian survey, at the discretion of the Principal Investigator. Test excavation units included both 50- by 50-centimeter shovel probes and 1- by 1-meter excavation units. Analysis and laboratory methods followed those described earlier in this chapter, conformed to standard archaeological practice in the region, and worked toward identifying whether sites contain archaeological deposits capable of addressing important research questions. Questions that can be addressed with material culture include those pertaining to technology and subsistence, exchange and mobility, chronology, and other research themes presented in this document. If dateable materials such as obsidian or organic materials associated with archaeological deposits were collected, samples were submitted for the appropriate dating technics following the schedule described in the CARIDAP (Jackson et al. 1988).

Geoarchaeological assessments were made at each site using test excavations that exposed pertinent stratigraphic profiles related to archaeological deposits. In some cases, excavation units were placed in locations identified by the geoarchaeologist as important for understanding the geoarchaeological context of archaeological deposits, whether subsurface components exist at sites, and the level of disturbance through post-depositional process (natural or human-induced). Geoarchaeological assessments work toward understanding the nature of these lithic scatter sites within desert pavement and other Holocene-age depositional environments. Stratigraphic profiles were developed, where possible, and compared to archaeological deposits to determine whether individual sites maintained depositional integrity and had the ability to inform research questions relating to site-formation processes.

6.6.4 Historical Period Refuse Dumps

Eleven archaeological sites (BH-S-001, BH-S-004, BH-S-009, BH-S-107, BH-S-109, BH-S-123, P-15-012793, P-15-018292, P-15-018676, and P-15-019545) that contain historical-period refuse dumps and materials were identified through the Phase I survey. The goals of the testing program for this category of sites were to identify whether the site constituents and features possessed data sufficient to address research questions, such as those relating to historical period settlement and land use, ethnicity, socioeconomic status, and others, that would qualify them as eligible for CRHR-listing. Two of these sites (BH-S-001 and P-15-018676) were in gen-tie alternatives and unavailable to be accessed for Phase II testing. Additionally, the testing program at these sites attempted to determine the integrity of archaeological deposits and the degree of post-depositional disturbance overall. Methods employed at these sites included archival research, detailed recordation and analysis of a sample of features, and subsurface investigations to examine features and conduct geoarchaeological analysis of the sites. All methods of artifact collection, analysis, documentation, and curation as described in Chapter 6.5, *Field Methods*, were followed during testing at these sites. Methods are briefly described below for both sites.

Archival research was conducted to provide contextual information and lines of inquiry necessary for assessing the potential inclusion of sites on the CRHR. All the sites appear to be single or multi-episodes of opportunistic refuse dumping. Archival research was conducted to determine if the refuse deposits could be identified with individual households or communities. Combined with the analysis of artifacts, archival research has the potential to aid in determining whether both sites were eligible for inclusion on the CRHR through the identification of research avenues and the potential for the constituents of the site to address them.

Detailed Recordation and Artifact Analysis was conducted within the known boundaries of these sites within the project area. During normal pedestrian surveys for the Phase I study all surface features were identified at both sites. Due to the lack of features and sparse number of materials at each site, only a sample of the artifacts within the sites were analyzed. Testing at the sites was conducted to determine whether the site content were sufficient to address research questions identified in this document such that the sites could be considered for their potential eligibility for CRHR-listing. Artifacts were analyzed in the field by the appropriate specialist and were not collected.

Test excavations were conducted at the sites to determine whether a subsurface component existed within their boundaries. Test excavation units were placed judgmentally at the discretion of the Principal Investigator. Analysis followed those methods described earlier in this chapter and conformed to standard archaeological practice in the region, with the aim of identifying whether sites contain archaeological deposits capable of addressing important research questions. If the appropriate materials and numbers of artifacts were present, questions that can be addressed with material culture and the analysis of features included those pertaining to technology and subsistence, the available resources for homesteading in the early twentieth century, socioeconomic status of residents, ethnicity, and the nature of ranching, farming, and animal husbandry on such sites.

Geoarchaeological assessments were made at each site using test excavations that exposed pertinent stratigraphic profiles related to archaeological deposits and features. In some cases, excavation units were placed in locations identified by the geoarchaeologist as important for understanding the geoarchaeological context of archaeological deposits, whether subsurface components exist at sites, and the level of disturbance through post-depositional process (natural or human-induced). Stratigraphic profiles were examined in the field and interpreted against archaeological deposits to determine whether individual sites maintain depositional integrity and could inform on research questions relating to site-formation processes.

6.7 Tested and Evaluated Archaeological Resources

6.7.1 New Archaeological Sites

The 2021 pedestrian survey identified 27 new sites in the archaeological study area. Table 6-1 lists and describes the new sites.

Table 6-1. Newly Recorded Sites Identified in the 2021 Pedestrian Survey

Site Number	Era	Description
BH-S-001	Historic-era	Historic-era refuse scatter
BH-S-002	Prehistoric	Large lithic scatter
BH-S-003	Prehistoric	Small lithic scatter with nine rhyolite tertiary flakes and one CCS flake
BH-S-004	Historic-era	Historic-era refuse scatter
BH-S-005	Prehistoric	Lithic scatter with two bifaces
BH-S-006	Prehistoric	Sparse lithic scatter with one core fragment and a projectile point
BH-S-008	Prehistoric	Small lithic scatter with three rhyolite flakes and one CCS primary flake with a modified edge
BH-S-009	Historic-era	Historic-era refuse scatter; cans in drainage
BH-S-011	Prehistoric	Small lithic scatter with seven rhyolite flakes
BH-S-012	Prehistoric	Large lithic processing area
BH-S-013	Prehistoric	Small lithic scatter including six rhyolite flakes
BH-S-102	Prehistoric	Lithic scatter with one projectile point and two bifaces
BH-S-107	Historic-era	Historic-era refuse scatter
BH-S-108	Prehistoric	Small lithic scatter with five rhyolite tertiary flakes
BH-S-109	Historic-era	Historic-era refuse deposit
BH-S-110	Prehistoric	Large lithic scatter with multiple projectile points; sites BH-S-114 and BH-S-115 subsumed into this site
BH-S-111	Prehistoric	Lithic scatter, including three rhyolite flakes, one chert flake, and one rhyolite biface fragment
BH-S-114	Prehistoric	Deflated hearth with associated lithic scatter; subsumed into BH-S-110
BH-S-115	Prehistoric	Lithic scatter with four rhyolite flakes, one chert flake, and one rhyolite hammerstone; subsumed into BH-S-110
BH-S-123	Historic-era	Historic-era refuse scatter
BH-S-134	Prehistoric	Low-density flake scatter
BH-S-140	Prehistoric	Lithic scatter, including five rhyolite flakes and one chert flake
BH-S-144	Prehistoric	Lithic scatter with approximately 80 flakes, including rhyolite, jasper, and chert
BH-S-202	Prehistoric	Large, dispersed lithic scatter with two loci
BH-S-207	Prehistoric	Primary lithic-reduction site in alluvial wash
BH-S-211	Prehistoric	Lithic scatter with 19 rhyolite flakes
BH-S-212	Prehistoric	Lithic scatter with one obsidian point and two rhyolite flakes

CCS = cryptocrystalline silicates

BH-S-001

BH-S-001 is a refuse scatter measuring approximately 115 by 63 feet in the shoulder of Tehachapi Willow Springs Road. This site contains approximately 200 historic artifacts, including cans, glass, and fragments of a dinner plate dating to 1927. It is unlikely that a subsurface component exists. The site lacks features and was likely the result of a single dump episode. The site is in a rural desert environment and the topography surrounding the site is characterized by flat desert terrain, with ground visibility between 90 and 100 percent across the site. The vegetation community is characterized by species associated with the Mojave Desert.

Artifact types include solder-dot cans, paint cans, sanitary cans, church-key-open cans, meat tins, a Copenhagen metal cap, enamelware, pull-top cans, chicken wire, and a tobacco lid. Colors of glass identified include amber, colorless, milk, cobalt, and sun-colored amethyst. Additional artifacts include a glass Vicks vapor rub container dating to the 1960s, fragments from a wooden pen, and white ware ceramic fragments of a tea pot and plate. The maker's mark on the plate indicates "Homer Laughlin/Made in U.S.A./E 7 N 5." Homer Laughlin China Company started in the early 1870s and continues to make mass-produced dinnerware sets. The fragment identified onsite comes from a plate mass-produced in May 1927 by Newell Potters in West Virginia. No features were identified at the site.

The site lacks physical integrity and is in poor condition. No features outside of the concentrations were observed. Because of its proximity to an active road, the site has most likely been affected by modern looting or littering. Cans at the site have bullet holes. The area is also subject to intense rain and winds. Therefore, the site has most likely been affected by wind and water disturbances. This site most likely represents a single roadside dumping episode from the mid-twentieth century.

BH-S-002

BH-S-002 is a lithic scatter of at least 75 artifacts dispersed over nearly 11 acres near Willow Springs. Various material types were represented onsite, including rhyolite, CCS, obsidian, quartzite, and basalt. No formal tools were identified on the site, which spans a block between Truman Road on the north and Felsite Road on the south. The surface assemblage contains a variety of material types, suggesting it was a multi-use lithic tool production and retouch site.

Because of its proximity to an active road, the site has most likely been affected by modern looting or littering. Well-established off-road vehicle trails are to the east of the site and have most likely caused disturbances to the site. The area is also subject to intense rain and winds.

BH-S-003

BH-S-003 is a sparse lithic scatter containing nine rhyolite flakes and one flake of CCS material (Plate 6-1). The site measures 42 by 18 meters. Most of the flakes are tertiary, suggesting this may represent a lithic reduction area. The site is between a residence (9678 Dawn Road, Rosamond, CA 93560) and Lloyd's Landing Airport, 135 meters south of Dawn Road. Raw materials were likely gathered onsite or procured from the known prehistoric lithic quarries in the nearby Rosamond Hills. The predominance of tertiary flakes and the limited number of cultural materials observed suggest that this assemblage may reflect a single-use lithic-reduction site. A lack of features and other material types further points to a brief, expedient use of this site.

Plate 6-1. BH-S-003 Rhyolite Flake, Plan View

Because of its proximity to an active residence, former airfield, and agricultural lands, the site has most likely been affected by modern looting or littering. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-004

BH-S-004 is a historic-era refuse scatter consisting of trash dating from the late 1960s to early 1970s, including beverage cans, gallon buckets, steel cable, and glass bottles. The site measures 19 by 14 feet and is in the corner of two perpendicular dirt roads. Artifacts of the small scatter appear contemporaneous and are likely from a single dump episode, most likely an expedient dumping location. The site is about 100 feet south of Favorito Avenue, in a flat and featureless part of the desert characterized by creosote scrub vegetation and nonnative grasses.

Observed in the assemblage was a 7-Up bottle that dates from the late 1960s to the early 1970s. The bottle has “7-UP” embossed sideways along the body of the bottle and “No Deposit No Return” embossed along the shoulder. An observed Pepsi can dates between 1967 and 1972. A broken Nesbitt’s bottle and a Canada Dry pull-top can date to the early 1970s. Additional artifacts include pull-tab bi-metal cans, steel cable, four steel gallon containers, and a metal speaker. Glass bottle fragments include green, colorless, amber, and aqua.

Because of its proximity to two active dirt access roads and nearby agricultural lands, the site has most likely been affected by modern vehicular activities, looting, or littering. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-005

BH-S-005 is a sparse lithic scatter that measures 145 by 61 meters on both sides of a chicken wire fenceline. The site contains two rhyolite bifaces and approximately 50 flakes, mostly rhyolite. Most observed flakes are tertiary, with some secondary. One of the bifaces is broken at the base and has use wear on one edge. This biface measures 6.5 by 4.1 by 1.1 centimeters. The other rhyolite biface measures 4.1 by 4 by 0.4 centimeters. This site appears to be a single-use lithic-reduction site using local materials.

Because of its proximity to an active residence and dirt access road, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-006 (Obsidian Date 936–894 B.P.)

BH-S-006 is a sparse prehistoric lithic scatter containing one obsidian projectile point, a core fragment, six obsidian flakes, and five rhyolite flakes. This site measures 64 by 54 meters and is south of Favorito Avenue and west of a dirt access road for a nearby active residence. The obsidian projectile point measures 3.5 by 2 by 0.25 centimeters and appears to be a Rose Spring Stemmed point (see Plate 6-2). The multidirectional core fragment measures 5 by 3.5 by 2.75 centimeters. This site appears to be a single-use lithic-reduction site using a combination of local materials and Coso obsidian sourced from the Coso volcanic fields approximately 80 miles north of this site.

Plate 6-2. BH-S-006 Obsidian Projectile Point, Plan View

The site is on a desert alluvial wash with patches of seasonal grasses and loose surface gravels. Because of its proximity to an active residence and dirt access road, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-008

BH-S-008 is a small lithic scatter containing three rhyolite flakes and one chert secondary flake with a modified edge that measures 3.8 by 2.9 by 1 centimeters. The site measures 29 by 12 meters and is in a desert alluvial plain extensively disturbed by agriculture and sheep grazing. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-009

BH-S-009 is a historic-era refuse deposit identified in a drainage containing two matchsticks and about 20 sanitary cans from the 1930s to 1960s. The site measures 48 by 16 feet and has been highly affected by water erosion and modern disturbances in this area. The sanitary cans have various openings, including church key, rotary-open, and knife cut. This site has been highly disturbed by water erosion from the drainage and surrounding alluvial wash. Additionally, this area has been used for agricultural purposes, which may have affected this site further.

BH-S-011

BH-S-011 consists of seven rhyolite flakes in a 20- by 19-meter area. Six flakes are tertiary, and one is a primary flake. The site appears to be an expedient lithic reduction station. This site is on an alluvial desert plain with loosely compacted sand. Vegetation includes bursage, thistle, and creosote. Disturbances include sheep grazing, power pole installation, dirt access roads, and private residences to the north and south.

BH-S-012

BH-S-012 is a large, dispersed, lithic processing site with multiple reduction stations in a relatively undisturbed parcel adjacent to a large drainage. This site measures 76 by 49 meters and is situated on a knoll covered in desert pavement. Lithic materials identified include rhyolite and CCS. Materials were likely sourced locally from quarries in nearby Rosamond Hills. Seven features were observed during the survey. Feature (F) 1 includes two secondary and two tertiary rhyolite flakes, two primary, six secondary, and two tertiary tuff flakes, and one secondary CCS flake. F2 includes three secondary and three tertiary rhyolite flakes and one secondary CCS. F3 includes two primary, five secondary, and six tertiary rhyolite flakes. F4 includes one primary, three secondary, and four tertiary flakes. F5 includes two primary, two secondary, and three tertiary flakes. F6 includes a rhyolite biface, three primary, three secondary, and four tertiary rhyolite flakes, and one tertiary CCS flake. F7 includes one primary, two secondary, and one tertiary rhyolite flakes.

The area is subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby CCS and rhyolite sources in the Rosamond Hills (approximately 4 miles east–northeast of BH-S-012) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-012).

BH-S-013

BH-S-013 is a small lithic scatter in the eastern margins of a dry seasonal drainage that measures 14 by 8 meters. The surface expression contains six rhyolite flakes that may point to a single- or limited-use activity area where a larger core was reduced for transport, tool production, or retouch. The six flakes include one primary, one secondary, and four tertiary flakes. The area is subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-102 (Obsidian Date 1805 B.P.)

BH-S-102 is a lithic scatter containing one obsidian projectile point, one rhyolite point, two bifaces (one rhyolite, one chert), one obsidian flake, and more than 30 flakes of rhyolite and chert. Eight flakes appear to have utilized edges, and most of the flakes are tertiary, with two secondary flakes. More than 90 percent of the material types are rhyolite, with chert the second-most prevalent material type and obsidian last. The site measures 48 by 27 meters and is in a disturbed and featureless area adjacent to Lloyd’s Landing Airstrip and Patrick Place. Raw materials are sourced mostly locally and were likely gathered onsite or procured from the known prehistoric lithic quarries in the nearby Rosamond Hills. Observed obsidian is Coso obsidian, which is sourced from the Coso volcanic fields approximately 80 miles north of this site.

Because of its proximity to an active residence and dirt access road, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-107

BH-S-107 is a small historic refuse scatter consisting of cans, bottle bases, glass shards, and unidentified metal fragments next to an abandoned two-track road near Lloyd's Landing Airstrip, close to the intersection of Dawn Road and Patrick Place. The site measures 57 by 42 feet and is 15 meters west of a dry seasonal wash. The resource is the result of a single dump episode sometime after the mid-1970s, although some of the artifacts date much earlier.

The site consists of olive, amber, colorless bottle bases, and glass fragments. Corroded metal artifacts include one meat tin, one solder-dot milk can, and one fruit can with church-key opening. Two bottle bases (one colorless and one olive) have embossing and appear to date to the late 1950s to mid-1970s. The first colorless bottle base reads "DI GIORGIO WINE CO./DI GIORGIO/CALIF./184E 4/(L)/REFILLING PROHIBITED." The second colorless bottle base reads "UNITED VINTNER INC/[Hazel Atlas maker's mark]/REFILLING/PROHIBITED/O-I 8." The olive-green bottle base reads "FLAVOR – GUARD/57/REFILLING/PROHIBITED/GALLO BOTTLE." The amber bottle base has an "L" in a circle as a maker's mark.

Because of its location in a highly disturbed cleared area and its proximity to an active residence and dirt access road, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-108

BH-S-108 is a small lithic scatter consisting of five rhyolite tertiary flakes, suggesting it is a single core reduction or retouch activity area. The site measures 17 by 13 meters. Soils consist of loamy sand on 0 to 5 percent slopes. Vegetation in the area consists of creosote, saltbush, Russian thistle, and other members of the creosote scrub community. Visibility on the site is good (approximately 90 percent).

Because of its proximity to agricultural land, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby chert and rhyolite sources in the Rosamond Hills (approximately 4 miles east–northeast of BH-S-108) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-108). No early-stage reduction flakes or single-reduction loci were identified; nor were any temporally diagnostic artifacts or dateable. A lack of features or other material types suggests that the site was only inhabited on a short-term basis; however, site features or other material types, if previously present on the surface, would have been destroyed by agricultural activity.

BH-S-109

BH-S-109 is a historic domestic refuse scatter in a heavily disturbed area north of Favorito Avenue. The scatter contains approximately 150 cans, various glass bottles and fragments (red, colorless, cobalt, and amber), miscellaneous metal, dinnerware, and other household refuse. Most artifacts date from the 1930s to the 1960s and appear to be a single opportunistic dumping episode, most likely from the nearby dirt road just south of the site.

Artifacts include a milk of magnesia bottle, a grease tube, a pressed red glass vessel, a colorless glass ink bottle, what looks like a child's ceramic art project, light bulbs, a steel kitchen scoop, a Bayer aspirin bottle, hinges, a white saucer, ceramic transferware, a Band Aid tin, lighter fluid cans, sanitary cans, matchstick filler cans, beverage cans, key wind cans, juice concentrate cans, condensed milk cans, meat tins, and a powder tin. Makers' marks include Owens Illinois, Knox Glass, Latchford-Marble Glass Company, and Consolidated Glassworks that date to 1920, 1936, 1941–1953, 1952, and generally the 1930s.

Vegetation in the area consists of creosote, saltbush, Russian thistle, and other members of the creosote scrub community. Visibility on the site is good (approximately 90 percent).

Because of its proximity to agricultural land, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes.

BH-S-110 (Obsidian Dates 3464–1983 B.P.)

BH-S-110 is large prehistoric habitation site measuring approximately 265 meters east–west by 250 meters north–south. The site assemblage is related primarily to stone tool manufacture, but includes a number of tools, groundstone, and deflated hearth features. The site consists of a large primary locus (Locus A) with two smaller outlying loci (Locus B and Locus C) that were originally believed to be separate sites (BH-S-114 and BH-S-115). Locus B and Locus C were subsumed into the site when sparse artifacts were identified between the loci during the intensive pedestrian survey for the current effort.

Locus A is a large prehistoric scatter containing more than 500 lithic artifacts made into a variety of forms from an array of materials, including obsidian, rhyolite, chalcedony, basalt, and chert. The rhyolite and CCS materials are in a wide variety of colors. Flaked stone artifacts include projectile points (three), utilized flakes (more than 10), bifacial tools, debitage, and cores. See Plate 6-3 for a picture of one of the obsidian projectile points. Two groundstone metate fragments (one vesicular basalt and one granite) were also located on site. The assemblage is dispersed across a stable terrace that is elevated about 2 meters from the ground surface below, less than 50 meters from a residence. Aerial imagery suggests a creek once skirted the western side of the landform. Clusters of broken rock around the site appear to be fire-affected and may be deflated hearth features; further testing will determine the presence or absence of thermal features. There is a main concentration measuring 83 meters east–west by 50 meters north–south. The artifacts radiate in all directions from this concentration, with the density of artifacts dropping with distance. The overall locus dimensions are 265 meters east–west by 190 meters north–south. No specific activity locations, such as single-reduction loci or food-processing areas, are apparent. The artifacts are well dispersed, with all lithic materials mixed together. The landform has been subjected to erosion and sheet flows, which have probably moved some of the artifacts, although not to an extent to be considered secondary deposition. The site exhibits some tire scars across the land, and narrow and currently unused dirt roads run east–west through the site. Given the proximity to a residence, it is likely that some opportunistic collecting has taken place; however, no evidence of looting pits was identified. The site is within creosote scrub habitat with some Joshua trees present. Overall site integrity is good to very good. This sprawling and diverse prehistoric artifact scatter is likely to produce more information because some artifacts, like the metates, were identified partially buried, and the geomorphology of the immediate area suggests there is some sediment deposition.

Plate 6-3. BH-S-110 Obsidian Projectile Point, Plan View

Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby chert and rhyolite sources in the Rosamond Hills (approximately 4 miles east–northeast of BH-S-110) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-110). The site has not been evaluated, and further testing and evaluation work is recommended for this archaeological site.

Locus B (Formerly BH-S-114) is a small lithic scatter and possible deflated thermal feature about 50 meters south of site ICF-BH-110, Locus A. The site measures 45 by 24 meters. Lithic artifacts onsite consist of one rhyolite and three chert flakes, and the possible hearth feature is made of what appears to be a cluster of fire-cracked and fire-affected basalt rocks.

Because of its location in agricultural land, the locus has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby basalt and rhyolite sources in the Rosamond Hills (approximately 4 miles east–northeast of the locus) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of the locus). No early-stage reduction flakes or single-reduction loci were identified; nor were any temporally diagnostic artifacts or dateable materials. The presence of a possible deflated hearth feature points toward a temporary camp site where some lithic processing occurred.

BH-S-110, Locus C is a small lithic scatter measuring 57 by 33 meters and containing four rhyolite flakes, one chert flake, and one rhyolite hammerstone (Plate 6-4). The scatter was identified in the scar of an old, two-track road leading to a residence off Tehachapi Willow Springs Road, 50 meters east of larger prehistoric site BH-S-110, Locus A.

Plate 6-4. BH-S-110, Locus B, Rhyolite Hammerstone, Plan View

Because of its proximity to an active residence and dirt access road, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes. No early-stage reduction flakes or single-reduction loci were identified; nor were any temporally diagnostic artifacts or dateable materials. A lack of features or other material types suggests that the locus was only inhabited on a short-term basis; however, site features or other material types, if previously present on the surface, would have been destroyed by agricultural activity.

BH-S-111

BH-S-111 is a small prehistoric lithic scatter consisting of a rhyolite biface fragment (Plate 6-5), three rhyolite flakes, and one chert flake. The scatter measures 30 by 15 meters and is in an area that has been grazed, with modern disturbances related to disking for agriculture. The rhyolite biface fragment measures 4.2 centimeters by 5.1 centimeters by 0.5 centimeter.

Plate 6-5. BH-S-111 Rhyolite Biface, Plan View

Because of its location in agricultural land, the site has most likely been affected by modern disturbances. The area is also subject to intense rain and winds, which can disturb artifacts in sites on these flat, alluvial desert washes. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant due to the nearby chert and rhyolite sources in the Rosamond Hills (approximately 4 miles east–northeast of BH-S-111), and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-111). No early-stage reduction flakes or single-reduction loci were identified; nor were any temporally diagnostic artifacts or dateable materials. A lack of features or other material types suggests that the site was only inhabited on a short-term basis; however, site features or other material types, if previously present on the surface, would have been destroyed by agricultural activity.

BH-S-123

BH-S-123 is a small historic refuse scatter consisting of 11 sanitary cans, five solder-dot cans, a mason jar, and a razor-blade holder. These artifacts appear to date to the early 1900s, and this site appears to represent an opportunistic dumping episode. The resource was identified in an area that has been affected by agriculture, about 420 feet north of McConnell Avenue.

Extreme disturbance from agricultural activity precludes meaningful interpretation of the surface expression of BH-S-123. Cans appear to have been windblown and affected by intense agricultural activities in this parcel. This parcel has underground and aboveground asbestos irrigation pipes that have affected the entire parcel.

BH-S-134

BH-S-134 is a low-density scatter of rhyolite flakes in a highly disturbed agricultural field. The surface expression contains 11 rhyolite flakes, which may point to a single- or limited-use activity area, where a larger core was reduced for transport, tool production, or retouch. The site measures 39 by 31 meters and is most likely not in situ, due to agricultural plowing.

The site is within a large agricultural field with a center-pivot irrigation system. Sediments consist of alluvial loamy sand on 0 to 5 percent slopes. Vegetation within the agricultural field consists almost entirely of hay. Visibility on the site is good (approximately 90 percent). The site is highly disturbed from several decades of agricultural activity.

Extreme disturbance from agricultural activity precludes meaningful interpretation of the surface expression of BH-S-134. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant, due to the nearby chert and rhyolite sources in the Rosamond Hills (approximately 4 miles east–northeast of BH-S-134) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-134). No early-stage reduction flakes or single-reduction loci were identified; nor were any temporally diagnostic artifacts or dateable materials. A lack of features or other material types suggests that the site was only inhabited on a short-term basis; however, site features or other material types, if previously present on the surface, would have been destroyed by agricultural activity.

BH-S-140

BH-S-140 is a sparse prehistoric lithic scatter covering an approximately 1,350-square-meter area. The site consists of five rhyolite flakes and one chert flake, all within the late stages of reduction. No features or other artifact types are present.

The site is within a large agricultural field with a center-pivot irrigation system. Sediments consist of alluvial loamy sand on 0 to 5 percent slopes. Vegetation within the agricultural field consists almost entirely of hay. Visibility on the site is good (approximately 90 percent). The site is highly disturbed from several decades of agricultural activity.

Extreme disturbance from agricultural activity precludes meaningful interpretation of the surface expression of BH-S-140. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant, due to the nearby chert and rhyolite sources in the Rosamond Hills (approximately 4 miles east–northeast of BH-S-140) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-140). No early-stage reduction flakes or single-reduction loci were identified; nor were any temporally diagnostic artifacts or dateable materials. A lack of features or other material types suggests that the site was only inhabited on a short-term basis; however, site features or other material types, if previously present on the surface, would have been destroyed by agricultural activity.

BH-S-144

BH-S-144 is a prehistoric lithic scatter that measures 265 by 35 meters, covering an approximately 5,850-square-meter area (1.4 acres). The site is within a large agricultural field. Sediments consist of alluvial loamy sand on 2 to 9 percent slopes. Vegetation within the agricultural field consists largely of Russian thistle (i.e., tumbleweed) and low desert grasses. Visibility on the site is good (approximately 80 percent). The site is highly disturbed from several decades of agricultural activity.

This site consists of approximately 80 flakes. Material types consist of rhyolite and CCS (chert and jasper); more than 95 percent of the flakes are rhyolite. Most flakes are in the late stages of reduction, but a few secondary flakes are present. No features or other artifact types are present within the site.

Extreme disturbance from agricultural activity precludes meaningful interpretation of the surface expression of BH-S-144. Based on the artifacts present, raw materials were likely procured nearby and reduced to manufacture lithic tools. Lithic materials within the site would have been easily accessible and abundant, due to the nearby CCS and rhyolite sources in the Rosamond Hills (approximately 4.5 miles east–northeast of BH-S-144) and rhyolite sources at Fairmont Butte (approximately 12 miles southwest of BH-S-144). A lack of features or other material types suggests that the site was only inhabited on a short-term basis; however, site features or other material types, if previously present on the surface, may have been destroyed by agricultural activity.

BH-S-202

BH-S-202 is a large, dispersed prehistoric lithic scatter measuring 270 by 115 meters, covering an approximately 15,800-square-meter area (4 acres). The site is along a rise on the eastern side of a desert wash within a large alluvial plain. Soils consist of loamy sand on 0 to 5 percent slopes. Vegetation in the area consists of Joshua trees, creosote, saltbush, Russian thistle, and other members of the creosote scrub community. Visibility on the site is good (approximately 80 percent). The site appears to be moderately disturbed through the effects of natural erosion and from vehicle traffic on the unpaved Dawn Road through the southern edge of the site. The site is subject to erosional activity from adjacent washes and drainages and alluvial deposition from the hills above the site to the south (Willow Springs Butte and Tropico Hill area).

BH-S-202 consists of more than 100 rhyolite flakes and 18 CCS flakes (17 chert and one jasper). All stages of lithic reduction took place at the site, with a focus on later stage reduction. Of the rhyolite flakes, more than 90 percent are in the late stages of reduction, with only a few flakes in the secondary stages of reduction. No rhyolite primary flakes or cores were observed. Of the CCS flakes, approximately 70 percent are in the late stages of reduction; about 20 percent of the CCS flakes are secondary flakes, and 10 percent are primary. Seven flakes exhibit use wear, all of which are rhyolite. It is likely that some expedient tool production and tool manufacture or retouch took place at the site. The archaeological team did not identify distinct reduction loci, and materials appear to be randomly dispersed across the site. No features were identified at the site.

BH-S-202 represents a locus of lithic assaying and the production and/or retouch of expedient tools. Raw materials were likely gathered onsite or nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant, due to the nearby CCS and rhyolite sources in the Rosamond Hills (approximately 1–2 miles east–northeast of BH-S-202) and rhyolite sources at Fairmont Butte (approximately 13 miles southwest of BH-S-202). All stages of lithic reduction are represented at the site, with debitage consistent with later-stage lithic reduction seen in much higher numbers. It is unknown whether portions of the site have been destroyed by water erosion. Tool manufacture or retouch is evident through the presence of later-stage debitage and utilized flakes. No single-reduction loci were identified, and the site contains a scattered mix of two different locally acquired material types. A lack of features or other material types suggests that the site was only inhabited on a short-term basis.

BH-S-207

BH-S-207 is a primary lithic-reduction site covering an approximately 1,650-square-meter area. This site is a prehistoric lithic scatter consisting of approximately 23 flakes, three cores, and one bifacial flake. All artifacts are rhyolite except for the biface, which is made of chert. Of the flakes, approximately 57 percent are in their primary stage of reduction, 17 percent are in their secondary stage, and 26 percent are in their tertiary stage. One of the rhyolite tertiary flakes exhibits utilization along one edge. No features are present within the site.

The site is within an alluvial wash. Vegetation in the area consists of Joshua trees, creosote, saltbush, Russian thistle, and other members of the creosote scrub community. Visibility on the site is good (approximately 90 percent). The site appears to be moderately disturbed through the effects of natural erosion. The site is subject to erosional activity from adjacent washes and drainages and alluvial deposition from the hills above the site to the south (Willow Springs, Butte, and Tropico Hill area).

BH-S-207 represents a locus of lithic assaying and the production and/or retouch of expedient tools. Raw materials were likely gathered onsite or nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant, due to the nearby CCS and rhyolite sources in the Rosamond Hills (approximately 1–2 miles east–northeast of BH-S-207) and rhyolite sources at Fairmont Butte (approximately 13 miles southwest of BH-S-207). All stages of lithic reduction are represented at the site, with early stage more prevalent. It is unknown whether portions of the site have been destroyed by water erosion. Tool manufacture or retouch is evident through the presence of later-stage debitage and utilized flakes. A lack of features and material-type diversity suggests that the site was only inhabited on a short-term basis.

BH-S-211

BH-S-211 is a lithic-reduction site covering an approximately 330-square-meter area. The site is within an alluvial drainage. This site consists of 18 rhyolite flakes, all in the late stages of reduction. One of the rhyolite tertiary flakes is worked on one side. No features or other artifact types are present within the site. Vegetation in the area consists of Joshua trees, creosote, saltbush, Russian thistle, and other members of the creosote scrub community. Sediments consist of sandy loam on 5 to 9 percent slopes. Visibility on the site is good (approximately 90 percent). The site appears to be moderately disturbed through the effects of natural erosion. The site is subject to erosional activity from adjacent washes and drainages and from alluvial deposition from the hills above the site to the south (Willow Springs, Butte, and Tropico Hill area).

Three STPs were excavated across the site to 50 centimeters deep. All STPs were negative for subsurface cultural materials and terminated at depth due to the lack of subsurface deposits. BH-S-211 represents a locus of lithic assaying and the production and/or retouch of expedient tools. Raw materials likely were gathered onsite or nearby and reduced to manufacture lithic tools or preforms. Lithic materials within the site would have been easily accessible and abundant, due to the nearby rhyolite sources in the Rosamond Hills (approximately 1–2 miles east–northeast of BH-S-211) and at Fairmont Butte (approximately 13 miles southwest of BH-S-211). It is possible that portions of the site have been disturbed by water erosion, because this site is on an alluvial wash. Tool manufacture or retouch is evident through the presence of late-stage debitage and a utilized flake. A lack of features and material-type diversity suggests that the site was only inhabited on a short-term basis.

BH-S-212

BH-S-212 is a small, sparse lithic scatter measuring 24 by 10 meters, covering an approximately 150-square-meter area. The site is on a low rise adjacent to a desert wash. Vegetation in the area consists of Joshua trees, creosote, saltbush, Russian thistle, and other members of the creosote scrub community. Sediments consist of loamy sand on 0 to 5 percent slopes. Visibility on the site is good (approximately 90 percent). The site appears to be moderately disturbed through the effects of natural erosion. The site is subject to erosional activity from adjacent washes and drainages and from alluvial deposition from the hills above the site to the south (Willow Springs, Butte, and Tropico Hill area).

The site consists of one obsidian projectile point and two rhyolite flakes (one with a utilized edge). The projectile point measures 2.25 by 2.5 by 1.5 centimeters and is small and triangular, with concave sides and a flat bottom, and appears to be a Cottonwood projectile point. The material appears to be Coso obsidian, sourced from the Coso volcanic fields approximately 80 miles north of this site. The rhyolite flakes suggest that BH-S-212 is a single-use lithic-reduction location. Two STPs were excavated across the site, both of which were negative for subsurface cultural materials and terminated at 50 centimeter deep, due to the lack of cultural materials. No features or other artifact types are present within the site.

BH-S-303

This site is a sparse lithic scatter on an alluvial fan terrace adjacent to intermittent wash. The site consists of one discarded rhyolite core and 12 rhyolite flakes in a 47-square-meter area. The core and rhyolite flakes suggest that BH-S-303 is a single-use lithic-reduction location. Lithic materials within the site would have been easily accessible and abundant, due to the nearby rhyolite sources in the Rosamond Hills (approximately 1–2 miles east–northeast of BH-S-303). Two STPs were excavated across the site, both of which were negative for subsurface cultural materials and terminated at 50 centimeters deep, due to the lack of cultural materials. No features or other artifact types are present within the site.

6.7.2 Previously Recorded Archaeological Sites

A total of six previously recorded sites, as mentioned in Section 5.4.2, *Previously Recorded Archaeological Resources*, were not previously tested, or their previous testing did not satisfy the requirements to evaluate eligibility. These sites are listed in Table 6-2 and described below.

Table 6-2. Previously Recorded Sites in the Archaeological Study Area

Site Number	Era	Description
P-15-002539	Prehistoric	Habitation site
P-15-012793	Historic	Historic refuse dump
P-15-018292	Historic	Historic refuse dump
P-15-019544	Prehistoric	Sparse lithic scatter
P-15-019545	Historic	Historic refuse dump
P-15-019546	Prehistoric	Sparse lithic scatter

P-15-002539/CA-KER-2539

Adella Schroth and M. Q. Sutton recorded site P-15-002539 in 1989 as a prehistoric artifact scatter measuring approximately 100 by 100 meters. The site is bisected by a dirt road, and the northern half of the site has been highly disturbed by human-made ponds. Artifacts included two stone bowl fragments, a core, and flakes.

ICF revisited the site in 2021 for the current survey, relocated the southern portion of the site, and extended the site boundary 155 meters south and east. The portion of the site north of the dirt road was not part of the survey area. The bowl fragment in the southern portion of the site was not relocated, but more than 300 lithic flakes were newly recorded in the extended site boundary. Approximately 80 percent of the flakes are rhyolite, and 20 percent were CCS.

Several diagnostic artifacts were observed, including an obsidian projectile point, a rhyolite secondary flake with a worked edge, a utilized chert flake, a quartzite core, a rhyolite metate fragment, a rhyolite biface fragment, a rhyolite mano fragment, a chert biface fragment, a rhyolite core/hammerstone, a rhyolite flake with a utilized edge, and three rhyolite cores.

P-15-012793/CA-KER-7214H

Pacific Legacy, Inc., recorded site P-15-012793 in 2010 as a large, historic-era refuse scatter measuring 1,143 by 726 feet. The site was described as consisting of approximately 150 cans, several concentrations of colorless glass, three wood posts, a square, cistern-like feature, and a shallow pit with a berm. This site is in an open alluvial plain with sparse, seasonal grasses and creosote scrub.

The pedestrian survey relocated the site, but the southern third of the site has been destroyed by the installation of a new electrical substation (SCE Whirlwind). All of the site north of the substation is as previously recorded, including a dispersed can scatter, colorless glass, and a shallow pit. The site conditions are the same as they were in 2010, except for the installation of the substation in the southern third of the site. The topography surrounding the site is characterized by flat desert terrain and low, sparse seasonal grasses, with ground visibility between 90 and 100 percent across the site. The vegetation community is characterized by species associated with the Mojave Desert. This site was disturbed extensively by the installation of a substation, and the level of disturbances to this site warranted additional testing. As such, the site was tested and evaluated for the current effort. Results are discussed in Chapter 7, *Results*.

P-15-018292/CA-KER-9985

SWCA Environmental Consultants recorded site P-15-018292 in 2015 as a historic-era refuse scatter that measures 535.4 by 147.9 feet. The site is in a broad alluvial valley and consists of a dispersed refuse scatter, including metal cans, milk glass, amethyst, aqua, colorless, and sun-colored amethyst glass fragments, and four stamped brick fragments.

The pedestrian survey relocated the site as previously recorded and extended the site south by 55 feet to include aqua insulator fragments, sun-colored amethyst glass fragments, and an additional two stamped brick fragments (Plate 6-6).

The site conditions are similar to those in 2015, with low, sparse seasonal grasses. The only exceptions are that a gen-tie line has been constructed to the north of the site and 170th Street West has been constructed to the east of the site. The topography surrounding the site is characterized by flat desert terrain disturbed by recent gen-tie and road construction, along with alluvial wash. Ground visibility was between 90 and 100 percent across the site. This site was disturbed extensively by the installation of associated roads and fence lines, and the level of disturbances to this site warranted additional testing. As such, the site was tested and evaluated for the current effort. Results are discussed in Chapter 7, *Results*.

Plate 6-6. P-15-018292 Stamped Bricks, Plan View

P-15-019544 (Obsidian Date 1719 B.P.)

ASM Affiliates, Inc., recorded Site P-15-019544 in 2017 as a low-density, prehistoric lithic scatter. The site was described as being in poor condition and consisting of five flakes (four rhyolite and one obsidian) within an 18- by 9-meter area. The site is in a previously plowed agricultural field occasionally used for sheep grazing.

The pedestrian survey relocated all rhyolite flakes and extended the site, but did not observe the obsidian flake inside the previous site boundary. An obsidian flake, rhyolite biface, and 20 additional flakes were observed to the west of the previously recorded site, and the site boundary was expanded. The site boundary now measures 157 by 52 meters. All flakes are tertiary, and approximately half of the flakes are CCS or chert; the other half are rhyolite.

The site conditions are the same as they were in 2017, with low, sparse seasonal grasses. The topography surrounding the site is characterized by flat desert terrain t severely disturbed by agricultural plowing and grazing, with ground visibility between 90 and 100 percent across the site. This site has not been previously tested for subsurface components.

P-15-019545/CA-KER-10709

ASM Affiliates, Inc., recorded Site P-15-019545 in 2017 as a sparse, historic-era refuse scatter measuring 364 by 107.5 feet. The site was described as consisting of cans, bed springs, kitchen utensils, and assorted bottle bases. The site components date between the early 1900s and mid-1970s and is along a fence line in a plowed field on open alluvial plain with sparse seasonal grasses and creosote scrub.

The pedestrian survey relocated the site as previously recorded. A dirt access road and fenceline delineate the eastern boundary of the site, and another dirt road delineates the northern boundary. The surrounding area has little to no vegetation, due to previous agricultural plowing from use of the parcel as sheep-grazing land. The site appears to have been previously disturbed by these activities. This site has not been previously tested for subsurface components.

P-15-019546/CA-KER-10710

ASM Affiliates, Inc., recorded Site P-15-019546 in 2017 as a low-density, prehistoric lithic scatter. The site was described as being in poor condition and consisting of four CCS interior flakes within a 23- by 6-meter area. It is in a previously plowed agricultural field occasionally used for sheep grazing.

The pedestrian survey relocated one CCS flake and recorded a new tertiary rhyolite flake in the previously recorded site boundary. The site conditions are the same as they were in 2017, with low, sparse seasonal grasses. The topography surrounding the site is characterized by flat desert terrain severely disturbed by agricultural plowing and grazing, with ground visibility between 90 and 100 percent across the site. This site has not been previously tested for subsurface components.

6.7.3 Newly Recorded Isolates

Fifty-one isolates were newly identified during the original Phase I survey, and an additional four isolates were identified during the current testing and evaluation effort. Traditionally, isolated artifacts or features are not considered eligible for the CRHR because recordation of isolated artifacts and features has exhausted their research potential. As such, the isolated cultural materials identified during this survey were not considered for their potential to meet the eligibility requirements of the CRHR, in accordance with State CEQA Guidelines Section 15064.5(a)(2), and found not to qualify as historical resources for the purposes of CEQA. The current evaluation has assigned a California Office of Historic Preservation 6Z status code (found ineligible through survey evaluation) to the isolates, and no further action is recommended for these resources. California Department of Parks and Recreation forms have been completed for all isolated artifacts identified during this project (See Appendix B of the Phase I report). Table 6-3 lists the newly recorded isolates.

Table 6-3. Newly Recorded Isolates in the Study Area

Temporary Number	Era	Description
BH-ISO-301	Prehistoric	Rhyolite core
BH-ISO-302	Prehistoric	Chert tertiary flake
BH-ISO-303	Prehistoric	Rhyolite secondary flake
BH-ISO-304	Prehistoric	Rhyolite projectile point fragment

6.8 Laboratory Methods

This section describes the laboratory methods and protocols for processing and analyzing precontact and historical artifacts collected while implementing this testing and evaluation plan. These protocols outline the use of specific methods for the analysis of several classes of artifacts and are grouped into two broad categories: precontact and historical. Artifact counts and attributes were recorded in a Microsoft Access database designed specifically for recording artifact data.

6.8.1 General Laboratory Procedures

Laboratory processing and analysis were completed at an appropriate offsite laboratory facility. Artifacts were categorized by site and context. Once materials entered the laboratory, they were sorted by material type (e.g., stone, vessel glass, ceramic, metal) for each unique context. A context-based catalog number was assigned to each artifact or group of associated artifacts and specific information, unique to that number, was recorded appropriately, such as whether the artifact or group of artifacts were discarded or curated.

All artifacts were cleaned appropriately to remove sediment. Artifacts such as ceramics, glass, stone, and plastics were cleaned using water and a soft toothbrush. Metal, nails, wood, brick, animal bones, shell, leather, stone tools, and other materials were dry-brushed with a soft brush that would not damage the artifact. Particularly delicate objects, such as paper labels on bottles, were only dry-brushed with a soft brush when appropriate. Once artifacts were cleaned, they were allowed to air dry before being placed in plastic, 0.4-centimeter-thick, archival-quality bags. Temporary artifact tags printed on acid-free paper were included in each bag and include the site number, project name, catalog number, context, provenience, artifact description, and count. These tags were computer generated or hand-written with pencil.

The following sections describe analytic procedures for both precontact and historical artifacts. Special detail is provided in each section for various material and artifact classes.

6.8.2 Precontact Artifacts

Precontact artifacts were sorted by artifact type. Selected artifacts were separated from the larger collection for specialized analyses (described below). Examples of such artifacts and special analyses include lithics likely to retain organic blood residue, fire-modified rock from discrete hearth features, and organic/faunal materials. The procedures for analyzing stone tools and debitage, faunal remains, FMR, and wooden artifacts are described in the following sections.

Stone Tools and Debitage

Stone tools and manufacturing debris (e.g., lithic flakes, debitage) were analyzed by an archaeologist who specializes in lithic analysis. This analyst followed current and industry-standard methods for lithic analysis. Both stylistic and technological attributes of tools were examined as potential indicators of stages of manufacture and/or use. Stylistic analysis focusing on the temporal placement of certain tool forms (e.g., projectile points, knives) were undertaken, as appropriate. Stylistic and technological analysis allowed for comparison of lithic artifacts found as a part of this project with those that have been previously examined in the region. It is anticipated that most of the artifact assemblage were chipped stone, but the assemblage may also include ground stone.

The specific data collected for lithic analysis includes both nominal and metric data recorded for all specimens, as follows.

- **Lithic debitage reduction class.** Lithic debitage was classified into three stages (i.e., primary, secondary, tertiary) based on the number of negative flake scars and presence, absence, or percentage of cortex on the dorsal surface of the flake.
- **Lithic material type.** Lithics were classified by raw material composition (e.g., rhyolite, obsidian, chert, calcedony).

- **Thermal alteration.** The presence or absence of visual indicators of thermal alteration were noted and described.
- **Dimensions.** The physical dimensions of lithic tools were recorded. At minimum, length, width, and thickness were recorded in millimeters.
- **Functional classification.** Where applicable, lithic tools were categorized by their functional use.
- **Stylistic classification.** Where applicable, lithic tools were categorized by their stylistic form to match them with regional typologies.

Special lithic analysis methods were used, when appropriate, to answer research questions outlined in Section 6.3, *Research Themes and Questions*. These analysis methods included X-Ray fluorescence and obsidian hydration.

Faunal Remains

Few faunal remains were identified in the project area. Comparative specimens were used, when possible, for taxonomic identification. Specimens were identified to taxonomic class (e.g., mammal, bird) and, where possible, these specimens were further separated into finer taxonomic categories. Information recorded for unidentifiable remains included size categories: specimens that could not be identified beyond taxonomic class were grouped into size categories, where possible, and tallied.

If the assemblage met the appropriate size and significance threshold for analysis, then identifiable specimens were analyzed following the procedures outlined below.

- **Number of identified specimens.** This is a simple counting measure that determines the relative abundance of any one species within the assemblage by calculating the maximum number of individuals present (Grayson 1984).
- **Skeletal element identification.** Elements were identified by the side of the body or body segment from which it originated, portion (i.e., whole, proximal, and distal), age (i.e., juvenile or adult), or size class, using a comparative skeletal collection.
- **Pre- and post-depositional modification.** Any modifications were identified, including cultural modification (e.g., intentional burning, degree of burning) and noncultural modifications (e.g., animal gnawing, weathering, post-depositional breakage).
- **Minimum number of individuals.** Minimum number of individuals were calculated to determine the minimum number of each animal present in each context by considering the most-common element for each taxon (Grayson 1984; Lyman 2008).
- **Diversity and richness.** Taxonomic diversity (i.e., number of taxa) and richness (i.e., proportion of the total number of specimens in each taxon) were calculated to evaluate precontact diet breadth (Lyman 2008).

6.8.3 Historical Artifacts

Artifact analysis centered on classifying artifacts by their functional types as outlined by the Sonoma Historic Artifact Research Database (SHARD), a database developed by the Anthropological Studies Center at Sonoma State University, Rohnert Park, California. This classification system is a four-tiered system that divides artifacts by their former function with categories including activities, domestic, indefinite use, personal, structural, and undefined groups. SHARD further subdivides to the basic artifact description. For example, a ceramic plate would be described as domestic, food preparation/ consumption, tableware, and plate. This method emphasizes the use of a template, and its standardized form allows for inter- and intra-site comparisons. Additional pertinent information recorded in SHARD includes estimated dates and location of manufacture and measurements (i.e., length, width, and thickness), when appropriate. The English measurement system was used because this is the system in which these materials were manufactured, and recording measurements therein will facilitate identification and increase precision that would otherwise be affected by converting between systems.

During analysis, counts of complete and fragmentary objects were recorded. Fragmentary items were refit where possible, and minimum numbers of individuals (MNI) was identified. For example, 12 earthenware ceramic fragments from a single plate, or a glass canning jar and its lid, were counted as one MNI. In some cases—such as buttons or beads, which cannot be definitively grouped together as belonging to an individual item—each artifact was recorded as a discrete MNI.

Procedures for three common material classes are included below to provide example protocols for detailed analyses.

Vessel Glass

Fragmentary vessel glass was sorted by color for each context and visually inspected to see if any pieces can be refitted to determine vessel attributes, if necessary, and MNI were calculated. For each individual vessel or group of like vessels, the following information was recorded and analyzed using Jones and Sutton (1985), Lindsey (2010), Lockhart (2006), Toulouse (1971), Whitten (n.d.), and other references, as needed.

- **Color**, using categories outlined by Lindsey (2010) to provide information about the date of manufacture and the bottle’s prior contents
- **Shape and form**, using period bottle catalogs to identify the function and/or contents to provide information about consumer behaviors
- **Finish type**, using definitions identified by Lindsey (2010) to provide the date of manufacture and the bottle’s prior contents
- **Finish and base marks** associated with manufacture method, using definitions in Lindsey (2010) and Jones and Sutton (1985) to provide information on method of manufacture and associated production dates
- **Maker’s marks and trademarks**, using Whitten (n.d.) and Toulouse (1971) to provide the date range and location of manufacture

Ceramics

Fragmentary ceramics were sorted by material type (e.g., common pottery, stoneware, earthenware, porcelain) and visually inspected to see if any pieces can be refit, and MNI were calculated. For each ceramic vessel form or group of like vessels, the following information was recorded using Gates and Ormerod (1982), Godden (2000), IMACS (1992), and other references, such as historic-period catalogs (e.g., Sears Roebuck and Company 1970), as needed.

- **Material type** (i.e., common pottery, stoneware, earthenware, and porcelain) and fabric, using definitions identified by Miller (1991) to provide information on the prior function and socioeconomic status of ceramics and their users
- **Form** (i.e., bowl, plate, mug, and cup) to identify the function of the vessel, providing information about consumer behaviors
- **Decorative treatment and pattern**, if applicable
- **Maker's marks**, to provide the date range and location of manufacture; when possible, the mean ceramic date was calculated using South (1977) to provide further date-range refinement.
- **Socioeconomic scale** of the assemblage was estimated, based on Miller's (1991) economic scale to generally characterize the user; and period catalogs, such as Sears Roebuck and Company (1970) catalogs, were consulted to provide information about historic consumer behavior.

6.9 Curation Preparation

Once the final version of the project's technical report summarizing the findings of the archaeological testing and evaluation has received concurrence from Kern County, ICF will transfer all artifacts collected during field efforts to a long-term curation facility. The curation facility will be selected in coordination with Kern County and meet the federal standards for curation facilities as outlined in 36 CFR 87.

6.9.1 Artifact Collection Discard Protocol

To avoid collection and analysis of nondiagnostic historic-period artifacts and abundant precontact artifacts (i.e., fire modified rock) during investigations, a field and laboratory curation policy was designed to record nondiagnostic artifacts in the field or laboratory and subsequently discard them. Nondiagnostic artifacts provide limited information toward understanding the history of an archaeological site and tend to be cumbersome and expensive to analyze and curate. Therefore, field and laboratory curation protocols were implemented to record the most-valuable information these artifacts provided, without burdening the subsequent collection.

Field Discard Policy

Materials less than 50 years old and historic period artifacts were not collected. Fire-modified rock was counted, and then discarded in the field.

Laboratory Discard Policy

Nondiagnostic artifacts (e.g., loose, non-distinct brick and brick fragments, mortar, plaster, concrete, wood, amorphous metal, slag, coal, and window glass) were not cataloged. In the laboratory, these items were sorted by material type (i.e., separating nondistinctive brick from slag) and recorded on each level form, indicating their average size (e.g., pea-sized, 1 inch in diameter) and approximate quantity (e.g., 1 percent of the level sediments, five fragments observed). In some cases, photographs of representative examples of nondiagnostic structural items were taken. Once the appropriate recordation occurred, the items were discarded or recycled when possible. Other policies include the following.

- Whole/complete marked bricks were analyzed, and then discarded.
- Nail fragments were counted for each provenience and discarded, but complete nails were analyzed prior to discard.
- Metal cans were analyzed and discarded.
- Redundant metal or glass objects after photographs and measurements are taken, for example bolts or bottles of identical size and shape, were discarded.

Nondiagnostic vessel glass and undecorated ceramic shards that do not cross mend (i.e., glass was sorted by color and counted, whereas ceramics were sorted by material type and counted for each context) were discarded.

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Chapter 7
Results

7.1 Testing Results

The following section provides the results of laboratory analysis of artifacts recovered at the tested archaeological sites and the results of their significance evaluations.

7.2 Obsidian Analysis

Obsidian was recovered at seven sites. Samples from four sites were sent for hydration analysis to determine the potential age of the artifacts and for XRF analysis to determine the source of the obsidian. The Origer Obsidian Laboratory in Rohnert Park, California, conducted hydration analysis, and the Far Western Anthropological Research Group in Sacramento, California, conducted XRF analysis. All samples were analyzed in early December 2021. A total of 20 specimens of obsidian representing sites BH-S-006, BH-S-102, BH-S-110 and P-15-019544 were of sufficient size to submit for analysis. The artifacts were all debitage or flakes, and no tools were used for analysis in order to preserve them for future analysis, if necessary.

The following is adapted from Origer's report (2021) and describes the methods used to conduct the obsidian hydration analysis. Procedures Origer's Obsidian Laboratory used for preparation of thin sections and measurement of hydration bands are described here. Specimens were examined to find two or more surfaces that yielded edges perpendicular to the microslides when preparation of each thin section was performed. Generally, two parallel cuts were made along the edge of each specimen with a 4-inch-diameter circular saw blade mounted on a lapidary trim saw. The cuts resulted in the isolation of small samples with a thickness of about 1 millimeter. The samples were removed from the specimens and mounted with Lakeside Cement onto etched-glass micro-slides. The thickness of the sample was reduced by manual grinding with a slurry of #600 silicon carbide abrasive on plate glass. Grinding was completed in two steps. The first grinding stopped when the sample thickness was reduced by approximately one-half, which eliminated micro-flake scars that the saw blade created during the cutting process. The slide was then reheated, which liquefies the Lakeside Cement, and then the sample was inverted. The newly exposed surfaces were then ground until proper thickness was attained. Correct thin section thickness was determined by the "touch" technique: a finger was rubbed across the slide, onto the sample, and the difference (i.e., sample thickness) determined. The second technique used to arrive at proper thin section thickness was the "transparency" test, wherein the micro-slide was held up to a strong source of light and the translucency of each sample observed. The sample was reduced enough when it readily allowed the passage of light. A cover glass was affixed over the sample when grinding was completed. The hydration bands were measured with a 60-power objective and a Bausch and Lomb 12.5-power filar micrometer eyepiece mounted on a Nikon Labophot-Pol polarizing microscope. Hydration band measurements have a range of ± 0.1 microns, due to normal equipment limitations. Six measurements were taken at several locations along the edge of the thin section and the mean of the measurements calculated.

According to the report from Origer (2021), effective hydration temperature (EHT) values for the specimens were calculated using temperature data from the Western Regional Climate Center website (wrcc.dri.edu/Climate/west_coop_summaries.php), following steps outlined by Rogers (2007). An EHT value of 21.0 was calculated from several weather stations (i.e., Mojave COOP, Mojave 2 ESE, Backus Ranch, Lancaster WM J FOX FLD, Lancaster COOP, Palmdale COOP, and Palmdale AP) near the subject sites.

The EHT value was used to adjust the measurements using an Arrhenius equation developed by Theodore Jones (2001). The natural log of the hydration rate equals
-9821.6 * (1/K) + 23. Jones postulates that this equation can be used to calculate the rate of hydration at any temperature.

Of the 20 samples submitted, five specimens failed to yield useful hydration measurements. Two specimens (Lab #14 and 17) exhibited a hydration band too diffuse to make a reliable reading and had weathered surfaces. Three specimens (Lab #9, 10, and 12) exhibited a hydration band with variable widths and had weathered surfaces. Seven specimens (Lab #2, 6, 7, 8, 16, 18, and 19) had multiple hydration bands, which could be the result of reworking of the specimens or the occurrence of damage. Band 1 on multiple band specimens was the thinner band, and Band 2 was the thicker band. The remaining eight specimens yielded normal measurements.

Following the hydration analysis, the samples were submitted for XRF to the Far Western Anthropological Research Group in Sacramento, California. Dr. Lucas Martindale Johnson performed the analysis. Source assignments were reviewed and qualified in consultation with M. Kathleen Davis.

Energy dispersive XRF analysis was conducted using Far Western's Bruker Tracer III-SD handheld XRF analyzer (Serial Number T3S1878), equipped with a rhodium X-ray tube. Specimens were analyzed at 40 kV and 40 µA for 180 live seconds with a 10-square-millimeter Xflash® detector, using a "green" filter composed of six milligrams of copper, one milligram of titanium, and 12 milligrams of aluminum without a vacuum (Far Western 2021). The X-ray beam focused on an area of approximately 2 by 3 millimeters. Trace-element values for the archaeological specimens were then compared to an in-house geologic source library, characterized by the Bruker Tracer III-SD, for 240 live seconds. The reference standard is scanned for 90 seconds prior to any new artifact scanning session, to confirm the instrument's stability and provide independent characterization of a known international standard (Far Western 2021).

Each scan records intensities for the K-alpha peaks of manganese, iron, zinc, gallium, rubidium, strontium, yttrium, zirconium, and niobium and the L-alpha peaks of thorium. Trace-element peak intensities for the above elements were normalized to the Compton scatter peak of rhodium (19.5–22 kiloelectron volts) and converted to parts per million using the MURR 2 matrix-specific calibration, developed by Bruker Elemental, in collaboration with the University of Missouri Research Reactor (MURR). This factory-installed calibration was based on analysis of 40 samples of unmodified obsidian and fine-grained volcanic rock from around the world, chosen by Bruker and MURR to represent the range of trace-element concentrations known to occur in these materials. To accommodate analysis of small artifacts, trace-element values are presented in two ways: as concentrations in parts per million and as peak ratios and relative percentages. The latter facilitates interpretation of results for artifacts that are smaller than the 2-by 3-millimeter incident X-ray beam, or thinner than "infinite thickness"; that is, the sample thickness required to absorb all incoming X-rays. For the analytical conditions used here, infinite thickness in an obsidian matrix is approximately 4 millimeters. For artifacts less than 4 millimeters thick, a portion of the incoming X-rays escaped through the back of the sample, resulting in a lower-than-normal signal for a given trace element in a particular obsidian (Far Western 2021). Small artifacts were also compared to 95 percent confidence regions calculated from the non-Euclidean Mahalanobis Distance statistic, derived from source material that included small and thin samples representative of those encountered in an archaeological sample, e.g., small interior and pressure flakes.

Results of the XRF analysis indicated that all submitted specimens originate from the Coso Volcanic Field and despite many of the samples being thin (i.e., <4mm) most can be assigned to subareas within (see Figure 7-1 for these subareas). Element peak ratios from nine specimens were consistent with West Sugarloaf, three align with Joshua Ridge, another three are from Sugarloaf Mountain, and two align with the West Cactus Peak source (Figure 7-1). The remaining four specimens could not be assigned confidently to the subarea within the Coso Volcanic field and were listed as "Unspecified" (Far Western 2021). See Table 7-1 and Table 7-2, below.

Table 7-1. Obsidian Source Assignment Summary for Sites Within the Project Area

Chemical Group	Site	N=
Coso Volcanic Field (West Sugarloaf)	BH-S-006, BH-S-102, BH-S-110, P-15-019544	9
Coso Volcanic Field (Joshua Ridge)	BH-S-110	2
Coso Volcanic Field (Sugarloaf Mountain)	BH-S-110	3
Coso Volcanic Field (West Cactus Peak)	BH-S-110	2
Coso Volcanic Field (Unspecified)	BH-S-110	4
Total	BH-S-110	20

Source: Far Western 2021.
N= count

The Coso Volcanic Field, in neighboring Inyo County, is approximately 30 miles long and 10 miles wide, sited east of the Sierra Nevada Range and west of the Coso Range, and extends from Indian Wells Valley on the south to Owens Valley on the north. There are multiple identified sources within the Coso Volcanic Field; four of the resources (Sugarloaf Mountain, West Sugarloaf, Joshua Ridge and West Cactus Peak) were attributed to the samples from four sites (BH-S-006, BH-S-102, BH-S-110 and P-15-19544) used in this analysis. The four identified sources were within an area approximately 6 miles long and 1.5 miles wide, approximately 75 miles from the project area.

Three obsidian samples were submitted from site BH-S-006; all three samples were traced to the West Sugarloaf source and date to between 1462–894 B.P. (Rose Spring Period). One obsidian sample was submitted from site BH-S-102 and traced to West Sugarloaf source, with a date range of 3330–1080 B.P. (Gypsum-Rose Spring Periods). One obsidian sample was submitted from site P-15-19544 and traced to the West Sugarloaf source, with a date range of 3172–1029 B.P. (Gypsum-Rose Spring Periods).

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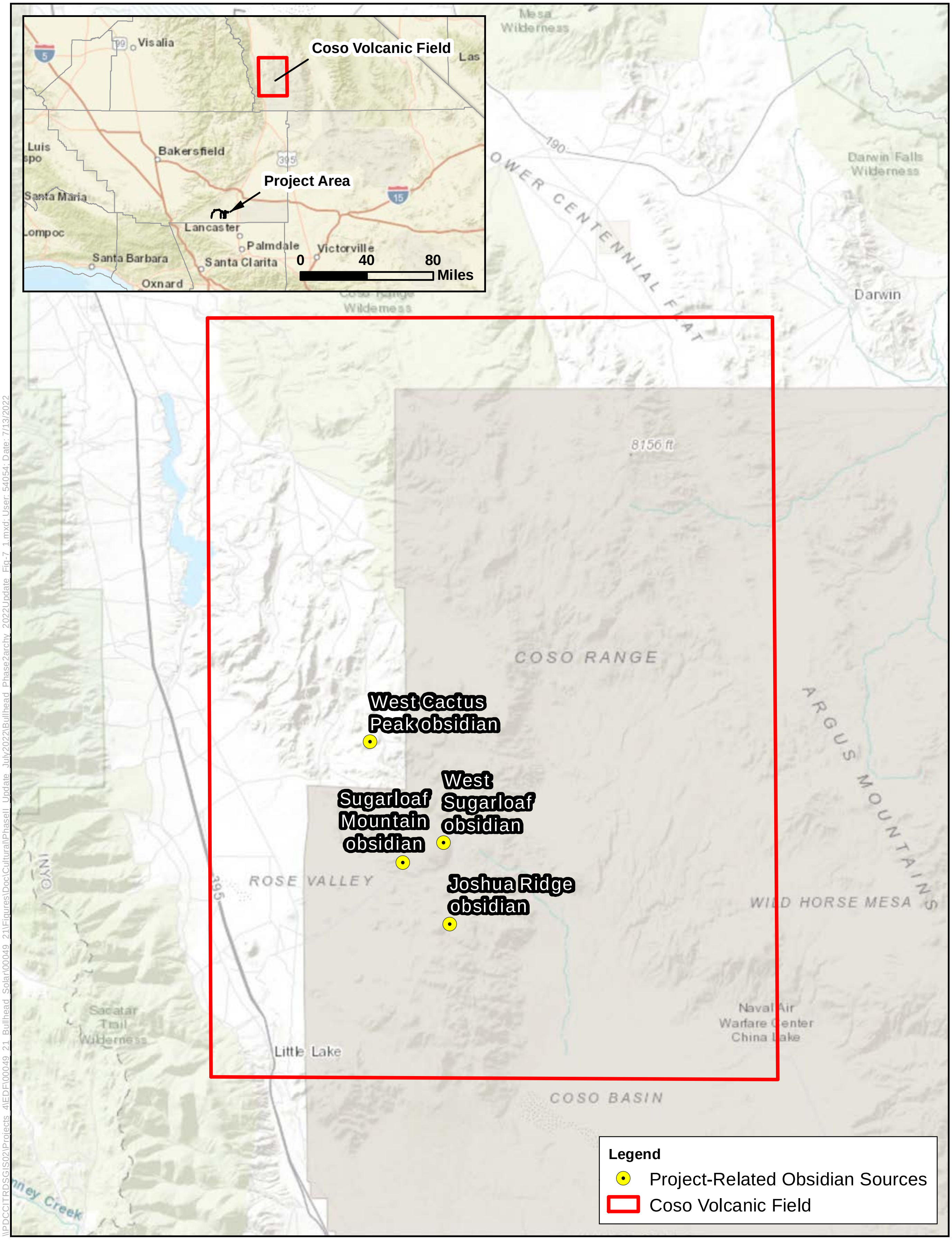

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Miles

Source: ESRI World Street Map (2017)

Figure 7-1
Coso Volcanic Field in Relation to the Study Area

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Table 7-2. ICF Bullhead Obsidian Samples XRF Analysis by Far Western and Hydration by Origer

Resource	ICF Cat.#	OOL#	XRF#	Source	Age (Years B.P. and Chronological Periods)
BH-S-006	8	2.1, 2.2	2855 22	West Sugarloaf	1462 B.P., Rose Spring Period
BH-S-006	9	3	23	West Sugarloaf	936 B.P., Rose Spring Period
BH-S-006	10	4	24	West Sugarloaf	894 B.P., Rose Spring Period
BH-S-102	16	5	25	West Sugarloaf	1943–1080 B.P., multiple hydration bands, Gypsum–Rose Spring Periods
BH-S-110	69	6.1, 6.2	26	West Sugarloaf	2654–1475 B.P., multiple hydration bands, Gypsum–Rose Spring Periods
BH-S-110	74	7.1, 7.2	27	West Sugarloaf	1943–1050 B.P., multiple hydration bands, Gypsum–Rose Spring Periods
BH-S-110	77	8.1, 8.2	28	Sugarloaf	N/A
BH-S-110	83	9	30	West Sugarloaf	N/A
BH-S-110	84	10	31	West Sugarloaf	N/A
BH-S-110	87	11	32	West Sugarloaf	3094 B.P., Gypsum Period
BH-S-110	88	12	33	Sugarloaf	N/A
BH-S-110	89	13	34	Sugarloaf	2135–1187 B.P., multiple hydration bands, Gypsum–Rose Spring Periods
BH-S-110	90	14	35	West Cactus Peak	N/A
BH-S-110	91	15	36	Joshua Ridge	3731–2073 B.P., multiple hydration bands, Gypsum–Pinto Periods
BH-S-110	110	16.1, 16.2	37	West Sugarloaf	2493–823 B.P., multiple hydration bands, Gypsum–Late Prehistoric Periods
BH-S-110	112	17	38	West Sugarloaf	N/A
BH-S-110	114	18.1, 18.2	39	West Sugarloaf	5365–1631 B.P., multiple hydration bands, Pinto–Rose Spring Periods
BH-S-110	116	19.1, 19.2	40	West Cactus Peak	2935–2165 B.P., multiple hydration bands, Gypsum Periods
BH-S-110	b-77	20	29	Joshua Ridge	2821–1568 B.P., Gypsum–Rose Spring Periods
P-15-019544	2	1	2855 41	West Sugarloaf	1851–1029 B.P., multiple hydration bands, Rose Spring Period

B.P. = before present; OOL = Origer Obsidian Laboratory; XRF = X-ray florescence

Obsidian was not locally available as raw lithic material in the Antelope Valley. Obsidian is common in archaeological sites in the Antelope Valley, but is generally found in more limited frequencies than in western Mojave Desert sites further to the north. Most studies identify obsidian in the western Antelope Valley as originating from the Coso Volcanic Field, approximately 4 or 5 days' walk to the north. Research suggests that four sources in the Coso Volcanic Field, West Sugarloaf, Sugarloaf Mountain, and West Cactus Ridge are the most common sources for obsidian in the Antelope Valley, with the West Sugarloaf source being the most common of the four subsources (Scharlotta 2014). Scharlotta's research aligns with the results of testing of obsidian submitted from the four sites in the project area, with 14 of the 20 samples originating from the West Sugarloaf subsource. Although obsidian is present in early sites from the Pinto and Lake Mojave Periods, its frequency in archaeological sites increased dramatically in the Gypsum Period before peaking in the late Gypsum and early Rose Spring periods (Mason et al. 2019). Rhyolite appears to have been the predominate choice for projectile points during the Pinto and Mojave periods and the early part pf the Gypsum Period, when spears and atlatls were the prevalent hunting weapons. It has been suggested that, during the earlier periods, group mobility was higher than in the Gypsum and Rose Spring periods, resulting in more-variable sources of obsidian than in the later periods, when the transition to a focus on hunting with the bow and arrow made obsidian more desirable for creating smaller projectile points (Scharlotta 2014; Mason et al. 2019; Allen 2018). It was during the Rose Spring Period that obsidian exchange into the Antelope Valley peaked, and multiple prehistoric trails once passed through the project area as part of this network (Figure 4). Although the sample size from the project area consists of only one Pinto projectile point recovered on the surface at BH-S-102, it is worth noting that this projectile point was made from rhyolite, consistent with previous research.

7.3 Other Lithic Materials

A variety of material types are present within the artifact assemblages analyzed. As discussed above, obsidian is present within the sites in the project area, as well as rhyolite (banded and non-banded), CCS, Pelona schist, granite, metavolcanic material, jasper, granite, sandstone, schist, steatite, tuff, vesicular basalt, and volcanic material. Table 7-3 presents the relative quantities of materials collected during testing across all 31 sites. Collected materials consisted of diagnostic artifacts on the surface of the sites and artifacts recovered during subsurface testing. It should be noted that obsidian is present in a higher relative quantity than would be present if looking at the entirety of the artifact assemblages within the sites (including nondiagnostic artifacts). This is because, as discussed above, obsidian has the ability to be geochemically sourced and dated, so all obsidian artifacts, including debitage, were collected.

Table 7-3. Relative Percentages of Lithic Material Types Across Sites

Lithic Material	Percentage (%)
Rhyolite	67.8
CCS	15.2
Obsidian	10.0
Paloma Schist	1.5
Granite	1.2
Banded Rhyolite	0.9
Metavolcanic	0.6
Jasper	0.6
Granite, Sandstone, Schist, Steatite, Tuff, Vesicular Basalt, Volcanic	Less than 0.3% each

CCS = cryptocrystalline silicate

These relative percentages give large-scale snapshots of the material types being utilized in prehistoric times throughout the project area. The two most common material types, rhyolite and CCS, are discussed below.

7.3.1 Rhyolite

Most of the artifacts observed in the project area were of local rhyolite. The colors of rhyolite ranged from pink to grey to purple. Darker bands were present in some rhyolite, and others had larger quartz inclusions. Rhyolite porphyry was observed in the project area, but no artifacts were observed utilizing the porphyry. Rhyolite is a fine-grained volcanic material that is generally very hard to flake, but is strong, making it an ideal source for lithic tools. The rhyolite in the Willow Springs area is very fine-grained and most likely cooled slowly, making it a more ideal material for tool manufacturing. As such, rhyolite is frequently found in Mojave Desert archaeological sites, especially in the Antelope Valley (Mason et al. 2019). Although it was widely used, it is generally seen as the source material for flake tools and bifaces, rather than projectile points.

Due to the proximity of rhyolite sources, it would have been an easy material source for day-to-day use. Rhyolite sources can be found as close as 1 mile to the east, in Rosamond Hills. Additional nearby sources include Fairmont Butte (southwest of modern Lancaster), Little Buttes (central Antelope Valley), Red Hill (Edwards Air Force Base), Opal Mountain, and Black Canyon (both east of Antelope Valley) (Peck 1949; Giambastini et al. 2007).

Many studies have revolved around the many sites and large rhyolite quarry (CA-LAN-898) near Fairmont Butte. A model, called the Pinto Complex “Rhyolite Tradition,” focused on dating quarrying activity in this location. It was found that much of the quarrying dates to late prehistory, but there appears to be evidence that quarrying occurred as early as the Pinto Complex (Glennan 1970, 1971; Sutton 1982, 1988). Scharlotta developed a method for sourcing rhyolite to study production and exchange of this lithic material in Antelope Valley. Samples from four Antelope Valley sites were determined to be from Rosamond Hills (82 percent), Fairmont Butte (11 percent), and other unknown sources (7 percent). This study showed the importance of Rosamond Hills as a local rhyolite source (Glennan 1970, 1971; Scharlotta 2010a, 2010b, 2014; Sutton 1982, 1988, 1989, 1993).

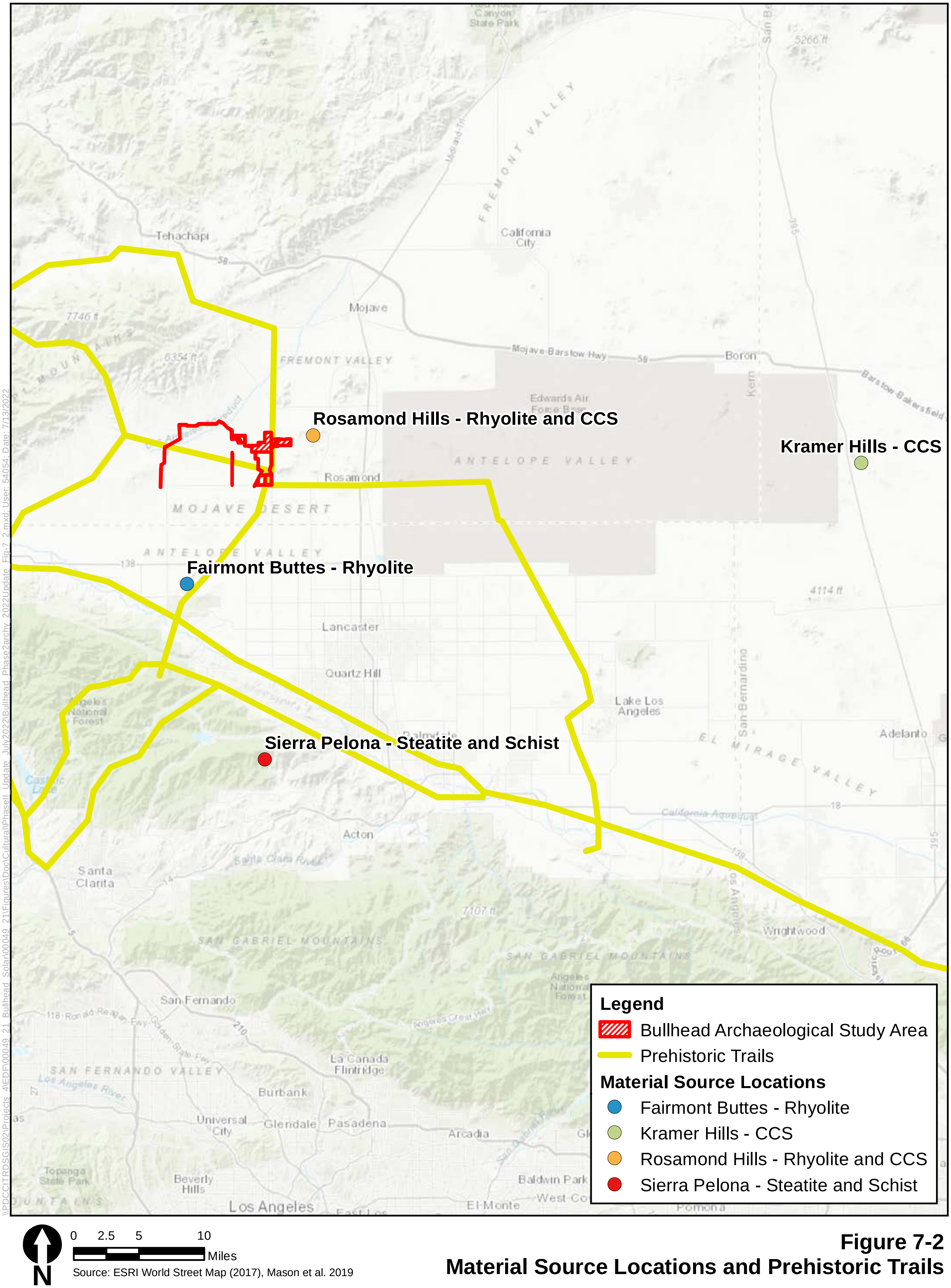
Scharlotta also combined archaeological, ethnographic, and historical data to develop a rhyolite procurement model that showed that rhyolite was being quarried and exchanged in Antelope Valley from at least 1500 to 300 B.P. (Scharlotta 2014). Rhyolite is typically found in assemblages dating to the Lake Mojave and Pinto Periods.

7.3.2 Cryptocrystalline Silicates (CCS)

CCSs (e.g., chert, chalcedony, jasper) are the most common lithic materials used to make flaked-stone tools in the western Mojave Desert (Mason et al. 2019). CCS sources are scattered across the Mojave Desert and in Antelope Valley, in the eastern end. Sources in the Rosamond Hills are in proximity to the project area. The material has been described as the most-common material for making stone tools in the Mojave Desert and an important resource for exchange with areas outside the Mojave (Sutton 1996). However, of the lithic artifacts identified in the project area, rhyolite accounts for 68 percent of the total, and CCS 15 percent, followed by obsidian at 10 percent. CCS was used extensively for a wide variety of tool types throughout the entire prehistoric sequence of the Mojave Desert, including projectile points, bifaces, unifaces, and retouched and utilized flakes.

7.3.3 Other

A number of other volcanic, pyroclastic, and sedimentary rocks were also observed in the project area. These date to the Tertiary age and include rhyolitic tuff, Bissell formation sandstone, and caliche. These formations can be found on isolated knolls throughout the region (Dibblee 1963). Only two artifacts were made using tuff and sandstone, most likely due to the low quality of the materials.



Source: ESRI World Street Map (2017), Mason et al. 2019

Figure 7-2
Material Source Locations and Prehistoric Trails

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7.4 Artifact Detail Analysis

7.4.1 Projectile Points and Cutting Tools

A total of eight projectile points and two likely knives/cutting tools were collected during the testing effort. No projectile points were found subsurface during testing; all projectile points were found on the surface. The artifacts are presented in Table 7-4 by site number. The obsidian point from BH-S-006 was typed based on a photograph taken during the previous survey effort for the current project; it was not relocated during testing and was therefore not collected. A photograph of the collected points (Plate 7-1) follows Table 7-4.

Table 7-4. Project Point Typology

Cat No.	Site No.	Locus	Material	Point Type	Date Range
292	P-15-002539	N/A	Rhyolite	Possible Rose Spring knife	Unknown
297	P-15-002539	N/A	Fused shale	Unknown, base missing, possible Cottonwood	Unknown
302	P-15-002539	N/A	Obsidian	Cottonwood	900–150 B.P.
60	BH-ISO-305	N/A	Metavolcanic	Unknown, stem missing	Unknown
7	BH-S-005	N/A	Rhyolite	Possible Rose Spring knife base missing	Unknown
N/A	BH-S-006	N/A	Obsidian	Rose Spring stemmed	1725–850 B.P.
15	BH-S-102	N/A	Rhyolite	Pinto	10,200–4400 B.P.
72	BH-S-110	A	Obsidian	Rose Spring sloping shoulder	1725–850 B.P.
76	BH-S-110	A	Rhyolite	Rose Spring sloping shoulder	1725–850 B.P.
21	BH-S-110	C	Obsidian	Unknown, stem missing	Unknown
273	BH-S-212	N/A	Obsidian	Cottonwood leaf	900–150 B.P.

B.P. = before present; Cat No. = Catalog number

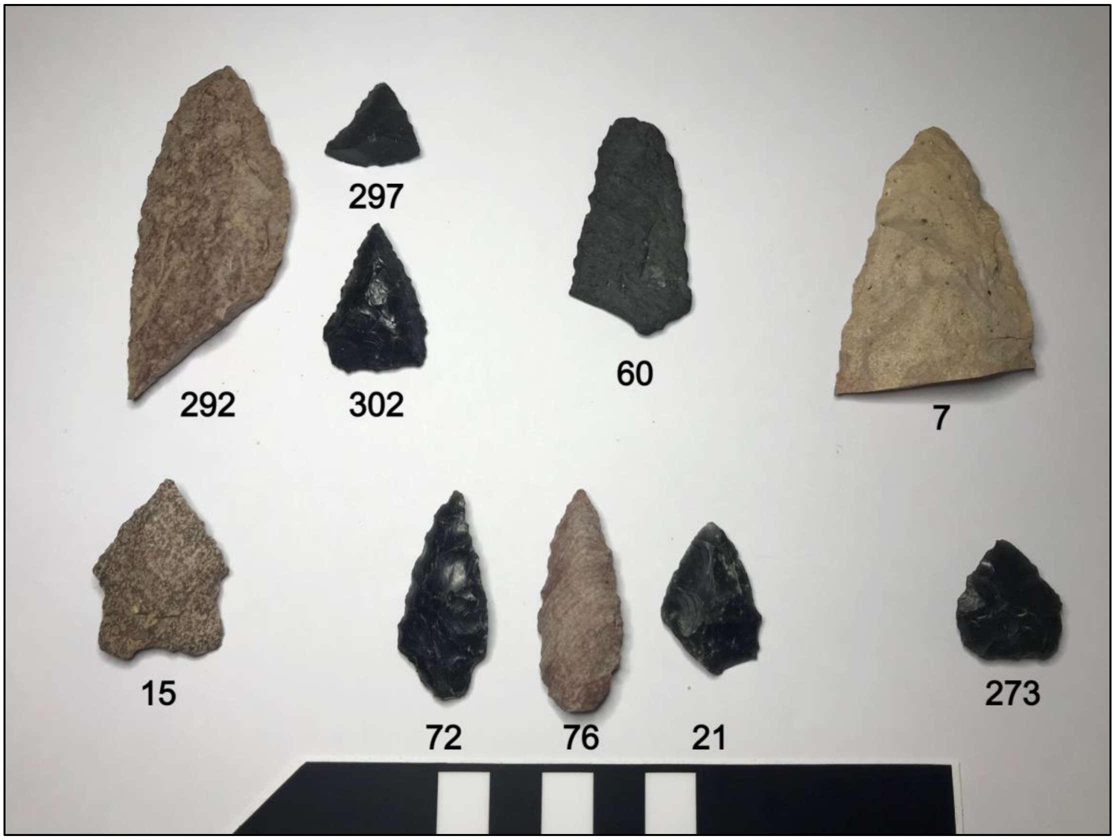

Plate 7-1. Projectile Points with Catalog Numbers

Pinto Series

One Pinto series point was found on the surface within site BH-S-102 (ICF Catalog #15). The point is rhyolite and measures 3.3 centimeters from tip to stem and 2.1 centimeters wide by 1 centimeter thick at the midsection. Accepted dates for Pinto series projectile points are from 10,200–4400 B.P.

Rose Spring Series

Two large, bifacially worked, incomplete rhyolite artifacts (ICF Catalog #7 and #292) could be large projectile-point fragments, but, based on the width of their tips and the thickness of the artifacts, it appears that these are more likely to have been cutting tools, such as knives. Catalog #7 from site BH-S-005 is 5.8 centimeters long by 4.1 centimeters wide and 1.1 centimeters thick at its medial point. The tool shows minimal thinning on its dorsal and ventral surfaces and has a rounded point, rather than a sharp, triangular point, indicating that it was more likely used for cutting than puncturing as a projectile point. ICF Catalog #292 from site P-15-002539 is also rhyolite and measures 7.2 centimeters long by 3.1 centimeters wide and 1 centimeter thick at its medial point. This artifact is lanceolate in shape and exhibits bifacial thinning on both the dorsal and ventral surfaces, with the dorsal surface flatter and more refined than the dorsal surface. ICF Catalog #292 has a slightly rounded tip and may be either an unfinished projectile point or a cutting tool, such as a knife. Previous researchers (Mason et al. 2019) noted the presence of stone knives being associated with the Rose Spring Period (1725–850 B.P.) in the Antelope Valley.

Three projectile points of the typologically dated to the Rose Spring Period (1725–850 B.P.) were identified during the current effort. An obsidian Rose Spring stemmed projectile point (no catalog number) was located on the surface at site BH-S-006 during the Phase I survey in July 2021; however, the point was missing from its recorded location when crews returned to excavate the site in October 2021. Fortunately, the artifact was measured and photographed in the field in July 2021 (Plate 7-2). The projectile point is 3.5 centimeters from stem to tip by 2 centimeters at the shoulders and 0.25 centimeter thick at the midsection. The stem is 0.5 centimeter tall by 0.75 centimeter wide.

Plate 7-2. Rose Spring Stemmed Projectile Point on the Surface during Survey, but not Located during Phase II Testing

The two other Rose Spring series projectile points were both found at site BH-S-110 (ICF Catalog #72 and #76). The projectile points both appear to be Rose Spring sloping shoulder types, which are more common in the eastern Mojave Desert and Great Basin (Justice 2002). ICF Catalog #72 is obsidian and appears to be complete, although not completely refined. The artifact is 3.9 centimeters from stem to tip, 1.8 centimeters wide, and 0.7 centimeter thick in the midsection. ICF Catalog #76 is a rhyolite projectile point 4.1 centimeters from stem to tip, 1.7 centimeters wide, and 0.9 centimeter think at the midsection. This artifact is somewhat thick in the middle and does not show many thinning flake scars, although the edges and tip are well developed from pressure flaking.

Cottonwood Series

Two projectile points appear to be related to the Cottonwood triangular series of projectile points that date from the Late Prehistoric Period (900–150 B.P.). The two points are both obsidian. ICF Catalog #302, found on the surface at site P-15-002539, is triangular in shape and appears to be complete. The projectile point exhibits thinning and concavity at the base. ICF Catalog #273 was identified on the surface of site BH-S-212. The projectile point is broken, and the base is not present. The artifact is slightly more leaf-shaped than triangular. A third artifact (ICF Catalog #297) is the tip of a projectile point that appears likely to have been a Cottonwood triangular point. The artifact was recovered from site P-15-002539 and is fused shale, which does not occur in the vicinity of the project area. Fused shale, although uncommon, is not unknown at sites in the Antelope Valley. Most fused shale from the site that have been sourced originate from the Grimes Canyon source in Ventura County, approximately 50 miles southeast of the project site.

7.4.2 Groundstone Artifacts

A total of 11 pieces of groundstone were observed in the archaeological study area. These artifacts comprise a variety of sources, including Pelona schist, steatite, basalt, rhyolite, and granite. See Table 7-5 for a list of all identified groundstone in the project area.

Table 7-5. Groundstone Artifacts

ICF Cat No.	Site No.	Locus	Material	Groundstone Type
274	P-15-002539	N/A	Sandstone	Mano fragment
275	P-15-002539	N/A	Granite	Metate fragment
276	P-15-002539	N/A	Diorite	Metate fragment
277	P-15-002539	N/A	Steatite	Stone bowl fragment
127	BH-S-202	N/A	Rhyolite	Bifacial metate fragment
352	BH-S-202	N/A	Rhyolite	Metate
124	BH-S-202	N/A	Granite	Metate fragment
125	BH-S-202	N/A	Rhyolite	Shaped mano
66	BH-S-110	A	Granite	Mano/hammerstone
351	BH-S-110	A	Granite	Metate
65	BH-S-110	A	Pelona Schist	Metate fragment
107	BH-S-110	A	Vesicular Basalt	Metate fragment

Cat No. = catalog number

Pelona schist is a metamorphic rock that occurs along the Garlock fault. It is very micaceous and also composed of chlorite, albite, quartz, and biotite or actinolite. It is fine- to medium-grained and highly foliated, with a green/blue hue and a silvery sheen, due to mica. The Pelona schist dates to the Precambrian age (Hershey 1902; Simpson 1934). The closest source of Pelona schist is south of Palmdale, in the Sierra Pelona, approximately 20 miles south of the project area (Eddy 2013; Landberg 1980; Mason et al. 2019; Rosenthal and Williams 1992; Sutton 1982). The Sierra Pelona is also the local source of steatite, commonly used for stone bowls, mortars, stone beads, effigies, pipes, and other artifacts, due to its high quality. Eddy conducted an analysis of these materials in 2013 and found that steatite and schist from the Sierra Pelona was an important raw material for local artifact production and traded outside of Antelope Valley (Eddy 2013).

A few pieces of granite and diorite was also observed in the project area. These plutonic rocks most likely date to the Mesozoic. The granite and diorite in the Antelope Valley region underlie large areas of the Tehachapi Mountains along the Garlock fault, west of the main project area, trending north toward Randsburg (Dibblee 1963). One metate fragment composed of vesicular basalt was identified. Rosamond Hills are geologically volcanic and were primarily a source of rhyolite prehistorically, but also a source of basalt.

All groundstone identified in the archaeological study area appears to be from sources within and adjacent to Antelope Valley.

7.4.3 Cores

A total of 21 cores were identified in the archaeological study area. A summary of the collected artifacts is provided in Table 7-6.

Table 7-6. Cores

Cat No.	Site No.	Locus	Material	Notes
278	P-15-002539	N/A	Rhyolite	–
281	P-15-002539	N/A	Rhyolite	–
284	P-15-002539	N/A	CCS	–
285	P-15-002539	N/A	Banded Rhyolite	Fragment
287	P-15-002539	N/A	Tuff	–
293	P-15-002539	N/A	Rhyolite	–
294	P-15-002539	N/A	Rhyolite	–
258a–c	BH-S-303	N/A	Rhyolite	Part of a three-piece refit
208	BH-S-207	N/A	Rhyolite	–
209	BH-S-207	N/A	Rhyolite	–
210	BH-S-207	N/A	Rhyolite	–
211	BH-S-207	N/A	Rhyolite	–
126	BH-S-202	N/A	Rhyolite	–
164	BH-S-202	N/A	Rhyolite	–
120	BH-S-110	A	CCS	–
13	BH-S-102	N/A	CCS	–
11	BH-S-006	N/A	Rhyolite	Expended
58	BH-ISO-301	N/A	Rhyolite	–
123	BH-ISO-131	N/A	Rhyolite	–
121	BH-ISO-130	N/A	Rhyolite	–
271	BH-ISO-014	N/A	Rhyolite	–

Cat No. = catalog number CCS = cryptocrystalline silicate

Of the 21 cores identified, 81 percent are rhyolite, 14 percent are CCS, and only one core is composed of tuff. Three of the core fragments are part of a three-piece refit. All the material types are local to the Antelope Valley, with rhyolite sources within 2 miles of the sites. The presence of cores through a number of sites supports the theory that quarrying and initial reduction occurred at nearby sources, such as Rosamond Hills, and then brought down to the valley for further lithic reduction.

7.4.4 Flaked-Stone Tools

A total of 48 flaked-stone tools were collected from seven sites and four isolates (Table 7-7). This does not include projectile points and cutting tools, which are discussed above in Section 7.4.1, *Projectile Points and Cutting Tools*. Overall, flaked-stone tools across all sites were made from rhyolite (69 percent), CCS (29 percent), and obsidian (2 percent). Table 7-7, below, presents a summary of the flaked-stone tools collected during the testing effort. All flaked-stone tools were collected from the surface; no tools were found subsurface.

Table 7-7. Flaked-stone Tools Summary by Site

Site	Tool Type	Material	Count
P-15-002539	Biface Fragment	CCS	1
		Rhyolite	1
	Core/Hammerstone	Rhyolite	2
	Edge-modified Flake	Rhyolite	2
	Scraper	Rhyolite	3
BH-ISO-013	Scraper	CCS	1
BH-ISO-107	Uniface	Rhyolite	1
BH-ISO-125	Biface	CCS	1
BH-ISO-141	Biface	Rhyolite	1
BH-S-012	Biface	Rhyolite	1
	Utilized Flake	Rhyolite	1
BH-S-102	Biface	CCS	1
	Utilized Flake	Rhyolite	1
BH-S-110	Biface Fragment	CCS	3
		Rhyolite	2
		Obsidian	1
	Core/Hammerstone	Rhyolite	1
	Edge-modified Flake	CCS	2
		Rhyolite	2
	Hammerstone	Rhyolite	1
	Scraper	CCS	1
	Utilized Flake	Rhyolite	1
BH-S-111	Biface	Rhyolite	1
BH-S-144	Biface	Rhyolite	1
BH-S-202	Biface	CCS	1
	Biface Fragment	Rhyolite	2
	Bifacially Worked Flake	CCS	1
		Rhyolite	1
	Scraper	Rhyolite	5
		CCS	1
	Uniface	Rhyolite	1
	Utilized Flake	CCS	1
		Rhyolite	2

CCS = cryptocrystalline silicate

7.4.5 Debitage

Of the 31 total sites evaluated for eligibility for CRHR-listing, 22 are prehistoric sites: 17 sparse lithic scatters, two large lithic-reduction sites, and three habitation sites. All 22 sites contain debitage (i.e., flakes and shatter) within their assemblages. Debitage was not collected during testing unless it was found during subsurface investigations. Some debitage was identified as chert during recordation, but has been grouped under CCS. Most debitage on the surface of the sites was recorded during the survey for the current project. The three habitation sites (BH-S-110, BH-S-202, and P-15-002539) contained the largest assemblages of flakes, most of which are tertiary flakes made from rhyolite. Site BH-S-110 contains approximately 550 pieces of debitage of the following material types: 69 percent rhyolite, 30 percent CCS, and less than 1 percent each of jasper, obsidian, and metavolcanic material. Site BH-S-202 contains approximately 200 pieces of debitage, with a similar material type ratio: 84 percent rhyolite and 16 percent CCS. Habitation Site P-15-002539 contains approximately 150 pieces of debitage, which are 90 percent rhyolite and 10 percent CCS. These material-type percentages roughly match the percentage of material types for the artifacts recovered during testing across all sites.

The remaining 19 sites, in which 100 or less pieces of debitage were observed and recorded in each, are also composed mainly of tertiary rhyolite flakes. The only site in which primary flakes were observed in a quantity and high-enough ratio to be considered a primary reduction site, along with the presence of multiple cores, is BH-S-207. Most materials at BH-S-207 are rhyolite. As described above, rhyolite would have been easily accessible and abundant, due to the nearby rhyolite sources in the Rosamond Hills (approximately 1–2 miles east–northeast of BH-S-207) and at Fairmont Butte (approximately 13 miles southwest of BH-S-207).

7.4.6 Faunal Analysis

Four of the prehistoric archaeological sites (BH-S-110, BH-S-144, BH-S-202, and P-15-002539) contained subsurface faunal remains.

BH-S-110

One articulating surface from the long bone of a small mammal, likely squirrel or rabbit, was recovered from the 40–50-centimeter level of STP #3. The bone is burned, but not calcined, and, due to the small size of the bone, it cannot be attributed to a particular mammal or identified as being onsite as a food source. Three very small faunal remains were recovered from the 60–70-centimeter level. The remains all appear to be avian, from a small bird. Two are likely leg bones, and one could be from a rib or wing. None of the three specimens from the 60–70-centimeter level show evidence of exposure to open flame. Total weight of the four specimens from BH-S-110 is approximately 1.1 grams.

BH-S-144

One very small bone fragment (less than 0.1 gram in weight) from a small mammal was recovered in the 40–50-centimeter level of STP #3. The fragment is very small and could be from a small bird or mammal, but it is too small to identify with certainty. The bone shows signs of prolonged exposure to high heat and is whitish-blue and polished, suggesting it was probably cooked in a campfire.

BH-S-202

Fourteen faunal remains were recovered from site BH-S-202. All of the specimens were recovered from STP #2 in the 30–40-centimeter level. The bones appear to be from a large canine and are the tarsal bones of a foot, including metatarsal, sesamoid bones, and proximal, middle, and distal phalanges. The bones are not burned. Total weight of all 14 bones was 10.5 grams. No artifacts were found in this level or in the 20–30 centimeters above it.

P-15-002539

Faunal remains recovered at P-15-002539 consist of seven very small, unidentifiable small-mammal remains. The remains have a combined weight of less than 1 gram. The remains are not burned. All of the specimens came from SS #1, within the 0–10-centimeter level. Also recovered in this level were 40 CCS and rhyolite debitage.

Faunal remains at the sites located in the project area were few in number and distribution. Only one of the remains, a small-mammal bone from BH-S-144, showed evidence of being cooked. The overall pattern suggests that hunting for immediate consumption and the cooking of meat was not a primary activity of the sites. Further investigation at the four sites may yield additional remains that could provide additional information on subsistence at the site.

7.5 Archaeological Testing and Evaluation

In July 2021, an intensive Phase I pedestrian archaeological survey was conducted (see Table 1-1 in Section 1.1.1, *Purpose of the Study*, for survey area definition and acreage). The Phase I survey identified 34 sites and one multicomponent archaeological and built-environment resource (Willow Springs) within the archaeological study that required evaluation to determine if the sites were eligible for CRHR-listing, as depicted in Table 7-8, below. A figure of the tested sites can be found in Confidential Appendix A.

To accomplish the goals of the testing program, the methods outlined in Section 6.5, *Field Methods,* were implemented. STPs were excavated adjacent to features or concentrations, where identified. Where concentrations or features were not apparent, STP locations were spread out across the sites to ensure sampling coverage across the site boundaries. Excavations were focused on identifying whether subsurface deposits were present and, if so, whether these deposits contained the density and diversity of materials and types to address the important resource questions identified in Section 6.3, *Research Themes and Questions*, and the sites' potential eligibility for CRHR as individual resources or as part of an archaeological district. Prehistoric archaeological districts generally include a grouping of contiguous sites and their settings, as well as other types of resources, such as landscape features linked by function or theme. Sites within an archaeological district may be CRHR eligible as individual resources or a contributing element that, although not eligible individually, contributes to the significance of a district overall as part of the greater cumulative resource.

Table 7-8. Archaeological Sites Requiring Evaluation for the Project

Site Number	Era	Description	Testing Method
P-15-000129	Multicomponent	Prehistoric habitation site, historical site – Willow Springs	In gen-tie location, not evaluated at this time
P-15-002539	Prehistoric	Prehistoric habitation site	4 STPs, 2 SS
P-15-012793	Historic-era	Historic-period refuse dump	2 STPs
P-15-018292	Historic-era	Historic-period refuse dump	2 STPs
P-15-018676	Multicomponent	Historic-period refuse dump and small lithic scatter	In gen-tie location, not evaluated at this time
P-15-019544	Prehistoric	Sparse lithic scatter	2 STPS, 1 SS
P-15-019545	Historic-era	Historic-period refuse dump	2 STPs
P-15-019546	Prehistoric	Sparse lithic scatter	2 STPs

Site Number	Era	Description	Testing Method
BH-S-001	Historic-era	Historic-period refuse dump	In gen-tie location, not evaluated at this time
BH-S-002	Prehistoric	Large lithic-reduction site	In gen-tie location, not evaluated at this time
BH-S-003	Prehistoric	Sparse lithic scatter with nine rhyolite tertiary flakes and one CCS flake	3 STPs
BH-S-004	Historic-era	Historic-period refuse dump	2 STPs
BH-S-005	Prehistoric	Sparse lithic scatter with a biface	4 STPs, 1 SS
BH-S-006	Prehistoric	Sparse lithic scatter with one core fragment and a projectile point	3 STPs
BH-S-008	Prehistoric	Sparse lithic scatter with three rhyolite flakes and one CCS primary flake with a modified edge	3 STPs
BH-S-009	Historic-era	Historic-period refuse dump	2 STPs
BH-S-011	Prehistoric	Sparse lithic scatter with seven rhyolite flakes	3 STPs
BH-S-012	Prehistoric	Large lithic-reduction site	3 STPs, 1 SS
BH-S-013	Prehistoric	Sparse lithic scatter, including six rhyolite flakes	2 STPs
BH-S-102	Prehistoric	Sparse lithic scatter with one projectile point and two bifaces	3 STPs, 1 SS
BH-S-107	Historic-era	Historic period refuse dump	2 STPs
BH-S-108	Prehistoric	Sparse lithic scatter with five rhyolite tertiary flakes	3 STPs
BH-S-109	Historic-era	Historic-period refuse dump	2 STPs
BH-S-110	Prehistoric	Prehistoric habitation site	12 STPs
BH-S-111	Prehistoric	Sparse lithic scatter, including three rhyolite flakes, one chert flake, and one rhyolite biface fragment	3 STPs
BH-S-123	Historic-era	Historic-period refuse dump	2 STPs
BH-S-134	Prehistoric	Sparse lithic scatter	3 STPs
BH-S-140	Prehistoric	Sparse lithic scatter, including five rhyolite flakes and one chert flake	3 STPs
BH-S-144	Prehistoric	Large lithic-reduction site with approximately 80 flakes, including rhyolite, jasper, and chert	3 STPs, 1 SS
BH-S-202	Prehistoric	Prehistoric habitation site	4 STPs, 1 SS
BH-S-207	Prehistoric	Sparse lithic scatter site in alluvial wash	4 STPs
BH-S-211	Prehistoric	Sparse lithic scatter with 19 rhyolite flakes	3 STPs
BH-S-212	Prehistoric	Sparse lithic scatter with one obsidian point and two rhyolite flakes	2 STPs
BH-S-303	Prehistoric	Sparse lithic scatter	2 STPs

*Highlighted sites remain unevaluated at this time due to inability to access parcels when fieldwork was conducted.
CCS = cryptocrystalline silicate; SS = surface scrape; STP = shovel test pit

A total of 30 archaeological resources were tested and evaluated for the current project. An additional four sites will require either evaluation or subsurface investigation for identification of potential significant deposits within portions of the sites that intersect the archaeological study area (shaded grey in Table 7-8 above). The results of the test and evaluation at each site are detailed below.

7.5.1 Archaeological Site Evaluations

P-15-002539/CA-KER-2539

Testing Results

P-15-002539 is a large prehistoric habitation site with numerous artifacts, including flakes, cores, a bowl fragment, bifaces, groundstone, a projectile point, and other prehistoric artifacts. The site is bisected by a dirt road, and only the southern half is located within the project area. ICF conducted testing at P-15-002539. Testing consisted of four STPs and two SSs. The summary of the testing results is presented in Table 7-9, below. STPs 1, 3, and 4 were negative for cultural resources; artifacts were found at 0–10 centimeters within STP 2, but all other levels were negative. All STPs were terminated at a depth of 50 centimeters, except for STP 4, which was terminated around 25 centimeters due to hitting caliche. Shovel scrapes were terminated at 10 centimeters deep. Diagnostic artifacts present on the ground surface within the site were also collected and are presented in Table 7-9.

Table 7-9. P-15-002539/CA-KER-2539 Testing Results

		Artifact Type (Count)				
Test Unit	**Level**	**Bone**	**Core**	**Debitage**	**Groundstone**	**Tool**
N/A	Surface	–	6	6	4	13
SS 1	Surface	–	–	23	–	–
	Subsurface	7	–	18	–	–
SS2	Surface	–	–	19	–	–
	Subsurface	–	–	27	–	–
STP 1	0–50 cm	Negative	–	–	–	–
STP 2	0–10 cm	–	–	1	–	–
	10–50 cm	Negative	–	–	–	–
STP 3	0–50 cm	Negative	–	–	–	–
STP 4	0–25 cm	Negative	–	–	–	–
Total	–	7	6	94	4	13

cm = centimeters; SS = surface scrape; STP = shovel test pits

Of the lithic artifacts recovered from P-15-002539, 78 percent is rhyolite, 15 percent is CCS, 3 percent is obsidian, and 2 percent is granite. The following material types make up less than 1 percent each of the lithic artifacts: sandstone, steatite, and tuff. Within the debitage assemblage, 88 percent are tertiary flakes, 6 percent are secondary flakes, and 6 percent are utilized or edge-modified flakes. A stone bowl fragment was recovered from the surface (Plate 7-3). A Cottonwood projectile point dating from approximately 900–150 B.P. was identified on the surface of the site, along with two other broken/incomplete projectile points of undetermined type and age.

Plate 7-3. Steatite Bowl Fragment on Surface at P-15-002539/CA-KER-2539

CRHR Evaluation and Recommendation

Based on artifacts observed within and recovered from P-15-002539, this is a prehistoric habitation site, likely a temporary camp. The site contains a breadth of materials, indicating that a variety of domestic activities occurred onsite and over time and could have important information regarding subsistence practices and site-formation processes. The depth of the deposit is relatively shallow, extending approximately 10 centimeters. However, the site contains a number of artifacts that are not obtainable locally and could shed light on regional trade and exchange. P-15-002539 is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). P-15-002539 is likely to yield information important to prehistory in what is currently a relatively poorly understood part of the Antelope Valley (Criterion 4). Site P-15-002539 is recommended for CRHR-listing.

P-15-012793/CA-KER-7214H

Testing Results

P-15-012793 is a large, historic-era refuse scatter measuring 1,143 by 726 feet. Pacific Legacy conducted testing at the site in 2010. Testing consisted of three 50- by 50-centimeter STPs excavated to a depth of 50 centimeters and eight shovel probes excavated to a minimum depth of 40 centimeters. No subsurface deposit was identified.

ICF's testing at P-15-012793 consisted of two STPs in the northern and central portion of the site. See Table 7-10 for a summary of the testing results.

Table 7-10. P-15-012793 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
P-15-012793	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile

cm = centimeters; STP = shovel test pit

The STPs were excavated to a depth of 50 centimeters and negative for cultural resources, consistent with Pacific Legacy's 2010 testing results. The soil matrix was a light-brown silty loam with light gravel throughout the levels.

CRHR Evaluation and Recommendation

P-15-012793 is the location of opportunistic, rural, domestic-refuse disposal. The site may be the result of multiple dumping episodes during the mid-twentieth century. Data obtained from this site's recordation can address very little (if anything) regarding the questions proposed above in Section 6.3, *Research Themes and Questions*, because there is no contextual information associated with the refuse dump to link the artifacts to a particular individual or group. Without such contextual information, the site does not demonstrate association with events that have made a significant contribution to broad patterns of our history (Criterion 1), and the site cannot be associated with a significant person or persons (Criterion 2). Refuse-disposal sites like P-15-012793 are ubiquitous in the region, and this site shares similarities in form with hundreds of other such sites. As such, the site does not embody the distinctive work of a master or possess high artistic values (Criterion 3). Subsurface testing was negative, and the site has not yielded, nor is likely to yield, information important to history (Criterion 4), and current documentation has likely exhausted any further potential of the site to do so. The site does not meet any of the four CRHR criteria and is therefore not recommended for CRHR-listing as an individual resource or as a contributor to a potential archaeological district.

P-15-018292/CA-KER-9985

Testing Results

P-15-018292 is a historic-era refuse scatter that measures 535.4 by 147.9 feet. The site was tested in 2015 by ICF in support of the Valentine Solar Project (ICF 2015). Testing consisted of one STP in the densest portion of the site. The STP was negative for subsurface cultural deposits, and the site was characterized as a thinly spread trash scatter dating from the 1900s to the 1940s. The site was recommended not eligible for CRHR-listing.

Testing for the current project consisted of two STPs to add to the 2015 testing evaluation. Soil within the site was a light reddish-brown alluvium. See Table 7-11 for a summary of the testing results.

Table 7-11. P-15-018292 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
P-15-018292	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile

cm = centimeters; STP = shovel test pit

STP 1 was terminated at a depth of 30 centimeters, due to a dense, decomposed-granite cobble layer. STP 2 reached a depth of 50 centimeters. Both STPs were negative for subsurface cultural resources.

CRHR Evaluation and Recommendation

The survey and testing effort conducted at P-15-018292 for the current project supports the previous recommendation that P-15-018292 is not eligible for CRHR-listing. As a small, historic-era trash scatter with minimal diagnostic materials, the site does not demonstrate an association with events that have made a significant contribution to broad patterns of our history (Criterion 1), and the site cannot be associated with a significant person or persons (Criterion 2). Refuse-disposal sites like P-15-018292 do not embody the distinctive work of a master, nor possess high artistic values (Criterion 3). Subsurface testing was negative, and the site has not yielded, nor is it likely to yield, information important to history (Criterion 4), and current documentation has likely exhausted any further potential of the site to do so. Site P-15-018292 does not meet the criteria for CRHR-listing.

P-15-019544/CA-KER-10708

Testing Results

P-15-019544 is a dispersed prehistoric lithic scatter consisting of 25 flakes and one rhyolite biface. Testing consisted of one SS and two STPs within the expanded site boundary, which covers approximately 4,320 square meters, with only 22 artifacts dispersed across the surface. The summary of the testing results is presented in Table 7-12, below. The SS (SS 1) was terminated at a depth of 10 centimeters. STP 1 was positive, but terminate at a depth of 70 centimeters, due to very low density of artifacts. STP 2 was negative and terminated at a depth of 50 centimeters. Diagnostic artifacts present on the ground surface within the site were also collected and are presented in Table 7-12.

Table 7-12. P-15-019544/CA-KER-10708 Testing Results

		Artifact Type (Count)	
Test Unit	Level	Debitage	Tool
N/A	Surface	1	1
SS 1	Surface	1	–
	Subsurface	Negative	–
STP 1	0–20 cm	Negative	–
	20–30 cm	1	–
	30–40 cm	1	–

Test Unit	Level	Artifact Type (Count)	
		Debitage	Tool
	40–50 cm	Negative	–
	50–60 cm	2	–
	60–70 cm	Negative	–
STP 2	0–50 cm	Negative	–
Total	–	6	1

cm = centimeters; SS = surface scrape; STP = shovel test pit

One banded rhyolite tertiary flake was found on the surface of SS 1, as well as in STP 1 at the 20–30-centimeter level. All other debitage recovered from STP 1 were (non-banded) rhyolite tertiary flakes. Diagnostic artifacts recovered from the surface of the site consist of an obsidian tertiary flake and one CCS flaked-stone tool (Plate 7-4).

Plate 7-4. CCS Flake on Surface at P-15-019544/CA-KER-10708

CRHR Evaluation and Recommendation

Site P-15-019544 has a diverse lithic assemblage by material type, but consists mostly of debitage. A wide range of materials, including CCS, chert, rhyolite, and obsidian, was observed in the artifact assemblage from the site. Eighty-six percent of the artifacts are debitage, and all of them are tertiary flakes, with the exception of one piece of shatter. The other artifacts include an edge-modified flake and a bifacially flaked chert tool. The abundance of tertiary flakes and lack of thinning flakes suggest production or maintenance of larger tools or bifaces at the site.

The single obsidian flake was analyzed and sourced to West Sugarloaf in the Coso Volcanic Field. The flake was dated to a range of 1851–1029 B.P., due to multiple hydration bands, which places the obsidian in the Rose Spring period.

As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). Because both the surface expression and subsurface components of the site are minimal and within a disturbed agricultural context lacking in integrity, the resource does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage during previous surveys and the analysis of diagnostic artifacts conducted during the current testing effort have exhausted the site's research potential. Site P-15-019544 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

P-15-019545/CA-KER-10709

Testing Results

P-15-019545 is a sparse, historic-era refuse scatter. Testing consisted of two STPs, one placed in the north end of the site, and one placed in the south end. See Table 7-13 for a summary of the testing results.

Table 7-13. P-15-019545 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
P-15-019545	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile

cm = centimeters; STP = shovel test pit

Both STPs were excavated to a depth of 50 centimeters, and both were negative for cultural resources. Soils in both STPs consisted of light-brown, medium-grain sandy loam with medium-sized pebbles at all levels.

CRHR Evaluation and Recommendation

P-15-019545 is the location of opportunistic, rural, domestic-refuse disposal. The time range to which the artifacts date suggests the site is the result of multiple dumping episodes throughout the twentieth century. Data obtained from this site's recordation can address very little regarding the research questions proposed in Section 6.3, *Research Themes and Questions*, because there is no contextual information associated with the refuse dump to link the artifacts to a particular individual or group. Without such contextual information, the site does not demonstrate association with events that have made a significant contribution to broad patterns of our history (Criterion 1), and the site cannot be associated with a significant person or persons (Criterion 2). Refuse-disposal sites like P-15-019545 do not embody the distinctive work of a master, nor possess high artistic values (Criterion 3). Subsurface testing was negative, and the site has not yielded, nor is it likely to yield, information important to history (Criterion 4), and current documentation has likely exhausted any further potential of the site to do so. Site P-15-019545 does not meet any of the four CRHR criteria and is therefore not recommended for CRHR-listing as an individual resource or as a contributor to a potential archaeological district.

P-15-019546/CA-KER-10710

Testing Results

P-15-019546 is a small lithic scatter consisting of a CCS flake and a rhyolite flake within a 23- by 6-meter area. It is in a previously plowed agricultural field occasionally used for sheep grazing. Testing at the site consisted of two STPs placed within the site boundary, both excavated to a depth of 50 centimeters. See Table 7-14 for a summary of the testing results.

Table 7-14. P-15-019546 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
P-15-019546	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile

cm = centimeters; STP = shovel test pit

The site consists of four CCS flakes spread over 113 square meters. The soil throughout both STPs was a light-brown silty loam with small pea gravels at all levels. Both STPs were negative for cultural resources.

CRHR Evaluation and Recommendation

P-15-019546/CA-KER-10710 does not contain a diverse artifact assemblage. All observed artifacts are flakes, and 100 percent are CCS. A lack of diagnostic or dateable artifacts prohibits assignment of a chronological period. As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). The resource is a small surface scatter, and subsurface testing was negative; therefore, the site does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage during previous surveys and the current testing effort has exhausted the site's research potential. The site is in a previously plowed agricultural field that is occasionally used for sheep grazing, which has highly affected the site's integrity. Site P-15-019546 does not meet the eligibility criteria for CRHR-listing as an individual resource or as a contributor to a potential archaeological district.

BH-S-003

Testing Results

BH-S-003 is a small, dispersed lithic scatter consisting of 10 lithic flakes spread across 579 square meters. Testing at BH-S-003 consisted of three STPs excavated to a depth of 50 centimeters. See Table 7-15 for a summary of the testing results.

Table 7-15. BH-S-003 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-003	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile
–	–	STP 3	Negative	N/A	50 cm	Sterile

cm = centimeters; STP = shovel test pit

Soils within the STPs throughout all levels were a compact, light-tan, fine-grained silt with pea gravel throughout. All three STPs were negative for cultural resources. Of the 10 tertiary flakes, nine are rhyolite, and one is CCS.

CRHR Evaluation and Recommendation

BH-S-003 does not contain a diverse artifact assemblage. All observed artifacts are flakes, and 90 percent are rhyolite. A lack of diagnostic or dateable artifacts prohibits assignment of a chronological period. As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). The resource is a small surface scatter, and subsurface testing was negative, so the resource does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage and current testing effort have exhausted the site's research potential. Site BH-S-003 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-004

Testing Results

BH-S-004 is a possibly historic-era refuse scatter consisting of trash dating from the late 1960s to early 1970s, including beverage cans, gallon buckets, steel cable, and glass bottles. Testing at BH-S-004 consisted of two STPs excavated to a depth of 50 centimeters. See Table 7-16 for a summary of the testing results.

Table 7-16. BH-S-004 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-004	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile

cm = centimeters; STP = shovel test pit

Soils within the STPs were a light-brown, medium-grain, sandy-loam sand with small pebble inclusions at all levels. Both STPs were negative for subsurface resources.

CRHR Evaluation and Recommendation

BH-S-004 is the location of opportunistic, rural, domestic-refuse disposal, likely from a single dumping episode in the 1970s. Data obtained from this site's recordation can address very little regarding the research questions proposed above because there is no contextual information associated with the refuse dump to link the artifacts to a particular individual or group. Without such contextual information, the site does not demonstrate association with events that have made a significant contribution to broad patterns of our history (Criterion 1), and the site cannot be associated with a significant person or persons (Criterion 2). Refuse-disposal sites like BH-S-004 do not embody the distinctive work of a master, nor possess high artistic values (Criterion 3). Subsurface testing was negative, and the site has not yielded, nor is it likely to yield, information important to history (Criterion 4), and current documentation has likely exhausted any further potential of the site to do so. Site BH-S-004 does not meet any of the four CRHR criteria and is therefore not recommended for CRHR-listing.

BH-S-005

Testing Results

BH-S-005 consists of approximately 50 widely dispersed lithic artifacts in an area of 6,293 square meters. Testing consisted of one SS (SS 1) and four STPs spaced throughout the site. The SS was excavated to 10 centimeters in depth, and the STPs were excavated to 50 centimeters in depth. See Table 7-17 for a summary of the testing results.

Table 7-17. BH-S-005 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-005	N/A	SS 1	Negative	N/A	10 cm	Sterile – reached termination depth
–	–	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile
–	–	STP 3	Negative	N/A	50 cm	Sterile
–	–	STP 4	Negative	N/A	50 cm	Sterile

cm = centimeters; SS = surface scrape; STP = shovel test pit

Soils were a light-tan, silty loam, ranging from low to medium compaction. The SS and STPs were all negative for cultural resources. One rhyolite biface was collected from the surface within the site (Plate 7-5).

Plate 7-5. Rhyolite Biface Collected from BH-S-005

CRHR Evaluation and Recommendation

BH-S-005 does not contain a diverse artifact assemblage. All observed artifacts, except for one, are flakes, and 100 percent are rhyolite. The one diagnostic artifact is a bifacial rhyolite knife or cutting-tool fragment. A lack of diagnostic or dateable artifacts prohibits assignment of a chronological period. As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2). Only one artifact in the site, the rhyolite biface, was diagnostic, and the site does not embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). As a sparce lithic scatter with no subsurface component, the resources do not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage and current testing effort have exhausted the site's research potential. Site BH-S-005 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-006

Testing Results

BH-S-006 consists of 11 flakes, a core fragment and an obsidian projectile point in an area of 1,743 square meters. Testing at BH-S-006 consisted of three STPs excavated to a depth of 50 centimeters. See Table 7-18 for a summary of the testing results.

Table 7-18. BH-S-006 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-006	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile
–	–	STP 3	Negative	N/A	50 cm	Sterile

cm = centimeters; STP = shovel test pit

Soils within the STPs throughout all levels were an orangish-brown alluvium, with heavier compaction around 15 centimeters below the surface. All three STPs were negative for cultural resources. Four diagnostic artifacts were collected from the surface within the site boundary: three obsidian tertiary flakes, and one rhyolite expended core. One obsidian flake was submitted for analysis and identified to the West Sugarloaf source in the Coso Volcanic Field and dating (1462–894 B.P.) to the Rose Spring Period (Plate 7-6). An obsidian Rose Spring stemmed projectile point, also dating to the Rose Spring Period (1725–850 B.P.), was also identified within the site. Unfortunately, the point was missing from its recorded location when crews returned to excavate the site in October 2021.

Plate 7-6. BH-S-006 Obsidian Projectile Point Observed During Survey, Plan View

CRHR Evaluation and Recommendation

Site BH-S-006 does not contain many artifacts and consists mostly of debitage. This site has a large percentage of obsidian (75 percent: five flakes, one projectile point) compared to other material types (25 percent: one rhyolite flake, one rhyolite core). Seventy-five percent of the artifacts are debitage, and all of them are tertiary flakes. The other artifacts include the obsidian Rose Spring projectile point and an expended rhyolite core. The Rose Spring projectile point dates to the Rose Spring Period, which ranges from 1725 to 850 B.P. Three obsidian flakes were analyzed, and all three also date to the Rose Spring Period (1462–894 B.P.).

As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2). Although a few select artifacts within the site are diagnostic (e.g., projectile point morphology), the site does not embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). Due to the presence of obsidian, the site does have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4); however, because obsidian on the surface of the site was collected and has been analyzed (see Section 7.2, *Obsidian Analysis*), the recordation and analysis of the surface assemblage and the current testing effort has exhausted the site's research potential. Site BH-S-006 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-008

Testing Results

BH-S-008 was identified as a sparse lithic scatter of four lithic flakes in a 237-square-meter area. Testing at the site consisted of three STPs, all excavated to a depth of 50 centimeters. See Table 7-19 for a summary of the testing results.

Table 7-19. BH-S-008 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-008	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile
–	–	STP 3	Negative	N/A	50 cm	Sterile

cm = centimeters; STP = shovel test pit

All STPs were negative for cultural materials. Soils throughout the site were a reddish-brown, medium-grain, well-compacted silty sand. No diagnostic artifacts were found on the surface of the site.

CRHR Evaluation and Recommendation

BH-S-008 does not contain a diverse artifact assemblage because it only contains four artifacts. All observed artifacts are flakes and all but one CCS flake are rhyolite. A lack of diagnostic or dateable artifacts prohibits assignment of a chronological period. As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). The resource is a small surface scatter and subsurface testing was negative; therefore, the resource does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage and current testing effort have exhausted the site's research potential. Additionally, the site has been extensively disturbed by agriculture, sheep grazing, and erosion. Site BH-S-008 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-009

Testing Results

BH-S-009 was identified as a small, historic-period can scatter. Testing at BH-S-009 consisted of two STPs, both excavated to a depth of 50 centimeters. See Table 7-20 for a summary of the testing results.

Table 7-20. BH-S-009 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-009	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile

cm = centimeters; STP = shovel test pit

Both STPs were negative for cultural resources. Soils within the STPs consisted of a low-compacted, light-tan, silty sand with pea gravel throughout. No artifacts were collected from BH-S-009.

CRHR Evaluation and Recommendation

BH-S-009 is the location of opportunistic, rural, domestic-refuse disposal, likely from a single dumping episode in the mid-1900s. Data obtained from this site's recordation can address very little regarding the research questions proposed above in Section 6.3, *Research Themes and Questions*, because there is no contextual information associated with the refuse dump to link the artifacts to a particular individual or group. Without such contextual information, the site does not demonstrate association with events that have made a significant contribution to broad patterns of our history (Criterion 1), and the site cannot be associated with a significant person or persons (Criterion 2). Refuse-disposal sites similar to BH-S-009 are ubiquitous throughout the Antelope Valley region and do not embody the distinctive work of a master, nor possess high artistic values (Criterion 3). Subsurface testing was negative, and the site has not yielded, nor is it likely to yield, information important to history (Criterion 4), and current documentation has likely exhausted any further potential of the site to do so. This site has been highly disturbed by water erosion from the drainage and surrounding alluvial wash. Additionally, this area has been used for agricultural purposes, which may have further affected this site. Site BH-S-009 does not meet any of the four CRHR criteria and is therefore not recommended for CRHR-listing.

BH-S-011

Testing Results

BH-S-11 was identified as a sparse lithic scatter consisting of seven rhyolite flakes dispersed across 195 square meters. Testing at BH-S-011 consisted of three STPs excavated to a depth of 50 centimeters. See Table 7-21 for a summary of the testing results.

Table 7-21. BH-S-011 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-011	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile
–	–	STP 3	Negative	N/A	50 cm	Sterile

cm = centimeters; STP = shovel test pit

Soils within the STPs throughout all levels were reddish-brown, fine-grained sandy silt. All three STPs were negative for cultural resources. No diagnostic artifacts were observed on the surface within the site boundary, and no artifacts were collected from BH-S-011.

CRHR Evaluation and Recommendation

BH-S-011 does not contain a diverse artifact assemblage because it only consists of seven artifacts. All observed artifacts are flakes, and all are rhyolite. A lack of diagnostic or dateable artifacts prohibits assignment of a chronological period. As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). Because the surface expression of the site is minimal, and subsurface testing was negative, the resource does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage during the previous survey and the current testing effort have exhausted the site's research potential. The site has been disturbed by agriculture, power pole installation, dirt access roads, and private residences to the west and south. Site BH-S-011 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-012

Testing Results

BH-S-012 is a large, dispersed, lithic processing site with multiple reduction stations in a relatively undisturbed parcel adjacent to a large drainage. Testing at BH-S-012 consisted of three STPs and an SS. The SS was positive for artifacts on the surface, but negative for subsurface cultural materials (Table 7-22). The SS was terminated at 10 centimeters below the surface. All three STPs were negative for cultural resources. STP 1 was terminated at 30 centimeters, due to a dense, Pleistocene-era layer of caliche. STP 2 was negative and therefore terminated at 50 centimeters. STP 3 was terminated at 35 centimeters, due to reaching a hardpan caliche layer. Diagnostic artifacts present on the ground surface within the site were also collected and are presented in Table 7-22.

Table 7-22. BH-S-012 Testing Results

		Artifact Type (Count)		
Test Unit	**Level**	**Debitage**	**Tool**	**Geofact**
N/A	Surface	–	2	1
SS 1	Surface	6	–	–
	Subsurface	Negative	–	–
STP 1	0–30 cm	Negative	–	–
STP 2	0–50 cm	Negative	–	–
STP 3	0–35 cm	Negative	–	–
Total	–	6	2	1

cm = centimeters; SS = surface scrape; STP = shovel test pit

The tools collected on the surface within BH-S-012 consist of a biface and a utilized flake, both rhyolite. The geofact is a Pelona schist manuport. The debitage found on the surface within SS 1 consists of one secondary flake and five tertiary flakes, all rhyolite.

CRHR Evaluation and Recommendation

As a large lithic-reduction site with multiple reduction stations, BH-S-012 has the potential to provide insight into lithic reduction methods of the past. However, because subsurface testing was negative, the recordation of the surface expression of the site has exhausted the site's research potential. Based on the assemblage present at BH-S-012, the site is not associated directly with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2). Although the site may represent a "distinctive type, period, or method of construction," the relatively few artifacts present (fewer than 80), all made from similar, locally procured materials, do not provide a large enough sample size to conduct meaningful analysis regarding a specific type, period, or method of construction; the site also does not represent the work of a master (Criterion 3). As previously stated, BH-S-012 does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation as The recordation of the surface assemblage and current testing effort have exhausted the site's research potential (Criterion 4). Site BH-S-012 does not meet any of the four CRHR criteria and is therefore not recommended for CRHR-listing as an individual resource or as a contributor to a potential archaeological district.

BH-S-013

Testing Results

BH-S-013 is a sparse lithic scatter on a small rise on the eastern margins of a dry seasonal drainage that measures 14 by 8 meters. It was recorded by ICF during the survey conducted for the current project. The site contains six rhyolite flakes that may point to a single reduction activity area, where a larger core was reduced for transport, tool production, or retouch. The six flakes include one primary, one secondary, and four tertiary flakes.

Testing within BH-S-013 consisted of two STPs, both excavated to a depth of 50 centimeters. Soils within the STPs consisted of a compact, greyish-brown loam with many small rocks throughout. See Table 7-23 for a summary of the testing results.

Table 7-23. BH-S-013 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-013	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile

cm = centimeters; STP = shovel test pit

Both STPs were negative for cultural resources. No diagnostic artifacts were observed on the surface of the site, and no artifacts were collected from BH-S-013.

CRHR Evaluation and Recommendation

BH-S-013 does not contain a diverse artifact assemblage because it only consists of six artifacts. All observed artifacts are flakes ,and all are rhyolite. A lack of diagnostic or dateable artifacts prohibits assignment of a chronological period. As a sparse lithic scatter, the resource is not associated directly with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). BH-S-013 consists of a small surface scatter, and subsurface testing was negative; therefore, the resource does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage and current testing effort have exhausted the site's research potential. This site is in an alluvial wash, which is subject to intense rain and winds that can disturb artifacts in sites. Site BH-S-013 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-102

Testing Results

BH-S-102 is sparse lithic scatter consisting of a Pinto projectile point, two bifaces, flake tools, and approximately 30 flakes in an 80-square-meter area. Testing at BH-S-102 consisted of one SS (SS 1) and three STPs. A hardpan caliche layer was encountered around 30–40 centimeters in all STPs, and the STPs were terminated once this layer was reached. Above this layer, soils within the STPs consisted of light-brown alluvial silt of medium compaction. The SS was terminated at 10 centimeters below surface level. The SS was positive on the surface, but negative for subsurface cultural resources (Table 7-24). All STPs were negative for cultural resources. Diagnostic artifacts on the surface within the site boundary were collected and are also presented in Table 7-24.

Table 7-24. BH-S-102 Testing Results

		Artifact Type (Count)		
Test Unit	**Level**	**Core**	**Debitage**	**Tool**
N/A	Surface	–	2	3
SS 1	Surface	1	–	–
	Subsurface	Negative	–	–
STP 1	0–30 cm	Negative	–	–
STP 2	0–40 cm	Negative	–	–
STP 3	0–40 cm	Negative	–	–
Total	–	1	2	3

cm = centimeters; SS = surface scrape; STP = shovel test pit

The core collected from the surface of SS 1 is made of CCS. The debitage collected from the surface of the site consists of one rhyolite secondary flake and one obsidian tertiary flake. The tools collected from the site consist of one rhyolite flaked-stone tool, one CCS biface, and one rhyolite Pinto projectile point (10,200–4400 B.P.) (Plate 7-7). The obsidian sample from the site was analyzed and found to be from the West Sugarloaf source in the Coso Volcanic Field, dating to the Gypsum or Rose Spring Periods (1943–1080 B.P.).

Plate 7-7. Rhyolite Pinto Point from BH-S-102

CRHR Evaluation and Recommendation

Site BH-S-102 has a diverse lithic assemblage by material type, but consists mostly of debitage. A wide range of materials, including CCS, chert, rhyolite, and obsidian, were observed in the artifact assemblage from the site. Eighty-nine percent of the artifacts are debitage with all but two composed of rhyolite. One flake is obsidian, and the other is chert. Eighty-four percent are tertiary flakes, nine percent are shatter, and six percent are secondary flakes. Additional artifacts in the site include a CCS biface and core, a rhyolite utilized flake, and a rhyolite Pinto point. The abundance of tertiary flakes and lack of thinning flakes suggest production or maintenance of larger tools or bifaces at the site.

The single obsidian flake was analyzed and sourced to West Sugarloaf in the Coso Volcanic Field. The flake was dated to a range of 1943 to 1080 B.P., due to multiple hydration bands, which places the obsidian in the Gypsum–Rose Spring periods.

As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). Because subsurface components to the site are minimal and within a disturbed agricultural context lacking in integrity, the resource does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage during previous surveys and the analysis of diagnostic artifacts conducted during the current testing effort have exhausted the site's research potential. Site P-15-019544 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-107

Testing Results

Site BH-S-107 was identified as a single-use, historic-period refuse dump consisting of household items from the early to mid-1900s. Testing at BH-S-107 consisted of two STPs. See Table 7-25 for a summary of the testing results.

Table 7-25. BH-S-107 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-107	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	40 cm	Sterile

cm = centimeters; STP = shovel test pit

STP 1 was excavated to a depth of 50 centimeters, and STP 2 was excavated to a depth of 40 centimeters. In both STPs, soils from the surface to approximately 15 centimeters deep consisted of a loose, coarse-grain, reddish-brown soil, and then transitioned to a densely compacted, fine-grain, light-brown sandy soil to the final termination depth. Both STPs were negative for cultural resources. No artifacts were collected from BH-S-107.

CRHR Evaluation and Recommendation

BH-S-107 is the location of opportunistic, rural, domestic-refuse disposal, likely from a single dumping episode. Data obtained from this site's recordation can address very little regarding the research questions proposed in Section 6.3, *Research Themes and Questions*, because there is no contextual information associated with the refuse dump to link the artifacts to a particular individual or group. Without such contextual information, the site does not demonstrate association with events that have made a significant contribution to broad patterns of our history (Criterion 1), and the site cannot be associated with a significant person or persons (Criterion 2). As discussed with the other historic refuse-disposal sites above, sites like BH-S-107 are very common in the region and do not embody the distinctive work of a master, nor possess high artistic values (Criterion 3). Subsurface testing was negative, and the site has not yielded, nor is it likely to yield, information important to history (Criterion 4), and current documentation has likely exhausted any further potential of the site to do so. Site BH-S-107 does not meet any of the four CRHR criteria and is therefore not recommended for CRHR-listing.

BH-S-108

Testing Results

BH-S-108 consists of five rhyolite flakes and a CCS secondary flake with a worked edge in a 190-square-meter area. Testing at BH-S-108 consisted of three STPs. See Table 7-26 for a summary of the testing results.

Table 7-26. BH-S-108 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-108	N/A	STP 1	Negative	N/A	22 cm	Caliche
–	–	STP 2	Negative	N/A	30 cm	Caliche
–	–	STP 3	Negative	N/A	20 cm	Caliche

cm = centimeters; STP = shovel test pit

A caliche layer was encountered within the site at around 20–30 centimeters deep, and all STPs were terminated when this caliche layer was reached. Above this layer, soils within the site are a light greyish-brown alluvial silt. The STPs were negative for cultural resources. One artifact, a CCS tertiary flake, was collected from the surface of the site adjacent to STP 1. No other artifacts were collected from BH-S-108.

CRHR Evaluation and Recommendation

BH-S-108 does not contain a diverse artifact assemblage because it only consists of six artifacts. All observed artifacts are flakes and all but one CCS are worked-edge flakes and rhyolite. A lack of diagnostic or dateable artifacts prohibits assignment of a chronological period. As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). Because the surface expression of the site is minimal, and subsurface testing was negative, the resource does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage during the previous survey and the current testing effort have exhausted the site's research potential. Site BH-S-108 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-109

Testing Results

BH-S-109 is a historic domestic refuse scatter in a heavily disturbed area north of Favorito Avenue. The scatter contains approximately 150 cans, various glass bottles and fragments (red, colorless, cobalt, and amber), miscellaneous metal, dinnerware, and other household refuse. Testing at BH-S-109 consisted of two STPs. See Table 7-27 for a summary of the testing results.

Table 7-27. BH-S-109 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-109	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	20 cm	Caliche

cm = centimeters; STP = shovel test pit

STP 1 was excavated to a depth of 50 centimeters and negative for cultural resources. STP 2 was excavated to 20 centimeters, due to encountering a caliche layer, and also was negative for cultural resources. Soil in STP 1 and above the caliche layer in STP 2 consisted of a light greyish-brown alluvial silt with small chunks of caliche throughout.

CRHR Evaluation and Recommendation

BH-S-109 is the location of opportunistic, rural, domestic-refuse disposal, likely from a single dumping episode. Data obtained from this site's recordation can address very little regarding the research questions proposed in Section 6.3, *Research Themes and Questions*, because there is no contextual information associated with the refuse dump to link the artifacts to a particular individual or group. Without such contextual information, the site does not demonstrate association with events that have made a significant contribution to broad patterns of local, state, or national history (Criterion 1), and the site cannot be associated with a significant person or persons (Criterion 2). Refuse dumps like BH-S-109 do not embody the distinctive work of a master, nor possess high artistic values (Criterion 3). Subsurface testing was negative, and the site has not yielded, nor is it likely to yield, information important to history (Criterion 4). The recordation of the surface assemblage during the previous survey and the current testing effort have exhausted the site's research potential. Site BH-S-109 does not meet the criteria to be eligible for the CRHR.

BH-S-110

Testing Results

BH-S-110 is large prehistoric habitation site measuring approximately 265 meters east–west by 250 meters north–south. The site assemblage is related primarily to stone tool manufacture, but includes a number of tools, groundstone, and deflated hearth features. Testing consisted of six STPs in Locus A and three STPs each in Locus B and C. No SSs were excavated, to minimize the ground disturbance to the potentially eligible site. The summary of the testing results is presented in Table 7-28, below. STPs 1, 3, and 4 were negative for cultural resources; artifacts were found at 0–10 centimeters deep within STP 2, but all other levels were negative. STP 2 was terminated at a depth of 50 centimeters. Diagnostic artifacts present on the ground surface within the site were also collected and are presented in Table 7-28. Fifteen obsidian sample were sent submitted for analysis. Results of the analysis indicated that the samples could all be traced to Coso Volcanic Field, mostly from the West Sugarloaf and Sugarloaf Mountain sources, but also including the Joshua Ridge and West Cactus Peak sources. The samples showed a broad range of dates (5365–826 B.P.), extending from the Pinto to the Rose Spring Periods and indicative of the site as a seasonal base camp returned to many times over a long period.

Table 7-28. BH-S-110 Testing Results

			Artifact Type (Count)	
Test Unit	**Locus**	**Level**	**Bone**	**Debitage**
STP 1	A	N/A	Negative	–
STP 2	A	N/A	Negative	–
STP 3	A	0–10 cm	–	1
		10–20 cm	–	3
		20–30 cm	–	1
		40–50 cm	–	12
		50–60 cm	–	2
		60–70 cm	3	3
STP 4	A	N/A	Negative	–
STP 5	A	0–10cm	–	1
		30–40 cm	–	1
		40–50 cm	1	7
STP 6	A	N/A	Negative	–
STP 1	B	N/A	Negative	–
STP 2	B	N/A	Negative	–

Test Unit	Locus	Level	Artifact Type (Count)	
			Bone	Debitage
STP 3	B	N/A	Negative	–
STP 1	C	N/A	Negative	–
STP 2	C	N/A	Negative	–
STP 3	C	N/A	Negative	–
Total	–	–	4	31

cm = centimeters; STP= shovel test pit

Of the lithic artifacts recovered from BH-S-110, more than 70 percent were rhyolite, and 30 percent were a type of CCS, much of which was chert. Observed rhyolite ranged from light pink to medium purple, and more than half of the rhyolite had banding. Approximately five percent of the rhyolite had small, granular quartz inclusions. Observed CCS colors included white, clear, orange, red, green, and root-beer brown. Approximately 70 percent of the CCS were an opaque chert material, and the remainder were semitransparent CCS, except for two red-green jasper artifacts. The following material types comprise less than one percent each of the lithic artifacts: granite, basalt, schist, Pelona schist, and Coso obsidian.

Only diagnostic artifacts were collected from the surface of the site during testing. Of the collected surface artifacts, 46 percent were debitage, 38 percent were tools, eight percent were geofacts, six percent were groundstone, and two percent were cores. Material types of collected surface artifacts include 48 percent obsidian, 18 percent rhyolite, 14 percent CCS, 10 percent Pelona schist, 4 percent granite, 2 percent jasper, and 2 percent basalt.

One of the obsidian blades identified during the initial survey effort was not observed during the testing effort, but several additional obsidian thinning flakes and other lithic artifacts were located within the site boundary.

CRHR Evaluation and Recommendation

Based on artifacts observed within and recovered from BH-S-110, this is a prehistoric habitation site, likely a temporary camp. The site contains a breadth of materials, processing tools, nonlocal materials, fire-affected rock, and possible deflated-hearth features, indicating that a variety of domestic activities occurred onsite and over time, which means the site could have important information regarding subsistence practices and site formation processes. The depth of the deposit is relatively deep, extending approximately 50 centimeters, in addition to having surface density. The site contains a number of artifacts that are not locally obtainable, so the site could shed light on regional trade and exchange. BH-S-110 is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). BH-S-110 is likely to yield information important to prehistory in what is currently a relatively poorly understood part of the Antelope Valley (Criterion 4). Site BH-S-110 is recommended for CRHR-listing.

BH-S-111

Testing Results

BH-S-111 was identified as four lithic flakes and one biface fragment in an area of 334 square meters. Three STPs were excavated in the site: two to 1–20 centimeters (STPs 2 and 3) and one to 50 centimeters deep (STP 1). All STPs were negative for subsurface cultural materials and terminated at depth either due to sterile soils (STP 1) or due to a Pleistocene-era caliche layer (STPs 2 and 3) (Table 7-29).

Table 7-29. BH-S-111 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-111	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	20 cm	Caliche
–	–	STP 3	Negative	N/A	20 cm	Caliche

cm = centimeters; STP= shovel test pit

All artifacts recorded during the initial survey were observed, and no new artifacts were identified during the current testing effort. The rhyolite biface was collected from the surface.

CRHR Evaluation and Recommendation

Based on artifacts observed within BH-S-111, this sparse lithic scatter is most likely a single-use lithic-reduction location. The site lacks a breadth and volume of materials, indicating that it was an expedient tool-production site using locally available rhyolite materials. As a low-density lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). To date, BH-S-111 has not yielded, nor is it likely to yield, information important to prehistory that has not been ascertained from numerous similar sites in the region (Criterion 4). Testing of the site revealed no subsurface potential. Additionally, the site has been extensively disturbed by blading associated with agriculture. As such, this site is not recommended eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-123

Testing Results

BH-S-123 is a small historic refuse scatter consisting of 11 sanitary cans, five solder-dot cans, a mason jar, and a razor-blade holder. During the current testing effort, two STPs were excavated on either side of the site to 50 centimeters deep. Both STPs were negative for subsurface cultural materials and terminated at depth, due to sterile soils (Table 7-30). The soil matrix was a light-brown silty loam with light gravel throughout the levels. No artifacts were collected.

Table 7-30. BH-S-144 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-123	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile

cm = centimeters; STP= shovel test pit

CRHR Evaluation and Recommendation

Based on artifacts observed within BH-S-123, this small historic-era refuse scatter is most likely a single-use opportunist dumping episode. Data obtained from this site's recordation can address very little (if anything) regarding the research questions proposed in Section 6.3, *Research Themes and Questions*, because there is no contextual information associated with the refuse dump to link the artifacts to a particular individual or group. Without such contextual information, the site does not demonstrate association with events that have made a significant contribution to broad patterns of our history (Criterion 1), and the site cannot be associated with a significant person or persons (Criterion 2). Refuse-disposal sites like BH-S-123 are ubiquitous in the region, and this site shares similarities in form with hundreds of other such sites. As such, the site does not embody the distinctive work of a master, nor possess high artistic values (Criterion 3). Subsurface testing was negative, and the site has not yielded, nor is it likely to yield, information important to history (Criterion 4), and current documentation has likely exhausted any further potential of the site to do so. Extreme disturbance from agricultural activity precludes a meaningful interpretation of the surface expression of BH-S-123. Cans appear to have been windblown and affected by intense agricultural activities in this parcel. This parcel has underground and aboveground asbestos irrigation pipes that have affected the entire parcel. The site does not meet any of the four CRHR criteria and is therefore not recommended for CRHR-listing.

BH-S-134

Testing Results

BH-S-134 is a sparse lithic scatter identified as 13 rhyolite tertiary flakes contained in a 639-square-meter area. During the current testing effort, three STPs were excavated throughout the site to 50 centimeters deep. One STP was positive in the 30–40-centimeter level, where a single rhyolite flake was recovered. This STP was terminated at 60 centimeters after two sterile levels. The other STP was negative for cultural materials and terminated at 50 centimeters due to sterile soils (Table 7-31).

Table 7-31. BH-S-134 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-134	N/A	STP 1	Positive	30–40 cm	60 cm	Reached two sterile levels
–	–	STP 2	Negative	N/A	50 cm	Sterile
–	–	STP 3	Negative	N/A	50 cm	Sterile

cm = centimeters; STP= shovel test pit

All artifacts recorded during the initial survey were observed, and no new artifacts were identified during the current testing effort.

CRHR Evaluation and Recommendation

Based on artifacts observed within BH-S-134, this sparse lithic scatter is most likely a single-use lithic-reduction location. This site is in a recently active agricultural field that has been extensively bladed. Soils are in chunks due to this blading, and the site appears to be highly disturbed and possibly dispersed due to these activities. The site lacks a breadth and volume of materials, indicating that it was an expedient tool-production site using locally available rhyolite materials. As a low-density lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction, nor represent the work of a master (Criterion 3). To date, BH-S-134 has not yielded, nor is it likely to yield, information important to prehistory that has not been ascertained from numerous similar sites in the region (Criterion 4). Testing of the site revealed very little subsurface potential because only one flake was observed during testing. Additionally, the site has been extensively disturbed by blading associated with agriculture. As such, this site is not recommended eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-140

Testing Results

BH-S-140 was recorded as six lithic flakes within a 1,348-square-meter area. During the current testing effort, three STPs were excavated in the site to 50 centimeters deep, and all STPs were negative for subsurface cultural materials. All were terminated at depth, due to highly disturbed, sterile soils (Table 7-32).

Table 7-32. BH-S-140 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-140	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile
–	–	STP 3	Negative	N/A	50 cm	Sterile

cm = centimeters; STP= shovel test pit

All artifacts recorded during the initial survey were observed, and no new artifacts were identified during the current testing effort.

CRHR Evaluation and Recommendation

Based on artifacts observed within BH-S-140, this sparse lithic scatter is most likely a single-use lithic-reduction location. This site is in a recently active agricultural field that has been extensively bladed. Soils are in chunks due to agricultural blading, and the site appears to be highly disturbed and possibly dispersed due to these activities. The site lacks a breadth and volume of materials, indicating that it was an expedient tool-production site using locally available rhyolite materials. As a low-density lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction nor represent the work of a master (Criterion 3). To date, BH-S-140 has not yielded, nor is it likely to yield, information important to prehistory that has not been ascertained from numerous similar sites in the region (Criterion 4). Testing of the site revealed no subsurface potential. Additionally, the site has been extensively disturbed by blading associated with agriculture. As such, this site is not recommended eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-144

Testing Results

BH-S-144 is a prehistoric lithic scatter that measures 265 by 35 meters, covering an approximately 5,850-square-meter area (1.4 acres). This site consists of approximately 80 flakes. During the current testing effort, three STPs were excavated across the site to 50 centimeters deep; one SS also was performed. Two STPs were negative for subsurface cultural materials and terminated at depth, due to sterile soils. STP 3 and SS 1 were positive for cultural materials. SS 1 was excavated to 10 centimeters, and STP 3 was terminated at 70 centimeters, due to two sterile levels (Table 7-33).

A single diagnostic artifact, a CCS utilized flake was collected from the site surface. The material appears to be a red-green jasper and is a local material. All artifacts unearthed from test excavations were collected.

Table 7-33. BH-S-144 Testing Results

		Artifact Type (Count)		
Test Unit	**Level**	**Bone**	**Debitage**	**Tool**
SS 1	Surface	–	2	–
	Subsurface	–	19	1
STP 1	N/A	Negative	–	–
STP 2	N/A	Negative	–	–
STP 3	10–20 cm	–	1	–
–	20–30 cm	–	4	–
–	30–40 cm	–	1	–
–	40–50 cm	1	4	–
Total		1	31	1

cm = centimeters; SS = surface scrape; STP= shovel test pit

Of the lithic artifacts recovered from P-15-002539, all were rhyolite, except for one CCS utilized flake. Within the debitage assemblage, approximately 90 percent were tertiary flakes, 10 percent were secondary flakes, and 1 percent were utilized or edge-modified flakes.

CRHR Evaluation and Recommendation

Based on artifacts observed within and recovered from BH-S-144, this resource is a large lithic-reduction site. The site does not contain a large breadth of materials, with most artifacts consisting of rhyolite and only a few CCS/jasper artifacts. The site lacks a breadth and volume of materials, indicating that it was an expedient tool-production site using locally available rhyolite materials.

The deposit is relatively deep, extending approximately 50 centimeters, in addition to having density on the surface. BH-S-144 is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction nor represent the work of a master (Criterion 3). BH-S-114 is likely to yield information important to prehistory in what is currently a relatively poorly understood part of the Antelope Valley (Criterion 4). Site BH-S-114 is recommended for CRHR-listing.

BH-S-202

Testing Results

BH-S-202 is a large, dispersed lithic scatter consisting of more than 100 rhyolite flakes and 18 CCS flakes (17 chert and one jasper). During the current testing effort, four STPs were excavated across the site to 50 centimeters deep, along with an SS excavated to 10 centimeters. Two STPs were negative for subsurface cultural materials and terminated at depth, due to sterile soils. STP 3 and SS 1 were positive for cultural materials. SS 1 was excavated to 10 centimeters, and STP 3 was terminated at 70 centimeters, due to two sterile levels (Table 7-34).

Table 7-34. BH-S-202 Testing Results

		Artifact Type (Count)	
Test Unit	**Level**	**Bone**	**Debitage**
SS 1	0–10 cm	–	16
STP 1	0–10 cm	–	1
STP 2	10–20 cm	–	3
STP 3	30–40 cm	14	–
STP 4	N/A	Negative	–
Total	–	14	18

cm = centimeters; SS = surface scrape; STP= shovel test pit

More than 200 artifacts were uncollected, consisting of mostly tertiary flakes. The majority were composed of rhyolite, with some CCS and chert. Twenty of the collected artifacts were debitage, and all but one CCS flake were rhyolite. Four pieces of groundstone were recovered from the surface, including a bifacial metate, a unifacial metate, a metate fragment, and a shaped mano. Sixteen of the collected artifacts are tools, and one is a rhyolite core. Of the 16 tools, 75 percent were rhyolite, and the remaining 25 percent were CCS.

CRHR Evaluation and Recommendation

BH-S-202 is a prehistoric habitation site that sits on a finger ridge above alluvial washes on either side of the site. Based on artifacts observed within and recovered from BH-S-202, the site represents a prehistoric habitation site that is likely a temporary or seasonal camp returned to many times. The site contains a breadth of materials, the large number of processing tools and multiple ground-stone implements indicate that a variety of domestic activities occurred onsite and over time, and the site could have important information regarding subsistence activities, trade and exchange, and settlement practices. The site has subsurface deposits extending to at least 40 centimeters deep and is in a minimally disturbed context with very good integrity. The lithic assemblage contained less than 1 percent primary flakes, and most flakes have little to no observed cortex. As such, the primary activity at BH-S-202 was likely the reduction of Rosamond Hills rhyolite cobbles that had already been significantly assayed and reduced. The presence of a significant percentage of secondary and larger tertiary flakes and cores suggests that much of the knapping at the site was to produce flakes suitable for expedient tools or more-finished flake tools. Because there are no diagnostic or dateable artifacts in the assemblage, no temporal period can currently be assigned to this site. However, such materials may be present in unidentified subsurface deposits within the site.

BH-S-202 is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction nor represent the work of a master (Criterion 3). BH-S-202 is likely to yield information important to prehistory in what is currently a relatively poorly understood part of the Antelope Valley (Criterion 4). Site BH-S-202 is recommended for CRHR-listing.

BH-S-207

Testing Results

BH-S-207 is sparse primary lithic-reduction site, consisting of 23 flakes, three cores, and one bifacial flake in a 1,650-square-meter area. During the current testing effort, a total of four STPs were excavated across the site to 20 centimeters deep. All STPs were negative for subsurface cultural materials and terminated at depth, due to a dense, Pleistocene-era layer of caliche (Table 7-35).

Table 7-35. BH-S-207 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-207	N/A	STP 1	Negative	N/A	20 cm	Caliche
–	–	STP 2	Negative	N/A	20 cm	Caliche
–	–	STP 3	Negative	N/A	20 cm	Caliche
–	–	STP 4	Negative	N/A	20 cm	Caliche

cm = centimeters; STP = shovel test pit

All artifacts recorded during the initial survey were observed, and no new artifacts were identified during the current testing effort.

CRHR Evaluation and Recommendation

BH-S-207 does not contain a diverse artifact assemblage because it only consists of 27 artifacts, 23 of which are flakes. Many of the flakes are larger primary and secondary flakes, and three cores were also identified, which points to a primary lithic-reduction site. Three of the artifacts are cores, and one is a bifacial flake. All artifacts, except for the CCS bifacial flake, were composed of locally sourced rhyolite. A lack of diagnostic or dateable artifacts prohibits assignment of a chronological period. As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction nor represent the work of a master (Criterion 3). Because the surface expression of the site is minimal, and subsurface testing was negative, the resource does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage during the previous survey and the current testing effort have exhausted the site's research potential. Site BH-S-207 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-211

Testing Results

BH-S-211 is sparse lithic scatter of 19 rhyolite flakes in a 377-square-meter area. Three STPs were excavated across the site to 20 to 35 centimeters deep. All STPs were negative for subsurface cultural materials and terminated at depth, due to a dense, Pleistocene-era layer of caliche (Table 7-36).

Table 7-36. BH-S-211 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-211	N/A	STP 1	Negative	N/A	35 cm	Caliche
–	–	STP 2	Negative	N/A	20 cm	Caliche
–	–	STP 3	Negative	N/A	25 cm	Caliche

cm = centimeters; STP = shovel test pit

All artifacts recorded during the initial survey of were observed, and no new artifacts were identified during the current testing effort.

CRHR Evaluation and Recommendation

BH-S-211 does not contain a diverse artifact assemblage because it only consists of 19 artifacts. All artifacts are locally sourced rhyolite flakes. A lack of diagnostic or dateable artifacts prohibits assignment of a chronological period. As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction nor represent the work of a master (Criterion 3). Because the surface expression of the site is minimal, and subsurface testing was negative, the resource does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage during the previous survey and the current testing effort have exhausted the site's research potential. Site BH-S-211 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-212

Testing Results

BH-S-212 is a very sparse lithic scatter consisting of an obsidian Cottonwood Leaf projectile point and two rhyolite flakes in an area of 150 square meters. Two STPs were excavated across the site.

Both STPs were negative for subsurface cultural materials. STP 1 was terminated at 50 centimeters deep, due to the lack of cultural materials, and STP 2 was terminated at 20 centimeters, due to a Pleistocene-era layer of hardpan caliche (Table 7-37). No features or other artifact types are present within the site.

Table 7-37. BH-S-212 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-212	N/A	STP 1	Negative	–	50 cm	Sterile
–	–	STP 2	Negative	–	20 cm	Caliche

cm = centimeters; STP = shovel test pit

All artifacts observed during the initial survey were observed during the testing phase. The Cottonwood Leaf projectile point is broken, and the base is not present. The artifact is slightly more leaf-shaped than triangular, like most Cottonwoods. This type of projectile point generally dates after 1000 B.P. (Justice 2002).

Plate 7-8. Obsidian Cottonwood Leaf Projectile Point

CRHR Evaluation and Recommendation

BH-S-212 does not contain a diverse artifact assemblage because it only consists of three artifacts. Two artifacts are rhyolite flakes, and the other is an obsidian projectile point. The projectile point is a Cottonwood point and dates after 1,000 B.P. Although this point gives a general date for the site, a lack of other diagnostic or dateable artifacts prohibits assignment of a concrete chronological period. As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction nor represent the work of a master (Criterion 3). Because the surface expression of the site is minimal, and subsurface testing was negative, the resource does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage during the previous survey and the current testing effort have exhausted the site's research potential. Site BH-S-212 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

BH-S-303

Testing Results

BH-S-303 was originally identified an isolate of two flakes (BH-ISO-216) during the survey in July 2021. During the Phase II testing work, additional flakes and core fragments were identified. The site includes one discarded rhyolite core and 12 rhyolite flakes in a 47-square-meter area. Two STPs were excavated across the site; both were negative for subsurface cultural materials and terminated at 50 centimeters deep, due to the lack of cultural materials (see Table 7-38). No features or other artifact types are present within the site.

Table 7-38. BH-S-303 Testing Results

Site	Locus	Test Unit	Results	Depth of Cultural Deposit	Termination Depth	Reason for Termination
BH-S-303	N/A	STP 1	Negative	N/A	50 cm	Sterile
–	–	STP 2	Negative	N/A	50 cm	Sterile

cm = centimeters; STP = shovel test pit

All material consisted of rhyolite, and the majority were tertiary flakes, with a few secondary flakes.

CRHR Evaluation and Recommendation

BH-S-303 does not contain a diverse artifact assemblage because it only consists of 13 artifacts. All but one of the observed artifacts are flakes. The exception is a three-piece refit rhyolite core. All artifacts were composed of locally sourced rhyolite. A lack of diagnostic or dateable artifacts prohibits assignment of a chronological period. As a sparse lithic scatter, the resource is not directly associated with people or events that had a broad-reaching impact on the community at the local, state, or national level (Criteria 1 and 2); nor does it embody the characteristics of a distinctive type, period, or method of construction nor represent the work of a master (Criterion 3). Because the surface expression of the site is minimal, and subsurface testing was negative, the resource does not have the potential to yield information important to an understanding of the prehistory or history of the local area, the state, or the nation (Criterion 4). The recordation of the surface assemblage during the previous survey and the current testing effort have exhausted the site's research potential. Site BH-S-303 does not meet the criteria to be eligible for the CRHR as an individual resource or as a contributor to a potential archaeological district.

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Chapter 8
Recommendations

8.1 Summary and Recommendations

The project site lies within a region of the Mojave Desert that was a center of activity for prehistoric people drawn to the perennial water sources, abundant and diverse lithic materials, and multiple trails/trading routes. A total of 30 sites (22 prehistoric, eight historic) were evaluated for their eligibility for listing the CRHR. Twenty-six of these sites, which consist of 17 sparse lithic scatters, eight historic-period refuse dumps, and one large lithic-reduction site, were found to lack significance and, in some cases, integrity, and are not recommended as eligible for the CRHR (see Table 8-1 below). Testing at these sites has shown that they do not possess substantial surface or subsurface materials. The sites lack sufficient materials to provide information that would enhance our knowledge of prehistory or the history of the region. Many of these resources lack integrity because they are not in their original depositional context, having been disturbed either through natural force, such as erosion and flooding, or through human activity, such as plowing, grading, trenching, or grazing. The recording and testing of these sites have exhausted their research potential, they are not recommended as eligible for the CRHR as individual resources or as contributors to a potential archaeological district, and no further excavation work is recommended for these 26 resources.

A total of four sites, which consist of three prehistoric habitation sites and one large lithic-reduction site (BH-S-110, BH-S-202, P-15-002359, and BH-S-144 respectively), were evaluated by ICF as significant and are recommended as eligible for the CRHR (Table 8-1). These four sites contain intact subsurface deposits, retain substantial integrity, possess a range of material types (which is evidence of diverse activities and habitation), and have the ability to address important questions regarding chronology, trade/exchange, subsistence, and settlement patterns of the region during prehistory. Additionally, site P-15-002821/CA-KER-2821/H (Bean Spring Archaeological Complex), which was not evaluated by ICF because it has previously been evaluated, is recommended eligible for listing in the CRHR (Way et al. 2009).

Table 8-1. CRHR Eligibility Evaluations for Sites within the Archaeological Study Area

Site Number	Era	Description	CRHR Eligibility Recommendation
P-15-000129	Multicomponent	Prehistoric habitation site, historical site – Willow Springs	N/A (in gen-tie location, not evaluated at this time)
P-15-002539	Prehistoric	Prehistoric habitation site	Eligible
P-15-012793	Historic-era	Historic-period refuse dump	Not eligible
P-15-018292	Historic-era	Historic-period refuse dump	Not eligible
P-15-018676	Multicomponent	Historic-period refuse dump and small lithic scatter	N/A (in gen-tie location, not evaluated at this time)
P-15-019544	Prehistoric	Sparse lithic scatter	Not eligible
P-15-019545	Historic-era	Historic-period refuse dump	Not eligible
P-15-019546	Prehistoric	Sparse lithic scatter	Not eligible

Site Number	Era	Description	CRHR Eligibility Recommendation
P-15-002821	Prehistoric	Bean Spring Archaeological Complex	Previously evaluated as eligible for listing in the CRHR (Way et al. 2009) (site is in gen-tie location, not evaluated at this time)
BH-S-001	Historic-era	Historic-period refuse dump	N/A (in gen-tie location, not evaluated at this time)
BH-S-002	Prehistoric	Large lithic-reduction site	N/A (in gen-tie location, not evaluated at this time)
BH-S-003	Prehistoric	Sparse lithic scatter with nine rhyolite tertiary flakes and one CCS flake	Not eligible
BH-S-004	Historic-era	Historic-period refuse dump	Not eligible
BH-S-005	Prehistoric	Sparse lithic scatter with a biface	Not eligible
BH-S-006	Prehistoric	Sparse lithic scatter with one core fragment and a projectile point	Not eligible
BH-S-008	Prehistoric	Sparse lithic scatter with three rhyolite flakes and one CCS primary flake with a modified edge	Not eligible
BH-S-009	Historic-era	Historic-period refuse dump	Not eligible
BH-S-011	Prehistoric	Sparse lithic scatter with seven rhyolite flakes	Not eligible
BH-S-012	Prehistoric	Large lithic-reduction site	Not eligible
BH-S-013	Prehistoric	Sparse lithic scatter, including six rhyolite flakes	Not eligible
BH-S-102	Prehistoric	Sparse lithic scatter with one projectile point and two bifaces	Not eligible
BH-S-107	Historic-era	Historic period refuse dump	Not eligible
BH-S-108	Prehistoric	Sparse lithic scatter with five rhyolite tertiary flakes	Not eligible
BH-S-109	Historic-era	Historic-period refuse dump	Not eligible
BH-S-110	Prehistoric	Prehistoric habitation site	Eligible
BH-S-111	Prehistoric	Sparse lithic scatter, including three rhyolite flakes, one chert flake, and one rhyolite biface fragment	Not eligible
BH-S-123	Historic-era	Historic-period refuse dump	Not eligible
BH-S-134	Prehistoric	Sparse lithic scatter	Not eligible
BH-S-140	Prehistoric	Sparse lithic scatter, including five rhyolite flakes and one chert flake	Not eligible
BH-S-144	Prehistoric	Large lithic-reduction site with approximately 80 flakes, including rhyolite, jasper, and chert	Eligible
BH-S-202	Prehistoric	Prehistoric habitation site	Eligible
BH-S-207	Prehistoric	Sparse lithic scatter site in alluvial wash	Not eligible

Site Number	Era	Description	CRHR Eligibility Recommendation
BH-S-211	Prehistoric	Sparse lithic scatter with 19 rhyolite flakes	Not eligible
BH-S-212	Prehistoric	Sparse lithic scatter with one obsidian point and two rhyolite flakes	Not eligible
BH-S-303	Prehistoric	Sparse lithic scatter	Not eligible

In addition to evaluating sites for their eligibility for individual listing on the CRHR, the prehistoric archaeological sites were also evaluated for the potential to contribute to an archaeological district based on their cumulative value and ability to provide meaningful information at a regional scale. However, many of these sites have been disturbed by human activity and lack context that would allow them to be placed within the regional chronological framework. Much of the surrounding area has been developed for agricultural purposes, which has likely damaged and certainly destroyed a number of other similar sites. The few sites in the project area that retain enough integrity to potentially contribute to an archaeological district have become so isolated by development and disturbance that they lack the contiguity necessary to form an archaeological district. Therefore, none of the prehistoric archaeological sites within the archaeological study area are recommended eligible as contributors to an archaeological district. It should be noted, however, that large areas offsite and east of the project site, including to the north and south of the far easterly undeveloped parcel APN 346-240-26, have undisturbed or relatively undisturbed landforms that, if surveyed, could yield potentially significant resources either individually or as contributors to an archaeological district.

Avoidance of significant archaeological sites is the preferred method of mitigation for impacts related to project construction. If feasible, the project can be redesigned to avoid the four sites and preserve them in place. If avoidance of the significant sites is not possible, capping the sites with sterile, chemically neutral soil, geofabric, and some form of shallow-rooted landscaping may also be appropriate mitigation. A sample of the archaeological deposit should be recovered before capping. Additional mitigation should include analysis of recovered materials.

If the above mitigation measures are not feasible, then a Phase III data-recovery effort may be appropriate mitigation. Data recovery is used to recover, analyze, interpret, report, curate, and preserve archaeological data that would otherwise be lost due to unavoidable impacts on a significant resource. The method would involve an archaeological excavation of a statistically significant portion of the site(s) in a controlled manner. A data recovery plan informed by the results of the Phase II evaluation, outlining the research design, research questions, and field and analysis methods, should be prepared and approved by the Lead Agency prior to commencing data-recovery field work. Conducting Phase III data-recovery excavations may not reduce the impact to the resources to a less than significant level. The determination of whether data-recovery efforts reduce impacts to less than significant depends on the nature of the site and the amount that is being destroyed.

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Chapter 9
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Chapter 10
Personnel

Table 10-1 provides a complete list of the key contributors to this report and their respective roles.

Table 10-1. List of Key Contributors

Name	Qualifications	Role and Responsibilities
Authors		
Patrick McGinnis[1]	MA	Author
Rachel Droessler[1]	MA	Author
Lauren Downs[1]	MA	Author
Tamar Love Grande	MA	Editor and Publications Specialist
Field Crew		
Patrick McGinnis[1]	MA	Archaeological principal investigator and field director
Rachel Droessler[1]	MA	Archaeological field director
Lauren Downs[1]	MA	Archaeological field director
Katherine Sinski[1]	MA	Archaeological co-field director
Peter Pham	MA	Field technician
Shannon Smith	MA	Field technician
Hector Galvez	BA	Field technician
Araceli Campos	MA	Field technician
Eduardo Toscano	BA	Field technician
Specialists		
Rachel Droessler[1]	MA	GIS map and figure production, laboratory technician, historic artifact analysis
Karen Crawford[1]	MA	Quality assurance/quality control
J. Tait Elder III[1]	MA	Quality assurance/quality control
Project Management		
Patrick McGinnis[1]	MA	Project Manager, Task Leader

[1] Federally qualified professional archaeologist (36 CFR 61).

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Appendix A

Confidential Figures

Please note that the maps in the following appendix cover the larger study area effective prior to May 2022. However, the updated body of the Bullhead Solar Archaeological Phase II Technical Report (dated August 2022) addresses the resources associated with the updated project boundary.

Confidential Appendix available upon request by a qualified county or contracting archaeologist.

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