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APPENDIX D

Soda Mountain Solar Site Visit

TECHNICAL MEMORANDUM

To: Ziad Alaywan
ZGlobal
604 Sutter Street
Folsom, CA 95630

From: Pauline Roberts, Principal Wildlife Biologist

Cc: Ian Todd, Project Manager

Date: January 13, 2022

Re: **Soda Mountain Solar Project Site Visit / SWCA Project No. 068347**

SWCA Environmental Consultants (SWCA) was retained by ZGlobal to conduct a site visit to record biological resources at the Soda Mountain Solar Project (project) site. The project site is located along Interstate 15 (I-15) approximately 6 miles southwest of Baker, California. The project site is within an intermontane desert valley surrounded by the Soda Mountains. The elevation at the project ranges from 1,265 to 1,490 feet above mean sea level. The project site is bound by I-15 to the north and west, the Soda Mountains to the south and east, and the Bureau of Land Management's Rasor Off-highway Vehicle Area to the southeast.

The entirety of the project site was surveyed for biological resources in 2009 and 2011–2012. The previous surveys included surveys for desert tortoise (*Gopherus agassizii*), rare plants, desert bighorn sheep (*Ovis canadensis nelsoni*), golden eagle (*Aquila chrysaetos*), bats, Mojave fringe-toed lizard (*Uma scoparia*), as well as avian point counts and wetlands/waters delineations. The purpose of the site visit described in this memorandum was to document current habitat conditions.

METHODS

SWCA biologist Pauline Roberts and botanist Maisie Borg performed the site visit on December 30, 2021, between 10:00 AM and 4:00 PM. Weather conditions were generally cool and partly cloudy, with temperatures averaging approximately 65 degrees Fahrenheit. The biologists slowly drove along Rasor Road as well as the unnamed road that runs North-South within the project area and surveyed on foot in selected portions of the project area, namely in the southernmost parcel and northernmost parcel (approximate area covered shown in Appendix A, Figure A-1). The biologists documented the current site conditions, and plant and wildlife species. Wildlife observations were made directly and aided by the use of binoculars or sign including tracks, scat, remains, and burrows or dens. When burrows or dens were encountered, the biologists examined them for the presence of sign, such as scat, American badger (*Taxidea taxus*) claw mark scrapes, burrowing owl (*Athene cunicularia*) pellets, whitewash, or prey remains. The presence of extensive spiderwebs, debris, or partial collapse was taken to indicate that the burrow/den was likely unoccupied. For potential desert tortoise burrows, the biologists assigned a condition class as described in the *Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii)* (U.S. Fish and Wildlife Service 2009). The condition classifications are as follows:

- Class 1: currently active, with desert tortoise or recent desert tortoise sign
- Class 2: good condition, definitely desert tortoise; no evidence of recent use
- Class 3: deteriorated condition which includes collapsed burrows; definitely desert tortoise
- Class 4: good condition; possibly desert tortoise
- Class 5: deteriorated condition which includes collapsed burrows; possibly desert tortoise

All special status species observations, and burrow and den locations were photographed and recorded using a global positioning system (GPS) unit. Lastly, the biologists documented the faunal diversity observed within the project site and incidental floral observations (Appendix B). Representative site photographs can be found in Appendix C

RESULTS

The overall habitat and vegetation communities observed during the survey were similar to those reported in *Biological Resources Technical Report* (Panorama Environmental, Inc. 2013). Vegetation communities were classified using A Manual of California Vegetation (California Native Plant Society 2022). The project site is dominated by Creosote Bush-White Bursage Scrub (*Larrea tridentata – Ambrosia dumosa* Shrubland Alliance). Small portions of Creosote Bush Scrub (*Larrea tridentata* Shrubland Alliance) and Cheesebush Scrub (*Ambrosia salsola* Shrubland Alliance) are also present throughout the project area.

Recent rains had catalyzed the germination of some annual plants in the northern part of the project site, however they were less than 0.5 cm high and thus too small to identify. Most of the perennial vegetation on-site seemed to be heavily affected by several consecutive years of drought. Many of the creosote shrubs had yellowed or brown leaves, especially in the northern areas of the site, and in some areas, many appeared dead (Photos C-4 and C-12). Creosote leaves may yellow when water is scarce, but healthy plants are usually green all year. Numerous creosote fruits were present on the ground, indicating conditions were sufficient for blooming and fruiting in spring-summer of 2021. The true extent of the creosote dieback would need to be verified during the growing season. Sixteen species of plants were documented during the site visit (Appendix B, Table B-1). However, because of the January timing of the site visit, some plant species could not be identified to the species level due to the lack of diagnostic characteristics. In addition, virtually all annual herbaceous plant species were not visible at this time of year except for the very small unidentifiable seedlings present.

The site and adjacent land was in active use by recreational off-highway vehicle (OHV) users, and at least 10 vehicles traveled between the Rasor Road interstate exit and the OHV area while the biologists were on site. Both old and fresh dirt bike and OHV tracks were visible throughout the site, especially the southern portion (Photo C-3). This type of land use has direct impacts on natural resources through noise pollution, increased illegal dumping, and land disturbance. This can be most damaging to delicate life such as the lichen and mosses in the biological soil crust present throughout the northeast part of the survey area (Photo C-13), which require long time periods to recover composition and function after physical disturbance. Small amounts of trash were observed throughout the site, which can affect local wildlife (Photo C-6).

Seven species of wildlife (direct sighting or their sign) were documented during the site visit (Appendix B, Table B-2). Two of these wildlife species are special status species: desert tortoise and desert kit fox (*Vulpes macrotis arsipus*). Four potential desert tortoise burrows were identified: one class 2, one class 3, and two class 5 burrows. The class 2 desert tortoise burrow had the characteristic half-moon shape and was in good condition (Photo C-5). However, there were no recent signs of use nearby. The biologists did not expect to find signs of recent activity: tracks and other sign outside occupied burrows can be erased by rain or high winds, and desert tortoise are generally inactive in their burrows during cold winter weather. The class 3 burrow was in poor condition and had trash in the entrance, with no sign of recent use (Photo C-6). The class 5 burrows appear to have the half-moon shape, but were partially collapsed and could not be confirmed as desert tortoise burrows (Photos C-7 and C-8). For desert kit fox, several potential burrows and scat were found in the project area (Photos C-9 and C-10). Several unknown burrows were also found during the site visit (Photo C-11). The species of animal that made these unknown burrows could not be identified due to the lack of sign, such as scat or scrape marks. However, desert tortoises are known to shelter in burrows excavated by a wide range of fossorial mammals.

DISCUSSION

Overall conditions at the project site appear to be similar to the previous surveys conducted in 2009 and 2011–2012, however many of the dominant shrubs now show severe signs of drought stress. Two special status wildlife species, desert tortoise and desert kit fox, were determined to be present on-site based on the presence of burrows and other sign.

LITERATURE CITED

California Native Plant Society. 2022. A Manual of California Vegetation, Online Edition. California Native Plant Society, Sacramento, CA. Available at: http://www.cnps.org/cnps/vegetation/. January 2022.

Panorama Environmental, Inc. 2013. *Biological Resources Technical Report*. San Francisco, California.

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

APPENDIX A

Maps

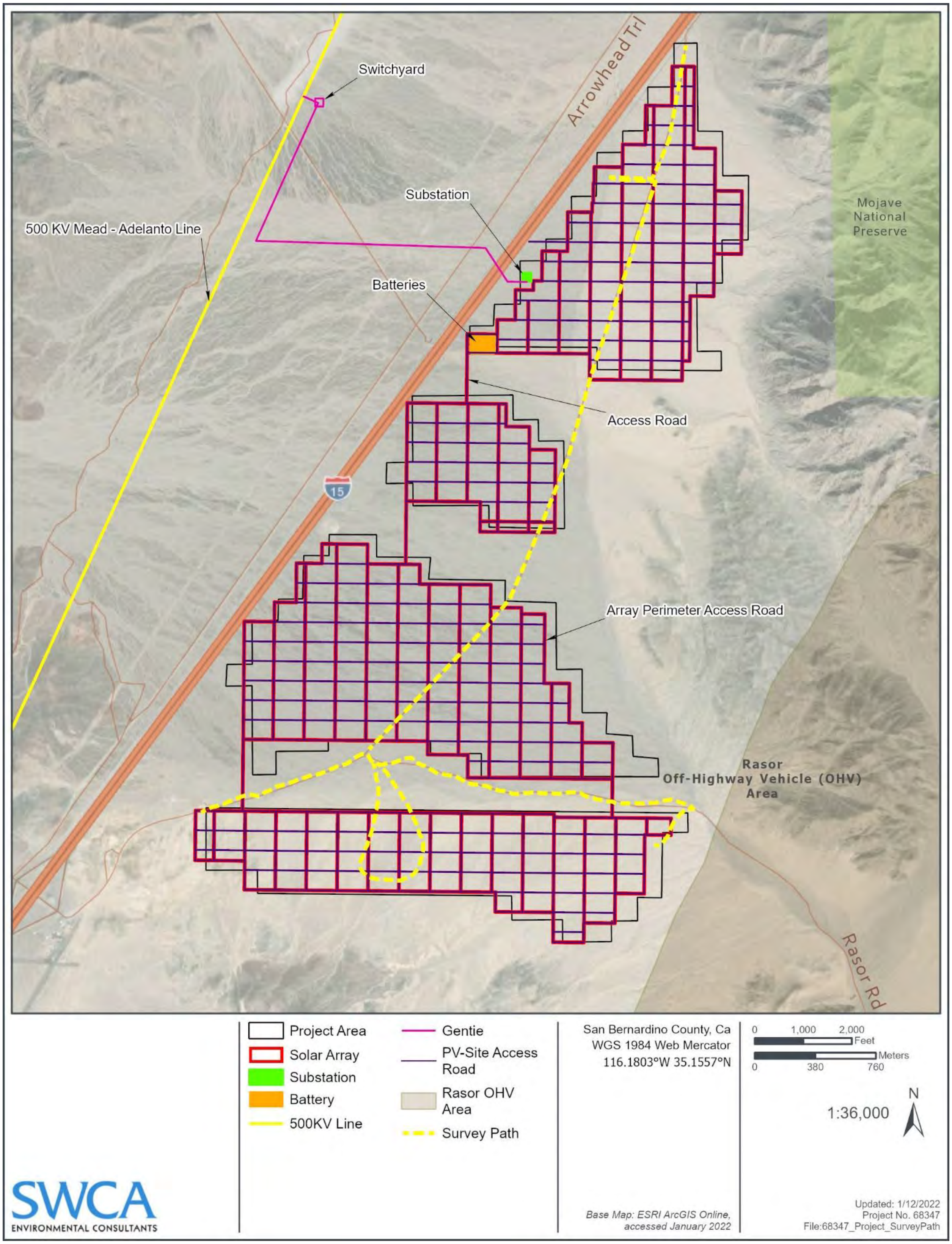

Figure A-1. Map of project area and approximate areas surveyed.

APPENDIX B

Floral and Faunal Compendia

Table B-1. Observed Plants at the Soda Mountain Solar Project

Scientific Name	Common Name	Life Form	Native Status
GYMNOSPERMS			
EPHEDRACEAE			
Ephedra sp.	Mormon tea	shrub	native
ANGIOSPERMS (EUDICOTS)			
ASTERACEAE			
Ambrosia dumosa	burro weed	shrub	native
Ambrosia salsola	burrobrush	shrub	native
Bebbia juncea var. *aspera*	rough sweetbush	shrub	native
Encelia frutescens	rayless encelia	shrub	native
BORAGINACEAE			
Cryptantha sp.	cryptantha	annual herb	native
CACTACEAE			
Cylindropuntia echinocarpa	silver cholla	shrub (stem succulent)	native
CHENOPODIACEAE			
Atriplex sp.	saltbush	shrub	native
CONVOLVULACEAE			
Cuscuta sp.	dodder	annual herb or vine (parasitic)	native
FABACEAE			
Parkinsonia florida	blue paloverde	tree	native
LOASACEAE			
Petalonyx thurberi	sandpaper plant	perennial herb	native
PLANTAGINACEAE			
Plantago ovata	desert plantain	annual herb	native
POLYGONACEAE			
Chorizanthe brevicornu	brittle spine flower	annual herb	native
Chorizanthe rigida	rigid spiny herb	annual herb	native
Eriogonum sp.	buckwheat	annual herb	native
ZYGOPHYLLACEAE			
Larrea tridentata	creosote bush	shrub	native

Table B-2. Wildlife and Sign Observed at the Soda Mountain Solar Project

Scientific Name	Common Name
CLASS REPTILIA	**REPTILES**
TESTUDINIDAE	**TORTOISES**
*Gopherus agassizii**†	desert tortoise
CLASS AVES	**BIRDS**
ALAUDIDAE	**LARKS**
Eremophila alpestris	horned lark
CORVIDAE	**JAYS & CROWS**
Corvus corax	common raven
CLASS MAMMALIA	**MAMMALS**
LEPORIDAE	**HARES & RABBITS**
Lepus californicus	black-tailed jackrabbit
SCIURIDAE	**SQUIRRELS**
Spermophilus beecheyi	California ground squirrel
HETEROMYIDAE	**POCKET MICE & KANGAROO RATS**
Dipodomys sp.*	kangaroo rat
CANIDAE	**CANIDS**
*Vulpes macrotis arsipus**†	desert kit fox

*Not directly observed, signs such as burrows and dens, pellets, whitewash, feathers, or scat were present

†Special status species. Includes federal and state listed and candidate species, California species of special concern, and California protected fur-bearer

APPENDIX C

Site Photographs

Photo C-1. Overview of the southern portion of the project site.

Photo C-2. View of an ephemeral wash in the southern portion of the project area.

Photo C-3. Overview of the southeastern boundary of the project area, with numerous OHV tracks visible.

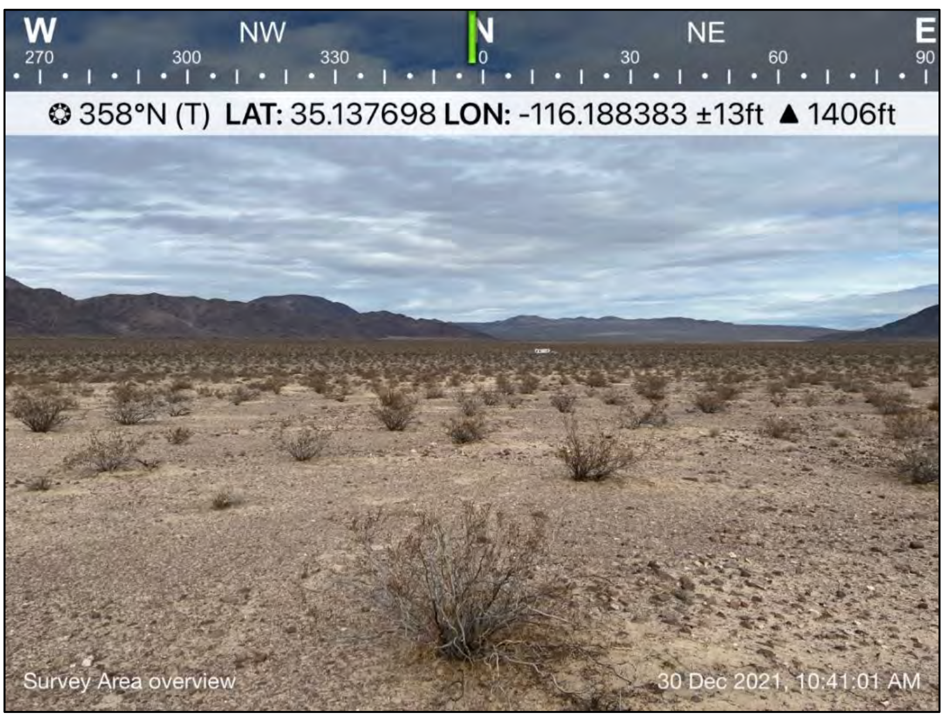

Photo C-4. Overview of the northern area of the project site showing the dry, nearly dead, creosote.

Photo C-5. Class 2 desert tortoise burrow.

Photo C-6. Class 3 desert tortoise burrow.

Photo C-7. Class 5 burrow, possibly desert tortoise.

Photo C-8. Class 5 burrow, possibly desert tortoise.

Photo C-9. Example of a potential desert kit fox burrow.

Photo C-10. Desert kit fox scat.

Photo C-11. Example of an unidentified mammal burrow.

Photo C-12. Photo of the very dry (likely dead) creosote shrubs present on-site.

Photo C-13. Photo of the desert biological soil crust present on the northeast portion of the site.

APPENDIX E

Rare Plant Survey and Vegetation Mapping Report for the Soda Mountain Solar Project

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TECHNICAL MEMORANDUM

To: Soda Mountain Solar, LLC

From: Shirley Innecken, Lead Natural Resources Project Manager

Date: June 14, 2024

Re: **Rare Plant Survey and Vegetation Mapping Report for the Soda Mountain Solar Project / SWCA Project No. 68347**

INTRODUCTION

This report describes the rare plant survey and vegetation mapping survey conducted by SWCA Environmental Consultants (SWCA) for the Soda Mountain Solar Project (project). The project is located along Interstate 15 approximately 50 miles northeast of Barstow, San Bernardino County, California (Figure 1). Soda Mountain Solar, LLC plans to develop a utility-scale photovoltaic (PV) solar facility on approximately 2,670 acres of land managed by the Bureau of Land Management (BLM) (Figure 2). The project site is situated in an alluvial valley between the northern and southern portions of the Soda Mountains in the Mojave Desert.

SWCA developed the biological survey methods in coordination with California Department of Fish and Wildlife (CDFW) and prepared a biological and aquatic resources work plan. Rare plant survey methods included pedestrian surveys during the optimal blooming period for rare plants with potential to occur. This report summarizes the methods and results of the rare plant survey and vegetation mapping survey conducted in April and May 2023 by SWCA for the project. For this report, the study area included the 2,634-acre proposed project site and the proposed gen-tie route (approximately 35.75 acres).

Twelve rare plants were determined to have the potential to occur within the study area based on existing records within the region and the presence of potentially suitable habitat (Table 1): alkali marsh aster (*Almutaster pauciflorus*), small-flowered androstephium (*Androstephium breviflorum*), Borrego milkvetch (*Astragalus lentiginosus* var. *borreganus*), black grama (*Bouteloua eriopoda*), Emory's crucifixion-thorn (*Castela emoryi*), Harwood's eriastrum (*Eriastrum harwoodii*), Utah vine milkweed (*Funastrum utahense*), Wright's jaffueliobryum moss (*Jaffueliobryum wrightii*), ribbed cryptantha (*Johnstonella costata*), winged cryptantha (*Johnstonella holoptera*), Cooper's rush (*Juncus cooperi*), and desert winged rockcress (*Sibara deserti*).

Figure 1. Soda Mountain Solar Project vicinity map.

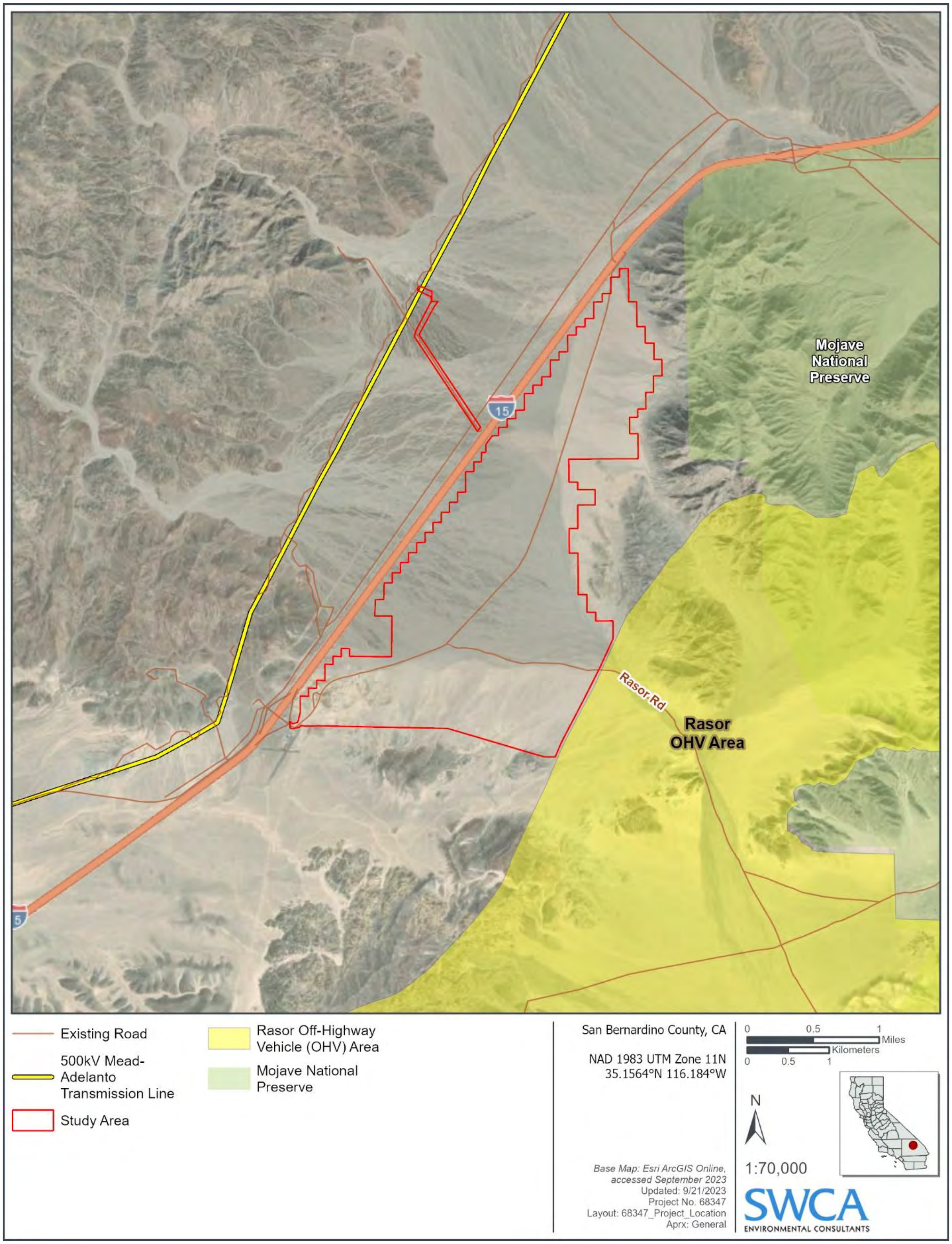

Figure 2. Project location map.

In general, vegetation on-site includes Mojavaen desert scrub types and desert wash scrub. Soils were found to be mostly composed of sand interspersed with gravel and cobble. Aeolian sand deposits were observed in the southern portion of the study area. The elevation in the project site ranges from 385 to 454 meters above mean sea level (amsl). As a result of a desktop assessment, it was determined that conducting a rare plant survey between April and early May would capture the blooming period of rare plants with potential to occur. The results of the desktop assessment were used to inform the presence/absence determinations of each species with potential to occur (see Table 1).

Table 1. Occurrence Potential for Special Status Plants in the Study Area

Species	Status*	Habitat Description†	Blooming Period	Habitat Suitability
Alkali marsh aster (*Almutaster pauciflorus*)	CRPR 2B.2	Perennial herb. Occurs in alkaline meadows and seeps. Elevational range: 239 to 800 meters above mean sea level (amsl).	June–October	**Absent**. Suitable habitat is not present in the study area. The species was not observed during the spring 2023 surveys.
Small-flowered androstephium (*Androstephium breviflorum*)	CRPR 2B.2	Perennial bulbiferous herb. Occurs in desert dunes and sandy to rocky soil in Mojavean desert scrub. Elevational range: 219 to 800 meters amsl.	March–April	**High**. Some aeolian sand habitat is present in the southern portion of the study area. The species was not observed during the spring 2023 surveys. The nearest record of this species is 4 miles southwest of the study area.
Borrego milkvetch (*Astragalus lentiginosus* var. *borreganus*)	CRPR 4.3	Annual herb. Occurs in sandy soils within Mojavean desert scrub and Sonoran desert scrub. Elevational range: 30 to 895 meters amsl.	February-May	**Moderate**. Suitable habitat is present in the study area. The nearest recent record is 3 miles to the west. No milkvetch (*Astragalus* sp.) species were found during the spring 2023 surveys.
Black grama (*Bouteloua eriopoda*)	CRPR 4.2	Perennial stoloniferous herb. Occurs in Joshua tree woodland and pinyon-juniper woodland. Elevational range: 900 to 1,900 meters amsl.	May–August	**Absent**. Suitable habitat is not present in the study area. The study area is below the known elevational range for the species. The species was not observed during the spring 2023 surveys.
Emory's crucifixion-thorn (*Castela emoryi*)	CRPR 2B.2	Perennial deciduous shrub. Occurs in gravelly soils within Mojavean desert scrub, washes, playas, and Sonoran desert scrub. Elevational range: 90 to 725 meters amsl.	(April) June–July (September–October)	**High**. There is suitable habitat in gravelly washes throughout the study area. The nearest record is located 1 mile northeast of the proposed gen-tie route. The species was not observed on-site during the April 2023 survey. Species is a distinct perennial shrub and is identifiable outside of the blooming period.
Harwood's eriastrum (*Eriastrum harwoodii*)	CRPR 1B.2, BLM_S	Annual herb. Occurs in desert dunes. Elevational range: 124 to 914 meters amsl.	March–June	**Low**. Marginally suitable aeolian sand habitat is located in the southern portion of the study area. The species was not observed on-site during the April 2023 survey. The nearest occurrence is located 6 miles south of the study area.
Utah vine milkweed (*Funastrum utahense*)	CRPR 4.2	Perennial herb. Occurs in gravelly (sometimes) and occasionally sandy soils within Mojavean desert scrub and Sonoran desert scrub. Elevational range: 100 to 1,435 meters amsl.	(March) April–June (September–October)	**Present**. Several individuals were found in and adjacent to the study area along the margins of ephemeral washes.

Species	Status*	Habitat Description†	Blooming Period	Habitat Suitability
Wright's jaffueliobryum moss (*Jaffueliobryum wrightii*)	CRPR 2B.3	Moss. Occurs in dry openings, rock crevices, and carbonate substrates within alpine dwarf scrub, Mojavean desert scrub, and pinyon-juniper woodland. Elevational range: 160 to 2,500 meters amsl.	n/a	**Absent**. Suitable habitat is not present within the study area. The nearest records are 3 miles from the study area.
Ribbed cryptantha (*Johnstonella costata*)	CRPR 4.3	Annual herb. Occurs in sandy soils within desert dunes, Mojavean desert scrub, and Sonoran desert scrub. Elevational range: 28 meters below mean sea level (bmsl) to 500 meters amsl.	February–May	**High**. Suitable habitat is present throughout the study area. The species was not observed during the spring 2023 survey. The nearest record is 3 miles north of the study area.
Winged cryptantha (*Johnstonella holoptera*)	CRPR 4.3	Annual herb. Occurs in gravelly to rocky soils, washes, slopes, ridges Mojavean desert scrub, and Sonoran desert scrub. Elevational range: 100 to 1,690 meters amsl.	March–April	**Moderate**. Suitable habitat is present throughout the study area. The species was not observed during the spring 2023 survey. The nearest record is 7 miles northeast of the study area.
Cooper's rush (*Juncus cooperi*)	CRPR 4.3	Perennial herb. Occurs in meadows and seeps. Elevational range: 100 meters bmsl to 1,769 meters amsl.	April-May(August)	**Absent**. Suitable habitat is not present in the study area. The species was not observed during the spring 2023 survey.
Desert winged rockcress (*Sibara deserti*)	CRPR 4.3	Annual herb. Occurs in washes, steep hillsides, dry flats, scree, calcareous rubble, rocky bluffs, and exposed crevices in Mojavean desert scrub. Elevational range: 344 to 1,300 meters amsl.	March–April	**Moderate**. Suitable habitat is present in the study area. The species was not observed during the spring 2023 survey. The nearest record is 7 miles northeast of the study area.

* Ranks for the species included in this list are sourced from CNDDB. Impacts to plants with California Rare Plant Ranks (CRPR) 1 and 2 must be considered pursuant to CEQA and are treated as sensitive.

CRPR Ranking:
1B: Rare, threatened, or endangered in California and elsewhere.
2B: Rare, threatened, or endangered in California, but more common elsewhere.
4: Watch List Plants of limited distribution.
0.2: Fairly threatened in California.
0.3: Not very threatened in California
BLM_S: Bureau of Land Management sensitive.
† Habitat descriptions are direct quotes from CNPS, consisting of the general and microhabitat descriptions of the corresponding element.

METHODS

Desktop Review

Prior to the field survey, a desktop review of all potential rare plants was conducted, and the likelihood of occurrence was established. The following resources were reviewed and were used to guide the rare plant surveys described in this report:

- California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB) RareFind 5 (CDFW 2023a)
- Calflora: Information on California plants for education, research and conservation (Calflora 2023)
- California Native Plant Society (CNPS) Rare Plant Inventory (RPI) (CNPS 2023a)
- Consortium of California Herbaria (2023)

- *Biological Resources Technical Report for Soda Mountain Solar Project* (Panorama Environmental, Inc. 2013).

No overlapping sensitive plant species were documented in the study area based on a review of CNDDB, Calflora, and CNPS. A review of the *Biological Resources Technical Report for Soda Mountain Solar Project* determined that two special-status plants were found within and the immediate vicinity of the study area (Panorama Environmental, Inc. 2013): Emory's crucifixion-thorn and Utah vine milkweed. These surveys were conducted in 2009 and 2012. The area where Emory's crucifixion-thorn was found is no longer part of the project footprint and study area.

Reference Populations

On April 10, 2023, CNDDB reference populations for small-flowered androstephium (EONDX 28) and Emory's crucifixion-thorn (EONDX 88732) were visited to assess their bloom status and habitat conditions. These reference populations are in close proximity to the study area, and both species were determined to have high potential to occur based on the desktop review.

Field Surveys

SWCA biologists Ryan Myers, Paris Krause, Lauren Strong, Minerva Lara, Luis Aguilar, Tamara Kramer, and Chennie Castanon conducted a field survey from April 10 through May 2, 2023. Conditions were mostly sunny and warm, with temperatures between 54 and 94 degrees Fahrenheit, and wind speeds from 0 to 20 miles per hour.

The survey was conducted in a manner consistent with the methods and guidance in the *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018). The biologists walked parallel transects up to 30 m apart throughout the study area. Portions of the project site deemed to have higher potential for rare plants, including sandy washes and areas with aeolian sands, were surveyed more intensely with parallel transects up to 10 m apart. Plant species or subspecies were identified to the highest taxonomic level possible when encountered. Plants that could not be identified in the field were collected and later identified using *The Jepson Manual: Vascular Plants of California* (Baldwin et al. 2012) and Jepson eFlora (Jepson Flora Project 2023). Rare plants encountered were recorded using a Geode GPS unit with submeter accuracy.

Vegetation alliances were mapped using *A Manual of California Vegetation* (Sawyer et al. 2009) and *A Manual of California Vegetation Online* (CNPS 2023b). CDFW's *California Natural Community List* was also reviewed to determine the presence or absence of sensitive associations on-site (CDFW 2023b). Vegetation communities were mapped using a minimum mapping unit of 1 acre or 0.25 acre for sensitive natural communities encountered.

RESULTS

Reference Populations

At the small-flowered androstephium reference population site, approximately 10 individuals of the target species were found on a west-facing slope with a sparse coverage of creosote bush (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), and desert lily (*Hesperocallis undulata*). The substrate included mostly aeolian sands interspersed with gravel. Only one plant was found to be flowering; the remaining were in bud or in a vegetative state.

At the Emory's crucifixion-thorn reference site, approximately five individual shrubs of the target species were found along the margins of a drainage growing with creosote bush and white bursage. None of the plants were blooming; however, the distinct shrub is identifiable at any phenological stage. Similar habitat was determined to be present on-site for both small-flowered androstephium and Emory's crucifixion-thorn.

Rare Plants

One special-status plant species was observed within the study area: Utah vine milkweed (Figure 3, Photograph A-1; see Table 1). Three Utah vine milkweed individuals were near the proposed gen-tie route northwest of the study area. These locations are consistent with the locations of the observations made during the 2009 and 2012 surveys. The plants were generally found at the interface of Creosote Bush – White Bursage Scrub (*Larrea tridentata – Ambrosia dumosa* Shrubland Alliance) and Cheesebush – Sweetbush Scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance), along the margins of an ephemeral wash. Additional individuals were found outside of the study area.

Common Species Observed

Common shrubs identified on-site included white bursage, burrobrush (*Ambrosia salsola*), desert holly (*Atriplex hymenelytra*), allscale saltbush (*Atriplex polycarpa*), woolly brickellia (*Brickellia incana*), rayless encelia (*Encelia frutescens*), California joint fir (*Ephedra californica*), little leaved ratany (*Krameria erecta*), and creosote bush. Common herbaceous species included pincushions (*Chaenactis* spp.), devil's spineflower (*Chorizanthe rigida*), desert dodder (*Cuscuta denticulata*), Booth's desert primrose (*Eremothera boothii* ssp. *desertorum*), desert lily, snake's-head (*Malacothrix coulteri*), desert dandelion (*Malacothrix glabrata*), distant phacelia (*Phacelia distans*), desert plantain (*Plantago ovata*), desert nest straw (*Stylocline micropoides*), and other nonnative herbs and grasses. Representative photographs of the survey results can be found in Attachment A. A complete list of plant species encountered is provided in Attachment B.

Vegetation Communities

Five vegetation communities were identified on-site (Table 2, Figures 4–13, Photographs A-2–A-7): Rigid Spineflower – Hairy Desert Sunflower (*Chorizanthe rigida – Geraea canescens* Desert Pavement Sparsely Vegetated Alliance), California Joint Fir – Longleaf Joint-fir Scrub (*Ephedra californica – Ephedra trifurca* Shrubland Alliance), Cheesebush – Sweetbush Scrub, Creosote Bush Scrub (*Larrea tridentata* Shrubland Alliance), and Creosote Bush – White Bursage Scrub. Additionally, maintained dirt roads, and other disturbed sites were mapped as Developed/Disturbed landcover type.

No sensitive alliance-level vegetation communities were mapped on-site. However, two sensitive association were identified on-site: Rigid Spineflower – Hairy Desert Sunflower (*Chorizanthe rigida– Geraea canescens* Desert Pavement Association) and California Joint Fir – Longleaf Joint-fir (*Ephedra californica – Ambrosia salsola* Association). Neither of these associations mapped on-site have a state rank (SR) rarity (see Table 2; see Figures 4–5, 8–10, and 12–13).

Table 2. Vegetation Communities and Land Cover Types

Vegetation Alliance (Association) or Cover Type	Global Rank*	State Rank†	Acres within the Project Site
Creosote Bush – White Bursage Scrub *Larrea tridentata – Ambrosia dumosa* Shrubland Alliance	G5	S5	2,459
Creosote Bush Scrub *Larrea tridentata* Shrubland Alliance	G5	S5	145

Vegetation Alliance (Association) or Cover Type	Global Rank*	State Rank†	Acres within the Project Site
Rigid Spineflower – Hairy Desert Sunflower *Chorizanthe rigida – Geraea canescens* Desert Pavement Sparsely Vegetated Alliance (*Chorizanthe rigida – Geraea canescens* Desert Pavement Association)	G4	S4 (Sensitive Association)	32
Cheesebush – Sweetbush Scrub *Ambrosia salsola – Bebbia juncea* Shrubland Alliance	G4	S4	8.2
California Joint Fir – Longleaf Joint-fir *Ephedra californica – Ephedra trifurca* Shrubland Alliance (*Ephedra californica – Ambrosia salsola* Association)	G5	S4 (Sensitive Association)	1.2
Developed/Disturbed	N/A	N/A	25

*Global Rank (NatureServe 2023):
G4 = Over 100 viable occurrences worldwide/statewide and/or more than 32,000 acres
G5 = Demonstrably secure because of its worldwide/statewide abundance
†State Rank (NatureServe 2023):
S4 = Over 100 viable occurrences worldwide/statewide and/or more than 32,000 acres
S5 = Demonstrably secure because of its worldwide/statewide abundance

DISCUSSION

Rare Plants

Rare annual plant species may not emerge or bloom every year, and their growth is dependent on specific environmental cues, particularly temperature and precipitation. For the 2023 rain year thus far (October 1, 2022–July 1, 2023), Barstow-Daggett Airport, which is the nearest reporting station with monthly precipitation data available, received 2.71 inches. Mean annual rainfall totals for the same location measure 3.26 inches (National Oceanic and Atmospheric Administration 2023). Additionally, mean temperatures were also generally below normal for winter and spring 2023. Conditions for annual plant detection were considered optimal based on the above-average rainfall and below-normal temperatures.

SWCA is highly confident that only Utah vine milkweed is present within the study area and that the other 11 special-status species evaluated are absent from the study area, including all CRPR 1 and 2 plants considered sensitive, pursuant to CEQA. No federally or state-listed plant species were determined to have potential to occur on-site. The results are also consistent with the rare plant surveys conducted in 2009 and 2012.

Vegetation Communities

Two sensitive associations were documented on-site: Rigid Spineflower – Hairy Desert Sunflower (*Chorizanthe rigida – Geraea canescens* Desert Pavement Association) and California Joint Fir–Longleaf Joint-fir (*Ephedra californica – Ambrosia salsola* Association). Potential impacts to sensitive natural communities may require mitigation.

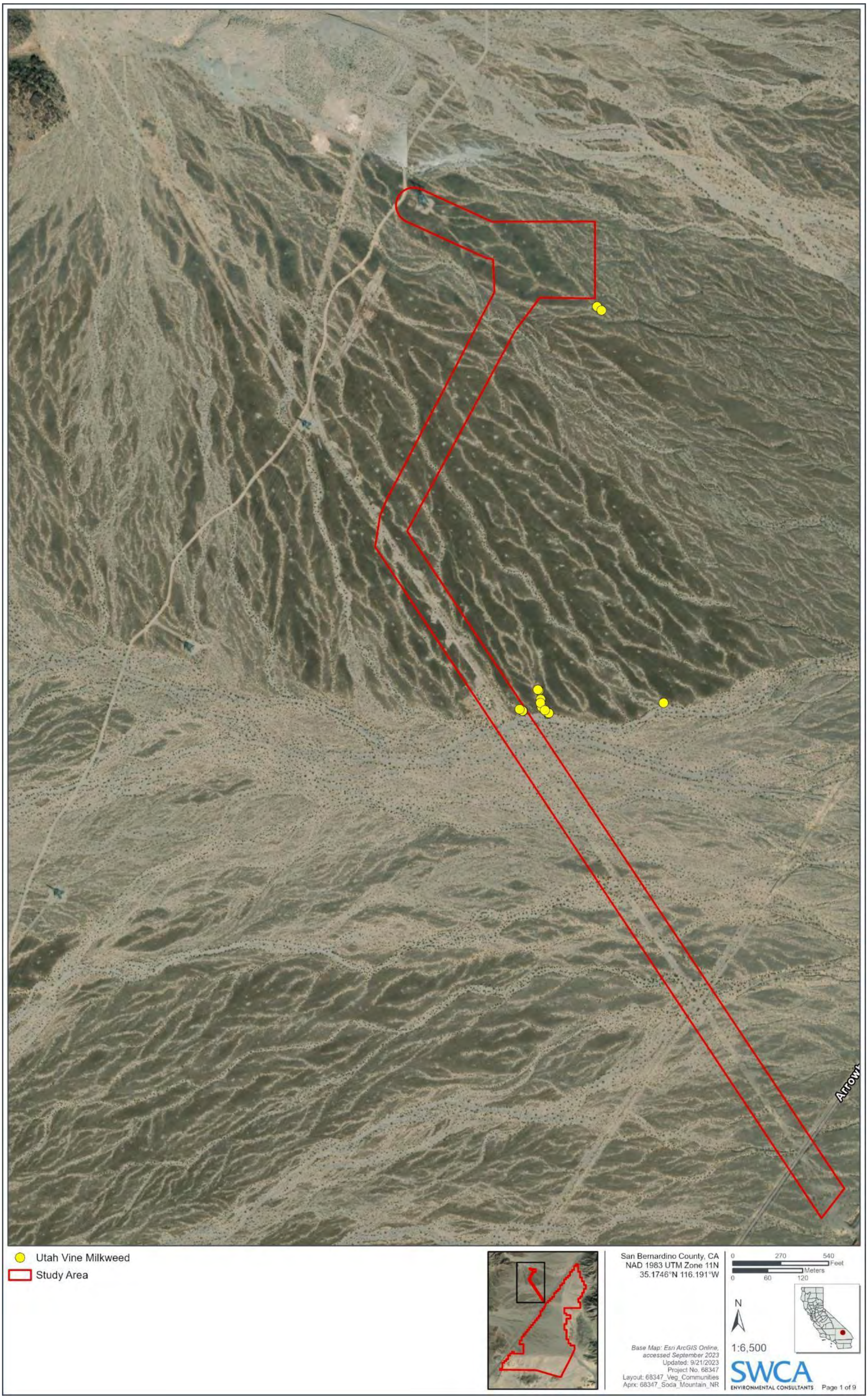

Figure 3. Utah vine milkweed individuals found within and near the study area.

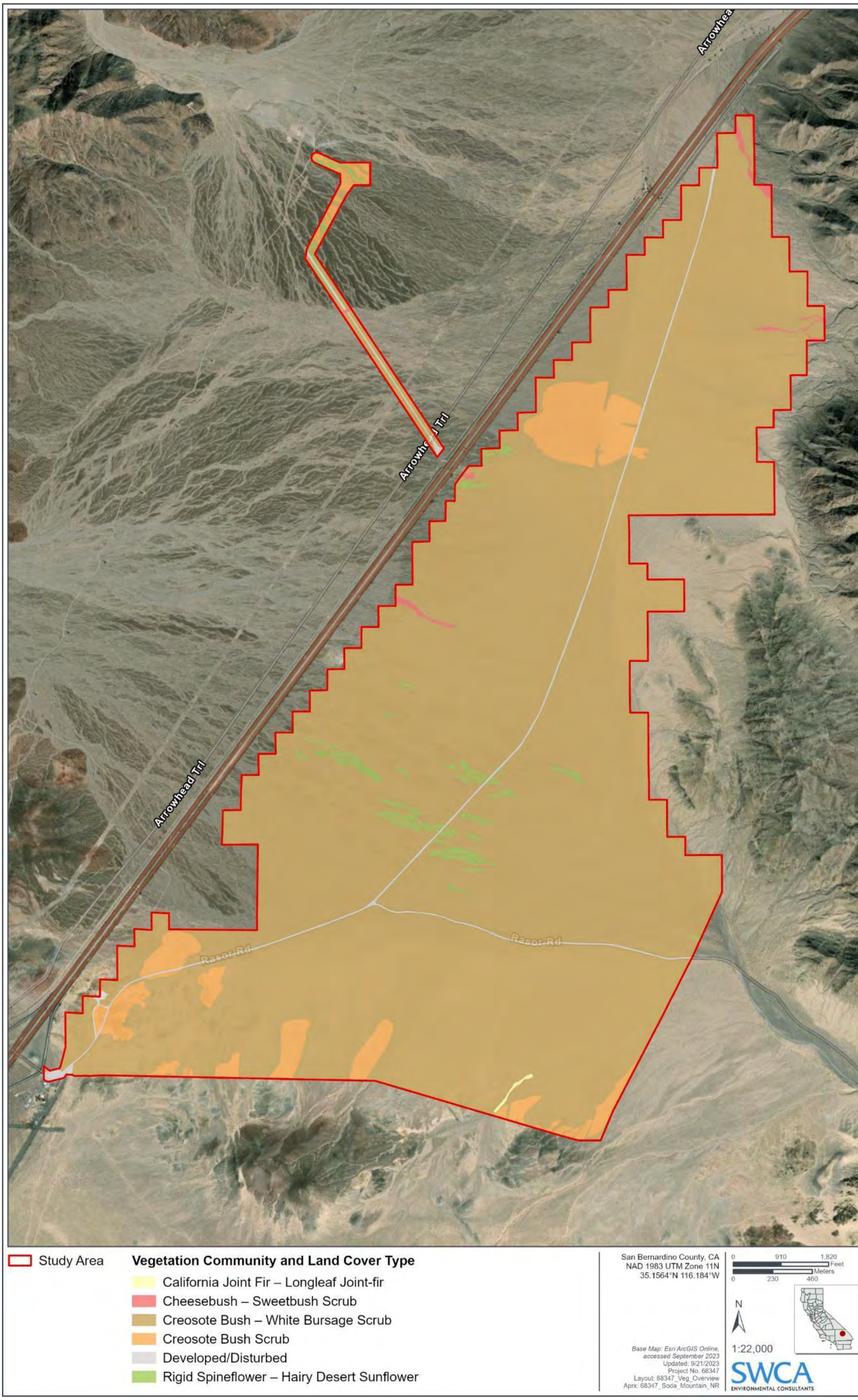

Figure 4. Vegetation community and land cover types, overview.

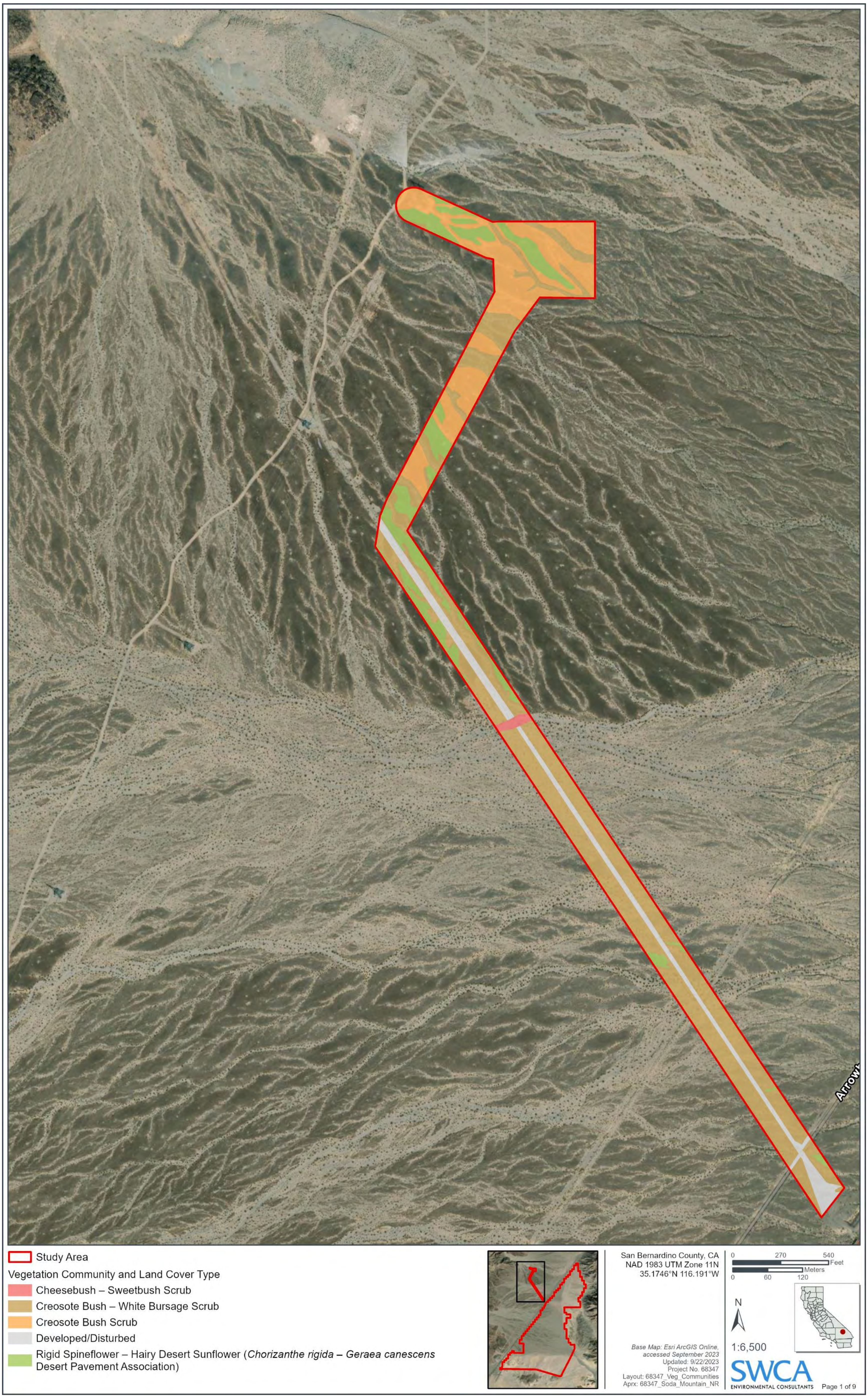

Figure 5. Vegetation communities and land cover within the gen-tie area.

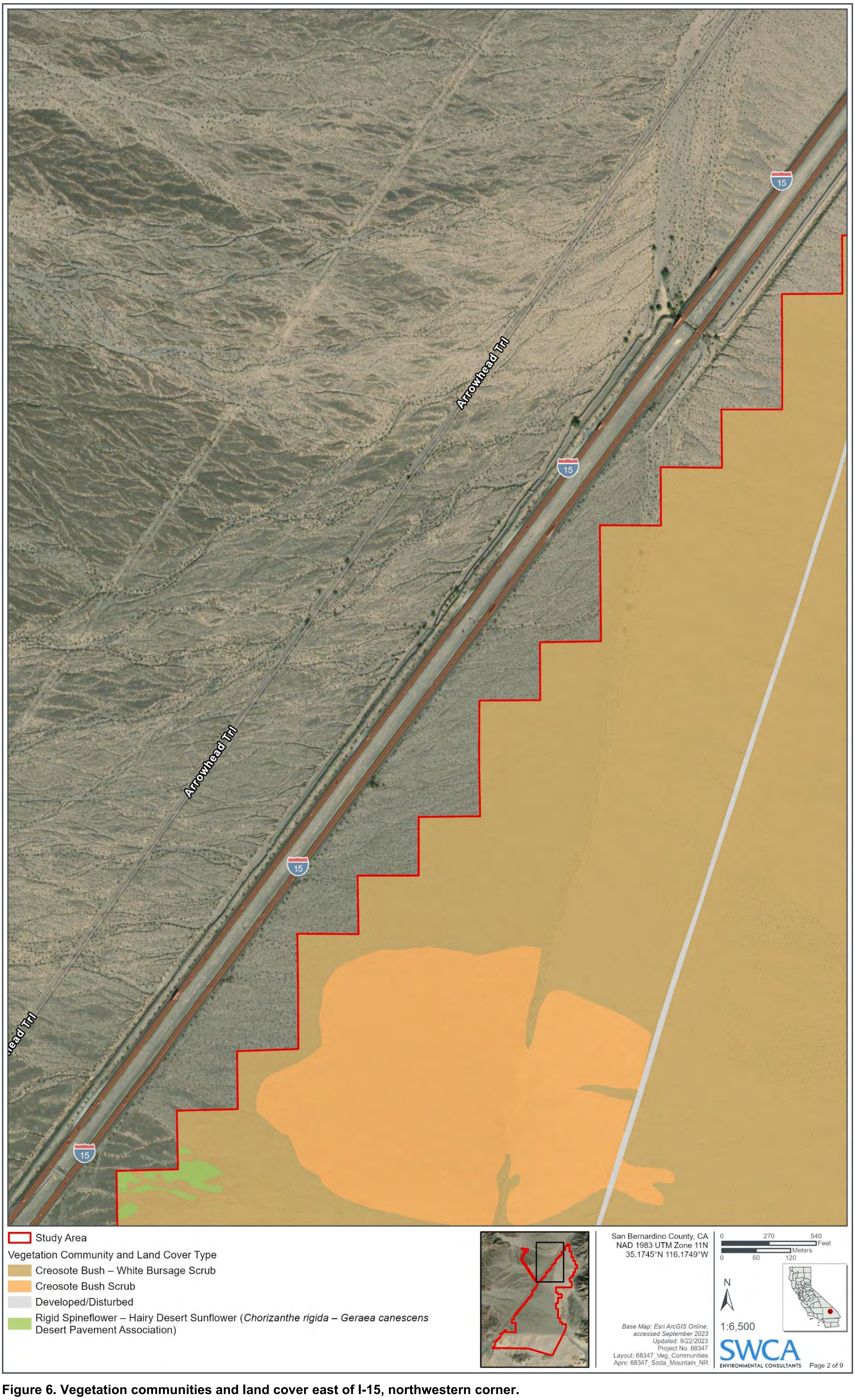

Figure 6. Vegetation communities and land cover east of I-15, northwestern corner.

Figure 7. Vegetation communities and land cover east of I-15, northeastern corner.

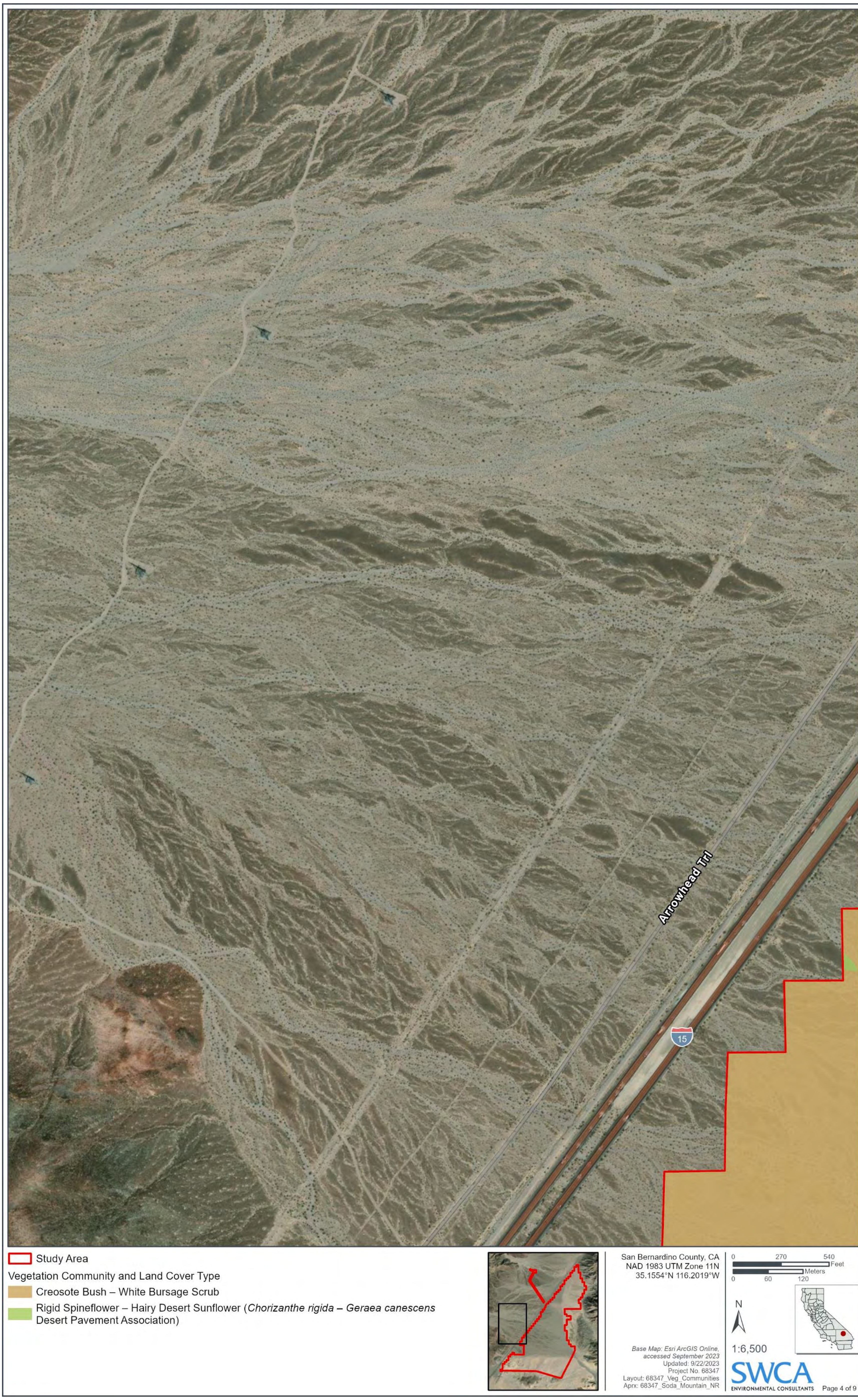

Figure 8. Vegetation communities and land cover east of I-15, west-central portion.

Figure 9. Vegetation communities and land cover east of I-15, central portion.

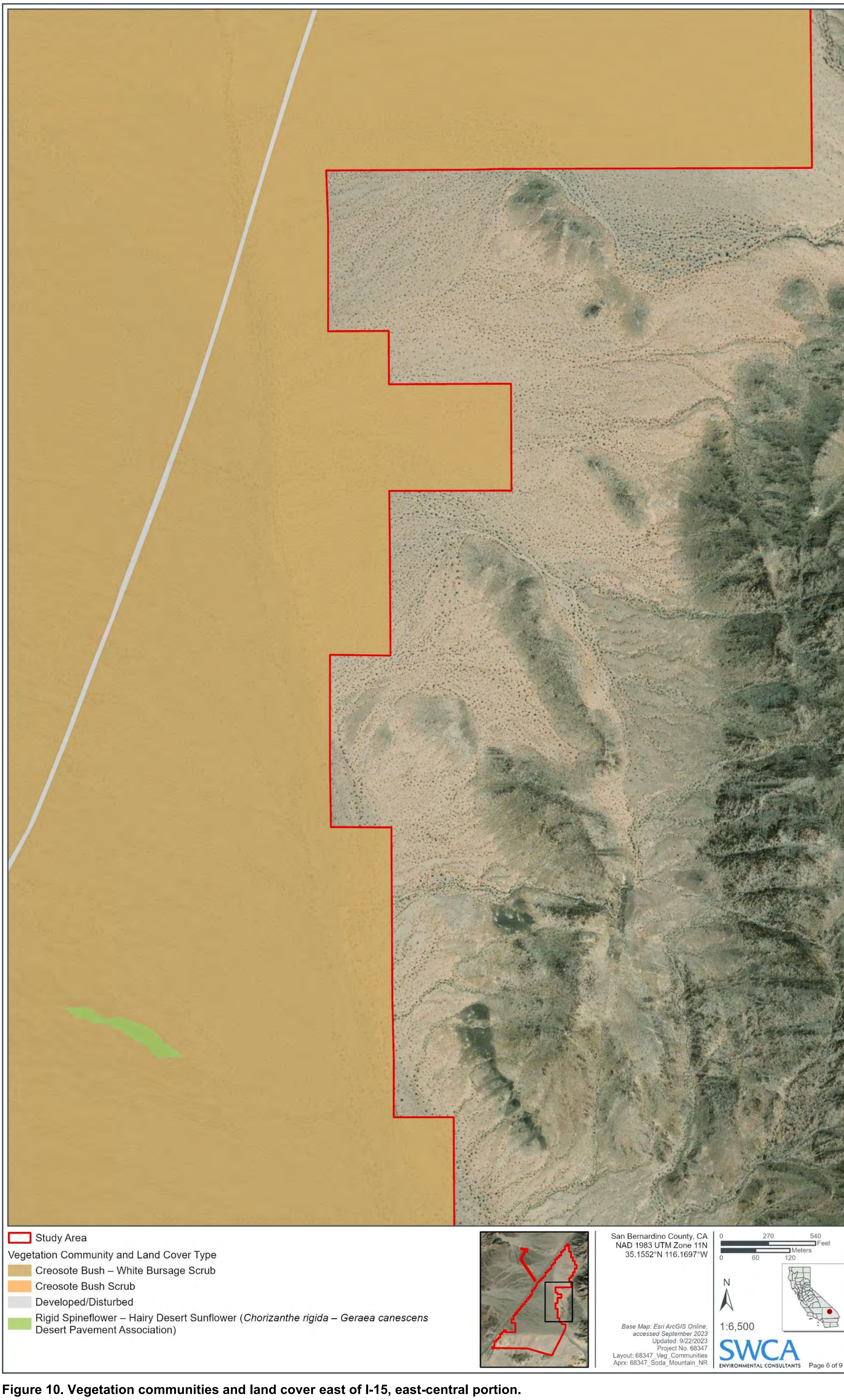

Figure 10. Vegetation communities and land cover east of I-15, east-central portion.

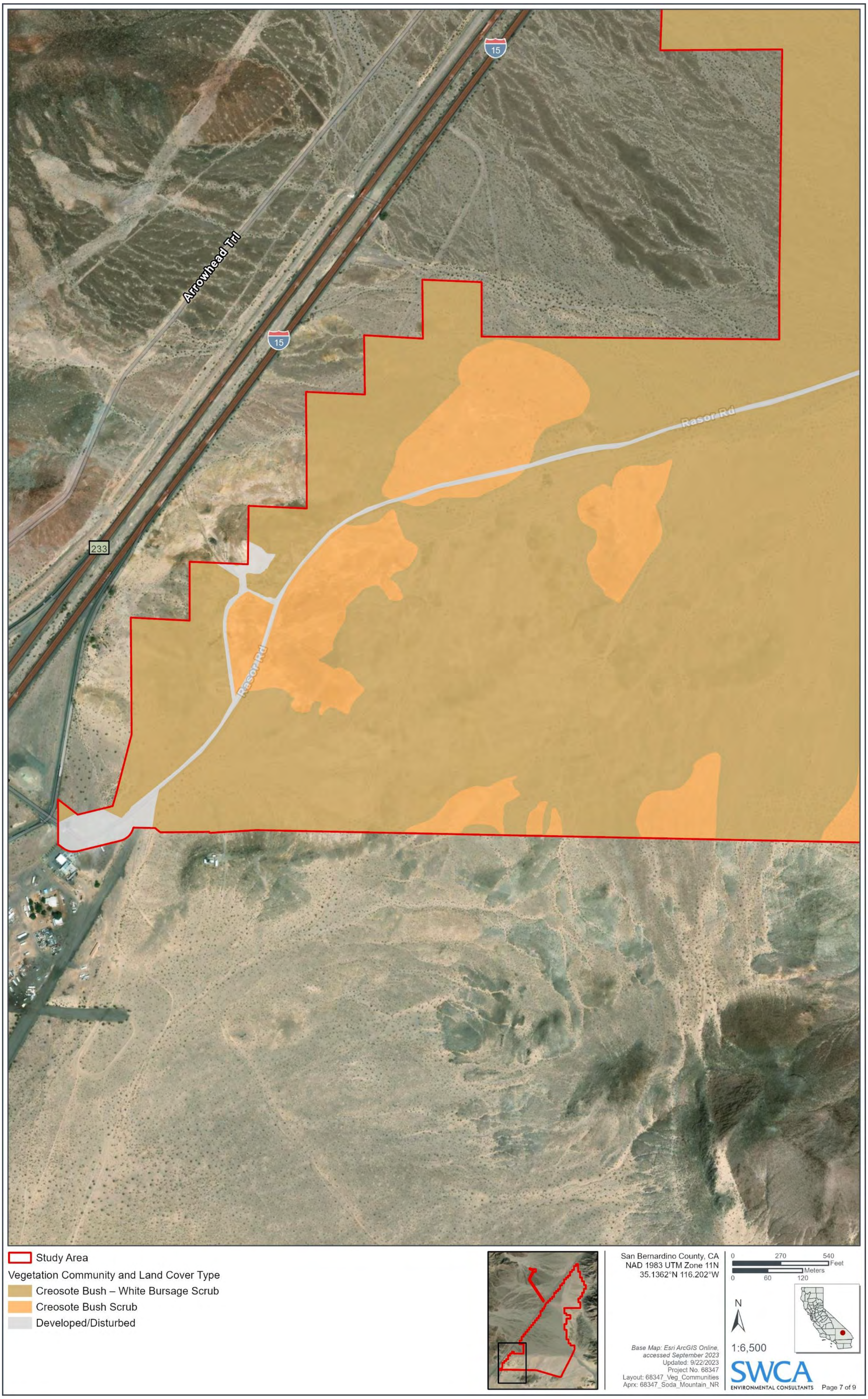

Figure 11. Vegetation communities and land cover east of I-15, southwestern corner.

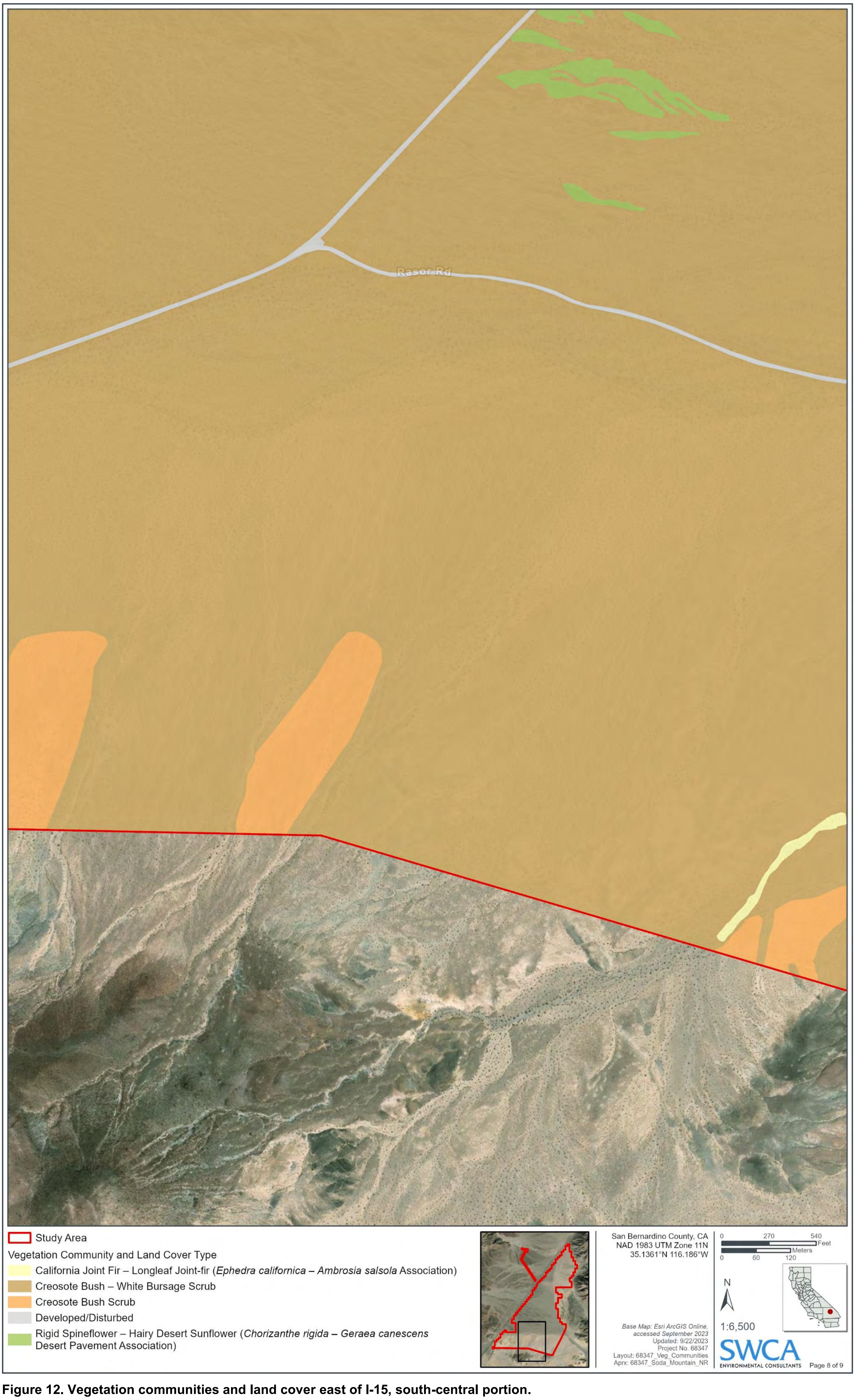

Figure 12. Vegetation communities and land cover east of I-15, south-central portion.

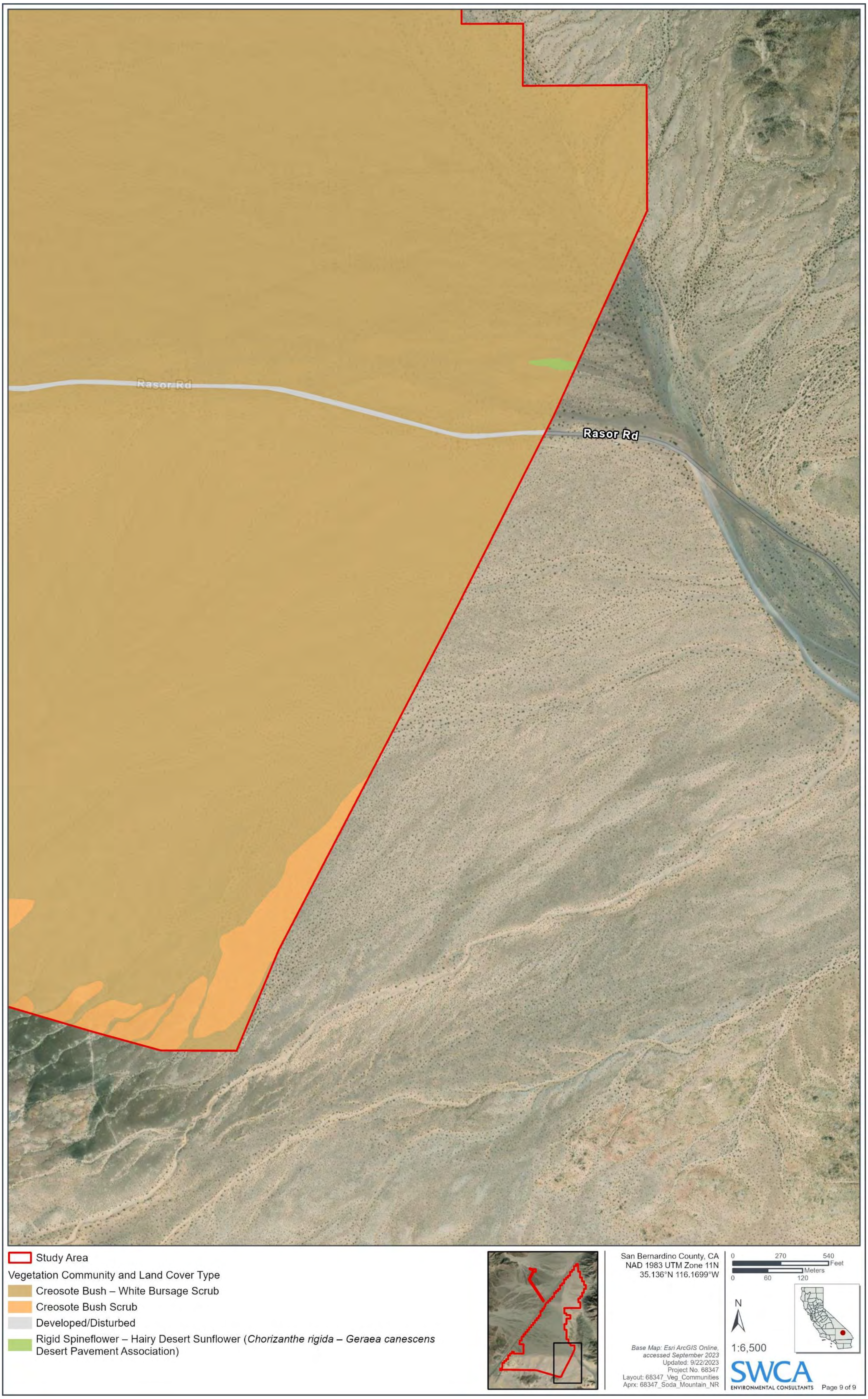

Figure 13. Vegetation communities and land cover east of I-15, southeastern corner.

LITERATURE CITED

Baldwin, B., D. Goldman, D. Keil, R. Patterson, and T. Rosatti (eds.). 2012. *The Jepson Manual: Vascular Plants of California*. 2nd ed. Berkeley, California: University of California Press.

Calflora. 2023. Calflora: Information on California plants for education, research and conservation. Available at: https://www.calflora.org/. Accessed April 2023.

California Department of Fish and Wildlife (CDFW). 2018. *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities*. Sacramento, CA: California Department of Fish and Wildlife. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18959&inline. Accessed April 2023.

———. 2023a. California Natural Diversity Database (CNDDB) using RareFind. Electronic database managed by the Biogeographic Data Branch, California Department of Fish and Wildlife. Sacramento, California. Available at: https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx. Accessed April 2023.

———. 2023b. California Natural Community List. Updated June 1, 2023. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=153398&inline. Accessed June 2023.

California Native Plant Society (CNPS). 2023a. Inventory of Rare and Endangered Plants, Online Edition. California Native Plant Society, Sacramento, CA. Available at: http://www.rareplants.cnps.org. Accessed April 2023.

———. 2023b. A Manual of California Vegetation, Online Edition. California Native Plant Society, Sacramento, CA. Available at: http://www.cnps.org/cnps/vegetation/. Accessed April 2023.

Consortium of California Herbaria. 2023. Consortium of California Herbaria. Available at: https://ucjeps.berkeley.edu/consortium. Accessed April 2023.

Jepson Flora Project. 2023. Jepson eFlora. Available at: https://ucjeps.berkeley.edu/eflora/. Accessed April 2023.

National Oceanic and Atmospheric Administration. 2023. NOAA Online Weather Data for BARSTOW-DAGGETT AIRPORT, California. Available at: https://www.weather.gov/wrh/Climate?wfo=vef. Accessed June 2023.

NatureServe. 2023. Definitions of NatureServe Conservation Status Ranks. Available at: https://help.natureserve.org/biotics/content/record_management/Element_Files/Element_Tracking/ETRACK_Definitions_of_Heritage_Conservation_Status_Ranks.htm. Accessed April 2023.

Panorama Environmental, Inc. 2013. *Biological Resources Technical Report for the Soda Mountain Solar Project*. San Francisco, CA.

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evens. 2009. *A Manual of California Vegetation*. 2nd ed. California Native Plant Society, Sacramento.

ATTACHMENT A

Site Photographs

Photograph A-1. Utah vine milkweed observed on April 19, 2023. This individual was found in the northern portion of the study area, west of I-15.

Photograph A-2. Creosote Bush – White Bursage Scrub in the northwestern portion of the study area, April 25, 2023; view facing southwest.

Photograph A-3. Creosote Bush Scrub in the southeastern corner of the study area, April 20, 2023; view facing northeast.

Photograph A-4. Example of desert pavement consisting of Rigid Spineflower – Hairy Desert Sunflower (*Chorizanthe rigida – Geraea canescens* Desert Pavement Association) in the western portion of the study area, April 18, 2023; view facing east.

Photograph A-5. Cheesebush – Sweetbush Scrub in the northeastern portion of the study area, April 13, 2023; view facing west.

Photograph A-6. California Joint fir – Longleaf Joint-fir (*Ephedra californica* – *Ambrosia salsola* Association) in the southeast corner of the study area, April 20, 2023; view facing north.

Photograph A-7. Example of aeolian sands where tighter transects were conducted, south end of study area.

ATTACHMENT B

Flora Compendium

Scientific Name	Common Name	Life Form
	GYMNOSPERMS (DICOTS)	
Ephedraceae (Ephedra Family)		
Ephedra californica	California joint fir	shrub
	ANGIOSPERMS (DICOTS)	
Aizoaceae (Iceplant Family)		
*Mesembryanthemum nodiflorum**	small flowered iceplant	annual herb
Amaranthaceae (Pigweed Family)		
Tidestromia suffruticosa var. *oblongifolia*	honeysweet	annual herb
Apocynaceae (Dogbane Family)		
Asclepias erosa	desert milkweed	perennial herb
Asclepias subulata	rush milkweed	perennial herb
Funastrum hirtellum	hairy milkweed	perennial herb
Funastrum utahense (CRPR 4.2)*	Utah vine milkweed	perennial herb
Asteraceae (Aster Family)		
Ambrosia acanthicarpa	annual bursage	annual herb
Ambrosia dumosa	white bursage	shrub
Ambrosia salsola	burrobrush	shrub
Baccharis brachyphylla	short-leaved baccharis	shrub
Bebbia juncea	sweetbush shrub	shrub
Brickellia incana	woolly brickellia	shrub
Chaenactis carphoclinia var. *carphoclinia*	pebble pincushion	annual herb
Chaenactis fremontii	Fremont pincushion	annual herb
Chaenactis steviodies	desert pincushion	annual herb
Encelia farinosa	brittlebush	shrub
Encelia frutescens	rayless encelia	shrub
Eriophyllum wallacei	Wallace's woolly daisy	annual herb
Geraea canescens	hairy desert sunflower	annual herb
Lasthenia gracilis	needle goldfields	annual herb
Logfia depressa	dwarf cottonrose	annual herb
Malacothrix coulteri	snake's head	annual herb
Malacothrix glabrata	desert dandelion	annual herb
Monoptilon bellioides	Mojave Desert star	annual herb
Pectis papposa	manybristle chinchweed	annual herb
Perityle emoryi	Emory's rock daisy	annual herb
Peucephyllum schottii	Schott's pygmycedar	shrub
Porophyllum gracile	odora	perennial herb
Prenanthella exigua	bright white	annual herb
Rafinesquia neomexicana	desert chicory	annual herb
Senecio mohavensis	Mojave ragwort	annual herb
Stephanomeria pauciflora	wire lettuce	perennial herb
Stylocline micropoides	desert nest straw	annual herb

Scientific Name	Common Name	Life Form
Boraginaceae (Borage Family)		
Amsinckia tessellata var. *tessellata*	devil's lettuce	annual herb
Cryptantha barbigera var. *barbigera*	bearded cryptantha	annual herb
Cryptantha dumetorum	bush loving cryptantha	annual herb
Cryptantha maritima	Guadalupe cryptantha	annual herb
Cryptantha nevadensis	Nevada cryptantha	annual herb
Cryptantha pterocarya var. *pterocarya*	wingnut cryptantha	annual herb
Eremocarya micrantha var. *micrantha*	desert red-root	annual herb
Johnstonella angustifolia	narrow-leaved johnstonella	annual herb
Pectocarya heterocarpa	chuckwalla pectocarya	annual herb
Pectocarya platycarpa	broad fruited combseed	annual herb
Pectocarya recurvata	curvenut combseed	annual herb
Brassicaceae (Mustard Family)		
*Brassica tournefortii**	Saharan mustard	annual herb
Caulanthus lasiophyllus	California mustard	annual herb
Lepidium lasiocarpum	shaggyfruit pepperweed	annual herb
*Sisymbrium irio**	London rocket	annual herb
Thysanocarpus curvipes	common fringe pod	annual herb
Cactaceae (Cactus Family)		
Cylindropuntia echinocarpa	silver cholla	stem succulent
Cylindropuntia ramosissima	branched pencil cholla	stem succulent
Echinocactus polycephalus	cottontop cactus	stem succulent
Mammillaria tetrancistra	common fishhook cactus	stem succulent
Opuntia basilaris var. basilaris	beavertail cactus	stem succulent
Campanulaceae (Bellflower Family)		
Nemacladus orientalis	eastern glandular nemacladus	annual herb
Nemacladus tenuis var. *aliformis*	desert namacladus	annual herb
Caryophyllaceae (Carnation Family)		
Spergularia sp.	spurrey	annual herb
Chenopodiaceae (Goosefoot Family)		
Atriplex hymenelytra	desert holly	shrub
Atriplex polycarpa	allscale saltbush	shrub
Salsola tragus	prickly Russian thistle	annual herb
Convolvulaceae (Morning Glory Family)		
Cuscuta denticulata	desert dodder	annual herb, vine
Cucurbitaceae (Cucumber Family)		
Cucurbita palmata	coyote melon	annual or perennial herb
Euphorbiaceae (Euphorbias Family)		
Euphorbia micromera	Sonoran sandmata	annual herb
Euphorbia polycarpa	smallseed sandmat	perennial herb

Scientific Name	Common Name	Life Form
Fabaceae (Bean Family)		
Acmispon strigosus	strigose lotus	annual herb
Lupinus shockleyi	purple desert lupine	annual herb
Dalea mollissima	silky dalea	perennial herb
Lupinus arizonicus	Arizona lupine	annual herb
Parkinsonia florida	blue paloverde	tree
Senna armata	desert senna	shrub
Geraniaceae (Storksbill Family)		
*Erodium cicutarium**	coastal heron's bill	annual herb
Erodium texanum	desert heron's bill	annual herb
Hydrophyllaceae (Waterleaf Family)		
Eucrypta micrantha	desert eucrypta	annual herb
Phacelia crenulata	notch-leaved phacelia	annual herb
Phacelia distans	distant phacelia	annual herb
Phacelia neglecta	alkali phacelia	annual herb
Krameriaceae (Ratany Family)		
Krameria erecta	little leaved ratany	shrub
Lamiaceae (Mint Family)		
Salvia columbariae	chia sage	annual herb
Loasaceae (Blazingstar Family)		
Mentzelia albicaulis	white stemmed blazing star	annual herb
Mentzelia involucrata	sand blazing star	annual herb
Mentzelia obscura	pacific blazing star	annual herb
Petalonyx thurberi ssp. *thurberi*	Thurber's sandpaper plant	perennial herb
Malvaceae (Mallow Family)		
Eremalche rotundifolia	desert fivespot	annual herb
Namaceae (Nama Family)		
Nama pusilla	small Leaf Nama	perennial herb
Nyctaginaceae (Four o'clock Family)		
Allionia incarnata	trailing windmills	perennial herb
Mirabilis laevis var. *retorsa*	wishbone bush	perennial herb
Onagraceae (Evening Primrose Family)		
Chylismia brevipes	yellow cups	annual or perennial herb
Chylismia claviformis	clavate fruited primrose	annual or perennial herb
Eremothera boothii ssp. *condensata*	clustered booth's desert primrose	annual herb
Eremothera boothii ssp. *decorticans*	shredding evening-primrose	annual herb
Eremothera boothii ssp. *desertorum*	Booth's desert primrose	annual herb
Orobanchaceae (Broomrape Family)		
Aphyllon cooperi	burroweed strangler	Perennial herb
Papaveraceae (Poppy Family)		
Eschscholzia glyptosperma	desert gold poppy	annual herb

Scientific Name	Common Name	Life Form
Eschscholzia minutiflora	pygmy poppy	annual herb
Phrymaceae (Lopseed Family)		
Diplacus bigelovii	Bigelow's monkeyflower	annual herb
Plantaginaceae (Plantain Family)		
Antirrhinum filipes	tangled snapdragon	annual herb
Plantago ovata	desert plantain	annual herb
Polemoniaceae (Phlox Family)		
Aliciella latifolia var. *latifolia*	broad-leaved aliciella	annual herb
Gilia scopulorum	rock gilia	annual herb
Gilia sp.	gilia	annual herb
Gilia stellata	star gilia	annual herb
Langloisia setosissima ssp. *punctata*	Great Basin langloisia	annual herb
Linanthus demissus	Desert linanthus	annual herb
Linanthus filiformis	yellow gilia	annual herb
Linanthus jonesii	Jones' linanthus	annual herb
Loeseliastrum matthewsii	desert calico	annual herb
Loeseliastrum schottii	Schott gilia	annual herb
Polygonaceae (Buckwheat Family)		
Chorizanthe brevicornu var. *brevicornu*	brittle spineflower	annual herb
Chorizanthe corrugate	wrinkled spineflower	annual herb
Chorizanthe rigida	Devil's spineflower	annual herb
Eriogonum inflatum	desert trumpet	perennial herb
Eriogonum sp.	annual buckwheat	annual herb
Eriogonum trichopes	little desert buckwheat	annual herb
Resedaceae (Reseda Family)		
Oligomeris linifolia	leaved cambess	annual herb
Solanaceae (Nightshade Family)		
Nicotiana obtusifolia	desert tobacco	perennial herb
Physalis crassifolia	thick-leaved ground-cherry	annual or perennial herb
Tamaricaceae (Tamarisk Family)		
*Tamarix aphylla**	Athel tamarisk	tree
Tamarix sp.*	tamarisk	tree
Zygophyllaceae (Caltrop Family)		
Larrea tridentata	creosote bush	shrub
*Tribulis terrestris**	puncturevine	annual herb
	ANGIOSPERMS (MONOCOTS)	
Agavaceae (Agave Family)		
Hesperocallis undulata	desert lily	perennial herb
Poaceae (Grass Family)		
Aristida adscensionis	three awn	annual grass
Bromus madritensis ssp. *rubens**	red brome	annual grass

Scientific Name	Common Name	Life Form
Festuca octoflora	sixweeks grass	annual grass
Hilaria rigida	big galleta	perennial grass
*Hordeum murinum**	foxtail barley	annual grass
*Schismus arabicus**	Mediterranean grass	annual grass
*Schismus barbatus**	common Mediterranean grass	annual grass
Themidaceae (Brodiaea Family)		
Muilla sp.	muilla	perennial herb

Note: *non-native species

APPENDIX F

Crotch's Bumble Bee Focused Survey Report for the Soda Mountain Solar Project

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SWCA ENVIRONMENTAL CONSULTANTS
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TECHNICAL MEMORANDUM

To: Soda Mountain Solar, LLC

From: Shirley Innecken, Lead Natural Resources Project Manager

Date: January 10, 2025

Re: **Crotch's Bumble Bee Focused Survey Report for the Soda Mountain Solar Project / SWCA Project No. 68347**

INTRODUCTION

This report summarizes the results of the Crotch's bumble bee (*Bombus crotchii*) habitat assessment and focused surveys conducted by SWCA Environmental Consultants (SWCA) for the Soda Mountain Solar Project (project). The project is located along Interstate 15 approximately 50 miles northeast of Barstow, San Bernardino County, California (Figure 1). Soda Mountain Solar, LLC plans to develop a utility-scale photovoltaic (PV) solar facility on approximately 2,670 acres of land managed by the Bureau of Land Management (BLM). The project is situated in an alluvial valley between the northern and southern portions of the Soda Mountains in the Mojave Desert.

SWCA developed the biological survey methods in coordination with the California Department of Fish and Wildlife (CDFW) and prepared a biological and aquatic resources work plan. The purpose of the Crotch's bumble bee surveys was to determine the presence or absence of Crotch's bumble bees within the project site and along the gen-tie option. The survey results summarized in this report serve to support environmental analysis of the project pursuant to the California Environmental Quality Act (CEQA).

Species Background

The Crotch's bumble bee is a candidate for listing as an endangered species in the State of California as defined by Section 2068 of the Fish and Game Code (CDFW 2023a). This species occurs predominantly within California throughout coastal areas, the Central Valley, the margins of the Mojave Desert, and Sierra foothills around most of the southwestern part of the state. Historically, the Crotch's bumble bee was common in much of the Central Valley of California but has since significantly declined due to conversion of suitable habitat into agricultural lands (Hatfield et al. 2018). According to recently published CDFW survey considerations, the study area falls outside of the current and historical range for Crotch's bumble bee (CDFW 2023b).

Figure 1. Soda Mountain Solar Project vicinity map.

Natural History

The Crotch's bumble bee inhabits warm, dry scrub and open grassland habitat. Similar to other bumble bee species, Crotch's bumble bee is a generalist forager and visits a variety of flowering plants. It is a short-tongued bumble bee and is therefore best suited to forage on open flowers with short corollas (Hatfield et al. 2018). Plant families most commonly associated with Crotch's bumble bee records in California include those in the Apocyanaceae (Dogbane), Asteraceae (Composite), Boraginaceae (Forget-me-not), Fabaceae (Pea), Hydrophyllaceae (Waterleaf), and Lamiaceae (Mint) families (Hatfield et al. 2018). Other reports commonly associate Crotch's bumble bee with plants in the genera *Asclepias, Chaenactis, Lupinus, Medicago, Phacelia*, and *Salvia* (Williams et al. 2014).

The flight period for Crotch's bumble bee queens in California is from late February to late October; the peak is early April, and there is a second pulse in July. The flight period for workers and males in California extends from late March through September; worker and male abundance peaks in early July (Thorp et al. 1983). The Crotch's bumble bee nests in late February through late October. This species prefers to nest underground and will utilize abandoned rodent burrows; however, it occasionally nests aboveground and has been recorded using abandoned bird nests, undisturbed bunch grasses, rock piles, or dead tree cavities as nesting sites (ForestWatch 2013). Little is known regarding the overwintering habitat used by this species, but it is speculated based on the habits of other bumble bee species that the Crotch's bumble bee uses soft disturbed soils or leaf litter as overwintering sites.

Threats

Like other bumble bee species, the Crotch's bumble bee has experienced recent population declines. Factors that have been identified as a substantial threat to the survival and reproduction of Crotch's bumble bee include loss of habitat due to human landscape modifications (agricultural intensification, livestock grazing, urban development), increased use of herbicides and pesticides, competition with nonnative bee species, climate change, genetic factors, and disease and pathogen spillover (Hatfield and Jepsen 2021; Hatfield et al. 2015)

METHODS

For the purposes of this report, the study area includes the 2,634-acre proposed project site and the proposed gen-tie route (approximately 35.75 acres), plus a 50-foot buffer (Figure 2). Prior to conducting the field surveys, a review of the CDFW California Natural Diversity Database (CNDDB) was performed to determine the nearest recorded locations of Crotch's bumble bee within the vicinity of the study area. Additionally, a desktop habitat assessment was conducted prior to visiting the study area to identify portions of the study area that were most likely to be suitable for Crotch's bumble bees. The desktop assessment considered the requirements for nesting, foraging, and overwintering. Additionally, data collected during the spring 2023 rare plant, desert tortoise, and burrowing owl surveys were used to inform study area survey efforts, where appropriate. SWCA analyzed this information to assess the study area for areas that were likely to contain suitable habitat for the Crotch's bumble bee and co-occurring pollinator species (e.g., high floristic diversity and abundance of suitable nectar sources, adequate nesting and overwintering features, and potential dispersal movement corridors informed by previously documented occurrences). Special attention was paid to natural areas serving as flight corridors between urban/developed areas, including roads and drainages.

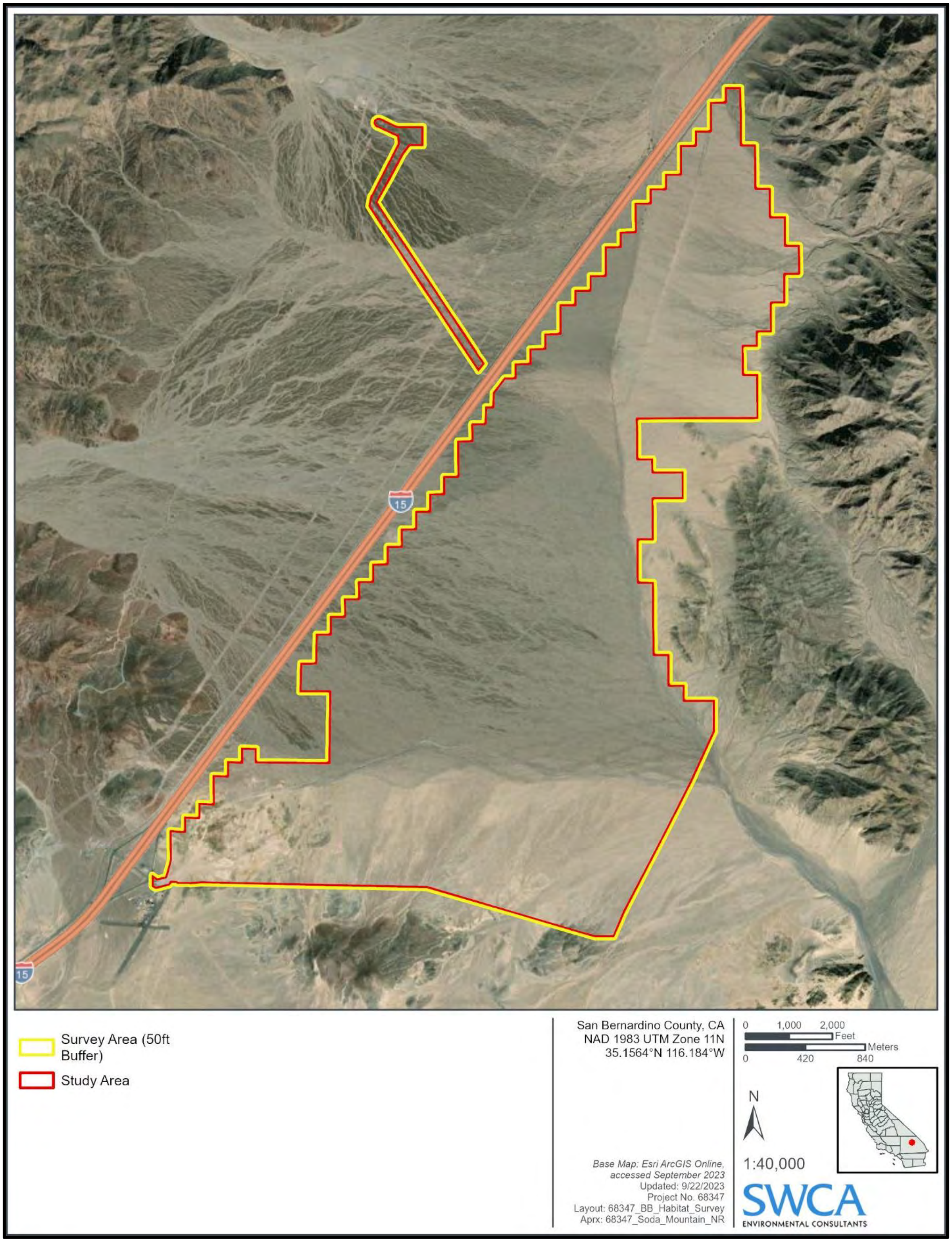

Figure 2. Soda Mountain Solar Project Crotch's Bumble Bee study area.

Project-specific focused survey methods were developed in coordination with CDFW. Per CDFW guidance, the May 2023 survey was conducted in accordance with 2019 U.S. Fish and Wildlife Service (USFWS) survey guidelines (version 2.2) for the rusty patched bumble bee (*Bombus affinis*), adjusting for differences between the rusty patched and Crotch's bumble bees (USFWS 2019). On June 6, 2023, after SWCA had already completed the desktop review, habitat assessment, and one focused survey, CDFW published new survey guidance for Crotch's bumble bee (CDFW 2023b). Following the publication of survey guidelines, subsequent surveys were conducted in accordance with the CDFW's *Survey Considerations for California Endangered Species Act (CESA) Candidate Bumble Bees* (CDFW 2023b).

Focused surveys were conducted during the 2023 season by qualified biologists experienced and skilled in the identification and ecology of the Crotch's bumble bee and other California native and nonnative bumble bees. Consistent with the rusty patched bumble bee survey guidelines, four equally spaced focused surveys were conducted during the colony active period (April–August) for the highest detection probability of Crotch's bumble bee. The CDFW June 2023 guidelines call for at least three focused surveys (CDFW 2023b).

SWCA biologists Sharif Durzi, Christina Torres, Nathan Kolberg, Rebecca Wang, Lee BenVau, and Marisol Sanchez conducted four Crotch's bumble bee focused surveys during a 13-week period from May 22 through August 16, 2023. Surveys were focused on the detection of foraging Crotch's bumble bee individuals and active nests. During the first survey, the biologists walked 10-meter-wide pedestrian transects throughout 100% of the areas in the study area that had been deemed potentially suitable foraging habitat according to the desktop habitat assessment (251.5 acres (Figure 4)). When a suitable flowering nectar plant was encountered, the biologists recorded the nectar resource using a GPS-enabled device. In areas of high nectar plant abundance, primarily within the large ephemeral washes, surveys were conducted with increased emphasis per CDFW survey considerations (CDFW 2023b). No bumble bees were captured or handled during survey efforts.

The results of the first focused survey were used to further refine the searchable area of the study area where Crotch's bumble bee would most likely be encountered for the remaining three surveys. Surveys 2 through 4 focused on 53.4 acres within the 251.5 acres of potentially suitable habitat in which floral resources were observed (Figure 5).

Surveys were conducted during the day, at least 1 hour after sunrise and at least 2 hours before sunset. The surveys were conducted during ideal survey conditions as much as possible, which are defined as between 9 a.m. and 1 p.m. when temperatures are between 60- and 90-degrees Fahrenheit (°F), with wind speeds below 8 miles per hour (mph). Table 1 summarizes survey timing, weather conditions, and personnel for each survey.

Table 1. Survey Conditions and Personnel

Date	Surveyors*	Start Time	End Time	Temperature (°F)	Wind Speed (mph)	Conditions
5/22	SD, CT, RW, NK	09:00	15:30	85–94	0–5	Sunny
5/23	SD, CT, RW, NK	08:40	14:15	85–97	0–11	Sunny
5/24	SD, CT, RW, NK	07:25	14:15	73–96	1–7	Sunny
5/25	SD, CT, RW, NK	07:30	12:00	69–86	3–6	Partly cloudy
6/15	SD, CT, LB, MS	07:45	14:45	78–97	0–3	Sunny
6/16	CT, LB, MS	08:00	13:45	77–95	0–6	Cloudy
7/17	SD, CT, LB, MS	06:55	09:10	93–102	3–6	Cloudy
7/18	SD, CT, LB, MS	06:40	08:40	86–99	0–6	Sunny

Date	Surveyors*	Start Time	End Time	Temperature (°F)	Wind Speed (mph)	Conditions
8/15	SD, LB, MS	07:15	15:00	67–94	1–4	Sunny
8/16	SD, LB, MS	07:15	13:30	63–90	2–10	Sunny

* SD = Sharif Durzi, CT = Christina Torres, RW = Rebecca Wang, NK = Nathan Kolberg, LB = Lee BenVau, MS = Marisol Sanchez

Survey Limitations

As described in the 2023 CDFW survey guidelines, surveys should occur within the colony active period for Crotch's bumble bee which commences in April. Focused surveys initiated at the end of May, immediately following a period of peak blooming, which may have contributed to the detection probability for Crotch's bumble bee individuals and nests. Additionally, as noted in the 2023 CDFW survey guidelines, ideal survey temperatures are between 60 and 90°F when activity of pollinating bumble bees is presumed to be highest. High summer desert temperatures at the study area made surveying within the temperature range difficult to achieve while adhering to the temporal survey window during the colony active period. High daytime temperatures may have reduced the detection probability of Crotch's bumble bee individuals and nest, particularly during the July field survey. In addition, wind speeds exceeded 8 mph on two survey dates (May 23rd and August 16th, see Table 1). Suboptimal wind conditions on these dates may have also reduced the detection of Crotch's bumble bee individuals.

RESULTS

Desktop Assessment

Prior to the field surveys, SWCA conducted a desktop-based habitat assessment to determine the availability of potential suitable nesting, foraging, and overwintering habitat within the survey site and the likelihood for Crotch's bumble bee occurrence based on historical records and species' habitat preference. Results of the desktop assessment showed the closest known historical occurrence of Crotch's bumble bee is approximately 21 miles north of the study area and was recorded in 1995 (CDFW 2023c). This occurrence is an isolated record that is significantly detached in distance and ecological context from the usual known species' habitat of coastal and central California. The study area was found to be more than 50 miles east of the current range of the Crotch's bumble bee as published in recent CDFW survey guidelines (Figure 3) (CDFW 2023b). SWCA identified 251.5 acres of potentially suitable habitat for Crotch's bumble bee foraging (see Figure 4).

Figure 3. Current and historic species range map for Crotch's bumble bee, from 2023 CDFW survey guidelines. Study Area denoted by red star.

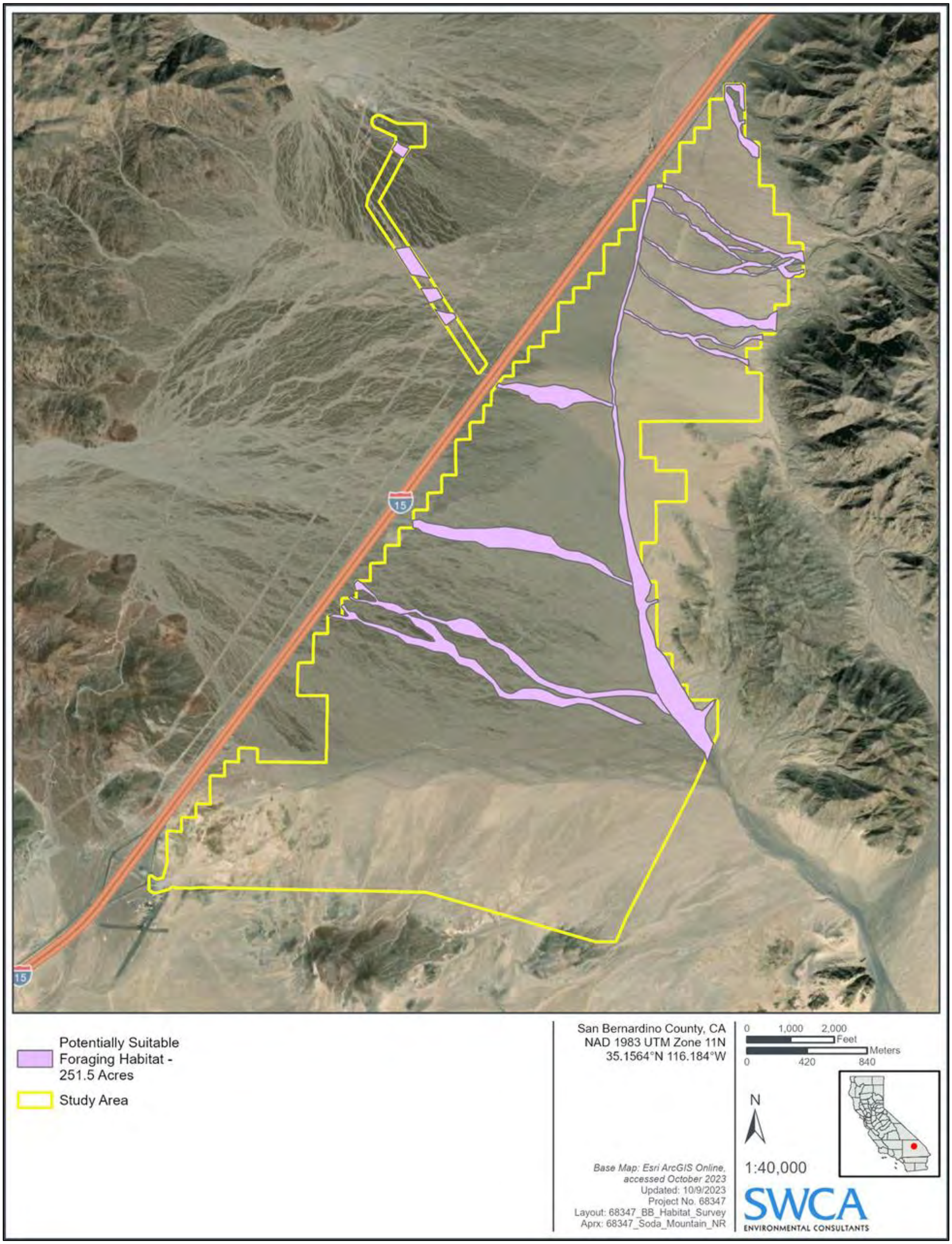

Figure 4. Potentially suitable foraging habitat based on the desktop assessment.

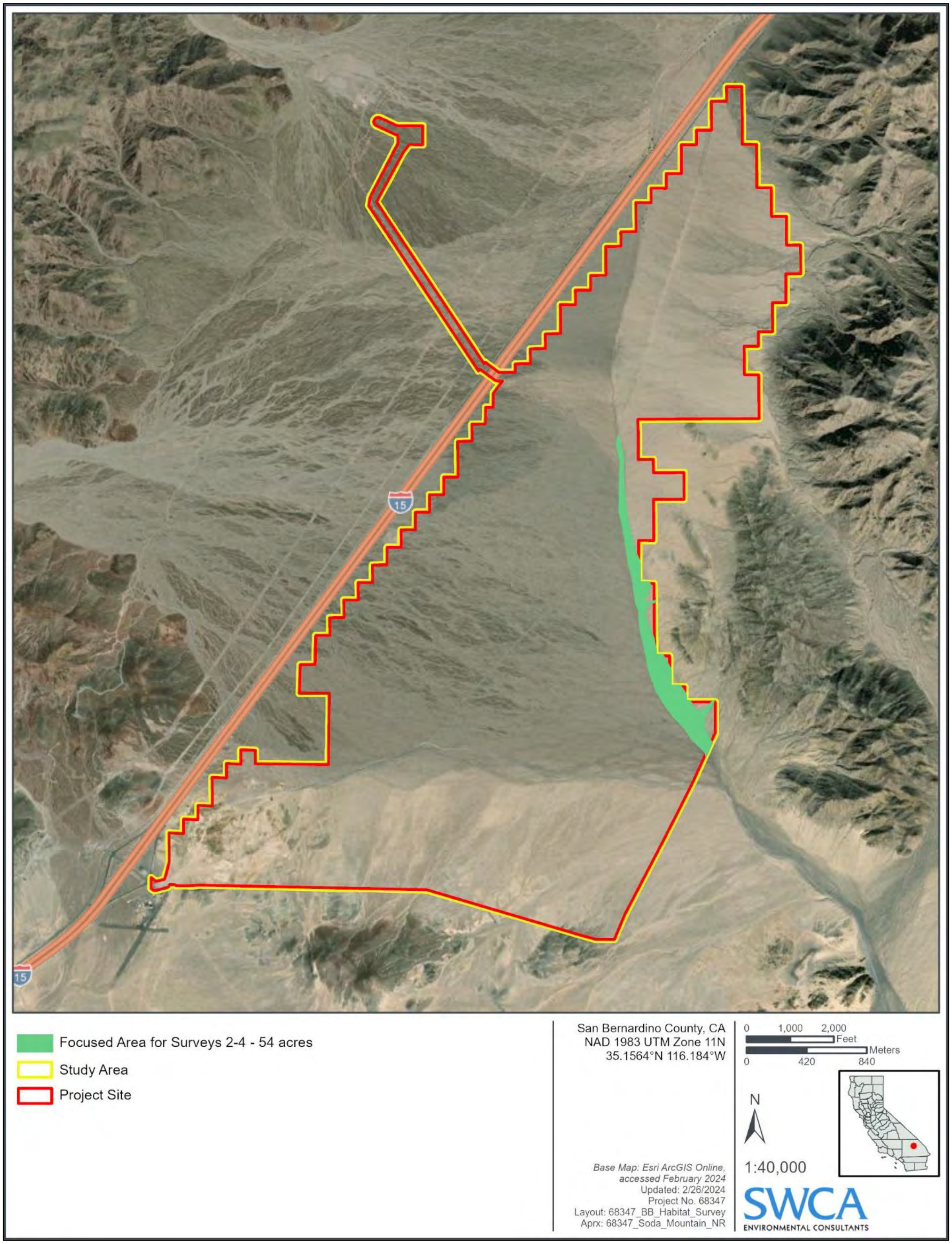

Figure 5. Study area for surveys 2 through 4 focused on 53.4 acres of potentially suitable habitat in which floral resources were observed.

Habitat Assessment

Foraging Habitat

Conditions during surveys were optimal for plant growth, given the above-average rainfall accompanied by below-normal temperatures during the previous winter and spring, causing the proliferation in annual wildflower species in the Mojave Desert. Potential nectar sources in bloom were observed from May through August. The most frequently encountered flowering nectar plants included desert milkweed (*Asclepias erosa*), rush milkweed (*Asclepias subulata*), sandpaper plant (*Petalonyx thurberi*), blue palo verde (*Parkinsonia florida*), and desert trumpet (*Eriogonum inflatum*). Desert milkweed, rush milkweed, sandpaper plant, and blue palo verde were actively blooming from May through August and hosted a wide array of pollinator species. Figure 5 shows the distribution of potentially suitable foraging habitat determined by the location of available nectar plants.

Potentially suitable foraging habitat was restricted to the areas of flowering nectar sources, largely concentrated along the ephemeral riparian systems that run throughout the study area. While flowering nectar sources were documented throughout each survey day, the abundance of flowering desert milkweed, rush milkweed, and desert trumpet diminished as the conditions became drier in the later summer months. The gen-tie route had few locations of flowering nectar sources, except for a few isolated locations of desert milkweed, rush milkweed, blue palo verde, and desert trumpet.

Nesting and Overwintering Habitat

The study area contained an abundance of rodent burrows of potentially suitable condition for bumble bee nesting and overwintering, although no hymenopteran (the order Hymenoptera includes bees, wasps, and ants) species were seen occupying these burrows. In addition to the rodent burrows, SWCA biologists also encountered thatched annual grasses and brush piles in potentially suitable conditions for nesting and overwintering throughout the study area. The abundance and wide distribution of nesting and overwintering substrate leads to the conclusion that the entire study area has potential to be suitable for nesting and overwintering populations of Crotch's bumble bees if they were to occur on-site.

Focused Survey Results

No foraging individuals or nests of Crotch's bumble bee or other *Bombus* species were encountered during any of the four focused surveys. Other pollinating hymenopteran (i.e., bees and wasps) and dipteran (flies) species were regularly documented on the actively flowering nectar sources, suggesting that survey efforts were conducted in accordance with seasonal pollinator activity. Reference photographs are included in Attachment A, and a full invertebrate species compendium is provided in Attachment B. Conditions during the survey were generally conducive for the detection of Crotch's bumble bee, with appropriate temperatures and conditions at least partly observed on each survey day (see Table 1).

Other pollinator species frequently observed on-site included Centridine bees (*Centris* spp.), Thisbe's tarantula-hawk wasp (*Pepsis thisbe*), Tiphiid wasps (*Paratiphia* sp.), Ashmead's digger wasp (*Sphex ashmeadi*), and various species of hover flies (family Syrphidae). Eusocial bee species observed within the study area included the western honey bee (*Apis mellifera*).

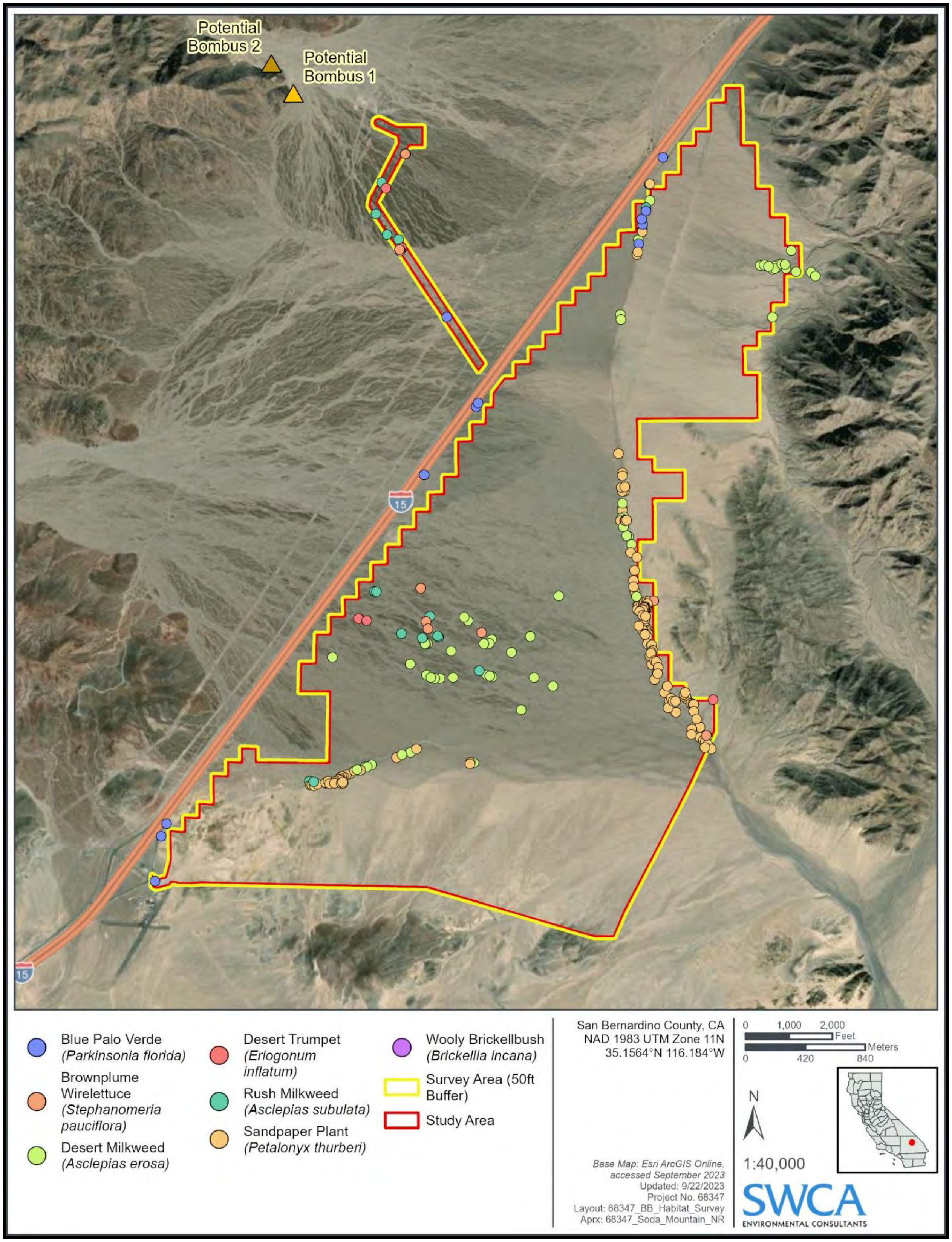

Figure 6. Potentially suitable nectar sources observed in the field and incidental potential bee observations.

Incidental Observations

During a nighttime acoustic bat survey, SWCA biologist Mason Townley reported encountering an unknown bumble bee species on 16 August at 7:40 p.m., approximately 0.36-mile northwest of the gen-tie (see Figure 5) and outside of the study area. No photographs were taken of this individual, and thus the identification of this potential *Bombus* sp. is not possible. A second potential *Bombus* sp. was documented during another nighttime acoustic bat survey by SWCA biologist Marisol Sanchez on 29 August at 6:55 p.m., approximately 0.53-mile northwest of the gen-tie (see Figure 5) and outside of the study area. This individual was reported to have a yellow stripe along the abdomen and possessed a flight pattern consistent with *Bombus* spp. No photograph was taken of this potential *Bombus* sp., and thus identification is not possible.

DISCUSSION

Across the four surveys, no Crotch's bumble bee individuals or nest sites were found. Potentially suitable foraging habitat was documented throughout the study area, primarily within the ephemeral washes. Potentially suitable nesting and overwintering habitat was determined to be present throughout the entirety of the study area. Overall, the quality of habitat at the study area was low for Crotch's bumble bee habitation. Although preferred floral resources for the Crotch's bumble bee were documented throughout the study area during early spring botanical surveys, there was a low abundance of blooming floral resources for the duration of the Colony Active Period in the summer months. Potentially suitable foraging habitat was restricted to areas of flowering nectar sources, which were largely concentrated along the larger ephemeral riparian systems present throughout the study area. While flowering nectar sources were documented throughout each survey effort, the abundance of flowering plants diminished as the conditions became drier in the later summer months. A higher abundance of blooming species documented during the spring botanical surveys suggests the project potentially serves as a source of floral resources during the onset of the Colony Active Period for bumble bee species in the area. However, the absence of bumble bee activity documented within the survey area during focused surveys, along with extreme temperature conditions and decreased abundance of blooming floral resources within the summer months, suggests that the site may provide lower-quality foraging habitat during the latter portion of the Colony Active Period. This may indicate the project does not support a consistent availability of pollen and/or nectar sources for the entire duration of the foraging and nesting period for Crotch's bumble bee. Based on this evidence, Crotch's bumble bee is considered not likely to occur in the study area.

The closest known historical occurrence of Crotch's bumble bee in the CNDDB is approximately 21 miles north of the study area and was recorded in 1995 (CDFW 2023c). The study area is more than 50 miles outside of the known current and historical range for this species, as outlined in recent CDFW survey guidelines (CDFW 2023b) and shown in Figure 3.

Typical habitat for this species consists of warm, dry scrub and open grassland habitat. Crotch's bumble bee colonies prefer to nest underground and will often utilize abandoned rodent and small mammal burrows, which were common throughout the study area. Crotch's bumble bees are generalist foragers with short tongues; therefore, their nectar sources are usually open flowers with short corollas and include plants from the genera *Asclepias, Chaenactis, Lupinus, Medicago, Phacelia*, and *Salvia* (Williams et al. 2014). Desert milkweed and rush milkweed were encountered within the study area; however, the restricted blooming time and generally unfavorable climatic conditions of the study area's desert environment make the occurrence of Crotch's bumble bee unlikely.

LITERATURE CITED

California Department of Fish and Wildlife (CDFW). 2023a. *Special Animals List*. California Natural Diversity Database (CNDDB). Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109406. Accessed June 2023.

______. 2023b. *Survey Considerations for California Endangered Species Act (CESA) Candidate Bumble Bee Species*. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=213150&inline. Accessed June 2023.

______. 2023c. California Natural Diversity Database RAREFIND 5 database ver.5.2.14. Available at: www.wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed June 2023.

ForestWatch. 2013. *Crotch's Bumblebee.* Available at: https://lpfw.org/our-region/wildlife/Crotchs-bumblebee/. Accessed June 2023.

Hatfield, R., S. Colla, S. Jepsen, L. Richardson, R. Thorp, and S.F. Jordan. 2015. *IUCN Assessments for North American Bombus spp.* Available at: https://xerces.org/sites/default/files/publications/14-065.pdf. Accessed June 2023.

Hatfield, R., and S. Jepsen. 2021. *A conservation conundrum: protecting bumble bees under the California Endangered Species Act.* Submitted by The Xerces Society for Invertebrate Conservation, Defenders of Wildlife, and Center for Food Safety. Available at: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=193398. Accessed June 2023.

Hatfield, R., S. Jepsen, S.F. Jordan, M. Blackburn, and A. Code. 2018. *Petition to List Four Species of Bumble Bees as Endangered Species under the California Endangered Species Act.* Submitted by The Xerces Society for Invertebrate Conservation, Defenders of Wildlife, and Center for Food Safety. Available at: https://www.xerces.org/sites/default/files/2019-10/CESA-petition-Bombus-Oct2018.pdf. Accessed June 2023.

Thorp, R.W., D.S. Horning Jr., and L.L. Dunning. 1983. *Bumble bees and cuckoo bumble bees of California. Bulletin of the California Insect Survey* 23:1–79. Available at: https://essig.berkeley.edu/documents/cis/cis23.pdf. Accessed June 2023.

U.S. Fish and Wildlife Service (USFWS). 2019. *Survey Protocols for the Rusty Patched Bumble Bee (Bombus affinis) Version 2.2.* Available at: https://www.fws.gov/sites/default/files/documents/Survey_Protocols_RPBB_12April2019.pdf. Accessed April 2023.

Williams, P.H., R.W. Thorp, L.L. Richardson, and S.R. Colla. 2014. *The Bumble Bees of North America: An Identification Guide*. Princeton University Press, Princeton.

Attachment A
Photographs

Photograph 1. Tiphiid wasps (*Paratiphia* sp.) foraging on a flowering desert milkweed. Photographed May 22, 2023.

Photograph 2. Red-legged oil-digger bee (*Centris rhodopus*) foraging on a flowering desert milkweed. Photographed May 22, 2023.

Photograph 3. Centridine bee (*Centris* sp.) and tiphiid wasps foraging on a flowering desert milkweed. Photographed May 22, 2023.

Photograph 4. Oil digger bee (*Centris* sp.) foraging on a flowering blue palo verde. Photographed May 24, 2023.

Photograph 5. Tarantula-hawk wasp (*Pepsis thisbe)* foraging on a flowering desert milkweed. Photographed June 15, 2023.

Photograph 6. Striped sweat bee (*Agapostemon* sp.) on a desert milkweed seed pod. Photographed June 15, 2023.

Photograph 7. Urbane digger bee (*Anthophora urbana*) foraging on a flowering desert milkweed. Photographed June 16, 2023.

Photograph 8. A gray hairstreak (*Strymon melinus*) on a flowering desert milkweed. Photographed June 15, 2023.

Photograph 9. Western honey bee (*Apis mellifera*) foraging on blooming sandpaper plant. Photographed June 15, 2023.

Photograph 10. Sandpaper plant still in bloom during Survey 4. Photographed August 16, 2023.

Photograph 11. Flowering desert milkweed within ephemeral drainage during Survey 1. Photographed May 22, 2023.

Photograph 12. Desert milkweed plant pictured in Photograph 11 in seed during Survey 3. Photographed July 18, 2023.

Attachment B

Invertebrate Species Compendium

Table A-1. Invertebrate Species Compendium

Scientific Name	Common Name
INSECTS	
Acrididae	**Short-horned Grasshoppers**
Trimerotropis pallidipennis	pallid-winged grasshopper
Apidae	**Cuckoo, Carpenter, Digger, Bumble, and Honey Bees**
Anthophora urbana	urbane digger bee
Apis mellifera	western honey bee
Centris sp.	Centridine bee
Centris sp.	oil digger bee
Centris rhodopus	red-legged oil-digger
Ericrocis lata	ericrocidine cuckoo bee
Andrenidae	**Miner, Fairy, Allied Panurgine, and Oxaeine Bees**
Perdita sp.	fairy bee
Aeshnidae	**Darners**
Anax junius	common green darner
Asilidae	**Robber Flies**
Saropogon sp.	robber fly
Cerambycidae	**Longhorn Beetles**
Plionoma rubens	longhorn beetle
Coccinellidae	**Lady Beetles**
Coccinella septempunctata	seven-spotted lady beetle
Hippodamia convergens	convergent lady beetle
Crambidae	**Crambid Snout Moths**
Achyra rantalis	garden webworm moth
Formicoidea	**Ants**
Pogonomyrmex sp.	harvester ant
Veromessor pergandei	harvester ant
Geometridae	**Geometrid Moths**
Digrammia colorata	creosote moth
Halictidae	**Sweat Bees**
Agapostemon sp.	striped sweat bee
Dieunomia sp.	sweat bee
Hesperiidae	**Skippers**
Burnsius albescens	white checkered-skipper
Heliopetes ericetorum	northern white-skipper
Libellulidae	**Skimmers**
Sympetrum corruptum	variegated meadowhawk
Lycaenidae	**Blues, Coppers, Hairstreaks, Harvesters**
Brephidium exilis	western pygmy-blue
Echinargus isola	Reakirt's blue

Scientific Name	Common Name
Hemiargus ceraunus	Ceraunus blue
Leptotes marina	marine blue
Strymon melinus	gray hairstreak
Mutillidae	**Velvet Ants**
Dasymutilla sp.	velvet ant
Nymphalidae	**Brush-footed Butterflies**
Danaus gilippus	Queen butterfly
Pieridae	**Whites, Sulphurs, Yellows**
Abaeis nicippe	sleepy orange
Pontia protodice	checkered white
Pompilidae	**Spider Wasps**
Pepsis thisbe	Thisbe's tarantula-hawk wasp
Pterophoridae	**Plume Moths**
Anstenoptilia marmarodactyla	sage plume moth
Sphecidae	**Thread-waisted Wasps**
Ammophila aberti	thread-waisted wasp
Palmodes or *Prionyx* sp.	thread-waisted wasp
Prionyx parkeri	thread-waisted wasp
Sphex ashmeadi	Ashmead's digger wasp
Sphingidae	**Sphinx Moths**
Hyles lineata	white-lined sphinx moth
Syrphidae	**Hover Flies**
Syrphidae sp.	hover fly
Thomisidae	**Crab Spiders**
Misumena vatia	goldenrod crab spider
Tiphiidae	**Tiphiid Wasps**
Paratiphia sp.	Tiphiid wasp
Vespidae	**Yellowjackets, Hornets, and Paper Wasps**
Euodynerus sp.	potter wasp
Pterocheilus pimorum	potter wasp

APPENDIX G

Desert Tortoise Survey Report for the Soda Mountain Solar Project

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TECHNICAL MEMORANDUM

To: Soda Mountain Solar, LLC

From: Shirley Innecken, Lead Natural Resources Project Manager

Date: January 10, 2025

Re: **Revised Desert Tortoise Survey Report for the Soda Mountain Solar Project / SWCA Project No. 68347**

INTRODUCTION

This report describes the Mojave desert tortoise (*Gopherus agassizii*) survey conducted by SWCA Environmental Consultants (SWCA) for the Soda Mountain Solar Project (project). The project is located along Interstate 15 approximately 50 miles northeast of Barstow, San Bernardino County, California (Figure 1). Soda Mountain Solar, LLC plans to develop a utility-scale photovoltaic (PV) solar facility on approximately 2,670 acres of land managed by the Bureau of Land Management (BLM) (Figure 2). The project site is situated in an alluvial valley between the northern and southern portions of the Soda Mountains in the Mojave Desert.

SWCA developed the biological survey methods in coordination with California Department of Fish and Wildlife (CDFW) and prepared a biological and aquatic resources work plan. The purpose of this survey was to document tortoises and signs such as carcasses, burrows, and scat within the project site and along each gen-tie option. The survey was conducted according to the guidance in the U.S. Fish and Wildlife Service (USFWS) protocol during the April and May spring survey period (USFWS 2019). In addition to desert tortoise, other special-status species were incidentally recorded as they were encountered.

Species Background

Mojave desert tortoise is listed as threatened pursuant to the federal Endangered Species Act and threatened under the California Endangered Species Act, and is a candidate for endangered under the California Endangered Species Act. This population includes all tortoises north and west of the Colorado River in Arizona, Utah, Nevada, and California. Desert tortoise are impacted by ongoing threats, including loss, degradation, fragmentation of habitat, increased risks of wildfire, disease, road mortality, and predation of their eggs and hatchlings (USFWS 2019).

Desert tortoise spend much of their lives underground in burrows. Tortoises typically emerge from wintering burrows in early spring and remain active until fall. During hot summer weather, they spend significant periods inactive underground, during which they are able to reduce metabolism and water loss and consume very little food.

Figure 1. Soda Mountain Solar Project vicinity map.

Previous Desert Tortoise Surveys

The project site was previously surveyed for Mojave desert tortoise in 2009 and 2012. The 2013 biological resources technical report for the project identified suitable desert tortoise habitat, burrows, carcasses, and scat (Panorama Environmental, Inc. 2013). No desert tortoise individuals were found within the project boundary in either survey.

METHODS

For this report, the study area included the 2,634-acre proposed project site and the proposed gen-tie route (approximately 35.75 acres) (Figure 2). SWCA biologists Gigi Wagnon, Bridget Manjarrez, Lauren Strong, Amy Parlette, Minerva Lara, Alex Jamal, Chennie Castannon, Tamara Kramer, and Danielle Parsons conducted desert tortoise surveys in teams of two to four during a 4-week period from April 5 through May 4, 2023. Aardvark Biological Services LLC biologists Chip Cochran, Jeremy Wright, Youssef Attallah, Alexandria Hamilton, Marty Lewis, Matt Martin, Ben Delancey, Miguel Moutsis, Thomas Nhu, Dalton Stanfield, Sarah Mendez, Karyn Seruka, and Gary Thorunbrugh conducted desert tortoise surveys in teams of four from May 24 through May 29, 2023. The survey was conducted in accordance with the 2017 USFWS survey protocol (USFWS 2019). Conditions were ideal for the detection of live tortoises, with temperatures reaching no more than 94 degrees Fahrenheit on any given day. Table 1 summarizes the conditions throughout the survey period.

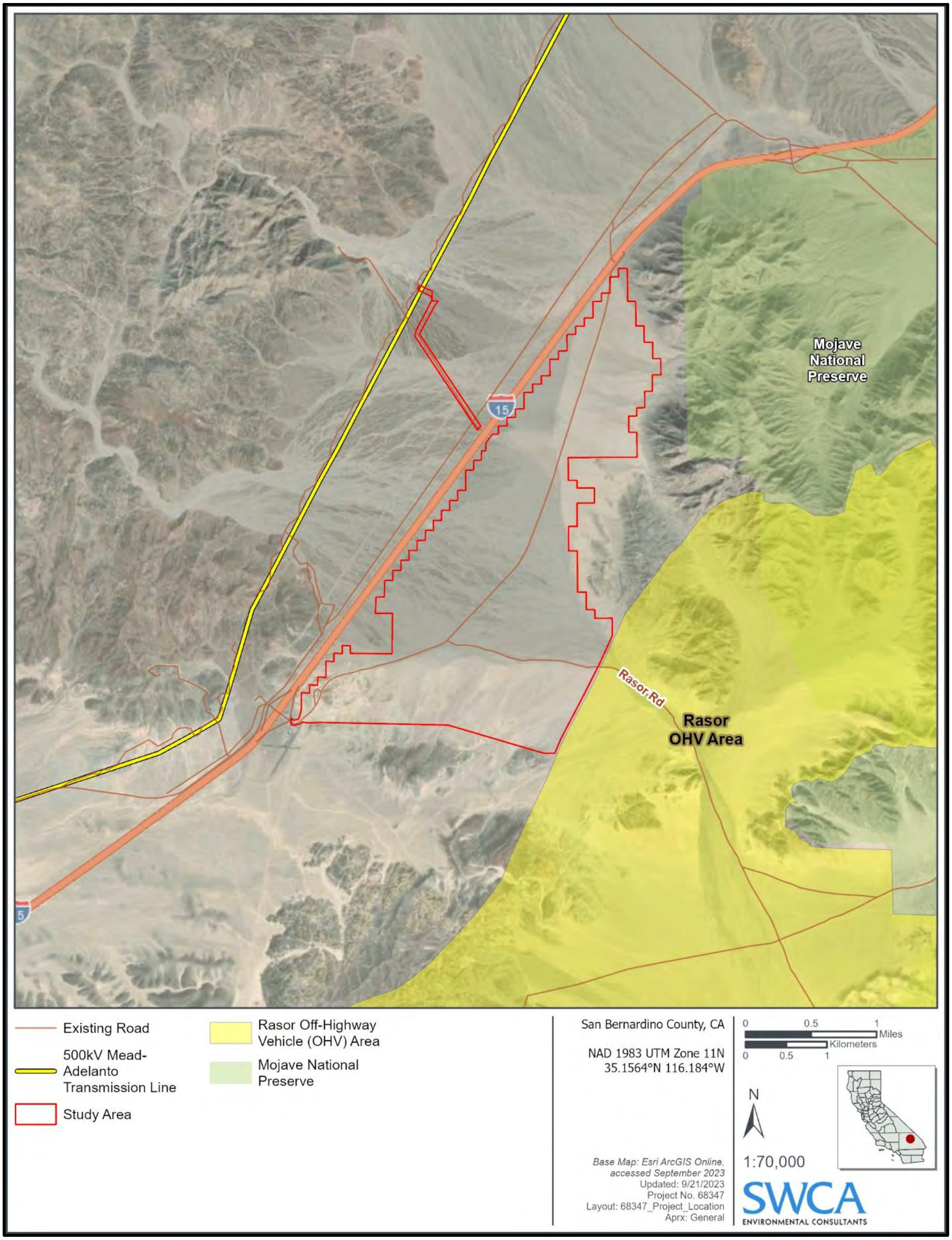

Figure 2. Soda Mountain Solar Project study area.

Table 1. Survey Times and Weather Conditions

Date	Start Time	End Time	Temperature (°F)	Wind Speed (mph)	Conditions
4/5	07:15	16:25	47–65	1–2	Sunny
4/6	07:15	14:45	47–70	2–3	Sunny
4/7	07:15	13:00	52–71	2	Cloudy
4/10	06:30	14:30	61–90	0–5	Sunny
4/11	06:45	14:30	60–91	2–6	Sunny
4/12	06:15	14:30	63–87	4–6	Cloudy
4/13	07:00	15:00	57–84	2–9	Cloudy
4/14	06:15	14:00	58–77	2	Sunny
4/15	07:15	15:00	67–94	1–4	Sunny
4/17	07:15	13:30	63 -90	2–10	Sunny
4/18	07:00	15:30	58–81	6–9	Cloudy
4/19	06:30	14:30	55–74	2–4	Sunny
4/20	06:30	14:30	58–93	1–4	Cloudy
4/21	06:30	14:30	60–83	3–5	Sunny
4/22	07:00	14:30	60–81	5–7	Cloudy
5/1	06:30	14:30	64–85	0–15	Sunny
5/2	06:30	14:30	54–74	0–7	Cloudy
5/4	06:30	12:00	57–61	5–12	Cloudy
5/24	05:45	12:00	68–93	0–7	Cloudy
5/25	05:50	12:30	69–92	0–5	Cloudy
5/26	06:00	12:00	67–90	0–5	Cloudy
5/27	06:00	12:00	70–93	0–5	Cloudy
5/28	06:00	12:00	71–93	0–5	Sunny
5/29	06:00	12:00	73–92	0–5	Sunny

The biologists walked 10-meter (m)-wide belt transects throughout the entire study area. In addition to the study area, the biologists also surveyed the proposed gen-tie routes by walking transects spaced 10 m apart on each side of the route.

During the survey, biologists searched for live tortoises and signs of tortoise presence. Signs include scat, carcasses, burrows, drinking depressions, courtship rings, tracks, herbivory, or eggshell fragments. When tortoise sign was found, the biologists determined the approximate age based on the condition of the sign.

Tortoise burrows were identified by the distinctive half-moon shape of the entrance and the walls of the tunnel. When a potential tortoise burrow was encountered, a mirror or bright flashlight was used to view the interior of the burrow. Each burrow was assigned a condition class as described in the USFWS *Desert Tortoise (Mojave Population) Field Manual* (USFWS 2009). The condition classifications are as follows:

- Class 1: currently active, with desert tortoise or recent desert tortoise sign
- Class 2: good condition, definitely desert tortoise; no evidence of recent use
- Class 3: deteriorated condition which includes collapsed burrows; definitely desert tortoise

- Class 4: good condition; possibly desert tortoise
- Class 5: deteriorated condition that includes collapsed burrows; possibly desert tortoise

In addition to burrows excavated by desert tortoise, tortoises are also known to seek shelter under shrubs, within caliche caves, and within burrows excavated by other species. Each non-tortoise burrow or den was classified based on the shape of the entrance, size, and presence of sign, such as scat, claw mark scrapes, owl pellets, whitewash, or prey remains. The biologists also recorded the occupancy status of each burrow or den. The presence of extensive spiderwebs, debris, or partial collapse was taken to indicate that the burrow/den was likely unoccupied. All burrow and den locations were recorded using a GPS unit with submeter accuracy. Lastly, biologists documented the faunal diversity observed within the study area.

RESULTS

Desert Tortoise

No live tortoises or carcasses were found during the survey. While not all tortoises are expected to be visible at any given time, daily surveys coincided with the highest likelihood of live, aboveground observations both seasonally and thermally. Additionally, open burrows were visually searched and did not yield any live tortoises or carcasses.

Fresh scat (less than 1 day old) from a subadult was found within the northeast corner of the study area (Figure 3, Photograph G-1). The scat was classified as recent due to the retention of dark coloration, intact state, and retention of moisture. The scat was not in the vicinity of any suitable desert tortoise burrows and was exposed to the typical desert elements. An additional scat (less than 1 month old) from a juvenile was found in the northwestern portion of the study area 900 m (0.5 mile) west of the fresh scat and within 250 m south of multiple Class 4 burrows (Photograph G-2; see Figure 3). This scat retained dark coloration and was intact but lacked moisture.

Across the entire study area, 182 burrows were identified as potential tortoise burrows, meaning that they had been originally excavated by desert tortoise, whether or not they were currently suitable for occupancy (see Figure 3). All burrows were identified as Classes 2–5 (Photographs G-3–G-6), and no burrows were classified as Class 1. The eastern and northeastern portions of the project contained the highest concentration of burrows, likely due to less rocky substrate in the landscape. The entire study area excluding the gen-tie and the western area was identified as suitable habitat. No other tortoise signs, such as carcasses, pallets, tracks, drinking depressions, courtship rings, or signs of ephemeral plant herbivory, were observed on-site.

The majority of the gen-tie route was found to be unsuitable habitat for desert tortoise due to extensive rocky outcrops. However, two burrows (Class 4 and Class 5) were identified but collapsed.

Weather and Habitat Conditions

Conditions during the survey were good for detecting desert tortoise, with appropriate temperatures and conditions (see Table 1). Based on the 4.1 inches (104 mm) of rainfall recorded in Barstow from October 2022 through July 2023 (National Oceanic and Atmospheric Administration 2023), desert tortoise would have been highly likely to be visible aboveground. USFWS estimates that in years with rainfall exceeding 1.5 inches (40 mm), the probability of desert tortoise being visible is approximately 85%, and the probability of detecting a tortoise if it is visible is approximately 63% (USFWS 2019).

Vegetation communities were mapped in the study area by SWCA biologists in spring 2023, which identified plant communities characteristic of desert tortoise habitat. A diverse array of annual and perennial food plants for desert tortoise were recorded in the study area during the vegetation mapping survey. The conditions during this survey were optimal for detecting annual plants given above average rainfall accompanied by below normal temperatures the previous winter and spring, causing the proliferation in annual wildflower species in the Mojave Desert. Observed forage plants in the study area included red brome (*Bromus madritensis* ssp. *rubens*), Booth's desert primrose (*Eremothera boothii* ssp. *desertorum*), sand blazing star (*Mentzelia involucrata*), Sonoran sandmat (*Euphorbia micromera*), purple desert lupine (*Lupinus shockleyi*), snake's-head (*Malacothrix coulteri*), wire lettuce (*Stephanomeria* spp.), Fremont pincushion (*Chaenactis fremontii*), white stemmed blazing star (*Mentzelia albicaulis*), and devil's lettuce (*Amsinckia tessellata*).

Evidence of anthropogenic disturbance such as off-road vehicle use is present throughout the study area (Photograph G-7). Other evidence of disturbance includes trash from illegal dumping and bullet casings. During the survey, the biologists observed several trucks, dirt bikes, and all-terrain vehicles being driven off-road within or near the study area at the Rasor OHV recreation area. The major highway (Interstate 15) passes directly through the project location, reducing connectivity and exacerbating fragmentation of desert habitat.

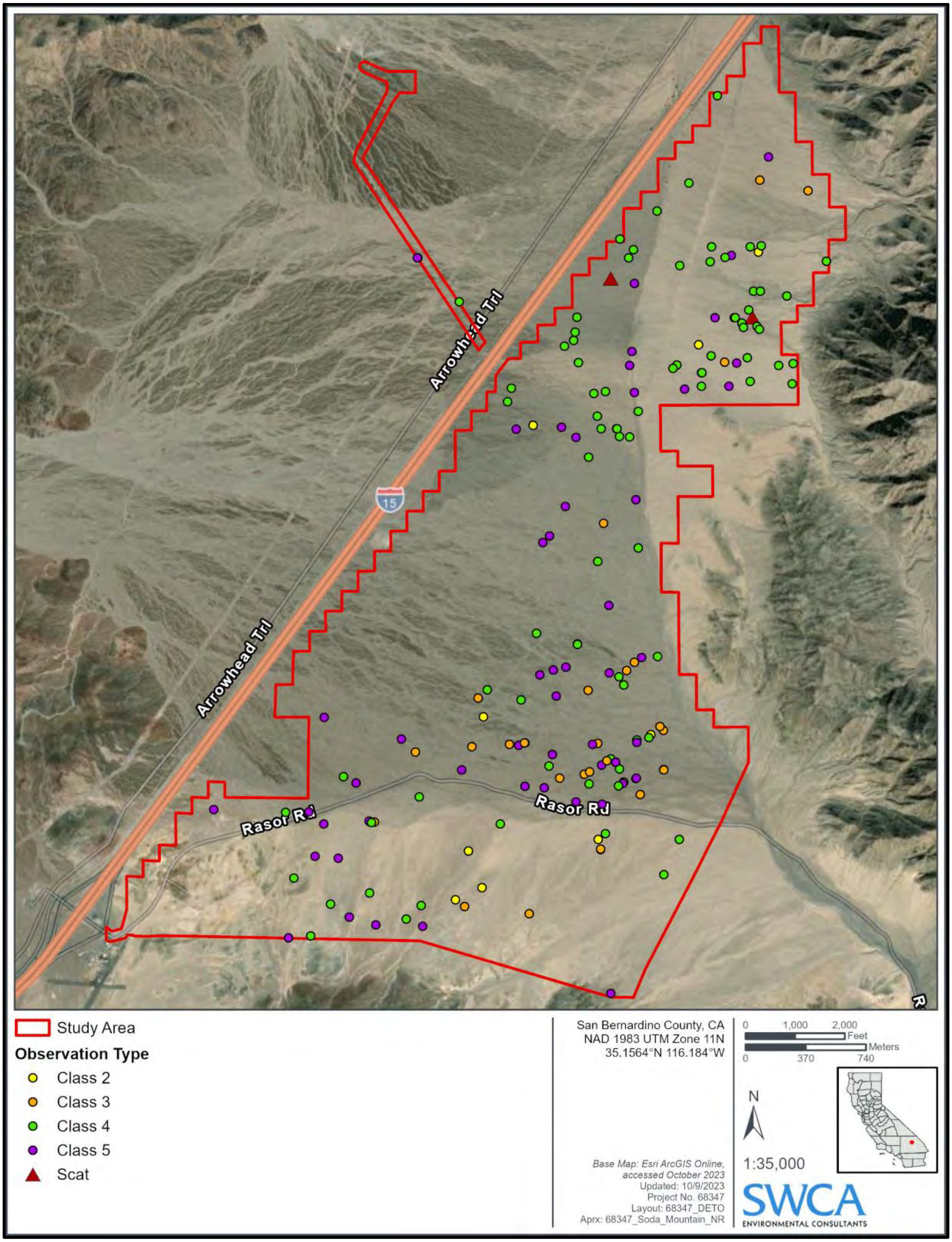

Figure 3. Desert tortoise burrows and scat in the study area.

Other Wildlife Observations

In a separate survey for burrowing owl (*Athene cunicularia*), desert kit fox (*Vulpes macrotis arsipus*), and American badger (*Taxidea taxus*), an additional 145 burrows were documented in the study area and determined to be non-tortoise. The results of this survey are reported in *Burrowing Owl, Desert Kit Fox, and American Badger Survey Results for the Soda Mountain Solar Project* (SWCA 2023). These burrows were determined to be non-tortoise due to distinctive markings, shape, and scat of other burrowing wildlife. In addition, burrows observed during the burrowing owl, kit fox, and American badger surveys were not included in the desert tortoise data (see Figure 3) because the surveys were conducted at different times and separate biological teams. Some burrows may overlap between the two surveys. Each survey focused on species-specific habitat assessments using slightly different methods (i.e. 10 m transects for desert tortoise vs. 20 m transects for burrowing owl, etc.). However, it is important to note that desert tortoise can use burrows made by burrowing owl, kit fox, and American badger, and the large number of burrows observed in the survey for these species are a consideration when assessing the potential for desert tortoise in the project area.

Loggerhead shrike (*Lanius ludovicianus*) was detected on-site and is listed as a CDFW species of special concern. Other wildlife species most commonly observed on-site included common raven (*Corvus corax*), desert horned lizard (*Phrynosoma platyrhinos*), desert iguana (*Dipsosaurus dorsalis*), and feral dogs (*Canis lupus familiaris*). Common ravens and feral dogs are known predators of the desert tortoise.

DISCUSSION

During the survey no live tortoises were found, although scat and unoccupied burrows were observed. Other special status species such as burrowing owl, desert kit fox, and loggerhead shrike were confirmed to be present in the study area.

Based on the 2019 USFWS survey protocol, desert tortoise is considered present at the site based on observations of sign, and scat was detected on-site. All tortoise burrows showed no recent sign of use, and some were collapsed. No other tortoise sign, such as carcasses, pallets, tracks, drinking depressions, courtship rings, or signs of ephemeral plant herbivory, was observed on-site. Desert tortoise is considered present at the study area due to the observations of scat and Class 2 and 3 burrows. However, no desert tortoise individuals or other signs were directly observed, and the desert tortoise population within and near the project is likely very low.

Typical desert tortoise habitat consists of alluvial fans and colluvial/bedrock slopes with vegetation communities consisting of creosote bush (*Larrea tridentata*), Joshua tree (*Yucca brevifolia*), and/or saltbush (*Atriplex* spp.) along with a high diversity of food plants such as perennial grasses, woody perennials, cacti, and native annual flowers such as desert sunflower (*Geraea canescens*) and desert dandelion (*Malacothrix glabrata*). Desert tortoise also forage on non-native plant species such as red brome (*Bromus madritensis* ssp. *rubens*) and red-stem filaree (*Erodium cicutarium*), which provide low nutritional value (Avery 1995). While some of the study area is composed of suitable vegetation communities, disturbances and anthropogenic effects in the study area have reduced habitat quality for desert tortoise.

LITERATURE CITED

Avery, H.W. 1995. *Digestive Performance of the Desert Tortoise (*Gopherus agassizii*) Fed Native and Non-native Desert Vegetation*. Report submitted to California Department of Parks and Recreation. National Biological Service, Riverside, California.

National Oceanic and Atmospheric Administration. 2023. California Nevada River Forecast Center. Available at: https://www.cnrfc.noaa.gov/monthly_precip.php. Accessed: July 2023.

Panorama Environmental, Inc. 2013. *Biological Resources Technical Report Soda Mountain Solar*. San Bernardino County, California. BLM Case Number CACA 49584.

SWCA Environmental Consultants. 2023. Burrowing Owl, Desert Kit Fox, and American Badger Survey Results for the Soda Mountain Solar Project. Pasadena, California: SWCA Environmental Consultants.

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

———. 2019. Preparing for any action that may occur within the range of the Mojave desert tortoise (*Gopherus agassizii*). Available: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=174633&inline. Accessed June 2023.

ATTACHMENT A

Site Photographs

Photograph G-1. Less than 1-day-old scat from a subadult desert tortoise. Photographed April 4, 2023.

Photograph G-2. Less than 1-month-old scat from a juvenile desert tortoise. Photographed May 11, 2023.

Photograph G-3. An example of a Class 2 desert tortoise burrow. Photographed April 7, 2023.

Photograph G-4. An example of a Class 3 desert tortoise burrow. Photographed March 27, 2023.

Photograph G-5. An example of a Class 4 desert tortoise burrow. Photographed March 27, 2023.

Photograph G-6. An example of a Class 5 desert tortoise burrow. Photographed March 28, 2023.

Photograph G-7. An example of off-road vehicle use in the study area. Photographed June 16, 2023.

APPENDIX H

Mojave Fringe-Toed Lizard Survey Report for the Soda Mountain Solar Project

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TECHNICAL MEMORANDUM

To: Soda Mountain Solar, LLC

From: Shirley Innecken, Lead Natural Resources Project Manager

Date: June 14, 2024

Re: **Mojave Fringe-Toed Lizard Survey Report for the Soda Mountain Solar Project / SWCA Project No. 68347**

INTRODUCTION

This report summarizes the results of the 2023 Mojave fringe-toed lizard (*Uma scoparia*) survey conducted by SWCA Environmental Consultants (SWCA) for the Soda Mountain Solar Project (project). The project is located along Interstate 15 approximately 50 miles northeast of Barstow, San Bernardino County, California (Figure 1). Soda Mountain Solar, LLC plans to develop a utility-scale photovoltaic (PV) solar facility on approximately 2,670 acres of land managed by the Bureau of Land Management (BLM) (Figure 2). The project site is situated in an alluvial valley between the northern and southern portions of the Soda Mountains in the Mojave Desert.

SWCA developed the biological survey methods in coordination with California Department of Fish and Wildlife (CDFW) and prepared a biological and aquatic resources work plan. The Mojave fringe-toed lizard is listed as a Species of Special Concern by the California Department of Fish and Wildlife (CDFW) and as sensitive by the BLM. This report presents information about the species' life history and range, describes habitat at the project site, provides survey methodology, and provides a brief assessment of the species' potential to occur within the project site.

Species Background

The Mojave fringe-toed lizard is restricted to habitats with loose windblown sand, particularly aeolian sand deposits, and the immediate surroundings (Norris 1958; USFWS 2011). Dunes, dry washes, hillsides, dry lake edges, and sandy hummocks may contain suitable windblown sands (BLM 2015). Captures of individuals more than 150 feet from this environment have not been documented (USFWS 2011). The species has several physical adaptations for loose sand, including a fringe of scales on the toes that provides traction, double eyelids, and smooth granular scales. When threatened, the Mojave fringe-toed lizard usually takes shelter under the sand and can move under the surface in a swimming motion (California Wildlife Habitat Relationships System Staff 2000). The species is most active during the warmer seasons and typically hibernates between November and February (Norris 1958; U.S. Fish and Wildlife Service [USFWS] 2011). When not active, the species takes refuge in burrows or under the sand.

Figure 1. Soda Mountain Solar Project vicinity map.

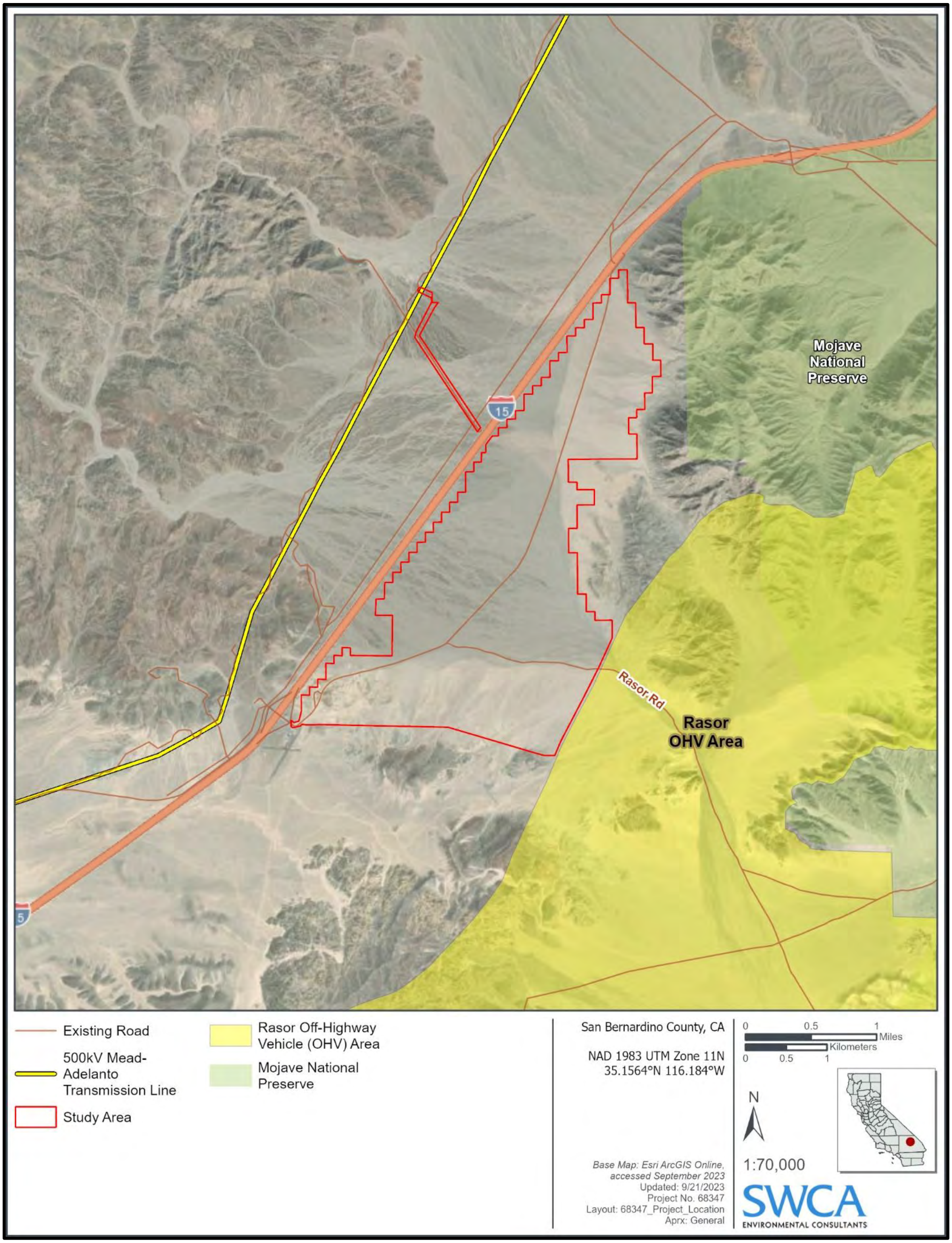

Figure 2. Soda Mountain Solar Project study area.

Species Range

Historically, the species' range spanned parts of northern Los Angeles County, San Bernardino County, southern Inyo County, and eastern Riverside County (BLM 2015; CDFW 2014). The dune complexes where the species is found are associated with three main river complexes: the Amargosa, Mojave, and Colorado Rivers. Several populations of Mojave fringe-toed lizard have been documented as extirpated within the western part of its range (Murphy et al. 2006). Based on studies by the USFWS (2011) of extant Mojave fringe-toed lizard populations, the project site is in close proximity to the defined Crucero-Rasor population (Figure 3).

Threats

Natural predators of Mojave fringe-toed lizard include larger lizards, snakes, greater roadrunner (*Geococcyx californianus*), burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus*), hawks, American badger (*Taxidea taxus*), and coyote (*Canis latrans*) (Jones and Lovich 2009). Off-highway vehicle (OHV) activity may kill lizards directly and degrade the dune habitat; designated OHV recreation areas overlaps with three significant historic populations of Mojave fringe-toed lizard: El Mirage Dry Lake, Dumont Dunes, and Rasor Road (labeled as Dumont Dunes and Crucero-Rasor on Figure 3). Habitat loss and disruption of natural windblown sand movement may also be a threat. Population declines for the closely related Coachella fringe-toed lizard (*Uma inornata*) are primarily attributed to habitat loss due to urban development and disruption of sand movement caused by associated roads and windbreaks (Beatley 1994; Weaver 1981). Establishment of nonnative plants and the loss of native perennial plants may affect the lizards' insect food sources, shelter, and dune dynamics in ways that are not well understood.

Previous Mojave Fringe-Toed Lizard Surveys

The project site was previously surveyed for Mojave fringe-toed lizard in 2009 and 2012. The 2013 biological resources technical report for the project identified approximately 5.82 acres of suitable habitat overlapping the southeastern portions of the previously proposed project boundary (Panorama Environmental, Inc. 2013). No Mojave fringe-toed lizards were found within the project boundary in either survey, but a total of 26 lizards were documented. The closest observation was approximately 1,000 feet from the southwest of the project boundary.

FIELD SURVEY METHODS

For this report, the study area included the 2,634-acre proposed project site and the proposed gen-tie route (approximately 35.75 acres) (Figure 2). The surveys focused on the southeastern areas of the study area closest to known populations and the wash outside of the study area where a population of Mojave fringe-toed lizards are documented. SWCA biologists Danny Cuellar and Par Singhaseni conducted focused field surveys for Mojave fringe-toed lizard on April 26 and July 11, 2023. The biologists walked 10-meter transects throughout areas with suitable habitat. Binoculars were used to observe lizards at a distance to confirm the species. Mojave fringe-toed lizard observations were recorded using a global positioning system (GPS) unit. The surveys were conducted during the active season for Mojave fringe-toed lizard, which is generally March – October. Conditions during the survey were ideal for the detection of lizards. Weather conditions are summarized in Table 1.

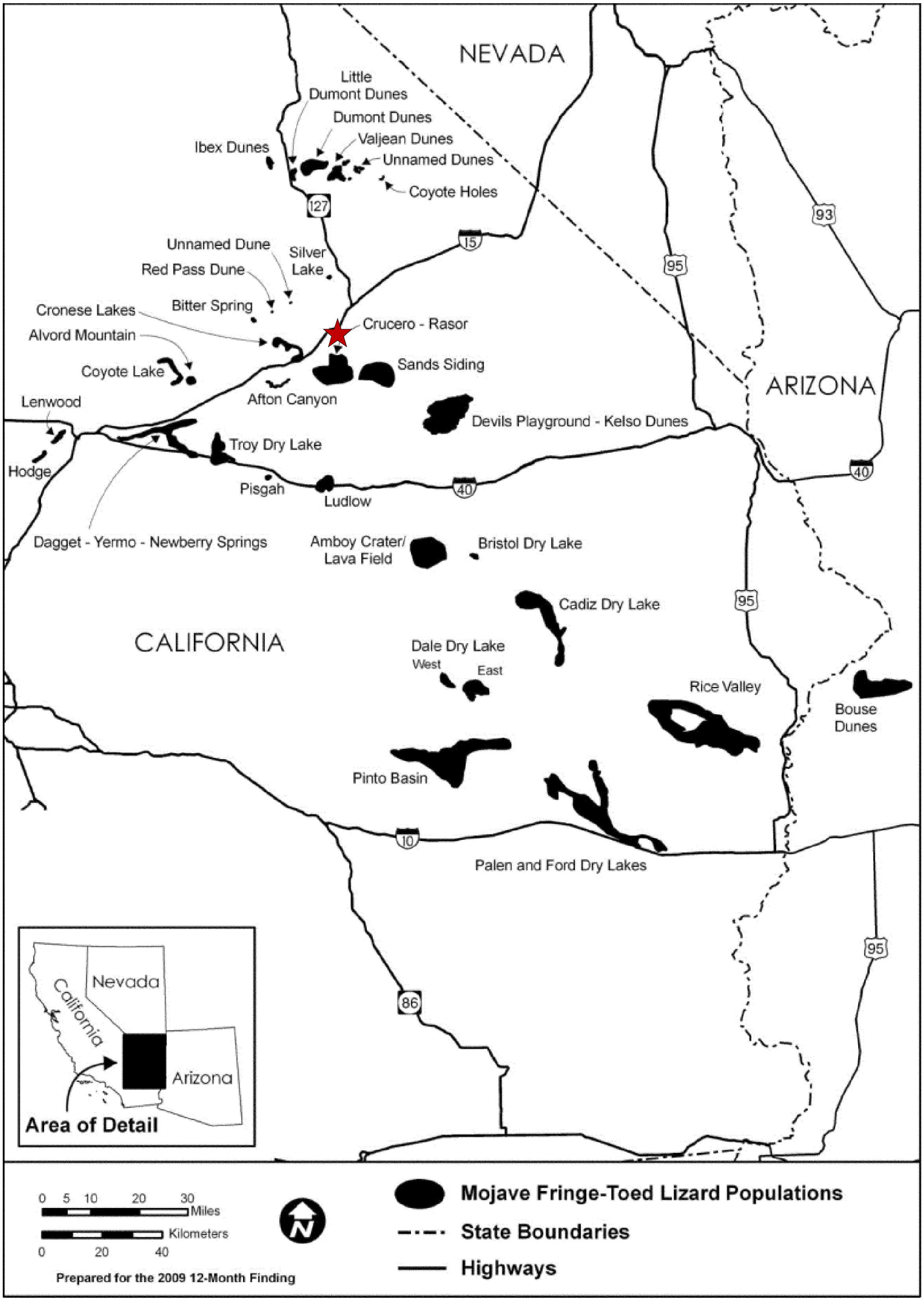

Figure 3. Mojave Fringe-toed Lizard populations (from U.S. Fish and Wildlife Service, 2011). The red star indicates the approximate project location.

Table 1. Weather Conditions and Survey Times

Date	Start Time	End Time	Temperature (°F)	Wind Speed (mph)	Conditions
4/26	08:00	11:00	75-91	0-2	Sunny
7/11	07:30	10:45	89-100	2-6	Sunny

RESULTS

A total of five Mojave fringe-toed lizards were observed during the surveys, two during the April survey and three during the July survey, within the sandy wash outside of the southern portion of the study area, the nearest observation approximately 1,000 feet south of the study area. (Figures 4 and 5; Photographs A-1 and A-2 in Attachment A). This result was similar to the findings of the 2009 and 2012 surveys. The lizards were found when temperatures ranged between 82.9 to 96.4 degrees Fahrenheit. Other common wildlife species observed during the surveys included western zebra-tailed lizard (*Callisaurus draconoides rhodostictus*), desert horned lizard (*Phrynosoma platyrhinos*), Great Basin whiptail (*Aspidoscelis tigris tigris*), sidewinder (*Crotalus cerastes*), and common raven (*Corvus corax*).

Vegetation within the southeastern portion of the study area and within the sandy wash outside of the study area consisted primarily of creosote bush (*Larrea tridentata*). During the April survey, several blooming annual plant species were also found within the wash, including desert lily (*Hesperocallis undulata*), desert sand verbena (*Abronia villosa* var. *villosa*), desert calico (*Loeseliastrum matthewsii*), freckled milk-vetch (*Astragalus lentiginosus*), and dune primrose (*Oenothera deltoides*) (Photograph A-3). Several of these species were found only in sand dunes outside the study area and were not found within the study area during the rare plant survey conducted in April 2023. Invasive Mediterranean grass (*Schismus* sp.) was also prevalent within the study area. During the July survey, conditions were hot and dry and only the perennial vegetation remained (Photograph A-4).

DISCUSSION

Habitat suitability was evaluated based on aerial imagery, data collected from other focused surveys for the project, and the 2013 biological resources technical report. Suitable habitat for Mojave fringe-toed lizard occurs within the southeast portion of the study area (see Figure 4), however was not identified until after the surveys concluded therefore was not surveyed. The 5.82 acres of previously mapped suitable habitat overlapping the previous project boundary (identified in the 2013 biological resources technical report) is no longer within the current study area. The portions of the study area closest to the suitable habitat and observations from the survey, specifically the southeastern boundary, were also not suitable for Mojave fringe-toed lizard as the ground cover primarily consisted of gravel (Photographs A-5 and A-6).

The biologists mapped the limits of suitable habitat within the wash to approximately 750 feet south-southwest of the study area. In this location, the soils within the wash begin to transition from sand to gravel (Photographs A-7–A-9). The section of the wash that extends further north toward Rasor Road was entirely gravel and would not be suitable for Mojave fringe-toed lizard. Finally, the southern portion of the wash had notable OHV disturbance, which may be detrimental to the species.

The population of Mojave fringe-toed lizard south of the study area appears to be relatively isolated. The wash could potentially provide connectivity to a second known population further south; however, the flow is disrupted by Rasor Road, and windblown sand deposits are limited to the southern areas of the wash. The Mojave fringe-toed lizard is considered absent within the study area and would not be impacted by the project.

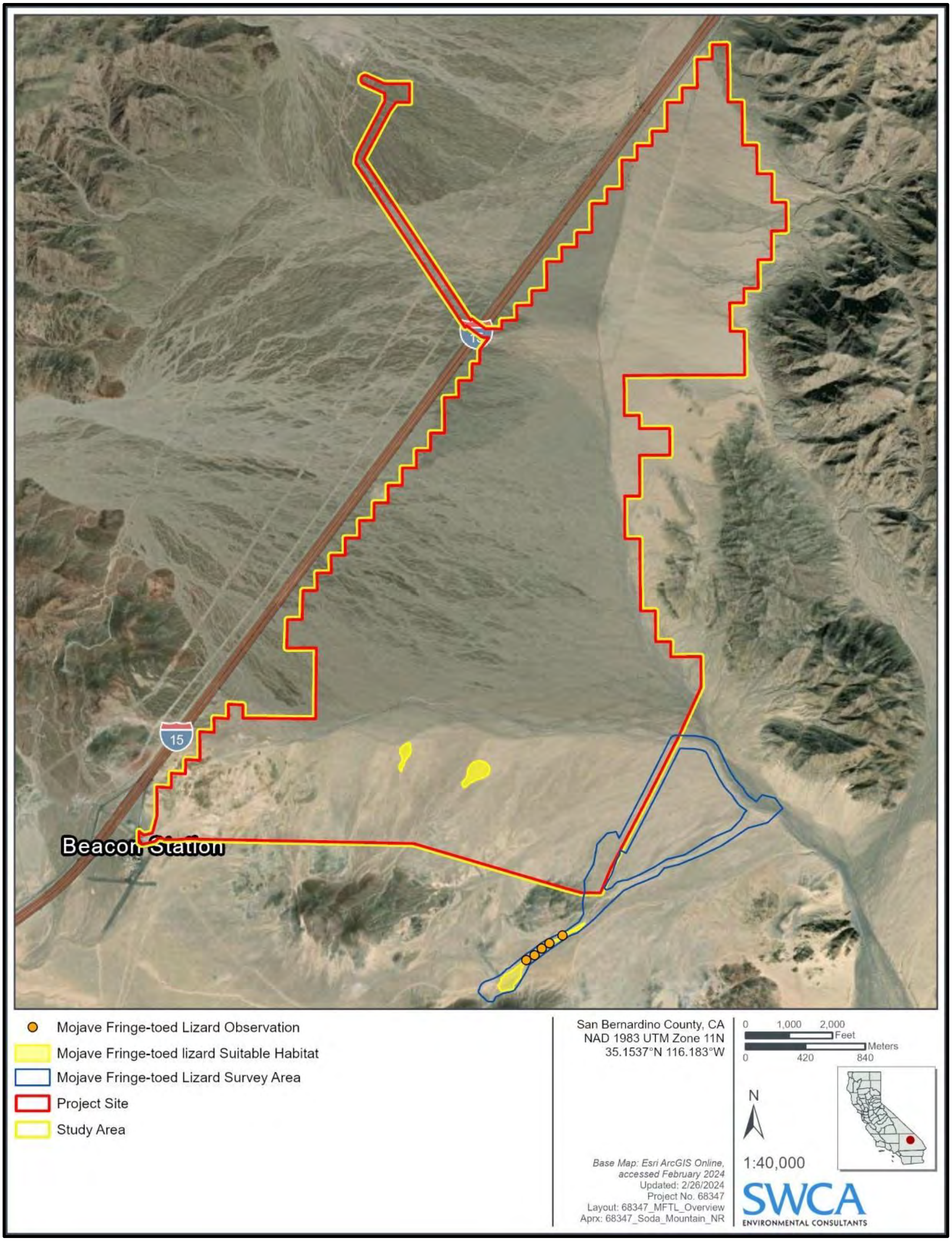

Figure 4. Mojave fringe-toed lizard suitable habitat and live observations.

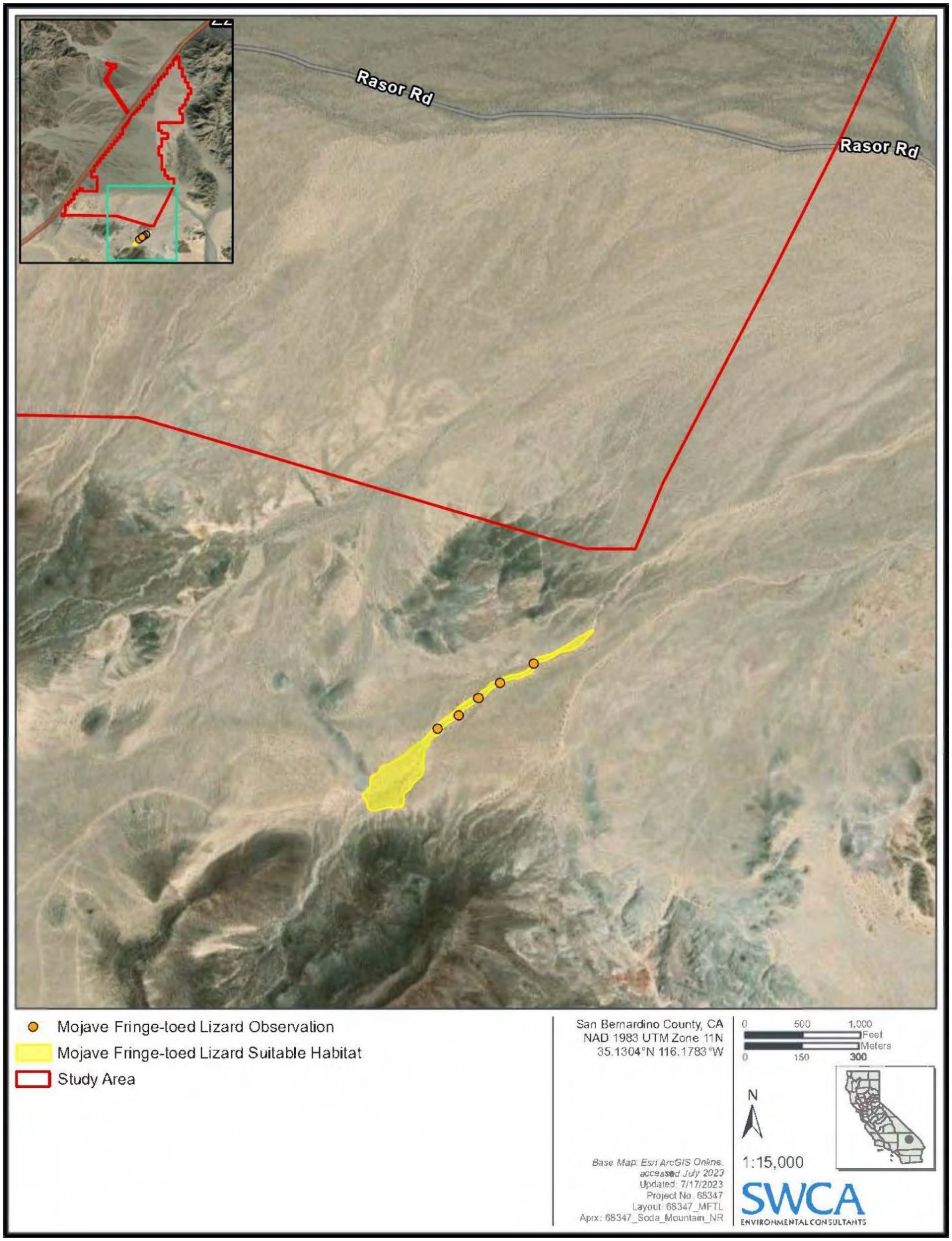

Figure 5. Focused view of Mojave fringe-toed lizard suitable habitat and live observations.

LITERATURE CITED

Beatley, T. 1994. Habitat Conservation Planning: Endangered Species and Urban Growth. Austin, Texas: University of Texas Press.

Bureau of Land Management (BLM). 2015. Desert Renewable Energy Conservation Plan Land Use Plan Amendment and Final Environmental Impact Statement, Appendix Q, Baseline Biology Report. U.S. Bureau of Land Management in partnership with U.S. Fish and Wildlife Service, California Energy Commission, California Department of Fish and Wildlife.

California Department of Fish and Wildlife (CDFW). 2014. Mojave Fringe-toed Lizard Range Map. California Department of Fish and Wildlife, California Interagency Wildlife Task Group. Available at: https://www.wildlife.ca.gov/Data/CWHR/Life-History-and-Range. Accessed: July 2023.

California Wildlife Habitat Relationships System Staff. 2000. Mohave Fringe-toed Lizard Life History Account. California Department of Fish and Wildlife, California Interagency Wildlife Task Group. Available at: https://www.wildlife.ca.gov/Data/CWHR/Life-History-and-Range. Accessed July 2023.

Jones, L.C., and R.E. Lovich. 2009. *Lizards of the American Southwest.* Tucson, Arizona.

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

Norris, K.S. 1958. The Evolution and Systematics of the Iguanid Genus Uma and Its Relation to the Evolution of Other North American desert reptiles. *Bulletin of the American Museum of Natural History* 114(3):251–317.

Panorama Environmental, Inc. 2013. Biological Resources Technical Report Soda Mountain Solar. San Bernardino County, CA. BLM Case Number CACA 49584

U.S. Fish and Wildlife Service (USFWS). 2011. Notice of 12-month petition finding: Endangered and Threatened Wildlife and Plants: 12-Month Finding on a Petition to List the Amargosa River Population of the Mojave Fringe-Toed Lizard as an Endangered or Threatened Distinct Population Segment. *Federal Register* 76(192): 61321–61330.

Weaver, D.C. 1981. Aeolian Sand Transport and Deposit Characteristics at Ten Sites in Coachella Valley, California. Part II in The Effect of Blowsand Reduction on the Abundance of the Fringe-Toed Lizard (*Uma inornata*) in the Coachella Valley, California. Prepared for the U.S. Army Corps of Engineers, Los Angeles District.

ATTACHMENT A

Site Photographs

Photograph A-1. Adult Mojave fringe-toed lizard sheltering under a creosote bush; the individual was observed outside of the study area. Photographed April 26, 2023.

Photograph A-2. Mojave fringe-toed lizard tracks found within the sandy wash approximately 1,000 feet outside of the study area. Photographed April 26, 2023.

Photograph A-3. Habitat conditions during the spring survey in the southern area of the wash; view facing west. Photographed April 26, 2023.

Photograph A-4. Habitat conditions in the southern area of the wash during the summer survey; view facing north. Photographed July 11, 2023.

Photograph A-5. View of the southeastern boundary of the study area, facing west. This habitat is not suitable for Mojave fringe-toed lizard. Photographed July 11, 2023.

Photograph A-6. Close-up of the ground cover at the southeastern boundary of the study area; view facing north. This habitat is not suitable for Mojave fringe-toed lizard. Photographed July 11, 2023.

Photograph A-7. Overview of the wash transitioning from windblown sands to gravelly soils, facing northeast. Photographed July 11, 2023.

Photograph A-8. Upstream view of habitat in the wash transitioning from windblown sands to gravelly soils, facing north. Photographed April 26, 2023.

Photograph A-9. Downstream view of the sandy wash where the soils transition from sand to gravel, facing southwest. Photographed April 26, 2023.

Photograph A-10. Close-up of windblown sand habitat in the wash outside of the study area. An individual was found sheltering in the burrow in the foreground. Photographed July 11, 2023.

Photograph A-11. View of Rasor Road at the entrance of the wash, facing southwest. Soils were primarily gravely with minimal windblown sands. Photographed July 24, 2023.

APPENDIX I

Winter Avian Use Survey Report for the Soda Mountain Solar Project

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TECHNICAL MEMORANDUM

To: Soda Mountain Solar, LLC

From: Shirley Innecken, Lead Natural Resources Project Manager

Date: June 14, 2024

Re: **Winter Avian Use Survey Report for the Soda Mountain Solar Project / SWCA Project No. 68347**

INTRODUCTION

This report describes the winter avian use survey conducted by SWCA Environmental Consultants (SWCA) for the Soda Mountain Solar Project (project). The project is located along Interstate 15 approximately 50 miles northeast of Barstow, San Bernardino County, California (Figure 1). Soda Mountain Solar, LLC plans to develop a utility-scale photovoltaic (PV) solar facility on approximately 2,670 acres of land managed by the Bureau of Land Management (BLM) (Figure 2). The project site is situated in an alluvial valley between the northern and southern portions of the Soda Mountains in the Mojave Desert.

Avian use surveys provide the species data necessary to determine how implementation of the project could affect use of the project site by resident, seasonal, and migratory birds. Nearly all species of native birds are protected under the federal Migratory Bird Treaty Act and California Fish and Game Code Sections 3503, 3503.5, and 3513. Furthermore, some birds are protected under the federal Endangered Species Act and California Endangered Species Act.

SWCA developed the biological survey methods in coordination with California Department of Fish and Wildlife (CDFW) and prepared a biological and aquatic resources work plan. Avian survey methods included a series of four replicate point counts spread over an entire year. This report summarizes the methods and results of the winter avian use survey conducted in January 2023 by SWCA for the project.

Figure 1. Soda Mountain Solar Project vicinity map.

METHODS

For this report, the study area included 24 avian point-count locations across the 2,634-acre proposed project site excluding the gen-tie (Figure 2). SWCA avian biologist Gigi Wagnon performed the winter avian use survey on January 24, 25, and 26, 2023. G. Wagnon conducted 20-minute unlimited-radius point counts at each point-count location (see Figure 2) during the survey. The survey points were along existing roads; all avian species detected by sight and sound were documented. Each point-count location was monitored for 20 minutes to maximize the chances of detecting uncommon species, such as eagles and other raptors. All point-count locations were recorded using a GPS unit with submeter accuracy. All point-count location habitat types and quality were documented and are described below. The survey was conducted at all times of day to maximize observation potential. The survey was conducted in safe weather conditions with full visibility for each point-count location.

Incidental observations of avian and other wildlife outside the 20-minute formal survey periods were documented to develop a comprehensive species list for the study area and record any observations or patterns of use that may be relevant to the project.

RESULTS

Weather conditions during the survey were mostly sunny and moderate, with temperatures between 34 and 61 degrees Fahrenheit and low wind speeds (Table 1).

Table 1. Survey Times and Weather Conditions

Date	Start Time	End Time	Temperature (degrees Fahrenheit)	Wind Speed (miles per hour)	Conditions
1/24/2023	07:10	14:55	35–60	1	Sunny
1/25/2023	07:10	16:30	34–61	0–4	Sunny
1/26/2023	07:15	14:05	38–60	1–4	Sunny

A total of seven avian species were detected by sight and/or sound within the study area during the winter period: common raven (*Corvus corax*), bushtit (*Psaltriparus minimus*), European starling (*Sturnus vulgaris*), horned lark (*Eremophila alpestris*), house sparrow (*Passer domesticus*), Say's phoebe (*Sayornis saya*), and verdin (*Auriparus flavicep*s). The number of detections for each species can be found in Table 2. There were 60 avian detections total, with most detections occurring within 300 meters of the gas station on Rasor Road (Table 3, Figure 3). No birds were detected at 10 of the point-count locations (see Figure 3).

No special-status avian species were observed in the study area during the survey periods or incidentally. The vegetation at all point-count locations were described as Creosote Bush - White Bursage Scrub (*Larrea tridentata - Ambrosia dumosa* Shrubland Alliance) based on the California Native Plant Society guidelines (California Native Plant Society 2023). The biologist observed several trucks, dirt bikes, and all-terrain vehicles being driven off-road within or near the study area. There were no incidental observations of birds or other wildlife in the study area outside the survey periods.

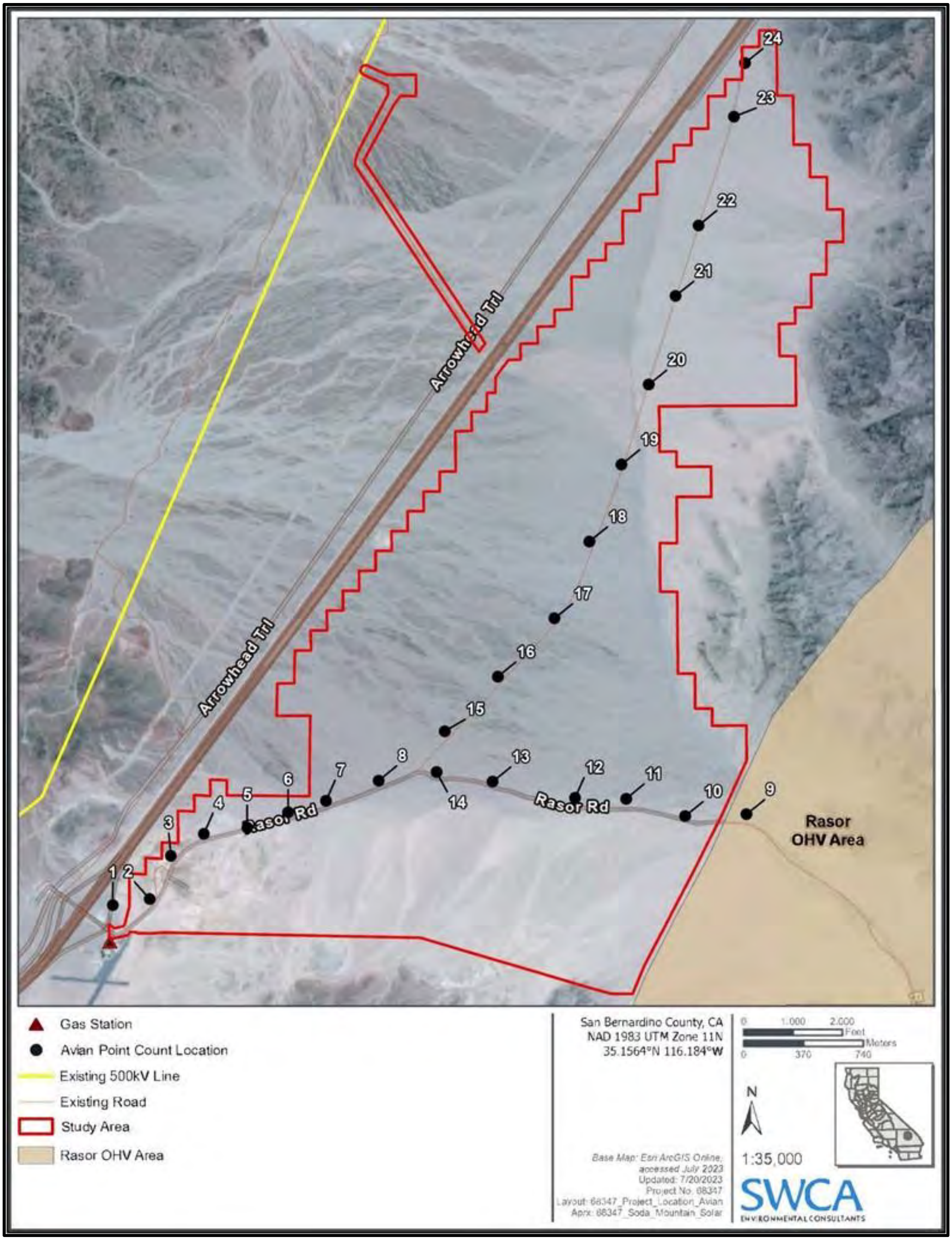

Figure 2. Avian point-count locations.

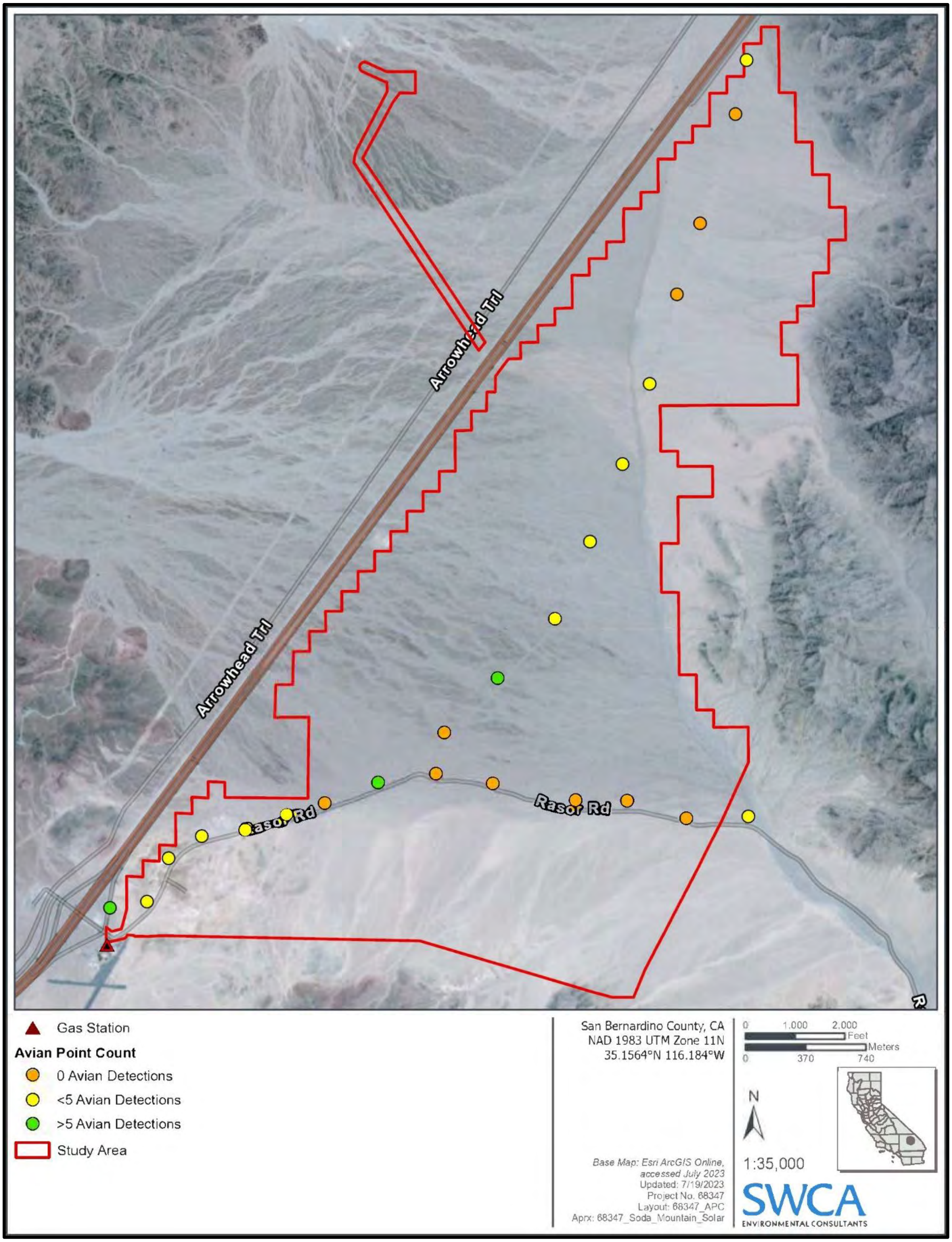

Figure 3. Winter avian use detections in the study area.

Table 2. Winter Avian Use Detections by Species

Species Group	Common Name	Scientific Name	Detections
Corvids	common raven	*Corvus corax*	19
Passerines	bushtit	*Psaltriparus minimus*	9
	European starling	*Sturnus vulgaris**	12
	horned lark	*Eremophila alpestris*	8
	house sparrow	*Passer domesticus**	1
	Say's phoebe	*Sayornis saya*	3
	verdin	*Auriparus flaviceps*	8
Total			**60**

* Nonnative species

Table 3. Winter Avian Use Detections by Point-Count

Point Count Number	Common Name (Scientific Name)	Detections
1	common raven (*Corvus corax*) European starling (*Sturnus vulgaris*)* house sparrow (*Passer domesticus*)* Say's phoebe (*Sayornis saya*)	11 12 1 1
2	common raven Say's phoebe	2 1
3	horned lark (*Eremophila alpestris*)	2
4	horned lark Say's phoebe	1 1
5	horned lark	1
6	horned lark	1
7	not applicable (N/A)	0
8	bushtit (*Psaltriparus minimus*)	9
9	verdin (*Auriparus flaviceps*)	2
10	N/A	0
11	N/A	0
12	N/A	0
13	N/A	0
14	N/A	0
15	N/A	0
16	common raven	5
17	horned lark verdin	3 1
18	verdin	2
19	verdin	1
20	verdin	2
21	N/A	0
22	N/A	0
23	N/A	0
24	common raven	1
Total		**60**

* Nonnative species

DISCUSSION

During the winter non-breeding season, the study area exhibited limited avian activity, with only 60 individuals detected across seven different avian species. Common raven, European starling, and house sparrow were the most frequently observed species in the study area. These species are adapted to human-altered landscapes and are closely associated with human-made structures such as the gas station immediately southwest of the project. European starlings and house sparrows are invasive species that often outcompete native birds for food and other resources due to their adaptability (Lowe 2020). Common ravens are known to be opportunistic and aggressive in their foraging and territorial behaviors, and their populations have increased in the Mojave Desert approximately 1,000% since the 1980s due to human built structures (Davidson 2017). Interstate 15 directly west of the study area is lined with utility poles which serve as suitable breeding sites for ravens. The presence of the common raven, European starling, and house sparrow may have an overall impact on avian species composition in the study area.

The point-count locations were characterized as Creosote Bush - White Bursage Scrub, which provides nesting sites, shelter from predators, and a source of food for birds and other wildlife. Off-road vehicle activity can alter native vegetation and soil composition, creating unsuitable habitat for avian species and other wildlife (U.S. Geological Survey 2020). Interstate 15 directly west of the study area introduces noise pollution that has the potential to negatively affect avian communities and influence their distribution patterns (Senzaki 2020). The combined impacts of these disturbances are likely to adversely affect avian use within the study area.

LITERATURE CITED

California Native Plant Society. 2023. *A Manual of California Vegetation, Online Edition. California Native Plant Society*. Sacramento, CA. Available at: https://vegetation.cnps.org/alliance/223. Accessed June 2023.

Davidson, C. 2017. *Ravens (U.S. National Park Service).* National Parks Service. Available at: https://www.nps.gov/articles/ravens.htm. Accessed May 2023.

Lowe, J. 2020. *Invasive Birds of the U.S.: Seven of the Most Common Species.* American Bird Conservancy. Available at: https://abcbirds.org/blog20/invasive-birds/. Accessed May 2023.

Senzaki, M., Kadoya, T., Clinton F. 2020. *Direct and indirect effects of noise pollution alter biological communities in and near noise-exposed environments*. Proc. R. Soc. B. 287: 20200176. https://doi.org/10.1098/rspb.2020.0176

U.S. Geological Survey. 2020. *Soil Compaction and Erosion.* U.S. Geological Survey. Available at: https://www.usgs.gov/centers/western-geographic-science-center/science/soil-compaction-and-erosion#overview. Accessed May 2023.

APPENDIX J

Spring Avian Use Survey Report for the Soda Mountain Solar Project

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TECHNICAL MEMORANDUM

To: Soda Mountain Solar, LLC

From: Shirley Innecken, Lead Natural Resources Project Manager

Date: June 14, 2024

Re: **Spring Avian Use Survey Report for the Soda Mountain Solar Project / SWCA Project No. 68347**

INTRODUCTION

This report describes the spring avian use survey conducted by SWCA Environmental Consultants (SWCA) for the Soda Mountain Solar Project (project). The project is located along Interstate 15 approximately 50 miles northeast of Barstow, San Bernardino County, California (Figure 1). Soda Mountain Solar, LLC plans to develop a utility-scale photovoltaic (PV) solar facility on approximately 2,670 acres of land managed by the Bureau of Land Management (BLM) (Figure 2). The project site is situated in an alluvial valley between the northern and southern portions of the Soda Mountains in the Mojave Desert.

Avian use surveys provide the species data necessary to determine how implementation of the project could affect use of the project site by resident, seasonal, and migratory birds. Nearly all species of native birds are protected under the federal Migratory Bird Treaty Act and California Fish and Game Code Sections 3503, 3503.5, and 3513. Furthermore, some birds are protected under the federal Endangered Species Act and California Endangered Species Act.

SWCA developed the biological survey methods in coordination with California Department of Fish and Wildlife (CDFW) and prepared a biological and aquatic resources work plan. Avian survey methods included a series of four replicate point counts spread over an entire year. This report summarizes the methods and results of the spring avian use survey conducted in March 2023 by SWCA for the project.

Figure 1. Soda Mountain Solar Project vicinity map.

METHODS

For this report, the study area included 24 avian point-count locations across the 2,634-acre proposed project site excluding the gen-tie (Figure 2). SWCA avian biologists Gigi Wagnon and Bridget Manjarrez performed the spring avian use survey on March 23 and 24, 2023. The biologists conducted 20-minute unlimited-radius point counts at each point-count location (see Figure 2) during the survey. The survey points were along existing roads; all avian species detected by sight and sound were documented. Each point-count location was monitored for 20 minutes to maximize the chances of detecting uncommon species, such as eagles and other raptors. All point-count location habitat types and quality were documented and are described below. The survey was conducted at all times of day to maximize observation potential. The survey was conducted in safe weather conditions with full visibility for each point-count location.

Incidental observations of avian and other wildlife outside the 20-minute formal survey periods were documented to develop a comprehensive species list for the study area and record any observations or patterns of use that may be relevant to the project.

RESULTS

Weather conditions during the survey were mostly sunny and moderate, with temperatures between 45 and 59 degrees Fahrenheit and low wind speeds (Table 2).

Table 2. Survey Times and Weather Conditions

Date	Start Time	End Time	Temperature (degrees Fahrenheit)	Wind Speed (miles per hour)	Conditions
3/23/2023	07:48	15:10	45–59	4–8	Partly cloudy
3/24/2023	07:19	10:50	49–56	3–7	Sunny

A total of 11 avian species were detected by sight and/or sound within the study area during the spring period: common raven (*Corvus corax*), sage thrasher (*Oreoscoptes montanus*), rock wren (*Salpinctes obsoletus*), cactus wren (*Campylorhynchus brunneicapillus*), horned lark (*Eremophila alpestris*), Say's phoebe (*Sayornis saya*), black-throated sparrow (*Amphispiza bilineata*), loggerhead shrike (*Lanius ludovicianus*), house finch (*Haemorhous mexicanus*), dark-eyed junco (*Junco hyemalis*), and verdin (*Auriparus flavicep*s). The number of detections for each species can be found in Table 2. In total, there were 123 bird detections, with most detections occurring in the northern portion of the study area (Table 3, Figure 3).

One CDFW species of special concern was detected in the study area: loggerhead shrike. The vegetation at all point-count locations were described as Creosote Bush - White Bursage Scrub (*Larrea tridentata - Ambrosia dumosa* Shrubland Alliance) based on the California Native Plant Society guidelines (California Native Plant Society 2023). The biologists observed several trucks, dirt bikes, and all-terrain vehicles being driven off-road within the southern portion of the study area. There were no incidental observations of birds or other wildlife in the study area outside the survey periods.

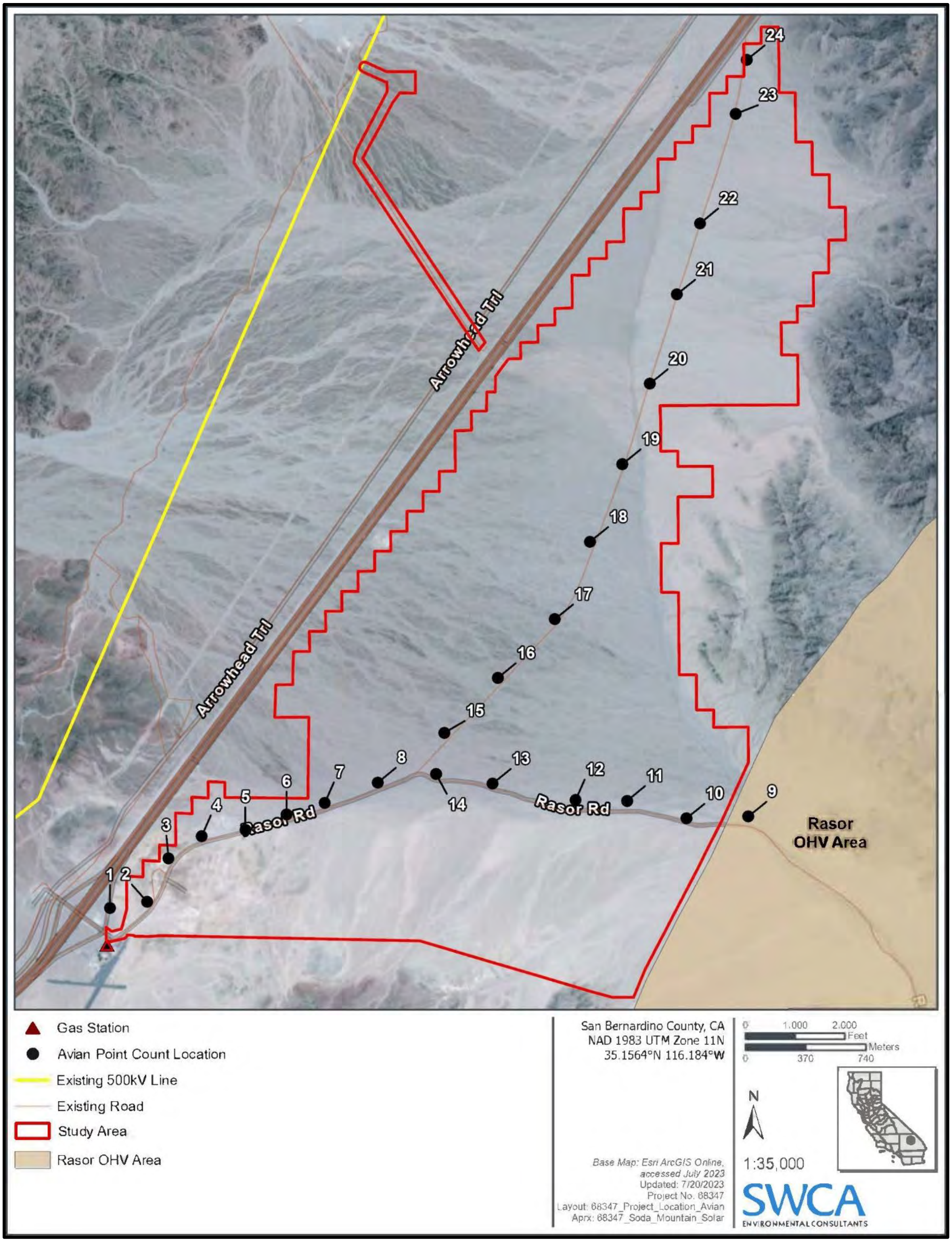

Figure 2. Avian point-count locations.

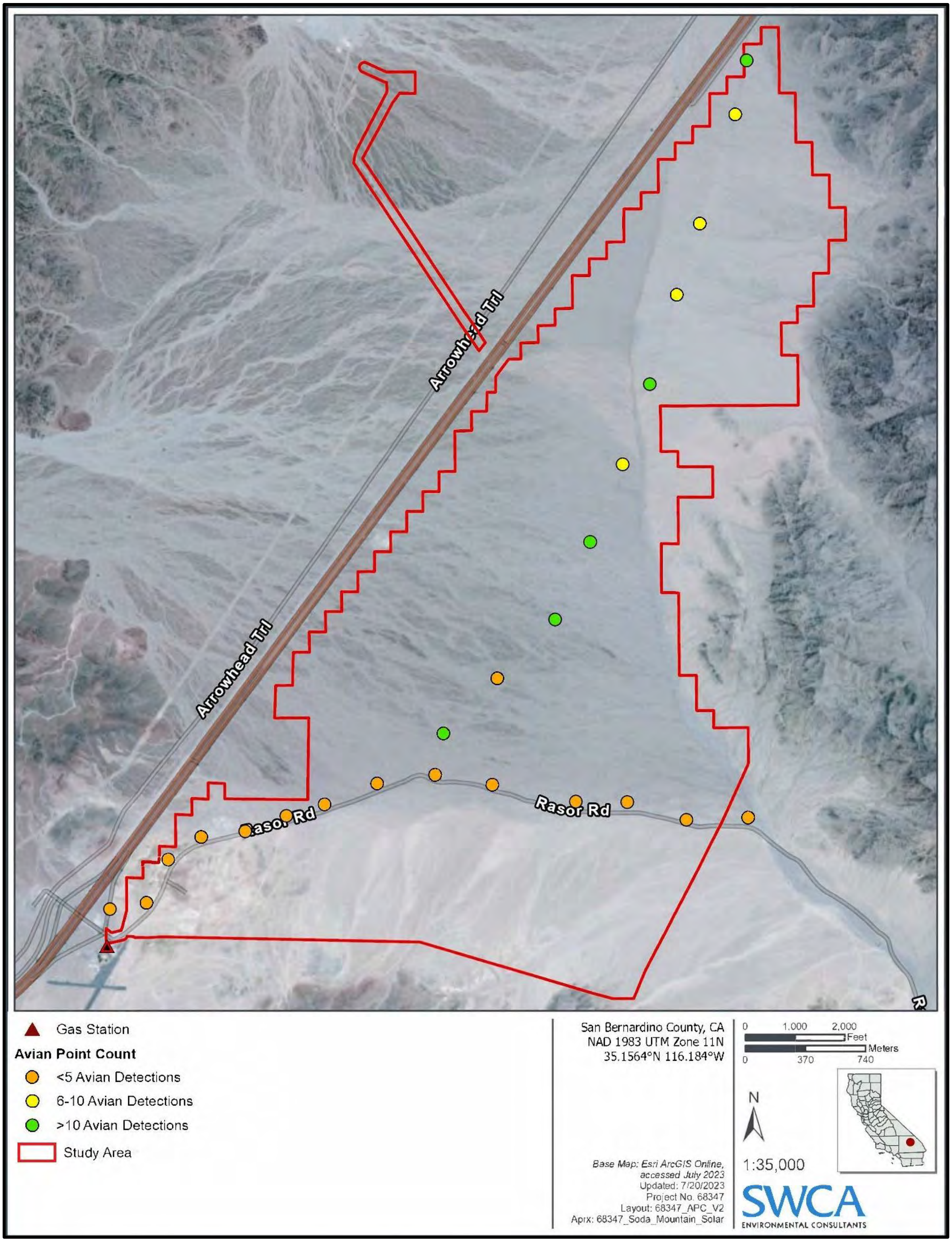

Figure 3. Spring avian use detections in the study area.

Table 1. Spring Avian Use Detections by Species

Species Group	Common Name	Scientific Name	Detections
Corvids	common raven	*Corvus corax*	12
Passerines	sage thrasher	*Oreoscoptes montanus*	1
	cactus wren	*Campylorhynchus brunneicapillus*	1
	rock wren	*Salpinctes obsoletus*	2
	horned lark	*Eremophila alpestris*	50
	Say's phoebe	*Sayornis saya*	2
	black-throated sparrow	*Amphispiza bilineata*	35
	loggerhead shrike*	*Lanius ludovicianus*	2
	house finch	*Haemorhous mexicanus*	10
	dark-eyed junco	*Junco hyemalis*	6
	verdin	*Auriparus flavicep*s	2
Total			**123**

* CDFW Species of Special Concern

Table 3. Spring Avian Use Detections by Point-Count

Point Count Number	Species	Detections
1	common raven (*Corvus corax*)	1
2	common raven	3
3	horned lark (*Eremophila alpestris*)	1
4	horned lark Say's phoebe (*Sayornis saya*)	3 1
5	horned lark	1
6	horned lark black-throated sparrow (*Amphispiza bilineata*)	1 1
7	horned lark	3
8	black-throated sparrow	1
9	loggerhead shrike (*Lanius ludovicianus*)* sage thrasher (*Oreoscoptes montanus)* rock wren (*Salpinctes obsoletus)*	1 1 1
10	common raven	1
11	horned lark	1
12	horned lark	1
13	common raven	1
14	loggerhead shrike*	1
15	horned lark house finch (*Haemorhous mexicanus*) black-throated sparrow	7 2 2
16	horned lark black-throated sparrow	2 2
17	horned lark house finch black-throated sparrow common raven	4 3 2 2

Point Count Number	Species	Detections
18	horned lark house finch black-throated sparrow	4 1 6
19	black-throated sparrow cactus wren horned lark	5 1 3
20	horned lark house finch black-throated sparrow	5 4 3
21	horned lark black-throated sparrow	4 2
22	verdin (*Auriparus flaviceps*) horned lark black-throated sparrow	2 5 2
23	dark-eyed junco (*Junco hyemalis)* horned lark black-throated sparrow	4 4 2
24	horned lark black-throated sparrow common raven dark-eyed junco Say's phoebe rock wren	1 7 4 2 1 1
Total		**123**

* CDFW Species of Special Concern

DISCUSSION

During the spring migration season, the study area exhibited limited avian activity, with only 123 individuals detected across 11 different avian species, including one CDFW species of special concern. Common raven, horned lark, black-throated sparrow, and house finch were the most frequently observed species in the study area.

Loggerhead shrike was detected on-site and is listed as a CDFW species of special concern. This species favors open country habitats with short vegetation, such as pastures with fence rows, agricultural fields, riparian areas, and open woodlands (Yosef 2020). In desert habitats, this species exhibits similar preferences for open areas with short vegetation, which may include grasslands, desert scrub, and low shrublands (Yosef 2020). Loggerhead shrike preys on large insects, amphibians, reptiles, small mammals, birds, and carrion (Yosef 2020). It requires open areas for hunting and shrubs or low trees for perches and nest sites (Yosef 2020). The point-count locations were characterized as Creosote Bush - White Bursage Scrub, which is defined by shrubs less than 1 meter in height (California Native Plant Society 2023). In addition to the short vegetation, the study area has many prey species available on-site for the loggerhead shrike such as many insects, reptiles, and small rodents.

Horned larks, black-throated sparrows, and house finches forage in mixed-species flocks in the nonbreeding season for increased foraging efficiency and enhanced vigilance against potential threats (Badyaev 2020; Beason 2020; Johnson 2020). Horned larks often form foraging groups with dark-eyed juncos, which were also detected in the study area (Beason 2020). Black-throated sparrows have large territories in the spring during courtship and nest building, and often glean insect prey off creosote bush (*Larrea tridentata*) and other desert shrubs (Johnson 2020). The house finch has a diet largely consisting of seeds, and it is known to feed on creosote bush (Badyaev 2020). These species were most commonly found in groups in the northern portion of the study area where off-road vehicle activity occurred the least and the habitat is likely less disturbed.

LITERATURE CITED

Badyaev, A.V., V. Belloni, and G.E. Hill 2020. House Finch (*Haemorhous mexicanus*), version 1.0. In Birds of the World (A.F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. Available at: https://birdsoftheworld.org/bow/species/houfin/cur/foodhabits. Accessed July 2023.

Beason, R.C. 2020. Horned Lark (*Eremophila alpestris*), version 1.0. In Birds of the World (S.M. Billerman, ed.). Cornell Lab of Ornithology, Ithaca, NY, USA. Available at: https://birdsoftheworld.org/bow/species/horlar/cur/behavior. Accessed July 2023.

California Native Plant Society. 2023. *A Manual of California Vegetation, Online Edition. California Native Plant Society*. Sacramento, CA. Available at: https://vegetation.cnps.org/alliance/223. Accessed June 2023.

Johnson, M. J., C. van Riper, and K. M. Pearson 2020. Black-throated Sparrow (*Amphispiza bilineata*), version 1.0. In Birds of the World (A.F. Poole and F.B. Gill, eds.). Cornell Lab of Ornithology, Ithaca, NY, USA. Available at: https://birdsoftheworld.org/bow/species/bktspa/cur/introduction. Accessed July 2023.

Yosef, R. 2020. Loggerhead Shrike (*Lanius ludovicianus*), version 1.0. In Birds of the World (A.F. Poole and F.B. Gill, eds). Cornell Lab of Ornithology, Ithaca, NY, USA. Available at: https://birdsoftheworld.org/bow/species/logshr/cur/foodhabits. Accessed July 2023.

APPENDIX K

Summer Avian Use Survey Report for the Soda Mountain Solar Project

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TECHNICAL MEMORANDUM

To: Soda Mountain Solar, LLC

From: Shirley Innecken, Lead Natural Resources Project Manager

Date: June 14, 2024

Re: **Summer Avian Use Survey Report for the Soda Mountain Solar Project / SWCA Project No. 68347**

INTRODUCTION

This report describes the summer avian use survey conducted by SWCA Environmental Consultants (SWCA) for the Soda Mountain Solar Project (project). The project is located along Interstate 15 approximately 50 miles northeast of Barstow, San Bernardino County, California (Figure 1). Soda Mountain Solar, LLC plans to develop a utility-scale photovoltaic (PV) solar facility on approximately 2,670 acres of land managed by the Bureau of Land Management (BLM) (Figure 2). The project site is situated in an alluvial valley between the northern and southern portions of the Soda Mountains in the Mojave Desert.

Avian use surveys provide species data necessary to determine how implementation of the project could affect use of the project site by resident, seasonal, and migratory birds. Nearly all native birds are protected under the federal Migratory Bird Treaty Act and California Fish and Game Code Sections 3503, 3503.5, and 3513. Furthermore, some birds are protected under the federal Endangered Species Act and the California Endangered Species Act.

SWCA developed the biological survey methods in coordination with the California Department of Fish and Wildlife (CDFW) and prepared a biological and aquatic resources work plan. Avian survey methods included a series of four replicate point counts spread over an entire year. This report summarizes the results of the summer avian use survey conducted in July 2023 by SWCA for the project.

Figure 1. Soda Mountain Solar Project vicinity map.

METHODS

For this report, the study area included 24 avian point-count locations across the 2,634-acre proposed project site (Figure 2). SWCA avian biologist Lauren Strong performed the summer avian use survey on July 12, 13, and 14, 2023. L. Strong conducted a 20-minute unlimited-radius point count at each point-count location (see Figure 2) during the survey. The survey points were located along existing roads; all avian species detected by sight and sound were documented. Each point-count location was monitored for 20 minutes to maximize the chances of detecting uncommon species, such as eagles and other raptors. All point-count locations were recorded using a GPS unit capable of submeter accuracy. All point-count location habitat types and quality were documented and are described in this report. The summer survey was conducted at earlier times of day to maximize observation potential, since avian species' activity decreases as temperatures increase. The survey was conducted in safe weather conditions with full visibility of the surrounding area.

The biologist also documented incidental observations of avian and other wildlife outside the 20-minute formal survey periods to develop a comprehensive species list for the study area and record any observations or patterns of use that may be relevant to the project.

RESULTS

Weather conditions during the survey were mostly sunny and dry, with temperatures between 80 and 94 degrees Fahrenheit (°F) and wind speeds between 0 and 13 miles per hour (mph) (Table 1).

Table 1. Weather Conditions and Survey Times

Date	Start Time	End Time	Temperature (°F)	Wind Speed (mph)	Conditions
7/12/2023	6:42	8:58	86–94	2–13 mph	Sunny, 0%–9% cloud cover, dry
7/13/2023	5:20	8:53	81–94	0–4.8	Sunny, 35%–45% cloud cover, dry
7/14/2023	5:16	8:17	80–88	1.3–6.5	Sunny, 0% cloud cover, dry

A total of seven avian species were detected by sight and/or sound within the study area during the winter period. Avian species present on-site included dark-eyed junco (*Junco hyemalis*), mourning dove (*Zenaida macroura*), black-throated sparrow (*Amphispiza bilineata),* common raven (*Corvus corax*), horned lark (*Eremophila alpestris*), verdin (*Auriparus flavicep*s), and one unidentified passerine. Individual detection quantities for each species can be found in Table 2. There were 15 avian detections in total, with most detections occurring within 1.3 miles of the southwest corner of the study area (Table 3, Figure 3). No birds were detected at 14 of the point-count locations (see Figure 3).

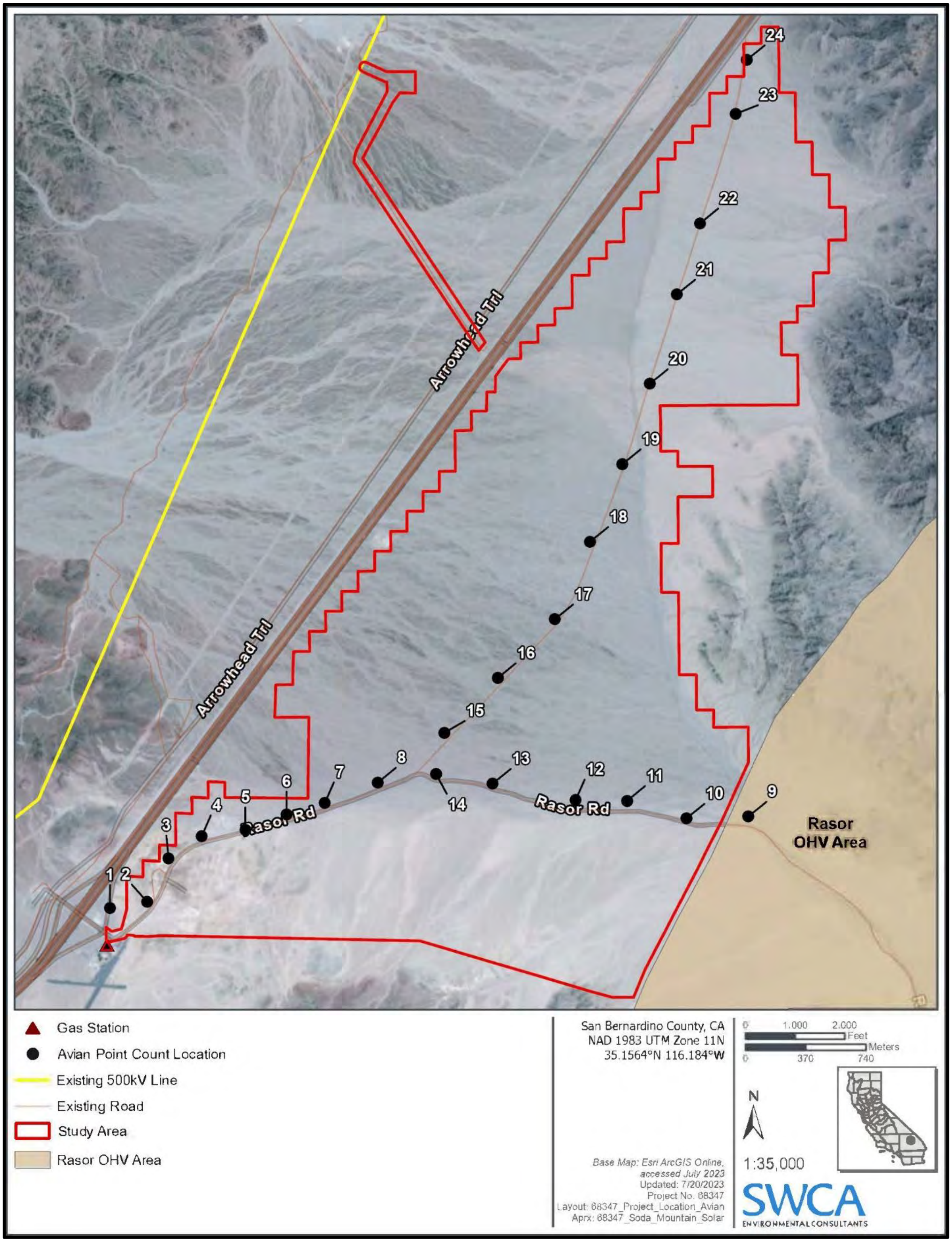

Figure 2. Avian point-count locations in the study area.

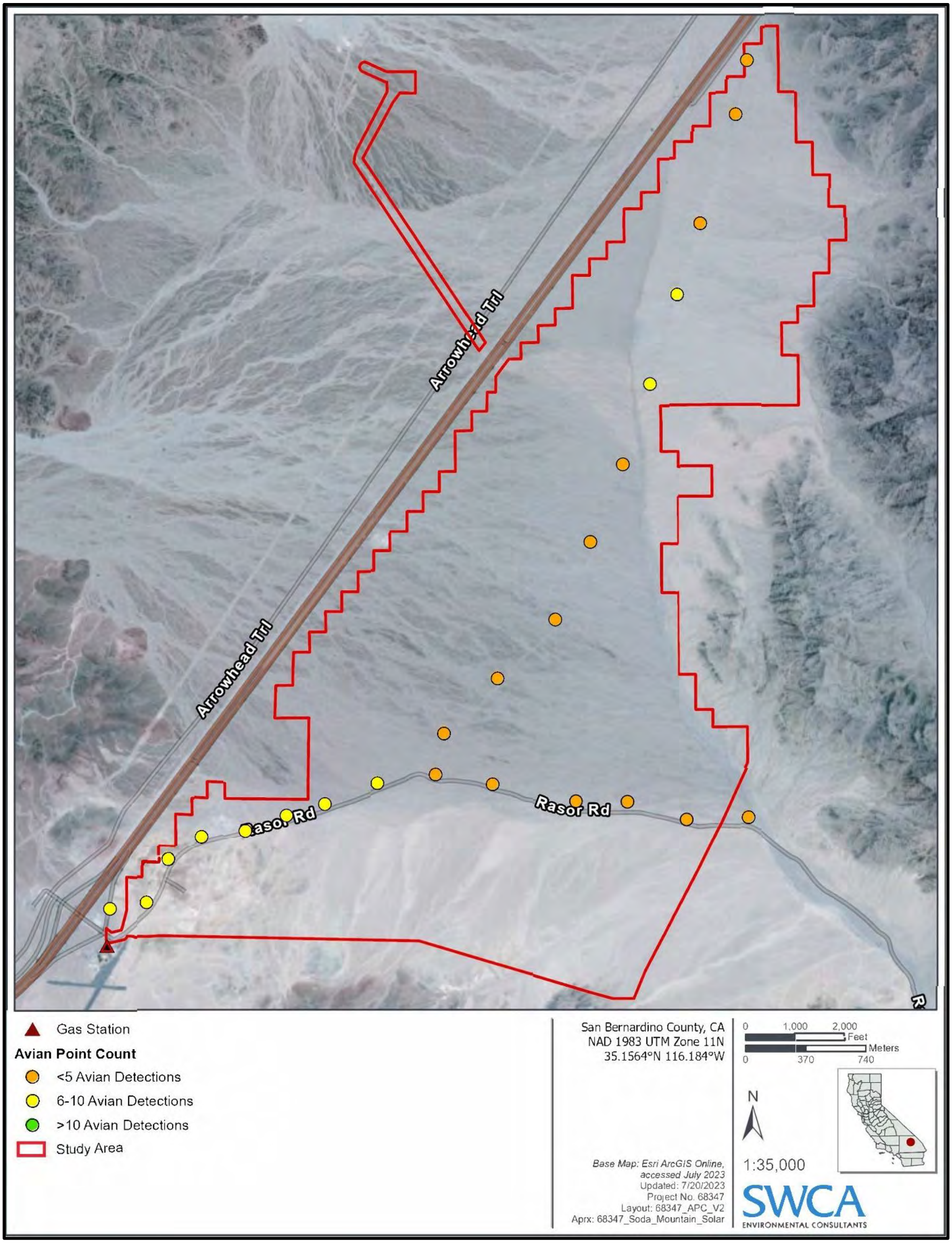

Figure 3. Summer avian use detections in the study area.

No special-status avian species were observed in the study area during the point counts or incidentally. All point-count locations were described as creosote bush-white bursage scrub (*Larrea tridentata* - *Ambrosia dumosa* Shrubland Alliance) based on the California Native Plant Society (CNPS) guidelines (CNPS 2023). The biologist observed recent tracks of all-terrain vehicles being driven off-road within or near the study area. The scat of a large carnivorous mammal approximately 37 cm long was observed incidentally approximately 165 meters south of point-count location 15, within the access road (Attachment C-1; Photograph C-1).

Table 2. Summer Avian Use Detections by Species

Species Group	Common Name (Scientific Name)	Detections
Doves	mourning dove (*Zenaida macroura*)	1
Corvids	common raven (*Corvus corax*)	5
Passerines	dark-eyed junco (*Junco hyemalis*)	1
	verdin (*Auriparus flavicep*s)	1
	horned lark (*Eremophila alpestris*)	5
	black-throated sparrow (*Amphispiza bilineata*)	1
	unidentified passerine	1

Table 3. Summer Avian Use Detections by Point Count

Point-Count Location	Common Name (Scientific Name)	Detections
1	common raven (*Corvus corax*)	1
2	common raven	3
3	unidentified passerine	1
4	black-throated sparrow (*Amphispiza bilineata*)	1
5	horned lark	1
6	horned lark	3
7	common raven horned lark	1 1
8	mourning dove (*Zenaida macroura*)	1
9	N/A	0
10	N/A	0
11	N/A	0
12	N/A	0
13	N/A	0
14	N/A	0
15	N/A	0
16	N/A	0
17	N/A	0
18	N/A	0
19	N/A	0
20	dark-eyed junco (*Junco hyemalis*)	1
21	verdin (*Auriparus flaviceps*)	1
22	N/A	0

Point-Count Location	Common Name (Scientific Name)	Detections
23	N/A	0
24	N/A	0

DISCUSSION

Avian use in the study area during the summer breeding season is determined to be low, with only 15 individuals across seven avian species. Common raven and horned lark were the most frequently observed species on the study area. Within the study area, potential nesting sites exist at the southwest corner and the northern tip of the gen-tie route, in the form of utility poles or towers that could serve as suitable breeding locations for ravens. Nevertheless, no nests were sighted on these utility structures.

The point-count locations were characterized as creosote bush - white bursage scrub, which is defined by shrubs less than 1 meter tall (CNPS 2023). Avian diversity is generally low in all desert habitats, but there are characteristic species, such as verdin, that exclusively reside in desert habitats (Austin 1976). A decline in bird song from spring to summer is typical, which may reduce the observers' ability to detect birds that are present (Ehnes et al. 2018).

LITERATURE CITED

Austin, G.T. 1976. Behavioral adaptations of the verdin to the desert. *Auk* 93:245–262.

California Native Plant Society (CNPS). 2023. *A Manual of California Vegetation, Online Edition. California Native Plant Society*. Sacramento, CA. Available at: https://vegetation.cnps.org/alliance/223. Accessed July 2023.

Ehnes, M., J.P. Dech, and J.R. Foote. 2018. Seasonal changes in acoustic detection of forest birds. *Journal of Ecoacoustics* 2(7). https://jea.jams.pub/article/2/1/41.

ATTACHMENT C-1

Site Photographs

Photograph C-1. Canine scat observed on July 13, 2023. This scat was found in the northern portion of the study area, west of Interstate 15.

APPENDIX L

Fall Avian Use Survey Report for the Soda Mountain Solar Project

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TECHNICAL MEMORANDUM

To: Soda Mountain Solar, LLC

From: Shirley Innecken, Lead Natural Resources Project Manager

Date: June 14, 2024

Re: **Fall Avian Use Survey Report for the Soda Mountain Solar Project / SWCA Project No. 68347**

INTRODUCTION

This report describes the fall avian use survey conducted by SWCA Environmental Consultants (SWCA) for the Soda Mountain Solar Project (project). The project is located along Interstate 15 approximately 50 miles northeast of Barstow, San Bernardino County, California (Figure 1). Soda Mountain Solar, LLC plans to develop a utility-scale photovoltaic (PV) solar facility on approximately 2,670 acres of land managed by the Bureau of Land Management (BLM). The project site is situated in an alluvial valley between the northern and southern portions of the Soda Mountains in the Mojave Desert.

Avian use surveys provide the species data necessary to determine how implementation of the project could affect use of the project site by resident, seasonal, and migratory birds. Nearly all species of native birds are protected under the federal Migratory Bird Treaty Act and California Fish and Game Code Sections 3503, 3503.5, and 3513. Furthermore, some birds are protected under the federal Endangered Species Act and California Endangered Species Act.

SWCA developed the biological survey methods in coordination with California Department of Fish and Wildlife (CDFW) and prepared a biological and aquatic resources work plan. Avian survey methods included a series of four replicate point counts spread over an entire year. This report summarizes the methods and results of the fall avian use survey conducted in October 2023 by SWCA for the project.

Figure 1. Soda Mountain Solar Project vicinity map.

METHODS

For this report, the study area included 24 avian point-count locations across the 2,634-acre proposed project site excluding the gen-tie (Figure 2). SWCA avian biologist Gigi Wagnon performed the fall avian use survey on October 9, 10, and 11, 2023. The biologist conducted 20-minute unlimited-radius point counts at each point-count location (see Figure 2) during the survey. The survey points were located along existing roads; all avian species detected by sight and sound were documented. Each point-count location was monitored for 20 minutes to maximize the chances of detecting uncommon species, such as eagles and other raptors. All point-count location habitat types and quality were documented and are described below. The survey was conducted at all times of day to maximize observation potential. The survey was conducted in safe weather conditions with full visibility for each point-count location.

Incidental observations of avian and other wildlife outside the 20-minute formal survey periods were documented to develop a comprehensive species list for the study area and record any observations or patterns of use that may be relevant to the project.

RESULTS

Weather conditions during the survey were mostly sunny and moderate to hot, with temperatures between 61 and 92 degrees Fahrenheit (°F) and low wind speeds (Table 1).

Table 1. Survey Times and Weather Conditions

Date	Start Time	End Time	Temperature (°F)	Wind Speed (miles per hour)	Conditions
10/9/2023	06:58	13:46	66–92	3–6	Partly cloudy
10/10/2023	07:08	13:55	63–86	3–7	Sunny
10/11/2023	07:05	09:15	61–64	3–4	Sunny

A total of eight avian species were detected by sight and/or sound within the study area during the fall period: common raven (*Corvus corax*), house sparrow (*Passer domesticus*), rock wren (*Salpinctes obsoletus*), horned lark (*Eremophila alpestris*), Say's phoebe (*Sayornis saya*), Brewer’s sparrow (*Spizellabreweri*), loggerhead shrike (*Lanius ludovicianus*), and house finch (*Haemorhous mexicanus*). The number of detections for each species can be found in Table 2. In total, there were 71 bird detections, with most detections occurring in the northern portion of the study area (Table 3, Figure 3).

One CDFW species of special concern was detected in the study area: loggerhead shrike. The vegetation at all point-count locations was described as Creosote Bush - White Bursage Scrub (*Larrea tridentata - Ambrosia dumosa* Shrubland Alliance) based on the California Native Plant Society guidelines (California Native Plant Society 2023). The biologist observed several dispersed campsites with RVs and campers southwest of Rasor Road near point counts 5, 6, and 7. There were no incidental observations of birds or other wildlife in the study area outside the survey periods.

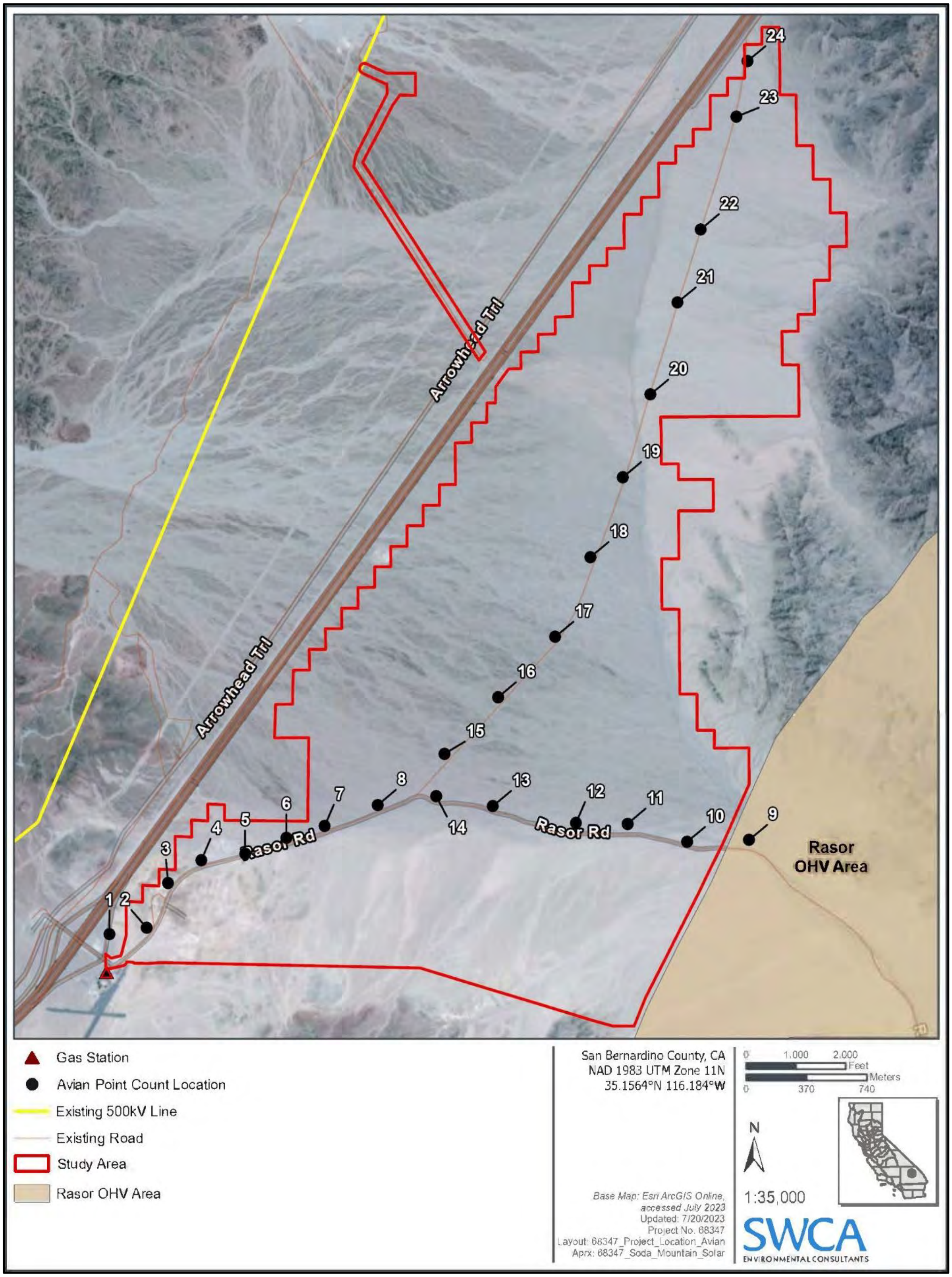

Figure 2. Avian point-count locations.

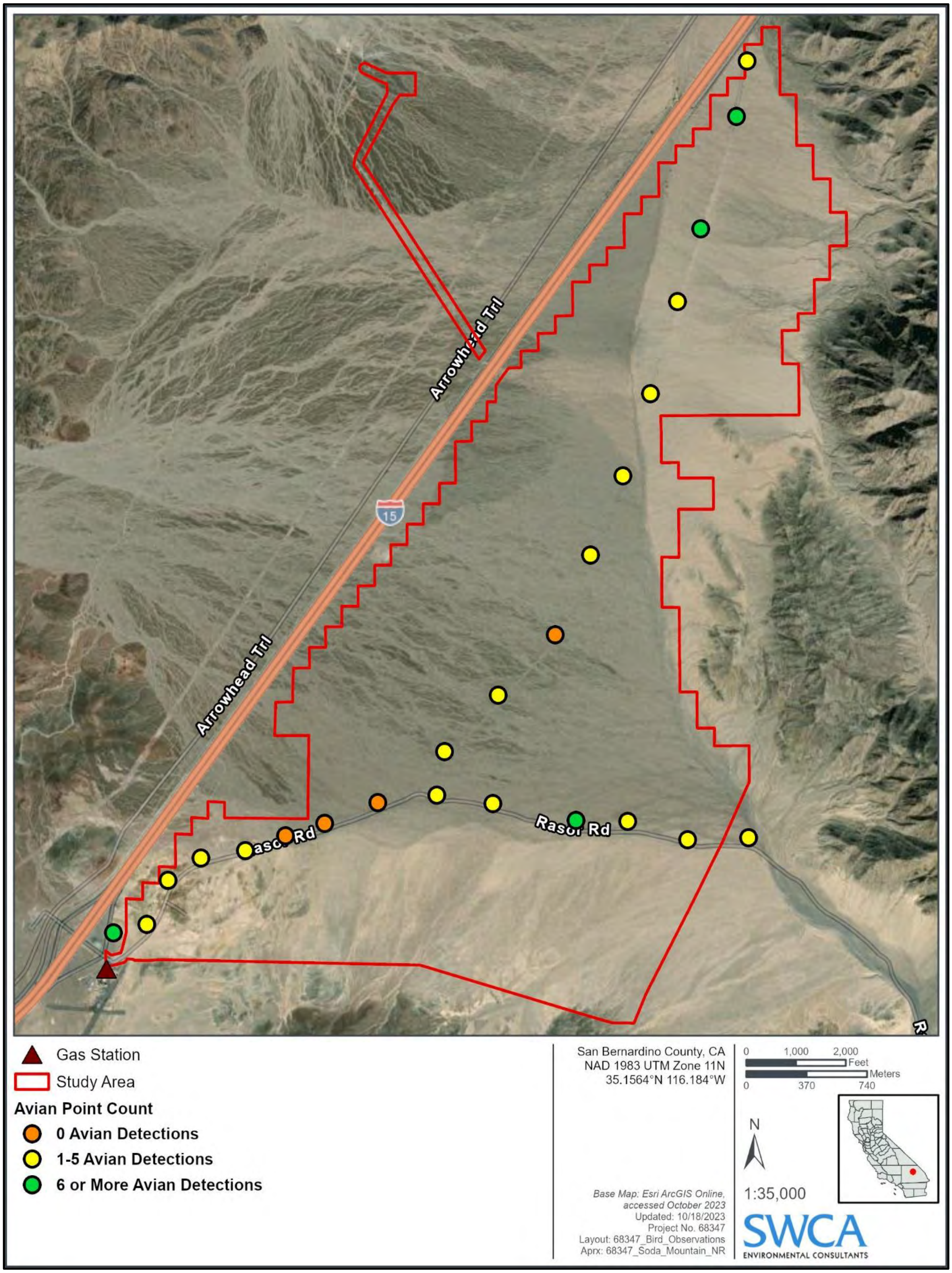

Figure 3. Fall avian detections in the study area.

Table 2. Fall Avian Use Detections by Species

Species Group	Common Name	Scientific Name	Detections
Corvids	common raven	*Corvus corax*	8
Passerines	house sparrow*	*Passer domesticus*	6
	rock wren	*Salpinctes obsoletus*	6
	horned lark	*Eremophila alpestris*	37
	Say's phoebe	*Sayornis saya*	2
	Brewer's sparrow	*Spizella breweri*	6
	loggerhead shrike†	*Lanius ludovicianus*	4
	house finch	*Haemorhous mexicanus*	2
Total			71

* Non-native species

† CDFW species of special concern

Table 3. Fall Avian Use Detections by Point Count

Point Count Number	Species	Detections
1	common raven (*Corvus corax*)	3
	house sparrow (*Passer domesticus*)	6
2	Say's phoebe (*Sayornis saya*)	1
	common raven	2
3	horned lark (*Eremophila alpestris*)	2
4	horned lark	1
	Say's phoebe	1
5	horned lark	1
6	N/A	0
7	N/A	0
8	N/A	0
9	common raven	1
	Brewer's sparrow (*Spizella breweri*)	1
	rock wren (*Salpinctes obsoletus*)	1
	horned lark	1
10	rock wren	1
	horned lark	1
11	horned lark	2
12	horned lark	7
13	rock wren	1
14	horned lark	1
15	rock wren	1
	loggerhead shrike (*Lanius ludovicianus*)*	1
	common raven	2

Point Count Number	Species	Detections
16	horned lark	1
17	N/A	0
18	horned lark	1
	rock wren	1
19	horned lark	1
20	horned lark	2
21	horned lark	3
22	rock wren	1
	horned lark	8
	loggerhead shrike*	1
	Brewer's sparrow	1
23	loggerhead shrike*	2
	horned lark	3
	Brewer's sparrow	4
24	horned lark	2
	house finch (*Haemorhous mexicanus*)	2
Total		71

* CDFW species of special concern

DISCUSSION

During the fall migration season, the study area exhibited limited avian activity, with only 71 individuals detected across eight avian species. The project site was previously surveyed for avian use in the spring and fall of 2009. The 2013 biological resources technical report for the project identified 23 avian species and 210 birds total in the fall 2009 survey (Panorama Environmental, Inc. 2013). Low avian activity at the project site could be a reflection of declining bird populations in the Mojave Desert (Riddell 2021). Bird populations are on the decline in the Mojave Desert due to the increase in average temperatures and declines in annual precipitation (Riddell 2021).

Common raven and horned lark were the most frequently observed species in the study area. Four loggerhead shrike individuals were detected on-site during the survey. This species is listed as a CDFW species of special concern. Four individuals were detected in the northern portion of the study area; two were detected at point count 23 (see Table 3). Loggerhead shrike was also detected in the spring 2023 avian use survey and incidentally during other biological resource surveys in the study area (SWCA 2023a, 2023b), indicating loggerhead shrike may use the project site year-round.

LITERATURE CITED

California Native Plant Society. 2023. *A Manual of California Vegetation, Online Edition.* Sacramento, California. Available at: https://vegetation.cnps.org/alliance/223. Accessed June 2023.

Panorama Environmental, Inc. 2013. *Biological Resources Technical Report for the Soda Mountain Solar Project.* San Francisco, California.

Riddell, E.A., K.J. Iknaya, L. Hargrove, S. Tremor, J.L. Patton, R. Ramirez, B.O. Wolf, and S.R. Beissinger. 2021. Exposure to climate change drives stability or collapse of desert mammal and bird communities. *Science* 371:633–636. DOI: 10.1126/science.abd4605.

SWCA Environmental Consultants (SWCA). 2023a. *Soda Mountain Solar Project Biological Resources Technical Report*. Pasadena, California: SWCA Environmental Consultants.

——. 2023b. *Spring Avian Use Survey for the Soda Mountain Solar Project.* Pasadena, California: SWCA Environmental Consultants

APPENDIX M

Spring Avian Use and Raptor Survey Report for the Soda Mountain Solar Project

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TECHNICAL MEMORANDUM

To: Soda Mountain Solar, LLC

From: Shirley Innecken, Lead Natural Resources Project Manager

Date: June 20, 2024

Re: **Spring 2024 Avian Use and Raptor Survey Report for the Soda Mountain Solar Project / SWCA Project No. 68347**

INTRODUCTION

This report describes the spring 2024 avian use and raptor surveys conducted by SWCA Environmental Consultants (SWCA) for the Soda Mountain Solar Project (project). The project is located along Interstate 15 approximately 50 miles northeast of Barstow, San Bernardino County, California (Figure 1). Soda Mountain Solar, LLC plans to develop a utility-scale photovoltaic (PV) solar facility on approximately 2,670 acres of land managed by the Bureau of Land Management (BLM). The project site is situated in an alluvial valley between the northern and southern portions of the Soda Mountains in the Mojave Desert.

Avian use surveys provide the species data necessary to determine how implementation of the project could affect use of the project site by resident, seasonal, and migratory birds. Nearly all species of native birds are protected under the federal Migratory Bird Treaty Act and California Fish and Game Code Sections 3503, 3503.5, and 3513. Furthermore, some birds are protected under the federal Endangered Species Act and California Endangered Species Act.

SWCA developed the biological survey methods in coordination with California Department of Fish and Wildlife (CDFW). This report details the methods and results of the bird surveys conducted in April and May 2024 by SWCA for the project.

Figure 1. Soda Mountain Solar Project vicinity map.

METHODS

For this report, the study area included 22 avian point count, and 5 raptor survey locations across the 2,634-acre proposed project site and gen-tie (Figure 2). Sentinel Science biologist Jonathan Nakai performed two replicate avian point count and raptor surveys on April 29–30, 2024 and May 20–21, 2024 (Table 1).

Table 1. Field Survey Dates, Type of Survey, and Personnel

Date	Field Survey	Personnel
April 29–30, 2024	Avian point count and raptor April survey	Jonathan Nakai
May 20–21, 2024	Avian point count and raptor May survey	Jonathan Nakai

Avian Point Count

The biologist conducted 10-minute unlimited-radius point counts at each point count location (Figure 2) during the survey. The survey points were provided by CDFW and distributed in areas not surveyed in the 2023 point counts. During each 10-minute count, all avian species detected by sight and sound were documented, and two replicate surveys were performed at least one week apart. The surveys were conducted in the morning hours when songbirds are most active. All point count location habitat types and quality were documented and are described below. All avian point count locations were accessible by foot, and the survey was conducted in safe weather conditions with full visibility for each point count location.

Raptor and Large Bird Survey

The biologist visited five raptor and large bird observation points no earlier than 10:00 AM for one-hour-long observation periods concurrent with the avian point counts (Figure 2). All large birds (raptors, ravens, etc.) detected within 800 meters of the biologist were documented, along with their flight paths and behavior consistent with the methodological recommendations of the CDFW and the USFWS Eagle Conservation Plan Guidance (ECPG; USFWS 2013). The distance to each bird was estimated with the use of a laser rangefinder and terrain features. Flight paths of all large birds within the 800-m-radius circle around the biologist were documented consistent with the ECPG, with a sketch of the flight path and notes on flight duration to record minutes spent within the circle. The observation points were selected to afford clear views of the mountains surrounding and the open valley/location of the project. All raptor point locations were accessible by foot, and the survey was conducted in safe weather conditions with full visibility for each survey location.

Incidental observations of birds and other wildlife outside the formal survey periods were documented to supplement the comprehensive species list for the project area. Patterns of use that may be relevant to the project, such as large flocks or concentrated movement around specific landscape features, were also recorded.

RESULTS

Weather conditions during the surveys were mostly sunny and moderate to hot, with temperatures between 59 and 88 degrees Fahrenheit (°F), and moderate to high wind speeds with gusts of up to 28 miles per hour (mph) (Table 2).

Table 2. Field Survey Weather Conditions

Date	Start Time	Stop Time	Temperature (°F)	Wind Speed (mph)	Conditions
April 29, 2024	6:37 a.m.	16:00 p.m.	59–88	3–24	Sunny
April 30, 2024	6:24 a.m.	15:55 p.m.	59–88	3–29	Sunny
May 20, 2024	5:57 a.m.	13:36 p.m.	65–87	9–16	Sunny; wind gusts up to 28 mph
May 21, 2024	6:24 a.m.	11:56 a.m.	61–81	2–16	Sunny; wind gusts up to 20 mph

Avian Point Count

A total of nine bird species were detected by sight and/or sound within the study area during the April survey including: rock wren (*Salpinctes obsoletus*), horned lark (*Eremophila alpestris*), Say's phoebe (*Sayornis saya*), black-throated sparrow (*Amphispiza bilineata*), western tanager (*Piranga ludoviciana*), Hammond's flycatcher (*Empidonax hammondii*), Costa's hummingbird (*Calypte costae*), lazuli bunting (*Passerina amoena*), and blue-gray gnatcatcher (*Polioptila caerulea*). The number of detections for each species can be found in Table 3. There were 98 bird detections during the April survey (Table 4, Figure 3).

A total of five bird species were detected by sight and/or sound within the study area during the May survey including: horned lark, black-throated sparrow, rock wren, common raven (*Corvus corax*), and house finch (*Haemorhous mexicanus*). There were 94 bird detections during the May survey (Table 4, Figure 3). Avian detections per point count location were relatively consistent, with only Points 3 and Point 21 resulting in a difference of over 6 detections between surveys.

As mapped during prior surveys, the vegetation at all point count locations was described as Creosote Bush - White Bursage Scrub (*Larrea tridentata* - *Ambrosia dumosa* Shrubland Alliance) based on the Manual of California Vegetation (CNPS 2024).

Raptor Survey

A total of three turkey vultures were detected during the two replicate raptor surveys. Two turkey vulture individuals were observed soaring, circling, and gliding to the north and northwest of the mountains at Point R5 during the April survey (Figure 4). An individual turkey vulture was observed circling over the mountains to the west at Point R3 during the May survey (Figure 5). No golden eagles (*Aquila chrysaetos*) were observed during the raptor survey.

Incidental Observations

During the 2024 avian point counts in April and May, the biologist did not observe any birds incidentally within the study area outside the survey periods. A red-tailed hawk pair were observed incidentally outside of the 800-m survey range and outside of the study area soaring over the mountains near Point R1 during the April raptor survey.

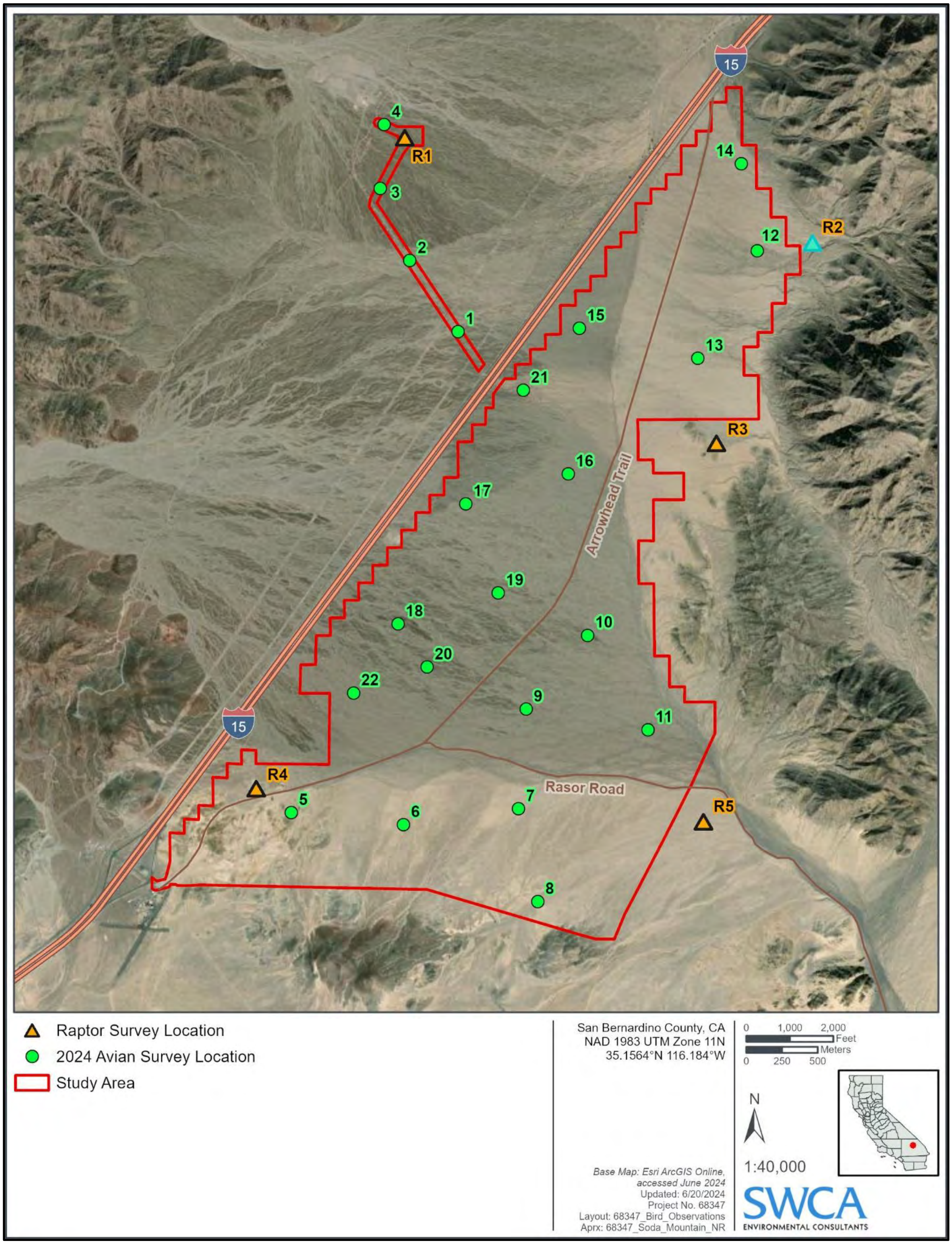

Figure 2. Spring 2024 avian point count and raptor survey locations.

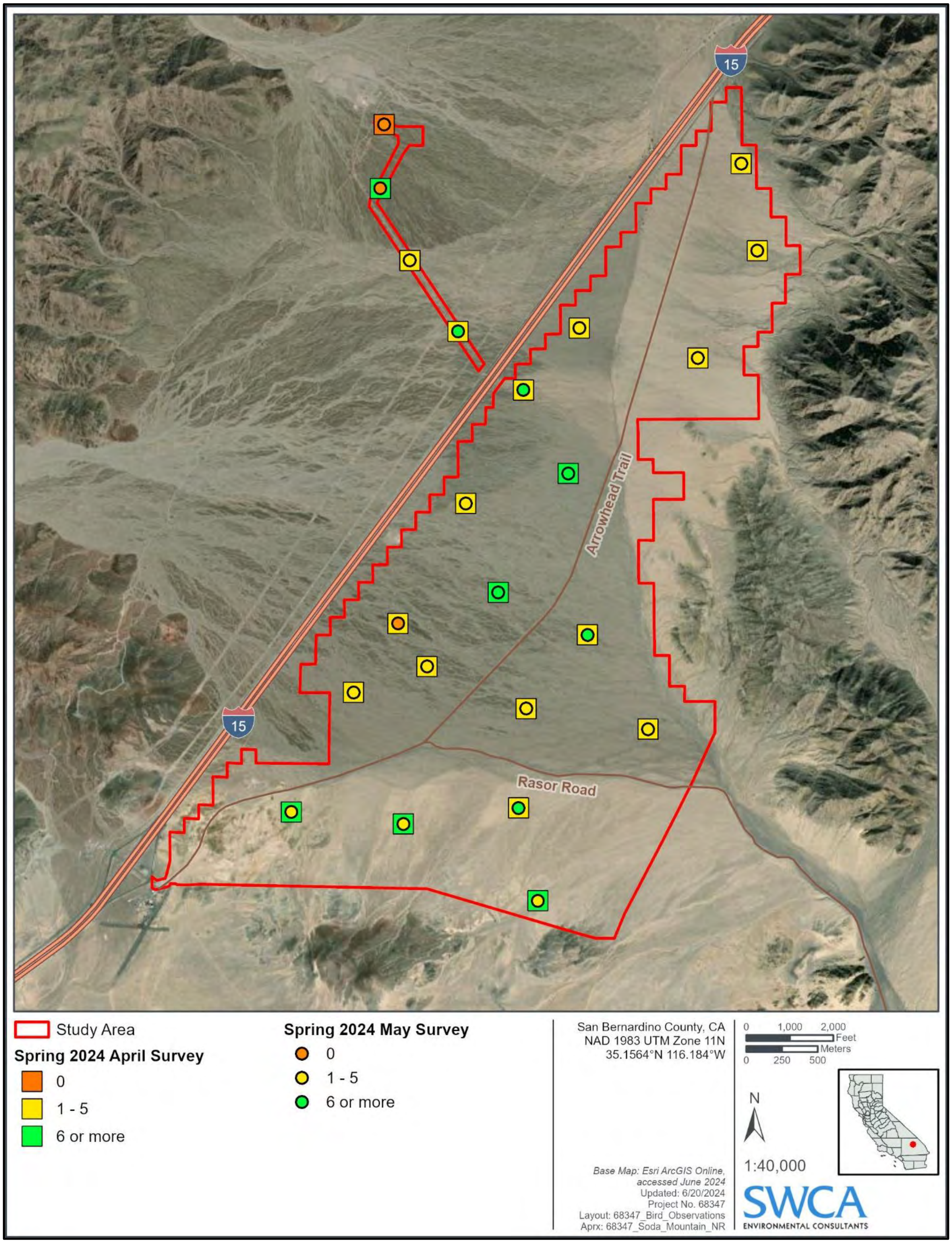

Figure 3. Spring 2024 avian detections in the study area for April and May surveys.

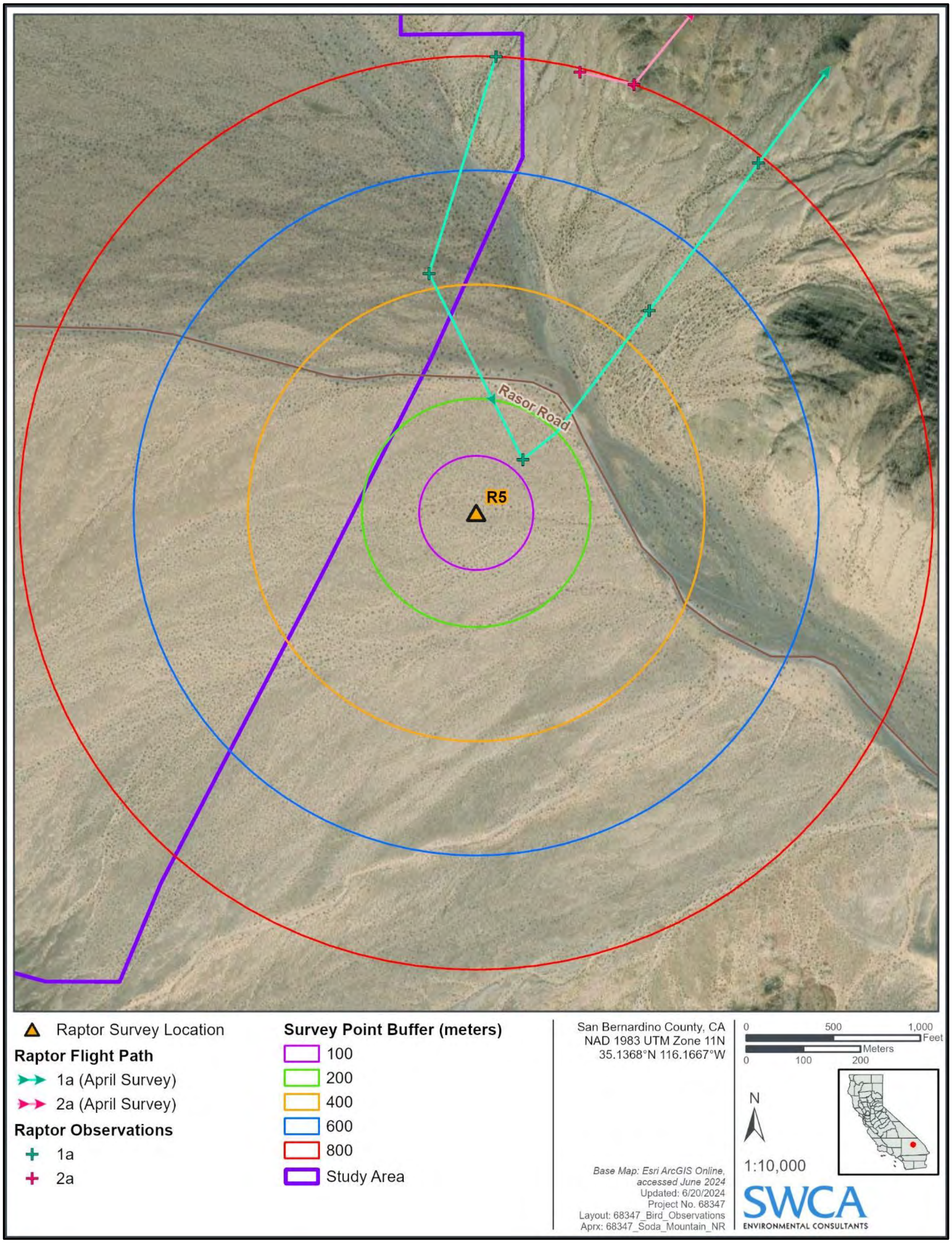

Figure 4. Raptor flight paths in the study area for the April survey.

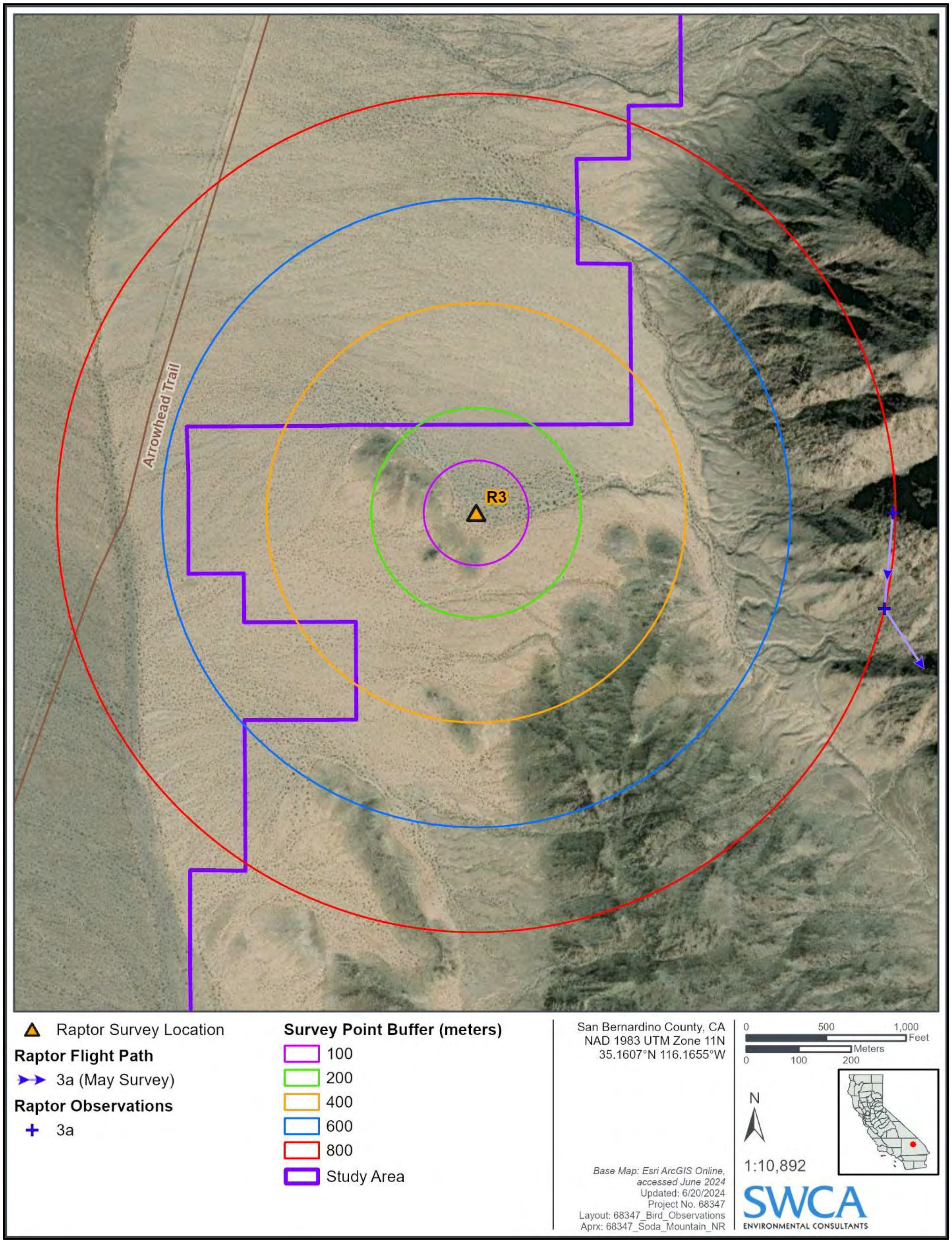

Figure 5. Raptor flight paths in the study area for the May survey.

Table 3. Spring Avian Use Detections by Species

Species Group	Common Name	Scientific Name	April Survey	May Survey
Corvids	common raven	*Corvus corax*	0	1
Passerines	rock wren	*Salpinctes obsoletus*	2	1
	horned lark	*Eremophila alpestris*	62	67
	Say's phoebe	*Sayornis saya*	1	0
	black-throated sparrow	*Amphispiza bilineata*	27	23
	blue-gray gnatcatcher	*Polioptila caerulea*	2	0
	house finch	*Haemorhous mexicanus*	0	2
	Lazuli bunting	*Passerina amoena*	1	0
	Hammond’s flycatcher	*Empidonax hammondii*	1	0
	Costa’s hummingbird	*Calypte costae*	1	0
	western tanager	*Piranga ludoviciana*	1	0
Total			**98**	**94**

Table 4. Spring Avian Use Detections by Point Count – April and May Survey

Point Count Number	April Detections	May Detections
1	3	7
2	1	3
3	13	N/A
4	N/A	N/A
5	7	2
6	7	4
7	5	7
8	6	5
9	5	5
10	1	6
11	4	4
12	4	5
13	4	4
14	4	4
15	1	4
16	6	7
17	4	3
18	5	N/A
19	6	6
20	5	5
21	2	9
22	5	4
Total	**98**	**94**

DISCUSSION

During the spring season, the study area exhibited limited avian activity. The April survey resulted in 98 detections across eight avian species, and the May survey resulted in 94 detections across five avian species. The project site was previously surveyed for avian use in the spring and fall of 2009. The 2013 biological resources technical report for the project identified 23 avian species and 210 birds total in the fall 2009 survey (Panorama Environmental, Inc. 2013). In 2023, a total of 16 avian species were detected by sight and/or sound within the study area during the winter, spring, summer, and fall avian surveys, and an additional 13 species were detected incidentally during surveys for other biological resources (SWCA 2023). Four species were detected during the April survey that had not been recorded during surveys conducted in 2023: lazuli bunting, Costa's hummingbird, Hammond's flycatcher, and western tanager.

The April survey documented more migrant species such as lazuli bunting, Hammond's flycatcher, and western tanager. These species do not nest in desert habitats, however, commonly migrate through the desert to reach suitable nesting habitat. Detections per point count across the site were relatively consistent, with only Points 3 and Point 21 resulting in a difference of over 6 detections between surveys. The detections at both points during the April and May survey consisted of horned larks, and likely reflects the movement of these birds throughout the project site.

During the raptor and large bird surveys, two turkey vultures were observed during the April survey, and one turkey vulture was observed during the May survey. A red-tailed hawk pair were also observed incidentally during the April survey. In 2023, raptors and other large birds were observed incidentally on-site including turkey vulture, red-tailed hawk, burrowing owl (*Athene cunicularia*), American kestrel (*Falco sparverius*) and common raven (SWCA 2023). No golden eagles were observed during the raptor survey.

LITERATURE CITED

California Native Plant Society. 2024. *A Manual of California Vegetation, Online Edition.* Sacramento, California. Available at: https://vegetation.cnps.org/alliance/223. Accessed May 2024.

Panorama Environmental, Inc. 2013. *Biological Resources Technical Report for the Soda Mountain Solar Project.* San Francisco, California.

SWCA Environmental Consultants (SWCA). 2023. *Soda Mountain Solar Project Biological Resources Technical Report*. Pasadena, California: SWCA Environmental Consultants.

U.S. Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance Module 1 – Land-based Wind Energy Version 2. U.S. Fish and Wildlife Service Division of Migratory Bird Management.

APPENDIX N

Burrowing Owl, Desert Kit Fox, and American Badger Survey Report for the Soda Mountain Solar Project

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TECHNICAL MEMORANDUM

To: Soda Mountain Solar, LLC

From: Shirley Innecken, Lead Natural Resources Project Manager

Date: January 10, 2025

Re: **Revised Burrowing Owl, Desert Kit Fox, and American Badger Survey Report for the Soda Mountain Solar Project / SWCA Project No. 068347-002**

INTRODUCTION

This report summarizes the results of the burrow survey conducted for burrowing owl (*Athene cunicularia*), desert kit fox (*Vulpes macrotis arsipus*), and American badger (*Taxidea taxus*), and breeding season surveys conducted for burrowing owl. Surveys were conducted by SWCA Environmental Consultants (SWCA) for the Soda Mountain Solar Project (project). The project is located along Interstate 15 approximately 50 miles northeast of Barstow, San Bernardino County, California (Figure 1). Soda Mountain Solar, LLC plans to develop a utility-scale photovoltaic (PV) solar facility on approximately 2,670 acres of land managed by the Bureau of Land Management (BLM) (Figure 2). The project site is situated in an alluvial valley between the northern and southern portions of the Soda Mountains in the Mojave Desert.

The burrow survey and burrowing owl breeding season surveys were conducted to support environmental analysis of the project pursuant to the California Environmental Quality Act (CEQA) and supplements the final Biological Resources Technical Report (BRTR) prepared for the project by SWCA. The surveys were conducted in accordance with the most current burrowing owl survey guidelines outlined by California Department of Fish and Wildlife (CDFW) (2012). Upon reviewing the previously completed biological resources technical report for the Soda Mountain Solar Project prepared by Panorama Environmental, Inc. (2013), a burrow survey and subsequent burrowing owl breeding season surveys were conducted in the study area, consisting of a total of six visits.

SWCA developed the biological survey methods in coordination with California Department of Fish and Wildlife (CDFW) and prepared a biological and aquatic resources work plan. The purpose of the burrow survey was to identify potentially suitable areas capable of supporting burrowing owl and record all potentially suitable burrows within the entire study area. In addition, the burrow survey also focused on identifying burrows of other fossorial species, specifically desert kit fox and American badger. Following the burrow survey, breeding season surveys were conducted for burrowing owl due to the observation of a live burrowing owl and presence of potential burrows. Three site visits were conducted to determine the occupancy of these burrows. The breeding season surveys were spaced at least 3 weeks apart and took place during the burrowing owl breeding season in California (February 1–August 31), as recommended in the CDFW *Staff Report on Burrowing Owl Mitigation* (CDFW 2012).

Figure 1. Soda Mountain Solar Project vicinity map.

SPECIES BACKGROUND

Burrowing Owl

In California, the burrowing owl is designated as a Species of Special Concern by the CDFW. This designation is given to species that are facing population declines or other vulnerability factors, which negatively impact their survival and population viability (CDFW 2012). Preliminary analyses conducted on breeding populations of this species in California have indicated declines in their central and southern breeding areas, as well as a statewide retraction of their breeding range (CDFW 2012).

Ecological Requirements

Burrowing owl predominantly inhabit open areas with short vegetation and access to low perches, such as fence posts, elevated mounds, or shrubs. They are commonly associated with grasslands, agricultural fields, prairies, scrublands, and desert areas; however, they have also demonstrated adaptability to landscapes modified by human activities. Suitable habitat for the burrowing owl in the study area is characterized by the availability of burrows for roosting and nesting, as well as relatively short vegetation with sparse shrubs and taller vegetation. This species often utilize burrows dug by fossorial mammals as nesting sites including those made by ground squirrels (e.g., *Otospermophilus beecheyi*), American badger, coyote (*Canis latrans*), and fox (e.g., *Vulpes macrotis*) (Ronan 2002). Additionally, human-made structures like culverts, concrete rubble piles, and pipes can serve as alternative nest sites.

The diet of burrowing owl consists of a diverse range of arthropods, small rodents, birds, amphibians, reptiles, and carrion (Gervais et al. 2000; Green et al. 1993; Plumpton and Lutz 1993; Thompson and Anderson 1988; York et al. 2002). During the breeding season, this species primarily forage in close proximity to their burrows but have been recorded hunting up to 1.7 miles away (Gervais et al. 2003; Haug and Oliphant 1990).

Threats

Habitat loss, degradation, and fragmentation present the most significant threats to burrowing owl in California. The majority of burrowing owl in California are now found in wide, flat lowland valleys and basins like the Imperial Valley and Great Central Valley, where intense residential and commercial development is occurring (DeSante et al. 2007). Urbanization in coastal counties has already led to the extirpation or drastic reduction of owl populations (Gervais et al. 2008). Loss of open lands further negatively impacts owl populations (Gervais et al. 2008). Another critical threat is the control of burrowing rodents, including California ground squirrel (*Otospermophilus variegatus*) burrows, which are most often used by burrowing owl for nesting and cover in California (Klute et al. 2003). Direct mortality from various sources is also a significant concern, with vehicle collisions being a major threat, especially in urban areas and along roads where owl nest (Gervais et al. 2008; Haug et al. 1993).

Desert Kit Fox

The desert kit fox is afforded protection from take under California Fish and Game Code Sections 460 and 4000-4003 as a California-protected furbearer. Much of the Mojave Desert provides habitat for this species, although its population status and trends are unclear.

Ecological Requirements

Although it is regularly encountered in desert habitats, the desert kit fox can be found in a wide range of habitat types, including desert scrub, washes, and arid grasslands. In the western Mojave, desert kit fox dens are frequently located on west- and northwest-facing slopes on friable soils with an absence of stones, caliche, or hardpan. Kit fox use multiple dens and switch dens frequently throughout the year. Breeding typically occurs in December and January, and pups have usually left the natal den by May. The entirety of the project site is suitable habitat for desert kit fox. This species primarily exhibits carnivorous behavior, with its diet primarily consisting of black-tailed jackrabbit (*Lepus californicus*) desert cottontail (*Sylvilagus audubonii*), kangaroo rat (*Dipodomys* spp.) and ground squirrels. Additionally, the species consumes insects, reptiles, some birds, bird eggs, and vegetation (Egoscue 1962; Laughrin 1970; Morrell 1971; Orloff et al. 1986).

Threats

Potential threats to this species including habitat loss and fragmentation, disease, predation, and vehicle collisions (Kadaba 2014).

American Badger

The American badger is classified as a species of special concern by CDFW. It is known to inhabit different regions throughout the state, except for heavily forested areas in the extreme northwest. Recent trends for this species indicate a significant reduction in both range and abundance, particularly in areas where it was once common (Williams 1986).

Ecological Requirements

American badger is typically found in open environments, such as open woodlands, desert scrub, and grasslands. It requires friable soils and a sufficient prey base of small rodents. Dens constructed by this species are distinctive in size and may display claw marks on the sides when excavated. This burrowing mammal uses friable soil to construct burrows for cover and protection. While they often reuse existing burrows, some individuals may create new dens nightly, particularly during the summer months (Messick and Hornocker 1981). As obligate carnivores, American badger primarily rely on a diet composed of fossorial rodents, including rats, mice, chipmunks, ground squirrels, and pocket gophers. Additionally, they consume reptiles, insects, earthworms, bird eggs, small birds, and carrion. The composition of their diet experiences seasonal and yearly variations, influenced by the availability and abundance of prey in their habitat.

Threats

While the American badger may exhibit some tolerance toward human activities, the implementation of predator control through indiscriminate trapping and persistent poisons results in significant losses for this species.

METHODS

Burrow Survey for Burrowing Owl, Desert Kit Fox, and American Badger

For this report, the study area included the 2,634-acre proposed project site and the proposed gen-tie route (approximately 35.75 acres) (Figure 2). The burrow survey was conducted from March 27 to April 5, May 8 to 12, and May 22 to 26, 2023 in order to cover the entire extent of the study area. The surveys were conducted in teams of two to four and included SWCA biologists Bridget Manjarrez, Par Singhaseni, Lauren Strong, Gigi Wagnon, Parker Richardson, and Kristen Burgess.

The biologists walked parallel transects spaced approximately 20 meters apart throughout the study area and documented potentially suitable burrows or dens for burrowing owl, desert kit fox, and American badger. Potential burrows or dens encountered were each thoroughly examined. General size and shape were recorded along with any signs of occupancy by these species.

Potential burrowing owl burrows were identified based on several factors, including the presence of whitewash, pellets, decorations, or burrows within areas that provided suitable conditions for this species. Burrow suitability factors included burrow entrances that measured approximately 4 to 6 inches wide and burrows located in areas with short vegetation and proximity to potential perch locations, such as dirt mounds and bushes. Burrows that were only partially dug were not considered potential burrowing owl burrows.

Potential desert kit fox dens and burrows were identified based on the shape of entrance, which are typically narrow and keyhole-shaped, and the presence of scat and tracks. An indicator of a desert kit fox den includes multiple entrances. Potential American badger dens or dig sites were identified based on horizontal scrapes along the walls of the tunnel and the presence of large spoils at the entrance. Additionally, several medium-sized mammal burrows could not be identified due to the lack of diagnostic characteristics, or due to burrows only being partially dug, and having shallow depth/collapsed and therefore were described as inactive unknown mammal burrow/dig. Each burrow was photographed, and its location recorded on a GPS unit. The timing of the survey and conditions were generally ideal for detection of burrowing owl, with the exception of March 29 and April 3, 2023, when wind gusts were up to 22 and 40 miles per hour (mph), respectively. Burrowing owl detection is generally more difficult when wind speeds are greater than 12 mph, (CDFW 2012). Weather conditions are summarized in Table 1.

Table 1. Burrow Survey Conditions

Date	Survey Start	Survey End	Temperature (°F)	Conditions
3/27/2023	8:15	16:30	50–61	Sunny, 5–9 mph wind speed
3/28/2023	7:15	15:15	48–69	Sunny, 0–1 mph wind speed
3/29/2023	7:30	14:15	53–63	Sunny, 9–22 mph wind speed
3/30/2023	7:45	15:00	54–60	Cloudy, 3–5 mph wind speed
3/31/2023	7:30	11:15	45–64	Sunny, 1–2 mph wind speed
4/3/2023	7:30	12:30	52–57	Partly cloudy, 8–40 mph wind speed
4/4/2023	8:00	15:15	50–65	Sunny, 3–4 mph wind speed
4/5/2023	7:15	16:25	47–65	Sunny, 1–2 mph wind speed
5/8/2023	6:45	14:45	69–86	Sunny, 3–10 mph wind speed
5/9/2023	6:00	14:00	63–85	Sunny, 1–2 mph wind speed
5/10/2023	7:00	13:45	59–85	Sunny, 5–6 mph wind speed
5/11/2023	6:15	14:00	64–89	Sunny, 0–2 mph wind speed
5/12/2023	7:00	10:30	68–80	Sunny, 1–4 mph wind speed
5/22/2023	6:15	14:15	75 -92	Sunny, 1-3 mph wind speed
5/23/2023	6:15	13:45	74-93	Sunny, 1-5 mph wind speed
5/24/2023	7:30	14:00	79-95	Sunny, 1-4 mph wind speed
5/25/2023	6:15	14:30	76-94	Sunny, 1-3 mph wind speed
5/26/2023	6:15	14:00	77-93	Sunny, 1-3 mph wind speed

Burrowing Owl Breeding Season Surveys

Three follow-up survey visits were conducted by SWCA biologists, with two visits occurring during the peak of the burrowing owl breeding season (between April 15 and July 15) (CDFW 2012) and one occurring after July 15. The first follow-up survey visit took place from June 5 to June 6, 2023, and was carried out by Omar Moquit and Marcus Goncalves. The second follow-up survey visit was conducted on July 6, 2023, by G. Wagnon and P. Richardson. The third follow-up survey was conducted by O. Moquit and Marisol Sanchez on July 24, 2023. Survey conditions were generally ideal for burrowing owl detection (Table 2). Photographs of site conditions during the breeding season surveys are shown in Photographs D-1 through D-4.

Table 2. Breeding Season Survey Conditions

Date	Survey Start	Survey End	Temperature (°F)	Conditions
Survey #1				
6/5/2023	7:30	15:00	76–85	Sunny, 3–7 mph wind speed
6/6/2023	6:30	14:30	61–85	Sunny, 5–7 mph wind speed
Survey #2				
7/6/2023	6:15	10:45	76–90	Cloudy, 11 mph wind speed
Survey #3				
7/24/2023	8:45	1140	93–111	Sunny, 0–1 mph wind speed

During each follow-up visit, the biologists examined burrows that had been identified as potential burrowing owl burrows. Burrows that showed no indication of activity or showed obvious sign of inactivity (such as the presence of debris or webbing at the entrance) were not revisited during subsequent survey visits.

During each survey, SWCA biologists systematically verified burrow activity by conducting a targeted field survey for each potential burrowing owl burrow within the study area. Data captured for each burrow included assessing the condition of the burrow entrance. This involved recording the presence of cobwebs and determining whether they were still intact, noting evidence of fresh excavations or scrapings, and noting whether the entrance of the burrow was collapsed. Detailed observations were made to document any changes compared with the previous status of each burrow recorded during the burrow survey. Potential burrows were examined with an emphasized focus on the presence pellets, prey remains, whitewash, or decoration. Finally, the biologists surveyed the surrounding areas using binoculars.

RESULTS

Burrow Survey for Burrowing Owl, Desert Kit Fox, and American Badger

The burrow survey for burrowing owl, desert kit fox, and American badger resulted in the identification and inventory of a total of 148 burrows (Figure 2). Based on further examination of each burrow, 50 were identified as potential burrowing owl burrows, six were identified as active desert kit fox dens, 28 were identified as inactive desert kit fox dens, five were identified as inactive American badger dens, and 59 were identified as unknown mammal burrows.

Burrows observed during the desert tortoise survey were not included in the burrowing owl, kit fox, and American badger data (see Figure 2) because the surveys were conducted at different times by separate biological teams, though some burrows may overlap between the two surveys. Each survey employed species-specific habitat assessment methods (e.g., 10 m transects for desert tortoise vs. 20 m transects for burrowing owl, etc.). However, it is important to note that burrowing owl, kit fox, and American badger can utilize desert tortoise burrows, and the large number of burrows observed in the desert tortoise survey are a consideration when evaluating habitat suitability for these species in the project area.

Burrowing Owl

Upon close examination of each burrow, only one burrow exhibited recent sign of potential burrowing owl activity, with whitewash staining around the entrance (Photographs D-5 through D-7 in Attachment D-1). During the burrow survey, it was deduced that the remaining 49 potential burrowing owl burrows in the study area were not inhabited at the time or actively being used by burrowing owl.

During the burrow survey on March 27, 2023, a single live burrowing owl was detected in the southern section of the study area, specifically within a desert wash located approximately 0.28 mile south of Rasor Road (see Figure 2). After the initial sighting, the observed individual dispersed to the southeast and out of visible range of the surveyors. No burrows were observed within proximity to the detected live specimen. After further investigation, there was no definitive association established between this individual owl and any of the surrounding burrows within the study area. Additionally, the observed behaviors of this owl did not clearly indicate any breeding or nesting activities. The primary behaviors noted were limited to vocalizations, which were promptly followed by dispersal. As a result, this observation did not provide substantial evidence of reproductive or nesting behavior in the vicinity.

Desert Kit Fox and American Badger

Upon completion of the burrow survey, it was determined that desert kit fox and American badger are likely be present in the project vicinity based on the presence of signs. Neither species was directly observed during the burrow surveys as: both species are nocturnal and would have been underground during the daytime surveys. A desert kit fox was observed during a nighttime bat survey in the study area Fresh signs, including scat, entrance scrapings, and tracks, were found at six burrow locations within the study area (see Figure 2). These burrows were considered active kit fox dens. Notably, all dens determined to be active showed evidence of fresh excavations, loose silty soil at the entrances, and/or relatively fresh or fresh scat (Photographs D-8–D-10 in Attachment D-1).

While the occurrence data for the desert kit fox species is not currently tracked in any online database, it is widely known that the species is distributed throughout the Mojave Desert based on scientific research and observations conducted by biologists, ecologists, and wildlife experts.

The signs indicating desert kit fox activity encompassed various observable characteristics, including the presence of fresh or recent scat, evidence of recent digging or excavation, and well-maintained entrances. The inactive American badger dens were identified by the lack of evidence of distinct claw prints and size and shape of den entrances (Photograph D-12 in Attachment D-1), and unknown inactive mammal burrows or digs were identified as such due to the lack of insufficient or inconclusive evidence of excavation or maintenance by a specific species (Photograph D-13 in Attachment D-1).

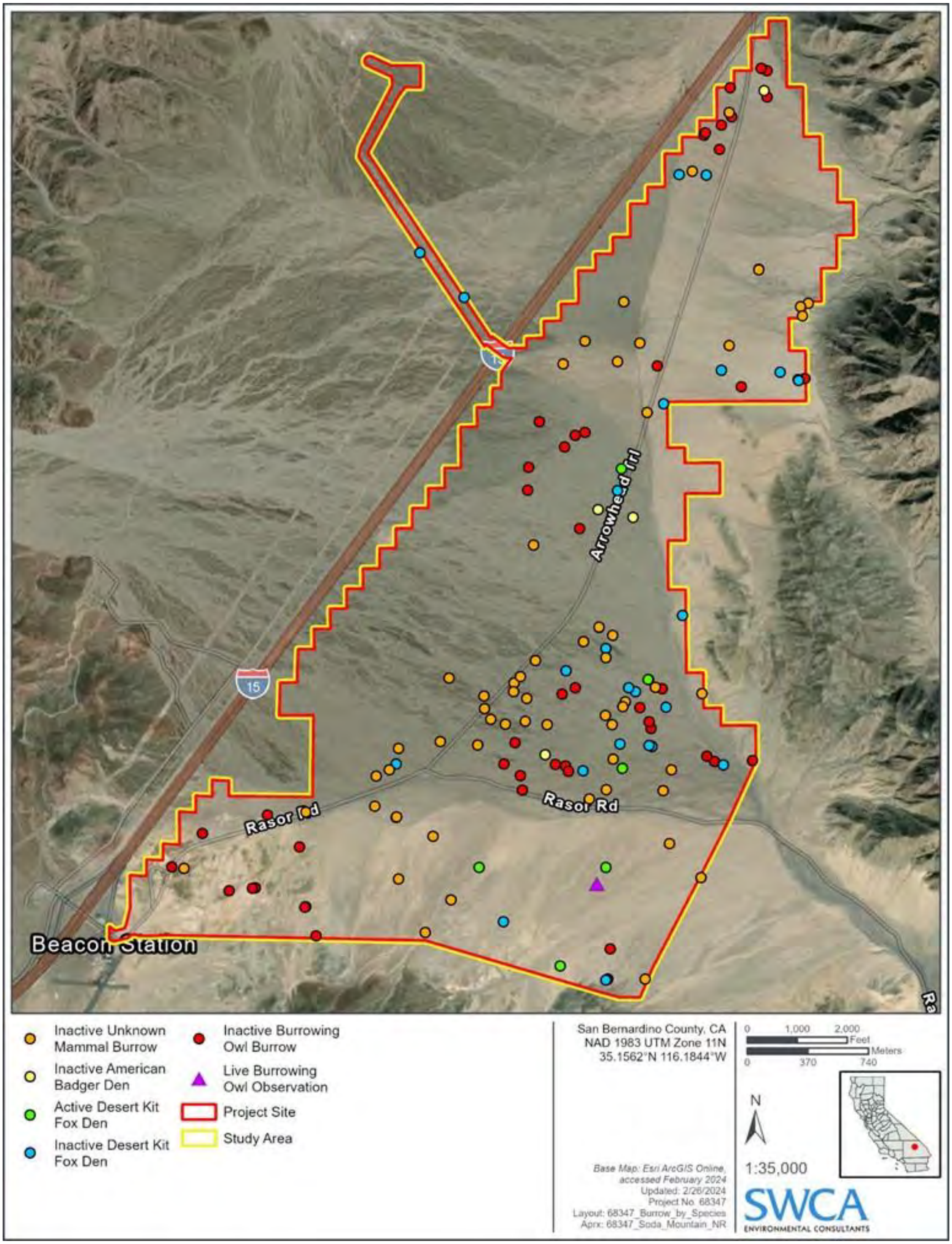

Figure 2. Location of live burrowing owl observation, unknown mammal burrows, and desert kit fox and American badger dens identified within the study area.

Burrowing Owl Breeding Season Surveys

The following section describes the results of three rounds of surveys conducted during the burrowing owl breeding season to assess the activity and occupancy status of 50 potential burrowing owl burrows that were identified during the initial burrow survey. During each survey, potential burrowing owl burrows that showed evidence of inactivity since the prior survey visit were noted and were determined to not require a revisit during the subsequent visits.

Survey #1

During the initial round of surveys, each of the 50 potential burrowing owl burrows were visited by SWCA biologists. None of these burrows, including one burrow that exhibited sign of potential burrowing owl activity, exhibited signs of new signs of burrowing owl activity. Additionally, during the survey, the location where a live specimen had been previously identified within an ephemeral wash was revisited. While remnants of old whitewash were still discernible at the location of the live observation, there was an absence of fresh whitewash, suggesting a lack of recent burrowing owl activity in the area.

After analyzing the data collected during this survey, it was observed that 15 burrows showed insufficient evidence of inactivity, as they lacked indicators of an inactive burrow such as debris or webbing at their entrances. As a result, these burrows were determined to require a revisit during the second round of surveys.

Survey #2

During the second round of surveys, similar findings were observed as in the initial round. Out of the 15 revisited potential burrowing owl burrows, no new signs of burrowing owl activity were detected and seven of these burrows displayed clear signs of inactivity which included desiccated plant matter or webbing at the entrances. Additionally, when revisiting the location where a live specimen had been previously identified in an ephemeral wash, it was observed that, although old whitewash persisted, the absence of fresh whitewash indicated a continued lack of recent burrowing owl activity.

Based on the data collected during this survey, it was determined that during the third and final round of surveys, eight burrows would require revisiting based on insufficient evidence of inactivity

Survey #3

The third and final round of surveys resulted in findings similar to those of the initial and second rounds of surveys. Of the eight burrows revisited; no indications of new burrowing owl activity were detected. Thorough examinations of these burrows determined that they were not occupied by burrowing owl.

Burrowing Owl Summary

All 50 potential burrowing owl burrows were determined to be unoccupied by burrowing owl. A complete inventory of burrows is provided in Table 3.

Other Burrows

The 28 inactive desert kit fox dens, five inactive badger dens, and six active desert kit fox dens were revisited to confirm their occupancy status based on the findings from the burrow survey. Dens that were confirmed to still be inactive at the time of the first survey visit were not revisited during the subsequent surveys. All 33 of the previously identified inactive desert kit fox and American badger dens, and the six active desert kit fox dens were revisited during the first visit. All 33 of the dens were confirmed to still be inactive. Six of the previously identified active desert kit fox dens were revisited during the second and third visits in order to determine if changes had occurred to their occupancy status. All six active burrows were determined to be active and occupied by desert kit fox during each survey visit.

Table 3. Burrows Identified within the Study Area

Observation Type	Quantity	Description
Burrowing Owl		
Occupied burrow, active nest	0	Burrows with chicks present and/or adults exhibiting nesting behavior.
Occupied burrow, nesting not confirmed	0	Burrows with at least one burrowing owl present but not displaying clear signs of nesting.
Unoccupied, with sign	1	Suitable potential burrows with burrowing owl signs such as whitewash, pellets, and/or feathers.
Unoccupied, no sign	49	Suitable potential burrows that have no sign of occupancy.
Sign (no burrow)	1	Sign of burrowing owl or live observation that was discovered but not associated with a burrow.
Desert Kit Fox		
Active den	6	Den displays evidence of recent activity, including recent or fresh excrements, fresh excavations indicated by silty soil near entrances, and/or distinct tracks near the vicinity of the den.
Inactive den	28	Den shows no signs of recent activity, with no recent tracks, webbed or debris-blocked entrances, and no evidence of entrance maintenance.
American Badger		
Inactive den	5	Den does not exhibit recent activity, such as recent tracks or claw scrapings. The entrances are either webbed or obstructed by debris, indicating a lack of maintenance or recent use.
Unknown Mammal Burrow		
Inactive burrow/dig	59	Burrow/dig appears partially excavated or has collapsed; no signs of recent activity such as tracks or scrapings. The entrances are either webbed or obstructed by debris, indicating a lack of maintenance or recent use.

Other Wildlife Observations

During the preliminary burrow survey, SWCA biologists discovered a desert bighorn sheep (*Ovis canadensis nelsoni*) skull. The skull showed evident signs of deterioration, including conspicuous cracks and absent teeth, indicative that it had likely been deceased for some time. Other common wildlife species that were observed during the surveys included western zebra-tailed lizard (*Callisaurus draconoides rhodostictus*), desert horned lizard (*Phrynosoma platyrhinos*), Great Basin whiptail (*Aspidoscelis tigris tigris*), Bell's sparrow (*Artemisiospiza belli*), black-throated sparrow (*Amphispiza bilineata*), common raven (*Corvus corax*), and pallid-winged grasshopper (*Trimerotropis pallidipennis*).

DISCUSSION

The burrow survey conducted for burrowing owl, desert kit fox, and American badger and subsequent breeding season surveys conducted for burrowing owl found no evidence of active burrow use by burrowing owl or American badger in the study area for any of the 148 burrows that were identified. A total of six active burrows, determined to be occupied by desert kit fox, were identified. During the initial burrow surveys, a single burrowing owl and one burrow with signs of potential burrowing owl use were detected. However, no evidence of burrowing owl utilization occurred during the subsequent breeding season surveys.

As described in the 2013 biological resources technical report (Panorama Environmental, Inc. 2013), burrowing owl was detected in the study area during botanical surveys conducted in 2012 (C.S. Ecological Surveys and Assessments 2012). Based on observations made during the time of the survey (late October to early November), the study area appeared to support between nine and 24 burrowing owl individuals. Twenty-four burrows with recent sign of use by burrowing owl were mapped during the botanical surveys. Live individuals were observed using eight of the 24 active burrows; one additional live owl was also observed in the project right-of-way. Many of the burrowing owls were observed foraging on grasshoppers, which were abundant during fall 2012 surveys (Schnurrenberger 2012). Burrowing owl that are observed during fall migration will commonly move on to other overwintering or nesting habitat (Schnurrenberger 2012). It is likely that a number of the burrowing owls observed in the fall were using the study area for foraging during migration. Only a portion of the owls observed on-site would be expected to overwinter in the area; other owls were likely migrating (Schnurrenberger 2012).

The absence of occupied burrowing owl burrows during the 2023 burrow survey and follow up surveys could be attributed to various factors. Low breeding densities for burrowing owl may be a characteristic of desert ecosystems (Crowe and Longshore 2010). Potential disturbances to suitable burrow sites caused by human activities may also be impacting burrowing owl burrow selection in the area. Primarily, the presence of humans and off-highway vehicle (OHV) use in the vicinity, particularly associated with BLM land, could contribute to their avoidance of suitable burrow sites in the study area.

Desert kit fox and American badger are presumed to be on-site, based on evidence of sign by each species. A desert kit fox was observed during a nighttime bat survey in the study area. American badger was not directly observed; however, as this species is nocturnal and rarely observed during daylight hours.

The results of the burrow survey suggest that desert kit fox and American badger are present within the study area. Although direct observations of these species were not made, both are nocturnal and are rarely seen during daylight hours. The identification of desert kit fox is supported by the discovery of distinctive signs commonly associated with this species. Notable evidence includes identifiable tracks, as well as the presence of scat and burrow openings displaying typical features of desert kit fox activity associated with six desert kit fox entrances. The identification of American badger is supported by evidence of conspicuous claw marks on five burrow entrances.

LITERATURE CITED

California Department of Fish and Game. 2012. *Staff Report on Burrowing Owl Mitigation*. California Department of Fish and Game, Sacramento, California.

Crowe, D.E., and K.M. Longshore. 2010. Estimates of density, detection probability, and factors influencing detection of burrowing owls in the Mojave Desert. *Journal of Raptor Research* 40(1):1–11.

C.S. Ecological Surveys and Assessments. 2012. Focused Fall Special-Status Plant Survey Soda Mountain Solar Project. October – November 2012. Prepared for Panorama Environmental, Inc. and BLM.

DeSante, D.F., E.D. Ruhlen, and R. Scalf. 2007. The distribution and relative abundance of burrowing owls in California during 1991–1993: Evidence for a declining population and thoughts on its conservation, in Proceedings of the California Burrowing Owl Symposium, November 2003 (J. H. Barclay, K. W. Hunting, J. L. Lincer, J. Linthicum, and T. A. Roberts, eds.), pp. 1–41. Bird Populations Monogr. 1. The Institute for Bird Populations and Albion Environmental, Inc.

Egoscue, H.J. 1962. Ecology and life history of the kit fox in Tooele Conty, Utah. *Ecology* 43:481–497.

Gervais, J.A., D.K. Rosenberg, and L.A. Comrack. Burrowing Owl (*Athene cunicularia*) in Shuford, W.D. and T. Gardali, eds. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento, California, USA.

Gervais, J.A., D.K. Rosenberg, and R.G. Anthony. 2003. Space use and pesticide exposure risk of male burrowing owls in an agricultural landscape. *Journal of Wildlife Management* 67:156–165.

Gervais, J.A., D.K. Rosenberg, D.M. Fry, L. Trulio, and K.K. Sturm. 2000. Burrowing owls and agricultural pesticides: evaluation of residues and risks for three populations in California. *Environmental Toxicology and Chemistry* 19:337–343.

Green, G.A., R.E. Fitzner, R.G. Anthony, L.E. and Rogers. 1993. Comparative diets of burrowing owls in Oregon and Washington. *Northwest Science* 67:88–93.

Haug, E.A., B.A. Millsap, and M.S. Martell. 1993. Burrowing owl (*Speotyto cunicularia*), in A. Poole and F. Gill, editors, The Birds of North America, The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C., SA.

Haug, E.A., and L.W. Oliphant. 1990. Movements, activity patterns, and habitat use of burrowing owls in Saskatchewan. *Journal of Wildlife Management* 54:27–35.

Kadaba, D. 2014. Ecology of the desert kit fox (*Vulpes macrotis arsipus*) in Chuckwalla Valley, California.

Klute, D.S., A.W. Ayers, M.T. Green, W.H. Howe, S.L Jones, J.A. Shaffer, S.R. Sheffield, and T.S. Zimmerman. 2003. Status assessment and conservation plan for the western burrowing owl in the United States. U.S. Department of the Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R6001-2003, Washington, D.C, USA.

Laughrin, L. 1970. San Joaquin kit fox: its distribution and abundance. California Department of Fish and Game, Sacramento. Wildlife Management Branch Administrative Report No. 70-2. 20 pp.

Messick, J.P., and M.G. Hornocker. 1981. Ecology of the badger in southwestern Idaho. *Wildlife Monographs* 76:1–51.

Morrell, S. 1971. Life history of the San Joaquin kit fox. California Department of Fish and Game. Wildlife Management Branch, Sacramento. 25 pp.

Orloff, S., F. Hall, and L. Spiegel. 1986. Distribution and habitat requirements of the San Joaquin kit fox in the northern extreme of their range. *Transactions of the Western Section of the Wildlife Society* 22:60–70.

Panorama Environmental, Inc. 2013. Biological Resources Technical Report Soda Mountain Solar. San Bernardino County, CA. BLM Case Number CACA 49584.

Plumpton, D.L., and R.S. Lutz. 1993. Prey selection and food habits of burrowing owls in Colorado. *Great Basin Naturalist* 53:299–304.

Ronan, N.A. 2002. Habitat selection, reproductive success, and site fidelity of burrowing owls in a grassland ecosystem. M.S. thesis, Oregon State University, Corvallis.

Schnurrenberger, Catherine. 2012. Personal communication with Susanne Heim, Panorama Environmental. October 30, 2012.

Thompson, C.D., and S.H. Anderson. 1988. Foraging behavior and food habits of burrowing owls in Wyoming. *Prairie Naturalist* 20:23–28.

Williams, D.F. 1986. Mammalian species of special concern in California. California Department of Fish and Game, Sacramento. Admin. Rep. 86-1. 112 pp.

York, M., D.K. Rosenberg, and K.K. Sturm. 2002. Diet and food-niche breadth of burrowing owls (*Athene cunicularia*) in the Imperial Valley, California. *Western North American Naturalist* 62:280–287.

ATTACHMENT A

Photographs

Photograph B-1. Site conditions from the southeastern extent of the study area from Rasor Road; view facing southwest. Photographed June 2023.

Photograph B-2. Site conditions from the southwestern extent of the study area from Rasor Road; view facing northwest. Photographed June 2023.

Photograph B-3. Site conditions in June 2023; view facing northwest from the central region of the study area. The photograph was taken from an unnamed access road within the study area.

Photograph B-4. Site conditions in July 2023; view facing Southeast from the northern region of the study area from the unnamed access road within the study area.

Photograph B-5. Whitewash staining at the location a live individual burrowing owl was detected during the burrow survey. Photographed June 2023.

Photograph B-6. Whitewash staining (indicated by red circle) near the entrance of a potential burrowing owl burrow that was identified during the burrow survey. Photographed March 2023.

Photograph B-7. Whitewash staining (indicated by red circle) near the entrance of a potential burrowing owl burrow that was identified during the burrow survey. Photographed March 2023.

Photograph B-8. Active kit fox den exhibiting a characteristic keyhole den entrance, fresh prints leading to and from the burrow entrance, and sign of fresh excavation as indicated by silty sand near entrance. Photographed July 2023.

Photograph B-9. Kit fox tracks, an indication of relatively recent activity closely linked to the depicted den. Photographed July 2023.

Photograph B-10. Relatively fresh kit fox scat compared with old scat found near the depicted den. Photographed July 2023.

Photograph B-11. Inactive kit fox den displaying a characteristic keyhole den entrance with no signs of recent excavations. Photographed May 2023.

Photograph B-12. Inactive badger den showing no webbing at the entrance and no fresh soil pile. Photographed March 2023.

Photograph D-13. Representative photograph of an inactive, unknown mammal burrow exhibiting webbing at the entrance and lack of fresh excavations. Photographed May 2023.

APPENDIX O

Bat Survey Report for the Soda Mountain Solar Project

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TECHNICAL MEMORANDUM

To: Soda Mountain Solar, LLC

From: Shirley Innecken, Natural Resources Lead Project Manager

Date: June 14, 2024

Re: **Bat Survey Report for the Soda Mountain Solar Project / SWCA Project No. 068347**

INTRODUCTION

This report summarizes the results of the bat habitat assessment survey and nighttime acoustic surveys conducted by SWCA Environmental Consultants (SWCA) for the Soda Mountain Solar Project (project). The project is located along Interstate 15 (I-15) approximately 50 miles northeast of Barstow, San Bernadino County, California (Figure 1). Soda Mountain Solar, LLC plans to develop a utility-scale photovoltaic (PV) solar facility on approximately 2,670 acres of land managed by the Bureau of Land Management (BLM) (Figure 2). The project site is situated in an alluvial valley between the northern and southern portions of the Soda Mountains in the Mojave Desert.

SWCA developed the biological survey methods in coordination with the California Department of Fish and Wildlife (CDFW) and prepared a biological and aquatic resources work plan. The purpose of this survey was to document the suitability, potential habitat usage, and suitability of areas within the immediate project site and the surrounding landscape of structures, both natural and constructed, as potential maternity, hibernacula, and/or nocturnal roost sites for bats. The survey was conducted in accordance with *Caltrans Bat Mitigation: A Guide to Developing Feasible and Effective Solutions* (H.T. Harvey & Associates 2019), *A Plan for the North American Bat Monitoring Program (NABat)* (Loeb et al. 2015), and *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins 2016). The surveys consisted of an initial daytime habitat assessment survey and three subsequent rounds of nighttime acoustic surveys consisting of dusk roost emergence and activity transect surveys.

Figure 1. Regional vicinity map.

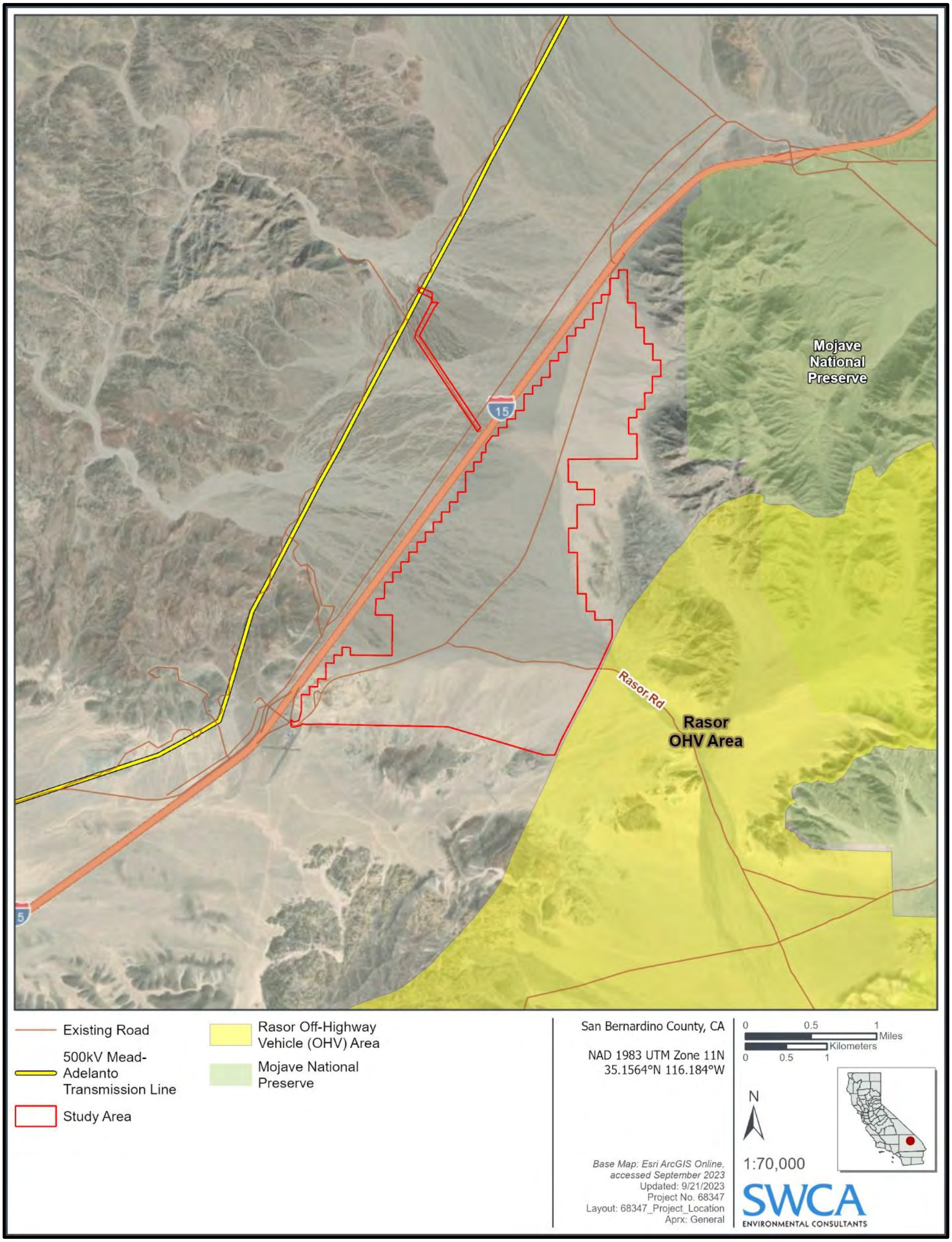


Figure 2. Soda Mountain Solar Project study area.

METHODS

This section identifies the methods and information sources used to describe and evaluate how bat species utilize the study area.

Database Reviews

Prior to conducting field surveys, a comprehensive review of relevant biological databases was conducted, including the California Natural Diversity Database (CNDDB) (CDFW 2023), Section 5 of *Caltrans Bat Mitigation: A Guide to Developing Feasible and Effective Solutions* (H.T. Harvey & Associates 2019), and *Log of Bridges on State Highways, District 8* (California Department of Transportation 2018). Desktop reviews of aerial imagery from Google Earth and ArcGIS Online were also conducted to identify geographically and environmentally suitable locations within the study area and its surrounding topography where bats may roost. Additionally, locations identified by Panorama Environmental, Inc. (2014) were referenced to determine habitat suitability.

Field Surveys

For this report, the study area included the 2,634-acre proposed project site and the proposed gen-tie route (approximately 35.75 acres). SWCA biologists conducted a daytime habitat assessment survey with the primary objective to identify structures or environmental features within the study area that could serve as suitable roosting, foraging, or commuting habitat for bats. Additionally, the survey aimed to identify suitable locations for conducting nighttime transect surveys, focusing on areas that would account for all representative habitat types within the study area.

Following the daytime habitat assessment survey, SWCA biologists conducted three nighttime acoustic surveys with the primary objective to confirm roost status, determine roost size, capture entry and exit roosts, and determine the use of the study area by bats. Conditions were generally clear, with temperatures between 98 and 108 degrees Fahrenheit, and wind speeds from 1 to 16 miles per hour. Table 1 summarizes the conditions throughout the survey period.

Table 1. Survey Times and Weather Conditions

Date	Start Time	End Time	Temperature (°F)	Wind Speed (mph)	Conditions
6/27	07:00	13:00	62–94	1–2	Sunny
6/28	07:00	13:00	60–96	2–3	Sunny
7/23	19:30	22:00	101–104	2–5	Clear
7/24	19:30	22:00	102–108	3–10	Clear
7/25	19:30	22:00	104–106	3–15	Clear
7/26	19:30	22:00	102–106	4–8	Clear
8/14	19:00	21:00	100–102	1–6	Clear
8/15	19:00	21:00	100–103	2–5	Clear
8/16	19:00	21:00	98–102	2–6	Cloudy
8/17	19:00	21:00	100–101	3–16	Cloudy
8/28	18:45	21:15	103–106	2–3	Clear
8/29	18:45	21:15	102–106	2–5	Clear
8/30	18:45	21:15	103–108	5–10	Clear
8/31	18:45	21:15	103–108	3–6	Cloudy

Daytime Habitat Assessment Survey

On June 27 and 28, 2023, SWCA biologists Mason Townley and Omar Moquit conducted a daytime habitat assessment survey of the study area. The evaluation encompassed various types of structures, including stormwater culverts, bridges, large-diameter trees with suitable cavities, boulder piles exhibiting appropriate openings, and other comparable formations that have the potential to provide cavities suitable for roosting.

During the survey, the biologists visually scanned the survey area, focusing on designated locations identified during the desktop review, for potential roosting sites. Attention was focused on rock crevices, tree cavities, and human-made structures, where the biologists searched for specific signs indicating the presence of bats such as guano, insect carapaces, urine staining, or deceased specimens to determine the status of potential roost locations. Specific locations that were determined to have the potential to support bats were mapped. Relevant information was noted for locations suitable for bat roosting or with habitat capable of supporting bats, as well as for locations with poor suitability to support bat roots or foraging habitat. Landscape features such as water features suitable for foraging within proximity to locations with crevice availability and suitability of structures to support bat roosts were noted. Locations that had the potential to support roosts, such as trees with suitable cavities and exfoliating bark, boulder outcroppings, and human-made structures, were documented. Photographs were taken at designated locations with likelihood of supporting roosts or foraging areas (Attachment A-1).

POTENTIAL ROOST LOCATIONS

Four potentially suitable roosting locations were identified during the daytime survey: Roost Emergence 1 (RE1), Roost Emergence 2 (RE2), Roost Emergence 3 (RE3), and Roost Emergence 4 (RE4) (see Figure 3). All four of these potential roosting locations occur within stormwater culverts passing underneath I-15.

TRANSECT LOCATIONS

Five transects were established throughout the study area that were designed to account for all habitat types within the project site: Transect 1 (T1), Transect 2 (T2), Transect 3 (T3), Transect 4 (T4), and Transect 5 (T5) (Figure 3). These chosen transect locations serve as the foundation for the nighttime acoustic surveys, which will involve systematic observations and data recording to capture bat activity patterns and identify specific roosting and foraging locations within the study area. Transects were distributed along areas that encompassed characteristics important for bat foraging and roosting, including rocky crevices, tree cavities, and human-made structures known to harbor suitable roosting features. This focused approach aimed to investigate regions with a higher likelihood of bat occupancy and roosting activity, considering factors such as the presence of water features, insect abundance, and vegetation types that support their feeding habits (Pierson and Rainey 1994). The strategically selected transects across habitats with key foraging characteristics allowed for a comprehensive assessment of bat habitat utilization within the study area.

Nighttime Acoustic Surveys

SWCA biologists Leonard Griffiths, M. Townley, Bridget Manjarrez, Tamara Kramer, Gigi Wagnon, Marisol Sanchez, and Minerva Lara conducted three nighttime acoustic surveys from July 23 through 26, August 14 through 17, and August 28 through August 31, 2023. Nighttime acoustic surveys took place at locations identified during the daytime habitat assessment survey as having potential roost sites, and along transects that present opportunities for bats to emerge from roosts and disperse to foraging grounds (T1, T2, T3, T4, and T5) (see Figure 3). Calls were recorded using acoustic monitoring equipment including two Wildlife Acoustics Echo Meter Touch units with built-in species identifiers (connected to

Android Galaxy tablets), a Pettersson u384 Ultrasonic Microphone (connected to a Lenovo IdeaPad laptop running BatSound), and an Anabat Scout standalone unit. Calls were analyzed to species level. All potential roost locations were recorded using a GPS unit. The nighttime acoustic surveys were conducted from a half hour prior to sunset to 2 hours after sunset. The surveys were conducted in all safe weather conditions with full visibility throughout the entire survey plot.

RESULTS

Two bat species listed as Species of Special Concern by the CDFW and as Sensitive by the Bureau of Land Management (BLM) were determined to have the potential to occur within the project site based on existing records and the presence of potentially suitable habitat: pallid bat (*Antrozous pallidus*) and Townsend's big-eared bat (*Corynorhinus townsendii*) (Table 2).

Table 2. Occurrence Potential for Special-Status Bats within the Soda Mountain Solar Project study area.

Common Name (Species Name)	Status Federal/ State*	Range or Habitat Requirements	Potential to Occur at the Project Site
Pallid bat (*Antrozous pallidus*)	SSC, BLM S	Pallid bats roost in a variety of places but favor rocky outcrops and desert habitats. They also typically occur in oak and pine forested areas and open farmland. Roosting sites are variable, depending on what is available. They can be found roosting in caves, rock crevices, mines, hollow trees, and buildings.	May occur (foraging only). No suitable habitat for roosting was observed during the summer 2023 surveys. The nearest CNDDB record is more than 12 miles from the project site and was a documented mist net capture.
Townsend's big-eared bat (*Corynorhinus townsendii*)	SSC, BLM S	Typical roosting habitat is located in mines, caves, old buildings, and tree hollows. Townsend's big-eared bats require moths and beetles for feeding, with moths being their primary food source.	May occur (foraging only). No suitable habitat for roosting was observed during the summer 2023 surveys. The nearest CNDDB record is 3.5 miles east of the project site and was a documented mist net capture.

SCC = Species of Special Concern
BLM S = BLM Sensitive Species

Two bat species were detected by sight and/or sound within the study area during the nighttime acoustic survey period: canyon bat (*Parastrellus hesperus*) and Mexican free-tailed bat (*Tadarida brasiliensis*) (Table 3). There were 18 detections total, all occurring between August 28 and August 31 at RE4, T2, and T5. The four roost emergence locations were determined to be potentially suitable for roosting due to the presence of crevices within the culverts displaying suitable depth, width, and height above the ground for bat roosting (Keeley and Tuttle 1999). Possible urine staining was additionally observed at RE3.

No roost emergence behavior was observed. Bat behavior during all acoustic detections and visual observations was consistently categorized as either foraging or commuting. The potential roosting sites identified during the daytime habitat assessment survey and monitored acoustically during the nighttime surveys did not reveal any active roosting sites, as there were no evident bat emergences detected during the acoustic monitoring surveys. No other potential roosting locations were identified within the study area or immediate vicinity during the surveys.

The highest densities of acoustic and visual detections were near RE4, the southern portion of T5, and the northern portion of T2. The areas displaying aggregations of bats were found in proximity to human-built structures such as the Rasor Road Shell Station in the southern portion of the study area, the wash adjacent to RE4 in the northern portion, and over natural communities such as Creosote Bush – White

Bursage Scrub (*Larrea tridentata – Ambrosia dumosa* Shrubland Alliance) and Cheesebush – Sweetbush Scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance) with rocky outcroppings in the northern portion of the study area (see Figure 4). These observations consisted of foraging, supported by acoustic data and visual documentation, and commuting behavior, supported by visible documentation, from the species observed.

Table 3. Bat Species Observed during Nighttime Acoustic Surveys

Common Name (Scientific Name)	Detections	Observed Behavior
Canyon bat (*Parastrellus hesperus*)	16	Foraging, commuting
Mexican free-tailed bat (*Tadarida brasiliensis*)	2	Foraging

DISCUSSION

No Species of Special Concern or BLM Sensitive bat species were found in the study area during the surveys. Conditions during the survey were good for detecting bats by sight and/or sound, with appropriate temperatures and conditions (Table 1). No bats were seen emerging from the potential roosts during the three nighttime acoustic surveys. Eighteen total observations of two species were recorded as part of the surveys; these were associated with activity transect and roost emergence surveys, on August 28, 29, and 31. Given this, use of the study area by bats is determined to be limited to foraging and/or commuting only, with minimal amounts of visual and acoustic evidence observed.

Conditions during the survey were suitable for detecting bat activity, with optimal temperatures, weather conditions, and timing of surveys (Table 1). The project site consisted of appropriate topography, elevation, and open foraging habitat to support pallid bat and Townsend's big-eared bat, and the project site is located within the known range of these species.

Additionally, foraging resources were limited at the project site. There are no permanent water sources within 3 miles of the project site, and insect and arachnid activity was limited during surveys. Therefore, SWCA has determined that habitat at the project site is best described as low-quality roosting habitat and moderate-quality foraging habitat for Species of Special Concern and BLM Sensitive bat species due to limited resources and moderate disturbance.

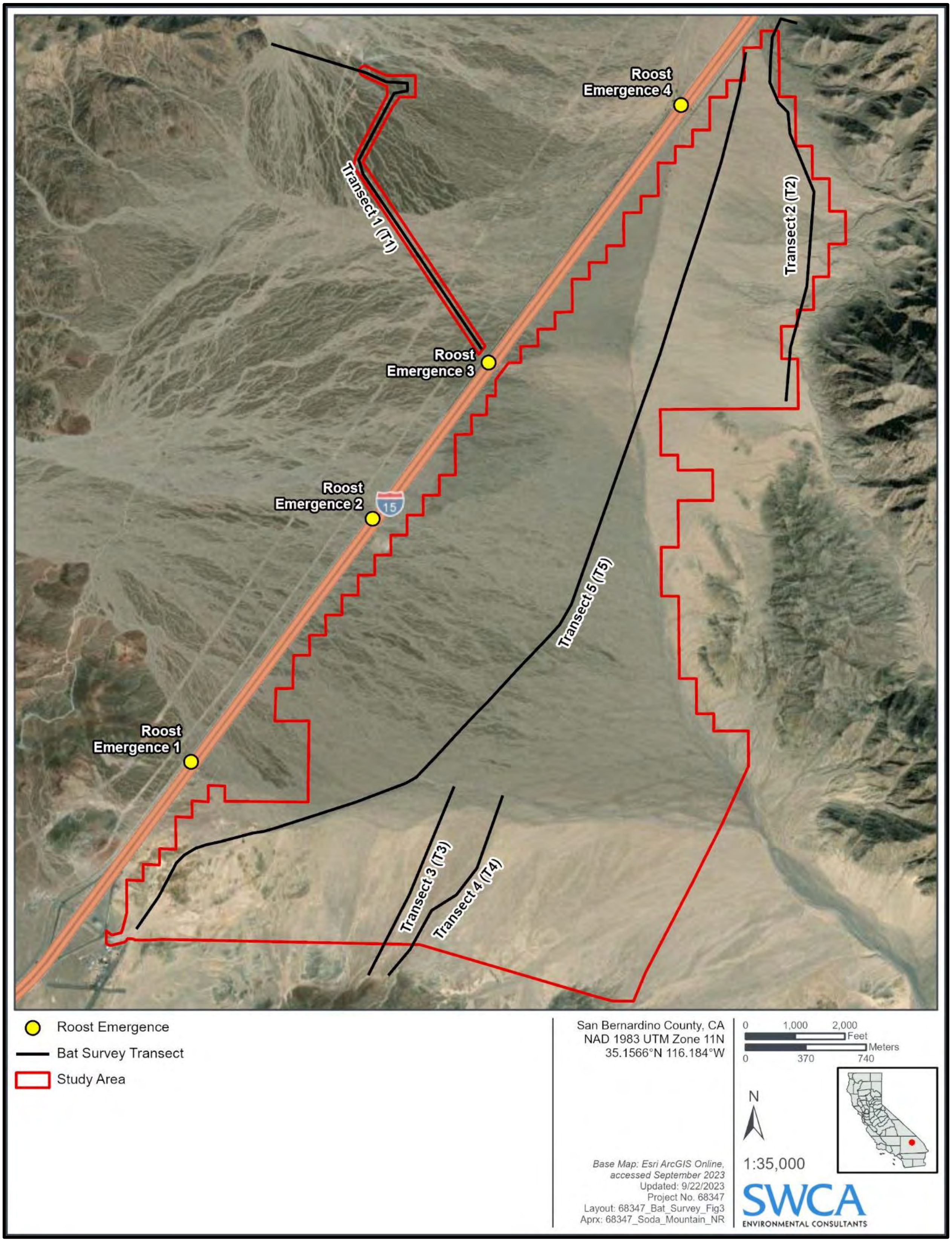


Figure 3. Locations of roost emergence and transect survey locations within the Soda Mountain Solar Project study area.

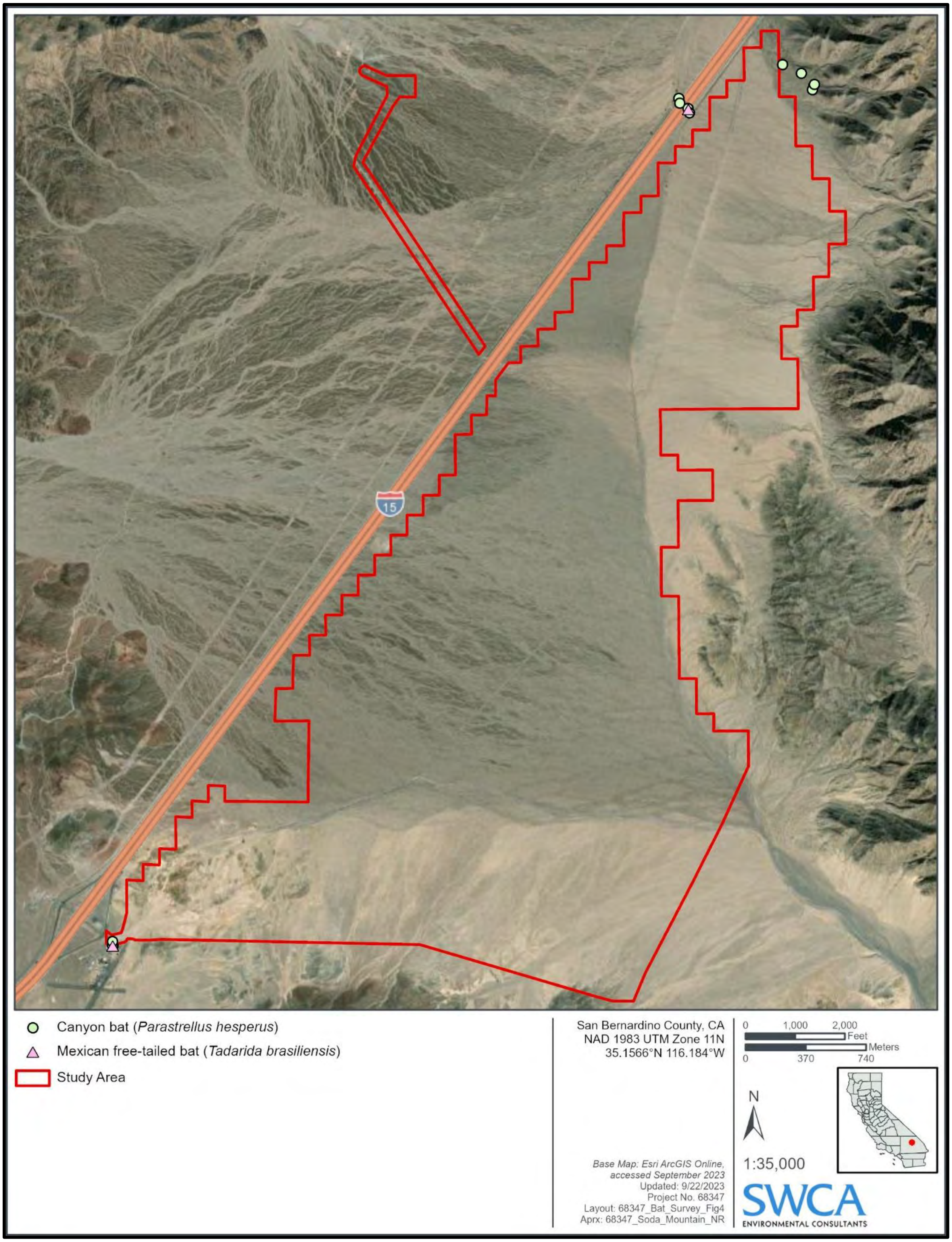


Figure 4. Locations of bats observed within the Soda Mountain Solar Project study area.

LITERATURE CITED

California Department of Fish and Wildlife (CDFW). 2023. California Natural Diversity Database (CNDDB) using RareFind. Electronic database managed by the Biogeographic Data Branch, California Department of Fish and Wildlife. Sacramento, California. Available at: https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx. Accessed April 2023.

California Department of Transportation, Structure Maintenance & Investigations. 2018. *Log of Bridges on State Highways, District 8*. Available at: https://dot.ca.gov/-/media/dot-media/programs/maintenance/documents/f0009155-logd08-a11y.pdf. Accessed April 2023.

Collins, J. (ed.). 2016. *Bat Surveys for Professional Ecologists: Good Practice Guidelines.* 3rd ed. The Bat Conservation Trust, London. ISBN-13 978-1-872745-96-1.

H.T. Harvey & Associates. 2019. *Caltrans Bat Mitigation: A Guide to Developing Feasible and Effective Solutions*. California Department of Transportation.

Keeley, B.W., and M.D. Tuttle. 1999. *Bats in American Bridges*. Bat Conservation International Inc., Austin Texas.

Loeb, Susan C., T.J. Rodhouse, L.E. Ellison, C.L. Lausen, J.D. Reichard, K.M. Irvine, T.E. Ingersoll, J.T.H Coleman, W.E. Thogmartin, J.R. Sauer, C.M. Francis, M.L. Bayless, T.R. Stanley, and D.H. Johnson. 2015. *A Plan for the North American Bat Monitoring Program (NABat)*. Gen. Tech. Rep. SRS-208. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 100 p.

Panorama Environmental, Inc. 2014. *Bird and Bat Conservation Strategy, Soda Mountain Solar Project*. San Francisco, CA.

Pierson, E.D., and W.E. Rainey. 1994. *Distribution, Status, and Management of Townsend's big-eared bat (*Corynorhinus townsendii*) in California*. State of California Department of Fish and Game. BMCP Technical Report Number 96-7.

ATTACHMENT A

Photographs

Photograph A-1. Site conditions at RE1; view facing northwest. Photographed June 2023.

Photograph A-2. Site conditions at RE2; view facing southeast. Photographed June 2023.

Photograph A-3. Site conditions at RE3; view facing southeast. Photographed June 2023.

Photograph A-4. Site conditions at RE4; view facing northwest. Photographed June 2023.

Photograph A-5. Site conditions from the northwestern point of T1, showing suitable foraging habitat of Creosote Bush – White Bursage Scrub; view facing southeast. Photographed June 2023.

Photograph A-6. Site conditions from the northeastern point of T2, showing suitable foraging habitat of Creosote Bush – White Bursage Scrub; view facing northwest. Photographed June 2023.

Photograph A-7. Site conditions from the southwestern point of T3, showing suitable foraging habitat of Creosote Bush Scrub; view facing north. Photographed June 2023.

Photograph A-8. Site conditions from the southwestern point of T4, showing suitable foraging habitat of Creosote Bush – White Bursage Scrub; view facing south. Photographed June 2023.

Photograph A-9. Site conditions at the approximate midpoint of T5, showing suitable foraging habitat of Creosote Bush – White Bursage Scrub; view facing northwest. Photographed June 2023.

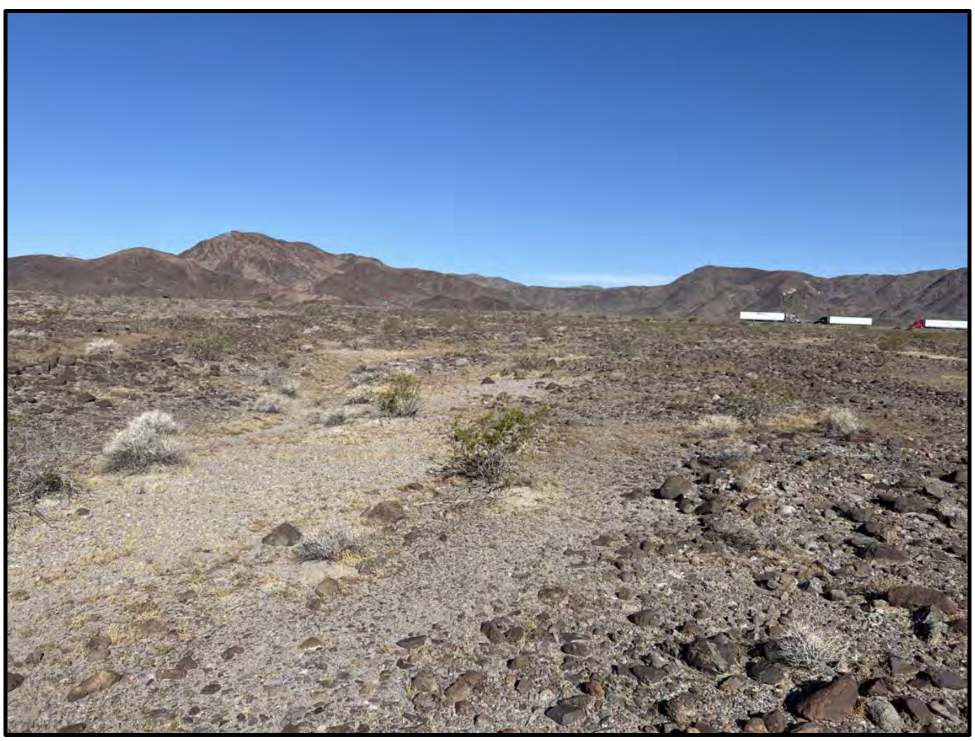
APPENDIX P

Site Photographs

Photograph P-1. Site conditions in the southeastern portion of the study area; view facing south. Photographed June 16, 2023.

Photograph P-2. Site conditions in the northern region of the study area; view facing northeast. Photographed April 3, 2023.

Photograph P-3. Example of off-road vehicle tracks in the southeastern portion of the study area; view facing northwest. Photographed March 27, 2023.



Photograph P-4. I-15 visible in the distance, directly west of the study area. Photographed May 25, 2023.

Photograph P-5. Wandering dog frequently encountered near the south end of the study area on Rasor Road. Illegal trash dumping can be seen in the background. Photographed April 4, 2023.

Photograph P-6. Utah vine milkweed observed along the gen-tie route in the northern portion of the study area, west of I-15. Photographed April 19, 2023.

Photograph P-7. Creosote Bush – White Bursage Scrub in the northwestern portion of the study area; view facing southwest. Photographed April 25, 2023.

Photograph P-8. Creosote Bush Scrub in the southeastern portion of the study area; view facing northeast. Photographed April 20, 2023.

Photograph P-9. Example of desert pavement consisting of Rigid Spineflower – Hairy Desert Sunflower (*Chorizanthe rigida – Geraea canescens* Desert Pavement Association) in the western portion of the study area; view facing east. Photographed April 18, 2023.

Photograph P-10. Cheesebush – Sweetbush Scrub in the northeastern portion of the study area; view facing west. Photographed April 13, 2023.

Photograph P-11. California Joint fir – Longleaf Joint-fir Scrub (*Ephedra californica – Ambrosia salsola* Association) in the southeast corner of the study area; view facing north. Photographed April 20, 2023.

Photograph P-12. Example of aeolian sands, where tighter transects were performed, at the south end of study area.

Photograph P-13. Less than 1-day-old scat from a subadult desert tortoise. Photographed April 4, 2023.

Photograph P-14. Less than 1-month-old scat from a juvenile desert tortoise. Photographed May 11, 2023.

Photograph P-15. Example of a Class 2 desert tortoise burrow. Photographed April 7, 2023.

Photograph P-16. Example of a Class 3 desert tortoise burrow. Photographed March 27, 2023.

Photograph P-17. Example of a Class 4 desert tortoise burrow. Photographed March 27, 2023.

Photograph P-18. Example of a Class 5 desert tortoise burrow. Photographed March 28, 2023.

Photograph D-19. Closeup of windblown sand habitat suitable for the Mojave fringe-toed lizard in the wash outside of the project boundary. An individual was found sheltering in the burrow in the foreground. Photographed July 11, 2023.

Photograph P-20. Adult Mojave fringe-toed lizard sheltering under a creosote bush; the individual was observed outside of the project boundary. Photographed April 26, 2023.

Photograph P-21. Black-throated sparrow nest in white bursage. Photographed April 6, 2023.

Photograph P-22. Horned lark nest at the base of a creosote bush. Photographed April 18, 2023.

Photograph P-23. Whitewash (feces) where a burrowing owl was observed during the habitat assessment. Photographed June 6, 2023.

Photograph P-24. Whitewash (indicated by red circle) near the entrance of a potential burrowing owl burrow that was identified during the habitat assessment. Photographed March 29, 2023.

Photograph P-25. Inactive badger den showing no webbing at the entrance and no fresh soil pile. Photographed March 25, 2023.

Photograph P-26. Active kit fox den exhibiting a characteristic keyhole den entrance, fresh prints leading to and from the burrow entrance, and sign of fresh excavation as indicated by silty sand near entrance. Photographed July 6, 2023.

Photograph P-27. Kit fox tracks, an indication of relatively recent activity closely linked to the depicted den. Photographed July 6, 2023.

Photograph P-28. Relatively fresh kit fox scat compared with old scat found near the depicted den. Photographed July 6, 2023.

Photograph P-29. Desert bighorn sheep skull found in the south-central portion of the study area. Photographed March 29, 2023.

APPENDIX Q

Plant and Wildlife Potential to Occur

Table Q-2. Wildlife Species with the Potential to Occur within 10 Miles of the Project Area

Scientific Name	Common Name
MAMMAL	
Bovidae	
Bos taurus	domestic cattle
Ovis canadensis	bighorn sheep
Canidae	
Canis familiaris	domestic dog
Canis latrans	coyote
Urocyon cinereoargenteus	gray fox
Vulpes macrotis	kit fox
Vulpes macrotis var macrotis (CPF)	desert kit fox
Cervidae	
Odocoileus hemionus	mule deer
Cricetidae	
Neotoma fuscipes	dusky-footed woodrat
Neotoma lepida	desert woodrat
Onychomys torridus	southern grasshopper mouse
Peromyscus boylii	brush deermouse
Peromyscus crinitus	canyon deermouse
Peromyscus eremicus	cactus deermouse
Peromyscus maniculatus	North American deermouse
Peromyscus truei	piÃ±on deermouse
Reithrodontomys megalotis	western harvest mouse
Equidae	
Equus asinus	feral burro
*Equus africanus asinus**	donkey
Felidae	
Felis rufus	Bobcat
Lynx rufus	bobcat
Puma concolor	cougar
Geomyidae	
Thomomys bottae	Botta's pocket gopher
Heteromyidae	
Chaetodipus fallax	San Diego pocket mouse
Chaetodipus formosus	long-tailed pocket mouse
Chaetodipus penicillatus	Desert Pocket Mouse
Chaetodipus spinatus	spiny pocket mouse
Dipodomys deserti	desert kangaroo rat
Dipodomys merriami	Merriam's kangaroo rat

Scientific Name	Common Name
Dipodomys microps	chisel-toothed kangaroo rat
Dipodomys panamintinus	Panamint kangaroo rat
Perognathus longimembris	little pocket mouse
Leporidae	
Lepus californicus	black-tailed jackrabbit
Sylvilagus audubonii	desert cottontail
Mephitidae	
Mephitis mephitis	Striped Skunk
Spilogale gracilis	western spotted skunk
Molossidae	
Eumpos perotis	Western Mastiff Bat
Tadarida brasiliensis	Mexican free-tailed bat
Mustelidae	
Taxidea taxus	American badger
Procyonidae	
Bassariscus astutus	ringtail
Rodentia	
Erethizon dorsata	North American porcupine
Sciuridae	
Ammospermophilus leucurus	white-tailed antelope squirrel
Spermophilus tereticaudus	round-tailed ground squirrel
Spermophilus variegatus	rock squirrel
Tamias panamintinus	Panamint chipmunk
Soricidae	
Notiosorex crawfordi	Crawford's grey shrew
Vespertilionidae	
Antrozous pallidus	pallid bat
Corynorhinus townsendii	Townsend's big-eared bat
Eptesicus fuscus	big brown bat
Euderma maculatum	Spotted Bat
Lasiurus cinereus	hoary bat
Myotis californicus	California myotis
Myotis cilioabrum	Western Small-footed Bat
Myotis evotis	long-eared myotis
Myotis melanorhinus	Mouse-eared bat, dark-nosed small-footed myotis
Myotis thysanodes	fringed myotis
Myotis volans	long-legged myotis
Myotis yumanensis	Yuma Myotis
Parastrellus hesperus	canyon bat

Scientific Name	Common Name
Pipistrellus hesperus	western pipistrelle
Tadarida brasiliensis	Mexican free-tailed bat
BIRD	
Accipitridae	
Accipiter cooperii	Cooper's Hawk
Accipiter striatus	Sharp-shinned Hawk
Aquila chrysaetos	Golden Eagle
Buteo jamaicensis	Red-tailed Hawk
Buteo lagopus	Rough-legged Hawk
Buteo swainsoni	Swainson's Hawk
Parabuteo unicinctus	Harris's Hawk
Aegithalidae	
Psaltriparus minimus	Bushtit
Alaudidae	
Eremophila alpestris	Horned Lark
Anatidae	
Anas cyanoptera	Cinnamon Teal
Mergus serrator	Red-breasted Merganser
Apodidae	
Aeronautes saxatalis	White-throated Swift
Chaetura vauxi	Vaux's Swift
Ardeidae	
Nycticorax nycticorax	Black-crowned Night-Heron
Bombycillidae	
Bombycilla cedrorum	Cedar Waxwing
Cardinalidae	
Passerina amoena	Lazuli Bunting
Pheucticus ludovicianus	Rose-breasted Grosbeak
Pheucticus melanocephalus	Black-headed Grosbeak
Piranga flava	Hepatic Tanager
Piranga ludoviciana	Western Tanager
Cathartidae	
Cathartes aura	Turkey Vulture
Caprimulgidae	
Caprimulgus arizonae	Mexican Whip-poor-will
Chordeiles acutipennis	Lesser Nighthawk
Phalaenoptilus nuttallii	Common Poorwill
Certhiidae	
Certhia americana	Brown Creeper

Scientific Name	Common Name
Charadrius vociferus	Killdeer
Columbidae	
Patagioenas fasciata	Band-tailed Pigeon
Zenaida asiatica	White-winged Dove
Zenaida macroura	Mourning Dove
Corvidae	
Aphelocoma californica	Western Scrub-Jay
Corvus corax	Common Raven
Gymnorhinus cyanocephalus	Pinyon Jay
Cuculidae	
Geococcyx californianus	Greater Roadrunner
Falconidae	
Falco mexicanus	Prairie Falcon
Falco sparverius	American Kestrel
Fringillidae	
Carpodacus cassinii	Cassin's Finch
Carpodacus mexicanus	House Finch
Coccothraustes vespertinus	Evening Grosbeak
Haemorhous mexicanus	house finch
Loxia curvirostra	Red Crossbill
Spinus lawrencei	Lawrence's goldfinch
Spinus pinus	Pine Siskin
Spinus psaltria	Lesser Goldfinch
Hirundinidae	
Hirundo rustica	Barn Swallow
Petrochelidon pyrrhonota	Cliff Swallow
Riparia riparia	Bank Swallow
Tachycineta thalassina	Violet-green Swallow
Icteridae	
Agelaius phoeniceus	Red-winged Blackbird
Icterus bullockii	Bullock's Oriole
Icterus cucullatus	Hooded Oriole
Icterus parisorum	Scott's Oriole
Molothrus ater	Brown-headed Cowbird
Sturnella neglecta	Western Meadowlark
Laniidae	
Lanius ludovicianus	Loggerhead Shrike
Laridae	
Larus delawarensis	Ring-billed Gull

Scientific Name	Common Name
Mimidae	
Mimus polyglottos	Northern Mockingbird
Oreoscoptes montanus	Sage Thrasher
Toxostoma bendirei	Bendire's Thrasher
Toxostoma crissale	Crissal Thrasher
Toxostoma lecontei	Le Conte's Thrasher
Motacillidae	
Anthus rubescens	American Pipit
Odontophoridae	
Callipepla gambelii	Gambel's quail
Paridae	
Baeolophus ridgwayi	Juniper Titmouse
Poecile gambeli	Mountain Chickadee
Picidae	
Colaptes auratus	northern flicker
Parulidae	
Cardellina pusilla	Wilson's Warbler
Cardellina rubrifrons	Red-faced Warbler
Geothlypis tolomiei	MacGillivray's Warbler
Geothlypis trichas	Common Yellowthroat
Icteria virens	Yellow-breasted Chat
Mniotilta varia	Black-and-White Warbler
Myioborus pictus	Painted Redstart
Oreothlypis celata	Orange-crowned Warbler
Oreothlypis luciae	Lucy's Warbler
Oreothlypis ruficapilla	Nashville Warbler
Oreothlypis virginiae	Virginia's Warbler
Seiurus aurocapilla	Ovenbird
Setophaga coronata	Yellow-rumped Warbler
Setophaga graciae	Grace's Warbler
Setophaga nigrescens	Black-throated Gray Warbler
Setophaga occidentalis	Hermit Warbler
Setophaga petechia	Yellow Warbler
Setophaga townsendi	Townsend's warbler
Passerellidae	
Aimophila ruficeps	Rufous-crowned Sparrow
Amphispiza belli	Sage Sparrow
Amphispiza bilineata	Black-throated Sparrow
Auriparus flaviceps	verdin

Scientific Name	Common Name
Junco hyemalis	Dark-eyed Junco
Melospiza lincolnii	Lincoln's Sparrow
Melospiza melodia	Song Sparrow
Passerculus sandwichensis	Savannah Sparrow
Passerella iliaca	Fox Sparrow
Pipilo chlorurus	Green-tailed Towhee
Pipilo maculatus	spotted towhee
Spizella atrogularis	Black-chinned Sparrow
Spizella breweri	Brewer's Sparrow
Spizella passerina	Chipping Sparrow
Zonotrichia atricapilla	Golden-crowned Sparrow
Zonotrichia leucophrys	White-crowned Sparrow
Passeridae	
Passer domesticus	House Sparrow
Picidae	
Colaptes auratus	Northern Flicker
Colaptes chrysoides	Gilded Flicker
Melanerpes lewis	Lewis's Woodpecker
Picoides scalaris	Ladder-backed Woodpecker
Phasianidae	
Alectoris chukar	Chukar
Podicipedidae	
Podiceps nigricollis	Eared Grebe
Polioptilidae	
Polioptila caerulea	Bluy-gray Gnatcatcher
Polioptila melanura	Black-tailed Gnatcatcher
Ptilogonatidae	
Phainopepla nitens	Phainopepla
Regulidae	
Regulus calendula	Ruby-crowned Kinglet
Remizidae	
Auriparus flaviceps	Verdin
Scolopacidae	
Actitis macularius	Spotted Sandpiper
Tringa solitaria	Solitary Sandpiper
Sittidae	
Sitta canadensis	Red-breasted Nuthatch
Strigidae	
Asio otus	Long-eared Owl

Scientific Name	Common Name
Athene cunicularia	Burrowing Owl
Bubo virginianus	Great Horned Owl
Megascops kennicottii	Western Screech-Owl
Otus flammeolus	Flammulated Owl
Sturnidae	
Sturnus vulgaris	European Starling
Trochilidae	
Calypte anna	Anna's Hummingbird
Calypte costae	Costa's Hummingbird
Selasphorus platycercus	Broad-tailed Hummingbird
Selasphorus rufus	Rufous Hummingbird
Troglodytidae	
Campylorhynchus brunneicapillus	Cactus Wren
Catherpes mexicanus	Canyon Wren
Salpinctes obsoletus	Rock Wren
Thryomanes bewickii	Bewick's Wren
Troglodytes aedon	House Wren
Turdidae	
Catharus guttatus	Hermit Thrush
Catharus ustulatus	Swainson's Thrush
Myadestes townsendi	Townsend's Solitaire
Sialia currucoides	Mountain Bluebird
Sialia mexicana	Western Bluebird
Turdus migratorius	American Robin
Tyrannidae	
Contopus cooperi	Olive-sided Flycatcher
Contopus sordidulus	Western Wood-Pewee
Empidonax difficilis	Pacific-slope Flycatcher
Empidonax hammondii	Hammond's Flycatcher
Empidonax oberholseri	dusky flycatcher
Empidonax occidentalis	Cordilleran Flycatcher
Empidonax traillii	Willow Flycatcher
Empidonax wrightii	Gray Flycatcher
Myiarchus cinerascens	Ash-throated Flycatcher
Myiarchus tyrannulus	Brown-crested Flycatcher
Sayornis nigricans	Black Phoebe
Sayornis saya	Say's Phoebe
Tyrannus verticalis	Western Kingbird
Tyrannus vociferans	Cassin's Kingbird

Scientific Name	Common Name
Vireonidae	
Vireo bellii	Bell's Vireo
Vireo cassinii	Cassin's Vireo
Vireo gilvus	Warbling Vireo
Vireo plumbeus	Plumbeous Vireo
Vireo vicinior	Gray Vireo
REPTILE	
Charinidae	
Lichanura trivirgata	rosy boa
Colubridae	
Arizona elegans	glossy snake
Chionactis occipitalis	western shovel-nosed snake
Coluber flagellum	coachwhip
Coluber taeniatus	striped whipsnake
Diadophis punctatus	ring-necked snake
Hypsiglena chlorophaea	desert nightsnake
Lampropeltis californiae	California kingsnake
Phyllorhynchus decurtatus	spotted leaf-nosed snake
Pituophis catenifer	gopher snake
Rhinocheilus lecontei	long-nosed snake
Salvadora hexalepis	western patch-nosed snake
Sonora semiannulata	western groundsnake
Tantilla hobartsmithi	Smith's black-headed snake
Trimorphodon biscutatus	California lyresnake
Crotaphytidae	
Crotaphytus bicinctores	Great Basin collared lizard
Gambelia wislizenii	long-nosed leopard lizard
Eublepharidae	
Coleonyx variegatus	western banded gecko
Helodermatidae	
Heloderma suspectum	gila monster
Iguanidae	
Dipsosaurus dorsalis	desert iguana
Dipsosaurus dorsalis dorsalis	northern desert iguana
Sauromalus ater	common chuckwalla
Sceloporus occidentalis	western fence lizard
Sceloporus uniformis	yellow-backed spiny lizard
Urosaurus graciosus	long-tailed brush lizard
Uta stansburiana	common side-blotched lizard

Scientific Name	Common Name
Leptotyphlopidae	
Rena humilis	western threadsnake
Phrynosomatidae	
Callisaurus draconoides	zebra-tailed lizard
Callisaurus draconoides rhodostictus	western zebra-tailed lizard
Phrynosoma platyrhinos	desert horned lizard
Phrynosoma platyrhinos calidiarum	southern desert horned lizard
Uma scoparia	Mojave fringe-toed lizard
Uta stansburiana elegans	western side-blotched lizard
Scincidae	
Plestiodon "gilberti"	Gilbert's skink
Teiidae	
Aspidoscelis tigris	tiger whiptail
Aspidoscelis tigris tigris	Great Basin whiptail
Viperidae	
Crotalus cerastes	sidewinder
Crotalus cerastes cerastes	Mohave desert sidewinder
Crotalus mitchellii	speckled rattlesnake
Crotalus scutulatus	Mojave rattlesnake
Xantusiidae	
Xantusia vigilis	desert night lizard
Testudinidae	
Gopherus agassizii	desert tortoise
AMPHIBIANS	
Bufonidae	
Anaxyrus punctatus	red-spotted toad
Hylidae	
Pseudacris regilla	northern Pacific treefrog
FISH	
Cyprinodontidae	
Cyprinodon nevadensis nevadensis	springs pupfish
Leuciscidae	
Siphateles bicolor mohavensis	Mojave tui chub
Poeciliidae	
Gambusia affinis	western mosquitofish
ARACHNIDS	
Araneidae	
Aculepeira sp.	orb weaver

Scientific Name	Common Name
Solifugae	
Unknown species	camel spider
Theridiidae	
Latrodectus sp.	black widow
Thomisidae	
Misumena vatia	goldenrod crab spider
INSECTS	
Acrididae	
Trimerotropis pallidipennis	pallid-winged grasshopper
Aeshnidae	
Anax junius	common green darner
Amelidae	
Litaneutria sp.	*Litaneutria* sp.
Andrenidae	
Perdita sp.	fairy bee
Apidae	
Anthophora urbana	urbane digger bee
Apis mellifera	western honey bee
Centris sp.	Centridine bee
Centris sp.	oil digger bee
Centris rhodopus	red-legged oil-digger
Ericrocis lata	ericrocidine cuckoo bee
Aphididae	
Aphis nerii	*Aphis nerii*
Aphis sp.	*Aphis* sp.
Asilidae	
Saropogon sp.	robber fly
Bombyliidae	
Lordotus sp.	bee fly
Cecidomyiidae	
Asphondylia floccosa	woolly stem gall midge
Cerambycidae	
Plionoma rubens	longhorn beetle
Coccinellidae	
Coccinella septempunctata	seven-spotted ladybug
Hippodamia convergens	convergent lady beetle
Crambidae	
Achyra rantalis	garden webworm moth

Scientific Name	Common Name
Formicidae	
Pogonomyrmex sp.	harvester ant
Veromessor pergandei	harvester ant
Geometridae	
Digrammia colorata	creosote moth
Halictidae	
Agapostemon sp.	striped sweat bee
Dieunomia sp.	sweat bee
Hesperiidae	
Burnsius albescens	white checkered-skipper
Erynnis funeralis	funereal duskywing
Heliopetes ericetorum	northern white-skipper
Libellulidae	
Libellula saturata	flame skimmer
Sympetrum corruptum	variegated meadowhawk
Lycaenidae	
Brephidium exilis	western pygmy-blue
Echinargus isola	Reakirt's blue
Hemiargus ceraunus	Ceraunus blue
Leptotes marina	marine blue
Strymon melinus	gray hairstreak
Meloidae	
Cysteodemus armatus	inflated blister beetle
Eupompha elegans	elegant blister beetle
Lytta magister	desert blister beetle
Mutillidae	
Dasymutilla sp.	velvet ant
Nymphalidae	
Danaus gilippus	queen butterfly
Vanessa cardui	painted lady
Pentatomidae	
Chlorochroa sayi	Say's stink bug
Pieridae	
Abaeis nicippe	sleepy orange
Pontia protodice	checkered white
Pompilidae	
Pepsis thisbe	Thisbe's tarantula-hawk wasp
Pterophoridae	
Anstenoptilia marmarodactyla	sage plume moth

Scientific Name	Common Name
Sphecidae	
Ammophila aberti	thread-waisted wasp
Sphex ashmeadi	Ashmead's digger wasp
Palmodes or *Prionyx* sp.	thread-waisted wasp
Prionyx parkeri	thread-waisted wasp
Sphingidae	
Hyles lineata	white-lined sphinx moth
Syrphidae	
Syrphidae sp.	hover fly
Tenebrionidae	
Eleodes sp.	Pinacate beetle
Tiphiidae	
Paratiphia sp.	Tiphiid wasp
Vespidae	
Euodynerus sp.	potter wasp
Pterocheilus pimorum	potter wasp

APPENDIX R

Flora and Fauna

Table R-1. Observed Flora at the Soda Mountain Solar Project

Scientific Name	Common Name	Life Form
	GYMNOSPERMS (DICOTS)	
Ephedraceae (Ephedra Family)		
Ephedra californica	California joint fir	shrub
	ANGIOSPERMS (DICOTS)	
Aizoaceae (Iceplant Family)		
*Mesembryanthemum nodiflorum**	small flowered iceplant	annual herb
Amaranthaceae (Pigweed Family)		
Tidestromia suffruticosa var. *oblongifolia*	honeysweet	annual herb
Apocynaceae (Dogbane Family)		
Asclepias erosa	desert milkweed	perennial herb
Asclepias subulata	rush milkweed	perennial herb
Funastrum hirtellum	hairy milkweed	perennial herb
Funastrum utahense (CRPR 4.2)*	Utah vine milkweed	perennial herb
Asteraceae (Aster Family)		
Ambrosia acanthicarpa	annual bursage	annual herb
Ambrosia dumosa	white bursage	shrub
Ambrosia salsola	burrobrush	shrub
Baccharis brachyphylla	short-leaved baccharis	shrub
Bebbia juncea	sweetbush shrub	shrub
Brickellia incana	woolly brickellia	shrub
Chaenactis carphoclinia var. *carphoclinia*	pebble pincushion	annual herb
Chaenactis fremontii	Fremont pincushion	annual herb
Chaenactis steviodies	desert pincushion	annual herb
Encelia farinosa	brittlebush	shrub
Encelia frutescens	rayless encelia	shrub
Eriophyllum wallacei	Wallace's woolly daisy	annual herb
Geraea canescens	hairy desert sunflower	annual herb
Lasthenia gracilis	needle goldfields	annual herb
Logfia depressa	dwarf cottonrose	annual herb
Malacothrix coulteri	snake's head	annual herb
Malacothrix glabrata	desert dandelion	annual herb
Monoptilon bellioides	Mojave Desert star	annual herb
Pectis papposa	manybristle chinchweed	annual herb
Perityle emoryi	Emory's rock daisy	annual herb
Peucephyllum schottii	Schott's pygmycedar	shrub
Porophyllum gracile	odora	perennial herb
Prenanthella exigua	bright white	annual herb
Rafinesquia neomexicana	desert chicory	annual herb
Senecio mohavensis	Mojave ragwort	annual herb
Stephanomeria pauciflora	wire lettuce	perennial herb

Scientific Name	Common Name	Life Form
Stylocline micropoides	desert nest straw	annual herb
Boraginaceae (Borage Family)		
Amsinckia tessellata var. *tessellata*	devil's lettuce	annual herb
Cryptantha barbigera var. *barbigera*	bearded cryptantha	annual herb
Cryptantha dumetorum	bush loving cryptantha	annual herb
Cryptantha maritima	Guadalupe cryptantha	annual herb
Cryptantha nevadensis	Nevada cryptantha	annual herb
Cryptantha pterocarya var. *pterocarya*	wingnut cryptantha	annual herb
Eremocarya micrantha var. *micrantha*	desert red-root	annual herb
Johnstonella angustifolia	narrow-leaved johnstonella	annual herb
Pectocarya heterocarpa	chuckwalla pectocarya	annual herb
Pectocarya platycarpa	broad fruited combseed	annual herb
Pectocarya recurvata	curvenut combseed	annual herb
Brassicaceae (Mustard Family)		
*Brassica tournefortii**	Saharan mustard	annual herb
Caulanthus lasiophyllus	California mustard	annual herb
Lepidium lasiocarpum	shaggyfruit pepperweed	annual herb
*Sisymbrium irio**	London rocket	annual herb
Thysanocarpus curvipes	common fringe pod	annual herb
Cactaceae (Cactus Family)		
Cylindropuntia echinocarpa	silver cholla	stem succulent
Cylindropuntia ramosissima	branched pencil cholla	stem succulent
Echinocactus polycephalus	cottontop cactus	stem succulent
Mammillaria tetrancistra	common fishhook cactus	stem succulent
Opuntia basilaris var. *basilaris*	beavertail cactus	stem succulent
Campanulaceae (Bellflower Family)		
Nemacladus orientalis	eastern glandular nemacladus	annual herb
Nemacladus tenuis var. *aliformis*	desert namacladus	annual herb
Caryophyllaceae (Carnation Family)		
Spergularia sp.	spurrey	annual herb
Chenopodiaceae (Goosefoot Family)		
Atriplex hymenelytra	desert holly	shrub
Atriplex polycarpa	allscale saltbush	shrub
Salsola tragus	prickly Russian thistle	annual herb
Convolvulaceae (Morning Glory Family)		
Cuscuta denticulata	desert dodder	annual herb, vine
Cucurbitaceae (Cucumber Family)		
Cucurbita palmata	coyote melon	annual or perennial herb
Euphorbiaceae (Euphorbias Family)		
Euphorbia micromera	Sonoran sandmat	annual herb
Euphorbia polycarpa	smallseed sandmat	perennial herb

Scientific Name	Common Name	Life Form
Fabaceae (Bean Family)		
Acmispon strigosus	strigose lotus	annual herb
Lupinus shockleyi	purple desert lupine	annual herb
Dalea mollissima	silky dalea	perennial herb
Lupinus arizonicus	Arizona lupine	annual herb
Parkinsonia florida	blue paloverde	tree
Senna armata	desert senna	shrub
Geraniaceae (Storksbill Family)		
*Erodium cicutarium**	coastal heron's bill	annual herb
Erodium texanum	desert heron's bill	annual herb
Hydrophyllaceae (Waterleaf Family)		
Eucrypta micrantha	desert eucrypta	annual herb
Phacelia crenulata	notch-leaved phacelia	annual herb
Phacelia distans	distant phacelia	annual herb
Phacelia neglecta	alkali phacelia	annual herb
Krameriaceae (Ratany Family)		
Krameria erecta	little leaved ratany	shrub
Lamiaceae (Mint Family)		
Salvia columbariae	chia sage	annual herb
Loasaceae (Blazingstar Family)		
Mentzelia albicaulis	white stemmed blazing star	annual herb
Mentzelia involucrata	sand blazing star	annual herb
Mentzelia obscura	pacific blazing star	annual herb
Petalonyx thurberi ssp. *thurberi*	Thurber's sandpaper plant	perennial herb
Malvaceae (Mallow Family)		
Eremalche rotundifolia	desert fivespot	annual herb
Namaceae (Nama Family)		
Nama pusilla	small leaf nama	perennial herb
Nyctaginaceae (Four o'clock Family)		
Allionia incarnata	trailing windmills	perennial herb
Mirabilis laevis var. *retorsa*	wishbone bush	perennial herb
Onagraceae (Evening Primrose Family)		
Chylismia brevipes	yellow cups	annual or perennial herb
Chylismia claviformis	clavate fruited primrose	annual or perennial herb
Eremothera boothii ssp. *condensata*	clustered booth's desert primrose	annual herb
Eremothera boothii ssp. *decorticans*	shredding evening-primrose	annual herb
Eremothera boothii ssp. *desertorum*	Booth's desert primrose	annual herb
Orobanchaceae (Broomrape Family)		
Aphyllon cooperi	burroweed strangler	Perennial herb
Papaveraceae (Poppy Family)		
Eschscholzia glyptosperma	desert gold poppy	annual herb

Scientific Name	Common Name	Life Form
Eschscholzia minutiflora	pygmy poppy	annual herb
Phrymaceae (Lopseed Family)		
Diplacus bigelovii	Bigelow's monkeyflower	annual herb
Plantaginaceae (Plantain Family)		
Antirrhinum filipes	tangled snapdragon	annual herb
Plantago ovata	desert plantain	annual herb
Polemoniaceae (Phlox Family)		
Aliciella latifolia var. *latifolia*	broad-leaved aliciella	annual herb
Gilia scopulorum	rock gilia	annual herb
Gilia sp.	gilia	annual herb
Gilia stellata	star gilia	annual herb
Langloisia setosissima ssp. *punctata*	Great Basin langloisia	annual herb
Linanthus demissus	Desert linanthus	annual herb
Linanthus filiformis	yellow gilia	annual herb
Linanthus jonesii	Jones' linanthus	annual herb
Loeseliastrum matthewsii	desert calico	annual herb
Loeseliastrum schottii	Schott gilia	annual herb
Polygonaceae (Buckwheat Family)		
Chorizanthe brevicornu var. *brevicornu*	brittle spineflower	annual herb
Chorizanthe corrugate	wrinkled spineflower	annual herb
Chorizanthe rigida	devil's spineflower	annual herb
Eriogonum inflatum	desert trumpet	perennial herb
Eriogonum sp.	annual buckwheat	annual herb
Eriogonum trichopes	little desert buckwheat	annual herb
Resedaceae (Reseda Family)		
Oligomeris linifolia	leaved cambess	annual herb
Solanaceae (Nightshade Family)		
Nicotiana obtusifolia	desert tobacco	perennial herb
Physalis crassifolia	thick-leaved ground-cherry	annual or perennial herb
Tamaricaceae (Tamarisk Family)		
*Tamarix aphylla**	Athel tamarisk	tree
Tamarix sp.*	tamarisk	tree
Zygophyllaceae (Caltrop Family)		
Larrea tridentata	creosote bush	shrub
*Tribulis terrestris**	puncturevine	annual herb
	ANGIOSPERMS (MONOCOTS)	
Agavaceae (Agave Family)		
Hesperocallis undulata	desert lily	perennial herb
Poaceae (Grass Family)		
Aristida adscensionis	three awn	annual grass
Bromus madritensis ssp. *rubens**	red brome	annual grass

Scientific Name	Common Name	Life Form
Festuca octoflora	sixweeks grass	annual grass
Hilaria rigida	big galleta	perennial grass
*Hordeum murinum**	foxtail barley	annual grass
*Schismus arabicus**	Mediterranean grass	annual grass
*Schismus barbatus**	common Mediterranean grass	annual grass
Themidaceae (Brodiaea Family)		
Muilla sp.	muilla	perennial herb

Note: *non-native species

Table R-2. Observed Fauna at the Soda Mountain Solar Project

Scientific Name	Common Name	Additional Observation Notes
CLASS ARACHNIDA (ARACHNIDS)		
Araneidae (orb weaver spiders)		
Aculepeira sp.	orb weaver	
Solifugae (camel spiders, wind scorpions, and sun spiders)		
Unknown species	camel spider	
Theridiidae (cobweb spiders)		
Latrodectus sp.	black widow	
Thomisidae (crab spiders)		
Misumena vatia	goldenrod crab spider	
CLASS INSECTA (INSECTS)		
Acrididae (short-horned grasshoppers)		
Trimerotropis pallidipennis	pallid-winged grasshopper	
Aeshnidae (darners)		
Anax junius	common green darner	
Amelidae (mantids)		
Litaneutria sp.	*Litaneutria* sp.	
Andrenidae (miner, fairy, allied panurgine, and oxaenine bees)		
Perdita sp.	fairy bee	
Apidae (cuckoo, carpenter, digger, bumble, and honey bees)		
Anthophora urbana	urbane digger bee	
Apis mellifera	western honey bee	
Centris sp.	Centridine bee	
Centris sp.	oil digger bee	
Centris rhodopus	red-legged oil-digger	
Ericrocis lata	ericrocidine cuckoo bee	
Aphididae (aphids)		
Aphis nerii	*Aphis nerii*	
Aphis sp.	*Aphis* sp.	
Asilidae (robber flies)		
Saropogon sp.	robber fly	
Bombyliidae (bee flies)		
Lordotus sp.	bee fly	

Scientific Name	Common Name	Additional Observation Notes
Cecidomyiidae (gall midges)		
Asphondylia floccosa	woolly stem gall midge	
Cerambycidae (longhorn beetles)		
Plionoma rubens	longhorn beetle	
Coccinellidae (lady beetles)		
Coccinella septempunctata	seven-spotted ladybug	
Hippodamia convergens	convergent lady beetle	
Crambidae (crambid snout moths)		
Achyra rantalis	garden webworm moth	
Formicidae (ants)		
Pogonomyrmex sp.	harvester ant	
Veromessor pergandei	harvester ant	
Geometridae (geometrid moths)		
Digrammia colorata	creosote moth	
Halictidae (sweat bees)		
Agapostemon sp.	striped sweat bee	
Dieunomia sp.	sweat bee	
Hesperiidae (skipper butterflies)		
Burnsius albescens	white checkered-skipper	
Erynnis funeralis	funereal duskywing	
Heliopetes ericetorum	northern white-skipper	
Libellulidae (skimmers)		
Libellula saturata	flame skimmer	
Sympetrum corruptum	variegated meadowhawk	
Lycaenidae (blues, coppers, hairstreaks, harvesters)		
Brephidium exilis	western pygmy-blue	
Echinargus isola	Reakirt's blue	
Hemiargus ceraunus	Ceraunus blue	
Leptotes marina	marine blue	
Strymon melinus	gray hairstreak	
Meloidae (blister beetles)		
Cysteodemus armatus	inflated blister beetle	
Eupompha elegans	elegant blister beetle	
Lytta magister	desert blister beetle	
Mutillidae (velvet ants)		
Dasymutilla sp.	velvet ant	
Nymphalidae (brush-footed butterflies)		
Danaus gilippus	queen butterfly	
Vanessa cardui	painted lady	
Pentatomidae (shield bugs)		
Chlorochroa sayi	Say's stink bug	
Pieridae (cabbage butterflies)		
Abaeis nicippe	sleepy orange	
Pontia protodice	checkered white	

Scientific Name	Common Name	Additional Observation Notes
Pompilidae (spider wasps)		
Pepsis thisbe	Thisbe's tarantula-hawk wasp	
Pterophoridae (plume moths)		
Anstenoptilia marmarodactyla	sage plume moth	
Sphecidae (thread-waisted wasps)		
Ammophila aberti	thread-waisted wasp	
Sphex ashmeadi	Ashmead's digger wasp	
Palmodes or *Prionyx* sp.	thread-waisted wasp	
Prionyx parkeri	thread-waisted wasp	
Sphingidae (sphinx moths)		
Hyles lineata	white-lined sphinx moth	
Syrphidae (hover flies)		
Syrphidae sp.	hover fly	
Tenebrionidae (darkling beetles)		
Eleodes sp.	Pinacate beetle	
Tiphiidae (tiphiid wasps)		
Paratiphia sp.	Tiphiid wasp	
Vespidae (yellowjackets, hornets, and paper wasps)		
Euodynerus sp.	potter wasp	
Pterocheilus pimorum	potter wasp	
CLASS REPTILIA (REPTILES)		
Crotaphytidae (collard lizards and leopard lizards)		
Gambelia wislizenii	long-nosed leopard lizard.	
Iguanidae (iguanas and chuckwallas)		
Dipsosaurus dorsalis dorsalis	northern desert iguana	
Phrynosomatidae (spiny lizards, horned lizards, fringe-toed lizards)		
Callisaurus draconoides rhodostictus	western zebra-tailed lizard	
Phrynosoma platyrhinos calidiarum	southern desert horned lizard	
Uma scoparia (BLMS, SSC)	Mojave fringe-toed lizard	Observed 1,000 feet outside of the project boundary. No suitable habitat within the study area.
Uta stansburiana elegans	western side-blotched lizard	
Teiidae (whiptails)		
Aspidoscelis tigris tigris	Great Basin whiptail	
Testudinidae (land tortoises)		
Gopherus agassizii (FT, SE)	desert tortoise	Fresh scat and burrows observed. No live observations.
Viperidae (Vipers)		
Crotalus cerastes cerastes	Mohave desert sidewinder	
CLASS AVES (BIRDS)		
Accipitridae (hawks, kites, and eagles)		
Buteo jamaicensis	red-tailed hawk	
Aegithalidae (bushtits)		
Psaltriparus minimus	bushtit	
Alaudidae (larks)		
Eremophila alpestris	horned lark	

Scientific Name	Common Name	Additional Observation Notes
Caprimulgidae (nighthawks)		
Chordeiles acutipennis	lesser nighthawk	
Phalaenoptilus nuttallii	common poorwill	
Cathartidae (new world vultures)		
Cathartes aura	turkey vulture	
Corvidae (jay's and crows)		
Corvus corax	common raven	
Falconidae (falcons)		
Falco sparverius	American kestrel	
Fringillidae (finches)		
Haemorhous mexicanus	house finch	
Hirudinidae (swallows, martins, and saw-wings)		
Tachycineta bicolor	tree swallow	
Laniidae (shrikes)		
Lanius ludovicianus (SSC)	loggerhead shrike	
Picidae (woodpeckers)		
Colaptes auratus	northern flicker	Red-shafted form. Only primary and secondary feathers found.
Strigidae (true owls)		
Athene cunicularia (BLMS, SSC)	burrowing owl	Live observation during the burrowing owl survey and one burrow with sign.
Mimidae (mockingbirds and thrashers)		
Oreoscoptes montanus	sage thrasher	
Passerellidae (New World sparrows)		
Amphispiza bilineata	black-throated sparrow	
Auriparus flaviceps	verdin	
Junco hyemalis	dark-eyed junco	
Spizella breweri	Brewer's sparrow	
Zonotrichia leucophrys	white-crowned sparrow	
Passeridae (Old World sparrows)		
Passer domesticus	house sparrow	
Poliptilidae (gnatcatchers)		
Polioptila caerulea	blue-gray gnatcatcher	
Sturnidae (starlings)		
Sturnus vulgaris	European starling	
Troglodytidae (wrens)		
Campylorhynchus brunneicapillus anthonyi	cactus wren	
Salpinctes obsoletus	rock wren	
Tyrannidae (tyrant flycatchers)		
Myiarchus cinerascens	ash-throated flycatcher	
Sayornis saya	Say's phoebe	
Vireonidae (vireos)		
Vireo cassinii	Cassin's vireo	

Scientific Name	Common Name	Additional Observation Notes
CLASS MAMMALIA (MAMMALS)		
Bovidae (bovines)		
Ovis canadensis nelsoni (BLMS, FP)	desert bighorn sheep	No live observations. A skull was found during the field surveys.
Canidae (canids)		
Canis familiaris	domestic dog	Feral dog observed at the south end of the study area near Rasor Road.
Canis latrans	coyote	Live observations along with scat and tracks.
Vulpes macrotis macrotis (CPF)	desert kit fox	Live observation during nighttime acoustic bat survey, along with scat and burrows.
Equidae (horses and donkeys)		
*Equus africanus asinus**	donkey	Scat observed.
Leporidae (rabbits and hares)		
Lepus californicus	black-tailed jackrabbit	
Vespertilionidae (common, vesper, and simple nosed bats)		
Parastrellus hesperus	canyon bat	Sixteen detections during the nighttime acoustic surveys.
Tadarida brasiliensis	Mexican free-tailed bat	Two detections during the nighttime acoustic surveys.

*Non-native species
Status Codes:
Federal Status:
FT = Federally Listed Threatened
BLMS = Bureau of Land Management: Sensitive

California State Status:
ST = California State-Listed Threatened
FP = CDFW Fully Protected
SSC = CDFW Species of Special Concern
CPF = California Protected Fur-bearer