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# AQUIFER TESTING AND WELL INTERFERENCE ANALYSIS PLAN
# PANOCHE VALLEY SOLAR PROJECT
# PAICINES, SAN BENITO COUNTY, CALIFORNIA
# KLEINFELDER PROJECT NO. 20154702.001A

**MARCH 24, 2015**

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**AQUIFER TESTING AND WELL INTERFERENCE ANALYSIS PLAN**
**PANOCHE VALLEY SOLAR PROJECT**
**PAICINES, SAN BENITO COUNTY, CALIFORNIA 95043**

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**AQUIFER TESTING AND WELL INTERFERENCE ANALYSIS PLAN**
**PANOCHE VALLEY SOLAR PROJECT**
**PAICINES, SAN BENITO, CALIFORNIA 95043**

# 1 INTRODUCTION

---

On behalf of AMEC Kamtech, Inc., a division of Amec Foster Wheeler (AMEC / Client), and at the request of the County of San Benito, California, Kleinfelder, Inc. (Kleinfelder) has prepared this *Draft Groundwater Monitoring and Reporting Plan* (Plan) for the Panoche Valley Solar Project (Site), located in the unincorporated community of Paicines, California (see Figure 1). This work plan was prepared in accordance with County Mitigation Measures (December 17, 2014) MM WR-1.2, Aquifer Testing and Well Interference Analysis. The Site consists primarily of vacant land located in the Panoche Valley drainage basin, within the County of San Benito (see Figures 1 and 2). Kleinfelder understands that this work is being performed to satisfy permit requirements for the development of a solar photovoltaic power generation facility on the Site.

This Plan provides proposed procedures and methods for aquifer testing and well interference analysis that will be used to evaluate potential adverse well interference effects prior to the onset of sustained pumping for the Site's construction and post-construction activities. This Plan was prepared in accordance with Kleinfelder's authorized scope of services described in its *Proposal for Groundwater Monitoring and Reporting, Panoche Valley Solar Project, Paicines, San Benito County, CA, d*ated January 14, 2015. The proposed scope of work is in general accordance with the recommendations in *Memorandum, Panoche Valley Solar Project, Groundwater Extraction Impact Evaluation* (Geologica, 2014).


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# 2 SITE BACKGROUND INFORMATION

## 2.1 SITE LOCATION AND DESCRIPTION

The Site is located within the northwest trending Panoche Valley drainage basin in the unincorporated community of Paicines, San Benito County, California (See Figures 1 and 2). The Valley is bounded to the northwest by the easternmost Diablo Range and to the northeast and southeast by Upper Cretaceous marine sedimentary rocks of the Great Valley sequence (Geologica, 2010). The Site is primarily comprised of vacant land that is being developed with a photovoltaic solar power generation facility. Based on client-provided information, approximately 26,677 acres of land have been purchased by Panoche Valley Solar of which approximately 2,492 acres will encompass the power generation facility.

A more comprehensive description of Site hydrogeology and geology is included in a 2010 hydrogeologic study (Geologica, 2010). The most recent groundwater data for the Site is included in a 2014 Technical Memorandum (Geologica, 2014). Based on review of the provided groundwater information, depth to groundwater is expected to range between 40 to 75 feet bgs and flow generally to the southeast.

## 2.2 PREVIOUS SITE ASSESSMENTS

A Site hydrogeologic study was performed to evaluate the geologic and hydrogeological setting of the Site, its underlying aquifers, historical and existing groundwater levels, and the viability of existing groundwater wells within the project area (Geologica, 2010). The study described the Panoche Valley drainage basin as filled with coarse-grained sediments and interlayered fine-grained sediments deposited in streams and on terraces draining the rising Diablo Range mountains to the west. As a result deposits within the basin can be laterally discontinuous and variable. This study identified approximately 46 groundwater wells within the valley, for which a review of available data suggested that most of the wells produced water from one or more gravelly zones within 80 to 400 feet of valley fill and that these zones could vary between wells that were less than 100 feet apart (Geologica, 2010). A review of the available well location and construction data was used to create the groundwater well information table included in this Plan (see Table 1).


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Since the 1970s through the early 2000s, water levels within the project area historically rose from approximately 100 feet below ground surface (bgs) to approximately 30 to 60 feet bgs due to a decrease in pumping for local agricultural irrigation since the early 1970s (Geologica, 2010). Development of the proposed solar power facility, which estimated a groundwater extraction rate of 25.5 acre-feet per year (AFY) during construction and 3.74 AFY during operation, is not expected to significantly impact the estimated annual groundwater recharge rate of 2,700 AFY in the valley (Geologica, 2010).

An assessment of potential hydrogeologic issues associated with the proposed groundwater extraction needs for the proposed Panoche Valley Solar Project evaluated the impact of water demands for the project during construction and operation and potential impacts to the aquifer and provided recommendations for additional investigation of the aquifer (Geologica, 2014). A maximum extraction rate of approximately 800,000 gallons per day (gpd) is projected to occur during the anticipated 18-month construction phase of the project (Geologica, 2014).

Based on a review of water level measurements collected on May 16, 2014, and Department of Water Resources (DWR) water level measurements available for a number of wells in the Panoche Valley, groundwater elevations in the Valley have generally decreased since the 2010 hydrogeologic study, presumably due to the drought conditions experienced in California over the last few years (Geologica, 2014). Based on numerical modeling, it was estimated that a maximum drawdown of 3 feet bgs near the edge of the southern project boundary would occur, with 1 to 2 feet of drawdown off-Site and 0.5 foot of drawdown or less close to the model boundaries (Geologica, 2014). Drawdown effects are expected to be transient and are expected to dissipate following the end of construction, in approximately the same amount of time as the construction phase. As a result, construction and long-term operation water use is not likely to significantly impair the existing water supply in the valley Geologica, 2014).


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# 3 PROPOSED SCOPE OF WORK

This Plan has been prepared, at the request of the County of San Benito, to meet the following objective:

- Evaluate the impact of groundwater use in the project vicinity due to extraction for project construction and ongoing maintenance.

Based on our understanding of the project, a 72-hour constant-rate pumping test is proposed to gather and evaluate the hydraulic parameters of the aquifer under pumping conditions and meet the above described objective. The following tasks are described in this work plan:

- Task 1 – Pre-field coordination and planning
- Task 2 – Well construction information research
- Task 3 – Step-drawdown and 72-hour constant rate pumping tests
- Task 4 – Interference modeling and aquifer testing report.

## 3.1 PRE-FIELD COORDINATION AND PLANNING

Prior to the field investigation, Kleinfelder will coordinate site access, conduct an internal kick-off meeting, and acquire water-level pressure transducers and aquifer testing equipment. Upon receipt of the equipment, Kleinfelder will test the equipment and prepare it for field use. A Site-Specific Health and Safety Plan (HASP) will be prepared prior to implementing field activities to address the health and safety of Kleinfelder's workers and provide contingency plans for emergencies that may arise. The HASP will provide guidelines for personal protection equipment and safety procedures to be used by Kleinfelder's staff during field operations. Kleinfelder will also review and comply with AMEC's project-specific Incident Prevention Plan.

A Worker Environmental Awareness handout will be reviewed with crews prior to the start of work and be kept on site during all work activities. Equipment and vehicle access to well sites should occur via existing roadways (including ranch roads) and overland travel through natural habitat should be avoided. All individual sensitive wildlife species, all burrows, and areas of ponded water will be avoided by vehicles and equipment. Dusk to dawn is when most sensitive species occurring on site are active. Working and driving on the site will only occur during daylight hours to avoid potential collisions. Any wildlife encountered by crews will not be


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handled and will be allowed to leave work areas on their own. If they do not leave the area, an avoidance buffer will be established in coordination with the Project Biologist and work will be redirected to avoid the occupied habitat and buffer zone. Discharge of water will be directed toward nearby natural stream channels and away from burrow concentrations and any sensitive species observed. If sensitive species are observed, work will cease or be reduced until coordination occurs with the Project Biologist.

## 3.2 WELL CONSTRUCTION INFORMATION

Kleinfelder will compile available well construction details for the existing wells that will be used in the proposed aquifer pumping test activities. Additionally, wells proposed for the pumping test and those adjacent to proposed construction water-storage ponds will be video logged to evaluate conditions prior to testing. Kleinfelder plans to video log the following wells: Well #0, #4, #19, #20, and #44 (Figure 2). Final well construction information will be presented in the investigation report.

The wells will be inspected to assess the condition of the pumps, casing, electrical supply, and other well components for long-term operational needs. Existing equipment (i.e., pump and discharge piping, etc.) will be removed from each well prior to evaluation to provide access for video logging. Because they are currently in active use, logging will be performed in wells #0 and #44 without removing equipment, if possible. Video logging will be performed 48 hours following pump and equipment removal to allow for well stabilization and clearing of potential turbidity. Note also that equipment removed from the wells may not be in a suitable condition for reinstallation, and may need to be stored or disposed (with the exception of wells #0 and #44 which appear to be actively used). In the event that well #4 (proposed test well) is found to be in poor condition, due to a long period of disuse, the well will be rehabilitated prior to performing the aquifer testing.

## 3.3 AQUIFER TESTING

Kleinfelder reviewed available data from previous aquifer tests performed in wells #19 and #20. A 16-hour pumping test was performed in well #20 by the driller following its installation in 1976. Although the testing data is relatively old, aquifer behavior is expected to remain similar to the 1976 results, and indicates that well #20 may serve as a potential source of water during construction and post-construction maintenance activities at the Site. Additionally, a pumping


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test was performed on well #19 in 2010 (Geologica, 2010), which establishing known performance parameters for the well. As for well #20, aquifer behavior at the well is expected to remain similar to the results reported in 2010.

Based on our review of the above described previous testing information, Kleinfelder proposes to perform a step-drawdown test, followed by a 72-hour constant rate pumping test, in well #4. Well #4 does not have a record of previous aquifer testing and it has a significant screen interval with relatively shallow groundwater, which could produce an observable influence on observation wells further from the extraction well unlike previous testing.

The observation wells selected for the aquifer test are #0, #19, #20, and #44. Similar to previous aquifer testing events, extracted groundwater will be discharged to the ground surface several hundred feet away and downgradient from the well, and a National Pollutant Discharge Elimination System (NPDES) permit is not expected to be required. Approximately 2.5 million gallons of water are expected to be discharged during this test, and a water diffusing device will be used at the discharge point. The discharge rate and volume of the extraction well will be monitored using a flow meter and totalizer connected to the discharge piping, and the data from both will be recorded regularly throughout the test.

Water levels will be measured in each well using a combination of pressure transducers and a manual electronic water level meter. Water level measurements will be collected in the observation and extraction wells before, during, and after a step-drawdown test, a 72-hour constant-rate constant pumping test, and recovery period. Water-level measurements will be collected starting the week prior to testing to establish any potential existing trends. The pressure transducers will be programmed to record frequent water level measurements (i.e. 1-second intervals) during the beginning of the step and constant-rate pumping tests and during the beginning of the recovery test, with less frequent measurements following the initial drawdown and recovery periods. Transducer measurements will be normalized to a water-level measurement taken in their respective wells. Furthermore, manual water level measurement will be collected prior to removing transducers form wells to confirm the long-term accuracy of the transducer readings.

The transducers will be installed in each well at a depth below the water surface, such that they do not exceed the pressure rating of the transducers. The transducers will be placed


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approximately 20 feet below the initial water surface in the observation wells and approximately 100 feet below the initial water surface in the pumping well. Potential barometric effects on water levels will be evaluated using a barologger placed in one observation well.

### 3.3.1 Step-Drawdown Test

The step-drawdown test is a single-well test that involves the pumping of a groundwater well at incrementally higher pumping rates at approximately equal durations. It is proposed to pump the test well at approximately 200, 300, 450, and 600 gallons per minute (gpm), each step lasting a maximum of 2 hours and less if the water level stabilizes. If substantial drawdown is experienced, the discharge rate and duration will be adjusted accordingly in consultation with the Kleinfelder Technical Lead. Before the start of the step-drawdown test, the groundwater level will be tagged. Manual groundwater levels will be measured during the test at a frequency decided in the field.

To provide sufficient time for the aquifer to equilibrate following the step-drawdown test, a minimum of one day will be permitted prior to commencement of the constant-rate test. Water levels will be monitored with transducers and electronic meters to evaluate groundwater conditions. The constant-rate test will commence when water levels have recovered at least 90 percent. The constant-rate pumping and recovery tests are discussed below.

### 3.3.2 Constant-Rate Aquifer Pumping Test

A 72-hour constant-rate pumping test will be conducted at a rate of approximately 80 percent of the maximum yield, depending on the results of step-drawdown testing, although a constant rate of approximately 500 gpm is anticipated, based on prior testing in the area. The proposed duration should provide ample time for the aquifer to react to the pumping stress, including identification of nearby hydraulic boundaries if present. The starting time of pumping will be clearly marked and a stop-watch will be used to record times of manual groundwater measurements. It is important to synchronize all timing devices that will be used during the constant-rate pumping test.


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At the start of and during the constant-rate pumping test, Kleinfelder personnel will collect manual depth-to-water measurements as specified below.

| Wells | Time Since Start of Pumping | Time Interval |
|---|---|---|
| Pumping well | 0 to 10 minutes | 0.5 minute |
| Observation well #19 | 0 to 10 minutes | 0.5 minute |
| Pumping well | 10 to 60 minutes | 5 minutes |
| Observation well #19 | 10 to 60 minutes | 5 minutes |
| Observation wells #0 and #20 | 0 to 120 minutes | 10 minutes |
| Pumping well | 60 to 120 minutes | 20 minutes |
| Observation well #19 | 60 to 120 minutes | 20 minutes |
| Pumping well | 120 to 240 minutes | 30 minutes |
| Observation wells | 120 to 240 minutes | 30 minutes |
| Pumping well | 240 minutes to pump shutdown | 60 minutes |
| Observation wells | 240 minutes to pump shutdown | 60 minutes |

If adjustment to the measurement frequency is required (e.g., due to distance between observation wells), site personnel will consult the Kleinfelder Technical Lead. At the end of the constant-rate pumping test, the pump will be turned off and the time will be recorded. If water levels are still trending significantly at the end of 72 hours, the test period may be extended.

The discharge rate of the pumping well will also be monitored throughout the event to maintain a consistent rate. The discharge rate will be recorded at approximate 5 to 10 minute intervals for the first hour, and then every few hours until the pump is shut down. Both the total volume pumped and instantaneous pumping rate will be recorded. Periodically throughout the test period, the transducers will be checked to ensure they are working properly and recording data accurately.

#### 3.3.3 Recovery Test

Once the pump is shut down, depth-to-water measurements will be collected in each well (pumping and observation) following a similar schedule as above. Following approximately 72 hours of recovery, equipment will be removed from wells and demobilized from the site.

### 3.4 INTERFERENCE MODELING AND AQUIFER TESTING REPORT

The primary objective of the aquifer test and well interference analysis is to “evaluate potential adverse well interference effects prior to the onset of sustained pumping for the project.”


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Pumping test results will be used to calculate aquifer parameters that will be used to predict, via modeling, long-term drawdown throughout the project area and in adjacent areas at nearby off-site wells.

### 3.4.1 Aquifer Pumping Test Analysis

A number of aquifer pumping test analysis methods are available for use in analyzing the step-drawdown and constant-rate pumping test data to calculate hydraulic parameters of the aquifer, including the Theis equation. The results of the pumping test will be evaluated using derivative and other analyses to select appropriate methods. The estimated aquifer hydraulic parameters will then be used to evaluate pumping interference. Additionally, data from the step and constant-rate tests will be used to extrapolate potential water infiltration rates for any possible leakage from the planned project construction ponds.

### 3.4.2 Interference Modeling

Kleinfelder will develop a model to evaluate the long-term effects of groundwater extraction for project construction and maintenance on groundwater levels in the basin and at nearby private wells. Because Geologica has already developed a simple numerical model of the valley and the local aquifer system, Kleinfelder will attempt to acquire this model, and will update it based on the evaluations and testing for this project. While analytic element modeling takes multiple-well interference (principle of superposition) into account, a numerical model is preferred in this case, because of the limited size of the basin and the irregular boundaries. If the existing model is not available, Kleinfelder will construct a numerical model using MODFLOW for use in interference modeling. Each known well will be included in the model so pumping effects can be evaluated at each location, and the transient pumping schedule expected during project construction and subsequent operation and maintenance will be incorporated. The model will also assume that the construction water storage ponds will be lined and will not affect the aquifer via recharge and mounding. The *Interference Modeling and Aquifer Testing Report* will be submitted to San Benito County at least 15 days prior to commencing sustained groundwater extraction for the project.


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# 4 SCHEDULE

We anticipate commencing the video survey and aquifer testing activities in April 2015. As indicated above, a report will be submitted at least 15 days prior to commencing sustained groundwater extraction for the project.


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# 5 LIMITATIONS

The preparation of this Plan was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

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Regulations and professional standards applicable to Kleinfelder's services are continually evolving. Techniques are, by necessity, often new and relatively untried. Different professionals may reasonably adopt different approaches to similar problems. Therefore, no warranty or guarantee, expressed or implied, is included in Kleinfelder's scope of service.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. It should be recognized that definition and evaluation of geologic and environmental conditions comprise a difficult and inexact science. Judgments leading to


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conclusions and recommendations are generally made with incomplete knowledge of the subsurface conditions present due to the limitations of data from field studies. Although risk can never be eliminated, more-detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service that provide adequate information for their purposes at acceptable levels of risk. More extensive studies, including subsurface studies or field tests, should be performed to reduce uncertainties. The Client's acceptance of this Plan will indicate that the Client has reviewed the document and determined that it does not need or want a greater level of service than provided.


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# 6 REFERENCES

Geologica, 2010, Panoche Valley Hydrogeologic Study, SolarGen Panoche Valley Solar Farm, Panoche Valley, California, June 1.

Geologica, 2014, Technical Memorandum, Panoche Valley Solar Project, Groundwater Extraction Impact Evaluation, Panoche Valley, California. December 15.


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# FIGURES


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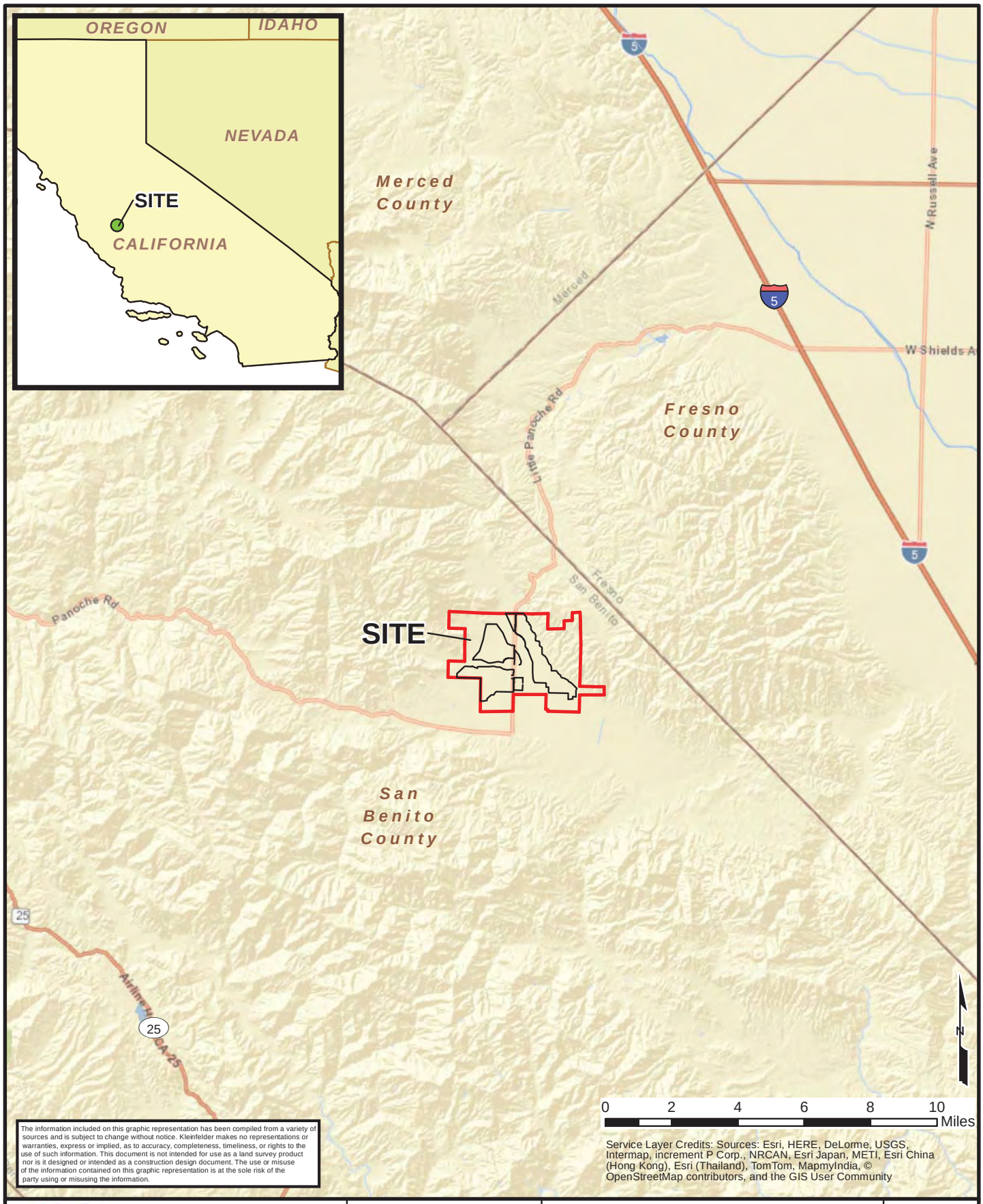


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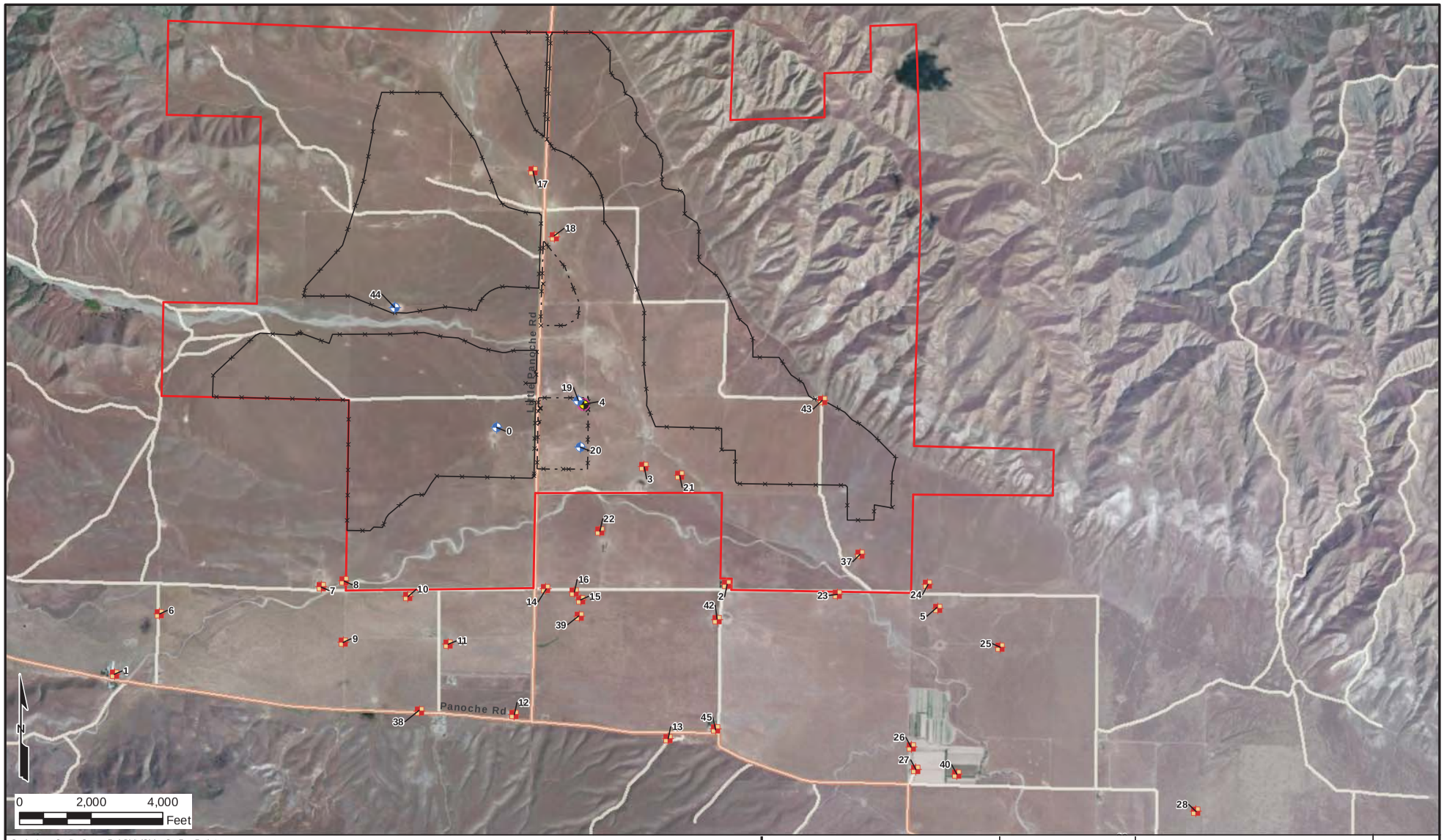
**Site Location Map**

AQUIFER TESTING AND WELL INTERFERENCE ANALYSIS PLAN
PANOCHE VALLEY SOLAR PROJECT
PAICINES, SAN BENITO COUNTY, CALIFORNIA 95053

FIGURE
1

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**Explanation**

- Aquifer Test - Observation Well
- Aquifer Test - Pumping Well
- Well
- Property Boundary
- Perimeter Fence
- Temporary Fence

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| CHECKED BY: | EM |
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**Site Plan with Well Locations**

AQUIFER TESTING AND WELL
INTERFERENCE ANALYSIS PLAN
PANOCHE VALLEY SOLAR PROJECT
PAICINES, SAN BENITO COUNTY, CALIFORNIA 95053

FIGURE
2

# TABLES


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# Table 1
## Well Information
Panoche Valley Solar Project
Paicines, San Benito County, California

| Geologica Well Number | State DWR Well ID Number | Latitude | Longitude | Easting (feet) | Northing (feet) | Ground Surface Elevation (ft AMSL) | Total Well Depth (ft bgs) | Screen Interval (ft bgs) | Casing Diameter (inches) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 15S10E16A001M | 36.629200000 | -120.880400000 | 6009941.77 | 2117572.99 | 1323 | n/a | 58-300 | n/a | Observation Well |
| 1 | 15S10E19H001M | 36.609700000 | -120.916300000 | 5999268.16 | 2110683.55 | 1420 | n/a | n/a | n/a | |
| 2 | 15S10E14N001M | 36.617500000 | -120.858200000 | 6016372.21 | 2113187.57 | 1275 | n/a | n/a | n/a | |
| 3 | 15S10E15G001M | 36.626400000 | -120.866300000 | 6014058.50 | 2116473.13 | 1282 | n/a | n/a | 12 | |
| 4 | 15S10E10P002M | 36.631900000 | -120.871000000 | 6012718.60 | 2118501.89 | 1300 | 422 | 182-422 | 14 | Extraction Well |
| 5 | 15S10E13N001M | 36.615977000 | -120.838097195 | 6022260.10 | 2112519.70 | 1300 | n/a | n/a | n/a | |
| 6 | 15S10E20D001M | 36.614400000 | -120.912100000 | 6000534.68 | 2112369.70 | 1395 | n/a | n/a | n/a | |
| 7 | 15S10E17R001M | 36.616700000 | -120.896800000 | 6005040.62 | 2113117.82 | 1358 | n/a | n/a | n/a | |
| 8 | 15S10E17R002M | 36.617200000 | -120.894600000 | 6005689.73 | 2113287.07 | 1352 | n/a | n/a | n/a | |
| 9 | 15S10E20H001M | 36.612500000 | -120.894600000 | 6005655.98 | 2111576.35 | 1350 | n/a | n/a | n/a | |
| 10 | 15S10E21C001M | 36.616100000 | -120.888500000 | 6007471.69 | 2112851.43 | 1338 | n/a | n/a | n/a | |
| 11 | 15S10E21G001M | 36.612500000 | -120.884600000 | 6008590.32 | 2111518.61 | 1340 | n/a | n/a | n/a | |
| 12 | 15S10E21.1001M | 36.607200000 | -120.878200000 | 6010430.56 | 2109552.70 | 1325 | n/a | n/a | n/a | |
| 13 | 15S10E22Q001M | 36.605600000 | -120.863500000 | 6014733.04 | 2108886.28 | 1273 | n/a | n/a | n/a | |
| 14 | 15S10E22D003M | 36.616900000 | -120.875400000 | 6011321.19 | 2113067.29 | 1300 | n/a | n/a | n/a | |
| 15 | 15S10E22D004M | 36.616100000 | -120.872100000 | 6012283.79 | 2112757.21 | 1300 | n/a | n/a | n/a | |
| 16 | 15S10E22D002M | 36.616700000 | -120.872700000 | 6012112.00 | 2112979.03 | 1300 | n/a | n/a | n/a | |
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| 19 | 15S10E10P001M | 36.632200000 | -120.871600000 | 6012544.72 | 2118614.51 | 1300 | 168 | 90-168 | 12 | Observation Well |
| 20 | 15S10E15F001M | 36.627800000 | -120.872400000 | 6012278.80 | 2117017.55 | 1304 | 380 | 90-120/280-360 | 16 | Observation Well |
| 21 | 15S10E15G002M | 36.625800000 | -120.862900000 | 6015051.76 | 2116235.37 | 1282 | 262 | n/a | 16 | |
| 22 | 15S10E15L001M | 36.621400000 | -120.870400000 | 6012820.18 | 2114676.61 | 1293 | n/a | n/a | n/a | |
| 23 | 15S10E23B001M | 36.616900000 | -120.847700000 | 6019448.88 | 2112909.73 | 1246 | n/a | n/a | n/a | |
| 24 | 15S10E13N001M | 36.617800000 | -120.839100000 | 6021978.56 | 2113188.88 | n/a | n/a | n/a | n/a | |
| 25 | 15S10E24F001M | 36.613100000 | -120.832100000 | 6023999.84 | 2111438.87 | 1245 | n/a | n/a | n/a | |
| 26 | 15S10E24N002M | 36.605300000 | -120.840400000 | 6021509.92 | 2108646.35 | 1240 | n/a | n/a | n/a | |
| 27 | 15S10E24N003M | 36.603600000 | -120.839900000 | 6021644.80 | 2108024.76 | 1240 | n/a | n/a | n/a | |
| 28 | 15S11E30C001M | 36.600800000 | -120.813200000 | 6029461.23 | 2106856.55 | 1210 | n/a | n/a | n/a | |
| 29 | 15S11E30E002M | 36.597800000 | -120.819300000 | 6027650.30 | 2105798.45 | 1191 | n/a | n/a | n/a | |
| 30 | 15S11E30M001M | 36.595000000 | -120.819900000 | 6027454.89 | 2104782.62 | 1184 | n/a | n/a | n/a | |
| 31 | 15S11E30F001M | 36.597200000 | -120.811600000 | 6029906.08 | 2105537.33 | 1190 | n/a | n/a | n/a | |
| 32 | 15S11E30K001M | 36.593100000 | -120.805700000 | 6031609.65 | 2104012.36 | 1177 | n/a | n/a | n/a | |
| 33 | 15S11E30R001M | 36.590600000 | -120.798800000 | 6033617.83 | 2103064.38 | 1160 | n/a | n/a | n/a | |
| 34 | 15S11E29E001M | 36.596100000 | -120.795400000 | 6034653.24 | 2105047.64 | 1180 | n/a | n/a | n/a | |
| 35 | 15S11E29.1001M | 36.594700000 | -120.784900000 | 6037725.53 | 2104480.61 | 1140 | n/a | n/a | n/a | |
| 36 | 15S11E32A001M | 36.587800000 | -120.782900000 | 6038265.92 | 2101958.17 | 1111 | n/a | n/a | n/a | |
| 37 | 15S10E14Q001M | 36.620000000 | -120.845600000 | 6020086.75 | 2114026.24 | n/a | n/a | n/a | 8 | |
| 38 | 15S10E21L001M | 36.607341000 | -120.887226218 | 6007782.79 | 2109655.96 | 1394 | n/a | n/a | n/a | |
| 39 | 15S10E22D001M | 36.614843000 | -120.872218355 | 6012240.14 | 2112300.36 | 1300 | n/a | n/a | n/a | |
| 40 | 15S10E24N001M | 36.603300000 | -120.836000000 | 6022787.24 | 2107893.66 | 1225 | n/a | n/a | n/a | |
| 41 | 15S10E25J001M | 36.592500000 | -120.833500000 | 6023445.87 | 2103948.58 | n/a | n/a | n/a | n/a | |
| 42 | 15S10E22J001M | 36.614796000 | -120.859037763 | 6016107.34 | 2112208.11 | n/a | n/a | n/a | n/a | |
| 43 | 15S10E14A001M | 36.631757000 | -120.849465472 | 6019035.01 | 2118327.46 | n/a | n/a | n/a | n/a | |
| 44 | DOODLEBUG | 36.637261000 | -120.891620846 | 6006707.70 | 2120571.72 | 1381 | n/a | n/a | n/a | Observation Well |
| 45 | PANOCHE SCHOOL | 36.606405000 | -120.859057392 | 6016042.45 | 2109154.02 | 1286 | n/a | n/a | n/a | |
| 46 | 15S10E25J002M | 36.593100000 | -120.833800000 | 6023361.98 | 2104168.66 | n/a | n/a | n/a | n/a | |
| 47 | 15S11E30E003M | 36.597200000 | -120.819300000 | 6027646.16 | 2105580.05 | n/a | n/a | n/a | n/a | |
| 48 | 15S11E30M002M | 36.595000000 | -120.816600000 | 6028423.45 | 2104764.28 | n/a | n/a | n/a | n/a | |
| 49 | 15S11E28R001M | 36.588100000 | -120.766800000 | 6042993.82 | 2101980.02 | n/a | n/a | n/a | n/a | |
| 50 | 15S09E24C001M | 36.616100000 | -120.950700000 | 5989221.09 | 2113216.27 | n/a | n/a | n/a | n/a | |

**Notes:**
Well location and construction information compiled from available information provded in the Geologica 2010 and 2014 reports
Northing and easting coordinates based on State Plane Zone IV coordinate grid, per the Site's American Land Title Association (ALTA) su
n/a = information not available


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# Avian Conservation Strategy

Panoche Valley Solar Facility
San Benito County, California

September 11, 2015

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## Acronyms, Abbreviations, and Definitions

| | |
|---|---|
| ACE | Avian Conservation Strategy |
| APLIC | Avian Power Line Interaction Committee |
| BGEPA | Bald and Golden Eagle Protection Plan |
| BLM | Bureau of Land Management |
| BMPs | Best Management Practices |
| CBC | Christmas Bird Count |
| CDFW | California Department of Fish and Wildlife |
| CESA | California Endangered Species Act |
| CEQA | California Environmental Quality Act |
| CFR | Code of Federal Regulations |
| CNDDB | California Natural Diversity Database |
| Conservation Lands | Areas to be preserved in perpetuity for the benefit wildlife, totaling 24,176 acres |
| County | San Benito County |
| dBA | A-weighted decibels |
| DC | direct current |
| EIS | Environmental Impact Statement |
| FESA | Federal Endangered Species Act |
| °F | Fahrenheit |
| FSEIR | Final Environmental Impact Report |
| GPS | Global Positioning System |
| HCP | Habitat Conservation Plan |
| HMMP | Habitat Management and Monitoring Plan |
| km | kilometer |
| MBTA | Migratory Bird Treaty Act |
| MW | megawatts |

| | |
|---|---|
| NEPA | National Environmental Policy Act |
| O&M | Operations and Maintenance |
| PG&E | Pacific Gas & Electric |
| Project Footprint | The portion of the Proposed Project that includes the solar arrays and associated transportation corridors and equipment |
| Proposed Project | Panoche Valley Solar Project |
| PV | photovoltaic |
| PVS | Panoche Valley Solar, LLC |
| SCRCL | Silver Creek Ranch Conservation Lands |
| UDA | Utilization Distribution Assessment |
| USACE | U.S. Army Corps of Engineers |
| USC | United States Code |
| USFWS | U.S. Fish and Wildlife Service |
| UTM | Universal Transverse Mercator |
| VFCL | Valley Floor Conservation Lands |
| VRCL | Valadeao Ranch Conservation Lands |
| WEGs | USFWS Land-based Wind Energy Guidelines |

# 1.0 INTRODUCTION

Panoche Valley Solar LLC (PVS) proposes to construct and operate an approximately 247 megawatt (MW) solar photovoltaic energy generating facility in San Benito County, California by the name of the Panoche Valley Solar Facility. The Panoche Valley Solar Facility is referred to herein as the "Project". The Project would be located on 2,506 acres with 1,794 acres of permanent impacts and 712 acres of temporary impacts in the Panoche Valley of eastern San Benito County. The Project includes construction and operation of the photovoltaic (PV) solar array complexes, an operations and maintenance (O&M) building, a project perimeter road including emergency access and egress, electricity collection lines, DC-AC inverters, an electrical substation and switchyard, associated Pacific Gas and Electric (PG&E) telecommunications upgrades, and decommissioning of the Project. Construction of the PVS Facility is anticipated to commence in late 2015 and span approximately 18 months, to be completed by the end of 2016.

The Project incorporates important general and species specific conservation measures proposed by PVS to avoid and minimize impacts on biological resources including avian resources. The Project will implement a conservation package consisting of permanent preservation, enhancement, and management of three large parcels of land in the vicinity of the Project to offset potential impacts to special status species and associated habitat. These conservation lands include approximately 2,514 acres of Valley Floor Conservation Lands, 10,772 acres of Valadeao Ranch Conservation Lands, and 10,890 acres of Silver Creek Ranch Conservation Lands. Together the three parcels total approximately 24,176 acres of high quality conservation land that will provide local mitigation, preserve core populations of special status species, and create permanent movement corridors with adjacent lands controlled by the U.S Department of Interior's Bureau of Land Management (BLM) for those species.

## 1.1 Purpose of the Avian Conservation Strategy

The following site-specific Avian Conservation Strategy (ACS) outlines various processes that PVS will implement to: 1) comply with all state and federal avian conservation and protection laws and regulations at the Project; 2) to ensure that any impacts to avian resources are identified, quantified, and analyzed; and 3) implement various conservation, avoidance, minimization, mitigation and adaptive management measures to address any impacts that result from operation of the Project.

Lastly, this Plan is being prepared in accordance with the 2015 Final Supplemental Environmental Impact Report (FSEIR), mitigation measure BR-14.2 which states,

> *Prior to the issuance of a construction permit, the Avian Conservation Strategy and Eagle Conservation Plans shall be reviewed and approved by the County. The final plans will be developed in consultation with California Department of Fish and Wildlife (CDFW) and U.S. Fish and Wildlife Service (USFWS). These plans have been prepared in general accordance with the USFWS Land based Wind Energy Guidelines (USFWS, 2012), Eagle Conservation Plan Guidance Module 1 – Land-based Wind Energy Version 2 Guidance (USFWS, 2013) and with information provided in the Avian Protection Plan guidelines outlined by APLIC (2005).*

***Bird mortality study.*** *The bird mortality component of the Avian Conservation Strategy shall include at a minimum: detailed specifications on data, a carcass collection protocol, and a rationale justifying the proposed schedule of carcass searches. The study shall also include seasonal trials to assess bias from carcass removal by scavengers as well as searcher bias.*

***Polarized light and insectivorous birds study.*** *The study of polarized light impacts on insectivorous birds shall include at a minimum: detailed specifications regarding data requirements, including protocols for collection and identification of insect eggs found on solar panels and a rationale for a data collection schedule. During construction and for one year following the beginning of the solar farm operation the biologist shall submit annual reports to the County describing the dates, durations, and results of monitoring and data collection. The annual reports shall provide a detailed description of any project-related bird or wildlife deaths or injuries detected during the monitoring study or at any other time and data collected for the study of polarized light impacts on insectivorous birds. The report shall analyze any project-related bird fatalities or injuries detected, and provides recommendations (in consultation with the County) for future monitoring and any adaptive management actions needed.*

***Thresholds.*** *Thresholds will be determined by the County in consultation with CDFW and/or USFWS. If the County determines that either (1) bird mortality caused by solar facilities is substantial and is having potentially adverse impacts on special-status bird populations, or that (2) the attraction of polarized light from solar panels is causing reproductive failure of aquatic insect populations at high enough levels to adversely affect insectivorous special-status birds, the Applicant shall be required to implement some or all of the mitigation measures below.*

***Implementation Measures.*** *To minimize bird mortality caused by solar facilities, the Applicant may be required to install additional bird flight diverters alterations to project components that have been identified as key mortality features, or implement other appropriate actions approved by the County and regulatory agencies based on the findings of the Avian Conservation Strategy and Eagle Conservation Plan.*

*If mitigation actions are required, the annual reporting shall continue until the County, in consultation with CDFW and USFWS, determines whether more years of monitoring are needed, and whether additional mitigation and adaptive management measures are necessary. After the Avian Conservation Strategy and Eagle Conservation Plan is determined by the County to be complete, the Applicant shall prepare papers that describe the design and monitoring results of the two studies to be submitted to peer-reviewed scientific journals. Proof of submittal shall be provided to the County, CDFW and USFWS within one year of concluding the monitoring studies.*

## 1.2 Regulatory Framework

Native birds in North America are protected under federal and state regulations: these include the Federal Endangered Species Act (FESA), the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (BGEPA), the California Endangered Species Act (CESA), and California Department of Fish and Game (CDFG) codes administered by the California Department of Fish and Wildlife (CDFW). These regulations are described in the following sub-sections.

### *1.2.1 Federal Endangered Species Act*

The purpose of the FESA is "to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, and to provide a program for the conservation of these species." Section 9 of the FESA prohibits "take" of federally-listed threatened or endangered species. "Take" under the FESA includes activities such as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" which includes harming a listed species or its habitat. Any activity that may result in the "incidental take" of a threatened or endangered species requires authorization pursuant to the FESA by means of the Section 7 consultation process with the United States Fish and Wildlife Service (USFWS), or through a Section 10 permit issued from the USFWS in conjunction with development of an approved Habitat Conservation Plan (HCP).

In addition, an amendment to the Fish and Wildlife Conservation Act (1988) mandates that the USFWS must identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the FESA.

### *1.2.2 Bald and Golden Eagle Protection Act*

The BGEPA of 1940 is the primary law protecting eagles in the United States. The BGEPA (United States Code [USC] Title 16, Chapter 5A, Subchapter II, § 668 a-d), as amended provides for the protection of Bald Eagles (*Haliaeetus leucocephalus*) and Golden Eagles (*Aquila chrysaetos*) by prohibiting the taking, possession, and commerce of such birds and establishes civil penalties for violation of this Act. BGEPA defines "take" to include "pursue, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb," and prohibits take of individuals and their parts, nests, or eggs. On November 10, 2009 the USFWS implemented new rules (74 FR 46835) governing the "take" of Golden and Bald Eagles under the existing BGEPA. The USFWS expanded the definition of "take" to include the term "destroy" to ensure that "take" includes destruction of eagle nests. The term "disturb" is further defined by regulation as "to agitate or bother a Bald or Golden Eagle to a degree that causes, or is likely to cause, injury to an eagle, a decrease in productivity, or nest abandonment" (50 Federal Regulation [FR] 22.3). USFWS guidance on the applicability of current Eagle Act statutes and mitigation is currently under review. The definition of disturb (72 FR 31132) includes interfering with normal breeding, feeding, or sheltering behavior to the degree that it causes or is likely to cause decreased productivity or nest abandonment. All activities that may disturb or incidentally take an eagle or its nest as a result of an otherwise legal activity must be permitted by the USFWS under this act.

Because large-scale solar projects could result in the loss of Golden Eagle foraging habitat, there are concerns about the cumulative impacts to Golden Eagles. These concerns have been addressed in the site-specific Eagle Conservation Plan prepared by PVS.

### *1.2.3 Migratory Bird Treaty Act*

The MBTA (Title 16 USC 703-712, as amended) governs take, possession, import, export, transport, selling, purchasing, or bartering of migratory birds, their eggs, parts and nests except as authorized by a valid permit (50 Code of Federal Regulations [CFR] 21.11 or under Section 704, as prescribed by the Secretary of the Interior. The USFWS is responsible for overseeing compliance with the MBTA. The MBTA requires that disturbance of active nesting territories be reduced or eliminated during critical phases of the nesting cycle for birds that may be present and nesting in the vicinity of a project. This Act offers protection to 836 species of migratory birds which includes waterfowl, shorebirds, seabirds, wading birds, raptors, passerines, and their occupied nests and eggs. Most bird species and their occupied nests that occur within the Project Footprint are protected under the MBTA. Most actions that result in taking of or the permanent or temporary possession of a protected avian species constitute violations of the MBTA. The Migratory Bird Permit Memorandum dated April 15, 2003, clarifies that destruction of most unoccupied bird nests is permissible under the MBTA; exceptions include nests of federally listed threatened or endangered migratory birds, Bald Eagles, and Golden Eagles.

### *1.2.4 California Endangered Species Act and Other State Fish and Game Codes*

The California Endangered Species Act (CESA) of 1970 is administered by the CDFW and states that all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation, will be protected or preserved. The CESA prohibits the take (hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill) of species listed under CESA.

In addition, California Fish and Game Code Subsections 3503, 3503.5, and 3800 prohibit the possession, incidental take, or needless destruction of eagles and other birds, as well as their nests and eggs. California Fish and Game Code Section 3511 lists birds that are “fully protected” as those that may not be taken or possessed except under specific permit. Lastly California Fish and Game Code Section 3513 prohibits any take or possession of birds that are designated by the MBTA as migratory non-game birds except as allowed by federal rules and regulations promulgated pursuant to the MBTA.

## 1.3 Corporate Policy

Panoche Valley Solar, LLC (PVS) maintains a commitment to work with local, state, and federal agencies regarding the protection of special status and migratory birds. PVS recognizes the importance of coordination with agency personnel to understand the scope of the Project and discuss facilities and features that may require specific attention for special status and migratory bird species. PVS and their representatives (e.g. environmental consultants) have been working in coordination with state and federal agency personnel regarding surveys and Project considerations

to ensure that everyone understands the scope of the Project and potential issues identified early in the Project's planning process.

This Avian Conservation Strategy (ACS) has been prepared in general accordance with the USFWS Land-based Wind Energy Guidelines (WEGs) (USFWS 2013) which contain a tier-based approach for assessing risk to wildlife in the course of siting, constructing, and operating wind energy facilities. While the WEGs were not specifically developed to address risk for solar projects, the process developed provides a useful framework for assessing wildlife risk at the Project and developing this ACS. This strategy is considered to be a living document that will be updated periodically as new information becomes available.

# 2.0 PROJECT INFORMATION

## 2.1 Project Location

The Project is located near the intersection of Panoche Road and Little Panoche Road, in eastern San Benito County and western Fresno County, approximately two miles north of the intersection of Panoche Road and Little Panoche Road. This location is approximately two miles southwest of the Fresno County Line and the Panoche Hills, and approximately 15 miles west of Interstate 5 and the San Joaquin Valley. The Project Footprint would be located within Township 15S, Range 10E, Sections 3-4, 8-11, and 13-16 of the United States Geologic Survey's Cerro Colorado, Llanada, Mercy Hot Springs, and Panoche 7.5-minute topographic quadrangle maps.

In addition to the Project Footprint, the Conservation Lands associated with the Proposed Project are located within Township 15S, Range 10E, Sections 3-4, 8-10, 13-16, and 25; Township 15S, Range 11E, Section 19; Township 14S, Range 10E, Sections 21-27, and 32-36; Township 14S, Range 11E, Sections 19, and 29-32; Township 15S, Range 10E, Sections 1-8, and 10-14; Section 15S, Township 11E, Sections 6-7, 19-20, and 26-36; and Township 16S, Range 11E, Sections 1-6, and 8-12.

The Project is bordered by rangeland to the north and south, by the Gabilan Range to the west, and by the Panoche Hills to the east. The Project Footprint elevation ranges from approximately 1,200 feet above mean sea level (amsl) near the southeastern end of the Project site to approximately 1,400 feet amsl near the western end of the Project site. The Project site was historically used for crop production, but during the past forty years the primary land use has been livestock grazing.

## 2.2 Project Description

PVS proposes to construct and operate a solar PV energy generating facility located in San Benito County, California (Figure 1, Appendix A). The Project Footprint consists of approximately 2,506 acres in the Panoche Valley of eastern San Benito County, California (Figure 2, Appendix A). The Project includes construction and operation of the PV solar array complexes, an O&M building, a project perimeter road including emergency access and egress, electricity collection lines, DC-AC inverters, an electrical substation and switchyard, associated PG&E telecommunications upgrades, and decommissioning of the Project. Construction of the PVS Facility is anticipated to span approximately 18 months, with construction estimated to be completed by 2016. The Project also includes the permanent preservation and management of approximately 24,176 acres of high

quality Conservation Lands that are contiguous with the Project Footprint when taken as a whole (Figure 3, Appendix A).

As part of those high quality Conservation Lands, approximately 2,514 acres of the high quality land is interspersed throughout and adjacent to the Project Footprint which would be undisturbed and designated as the Valley Floor Conservation Lands (VFCL). The VFCL would include wildlife movement corridors within on-site drainages and 100-year floodplains, as well as open space in the southern portion of the Project area (Figure 3, Appendix A).

In addition to the designation of the VFCL, the Project will include two large ranches for conservation/mitigation purposes due to impacts to waters, sensitive species and habitat. These ranches, the Valadeao Ranch Conservation Lands (VRCL; 10,772 acres) and the Silver Creek Ranch Conservation Lands (SCRCL; 10,890 acres), are contiguous with the Project Footprint and each other (Figure 3, Appendix A). The combined total acreage to be placed in permanent preservation and management is approximately 24,176 acres.

# 3.0 EXISTING CONDITIONS

## 3.1 Project Footprint

The Project Footprint consists of the area within the fence line of the solar facility (approximately 2,506 acres). The site is surrounded by rangeland and bordered by hills of the Gabilan Range to the west and the Panoche Hills to the east. The topography of the site dips gently down to the east-southeast. The site elevation ranges from approximately 1,200 feet amsl near the southeast end of the site to approximately 1,400 feet amsl near the west end.

The Project area experiences a Mediterranean climate with dry hot summers and cool wet winters. However, this region does not experience heavy rainfall. Annual precipitation in the general vicinity of the site ranges from eight to ten inches per year. Approximately 85 percent of precipitation falls between October and March. Temperatures average approximately 80 degrees Fahrenheit (˚F) in the summer and 40˚F in the winter, mid-summer temperatures are often over 100˚F, and winter lows can be close to freezing. Nearly all precipitation infiltrates into the site's soils and flows in creeks and drainages when soil capacity has been reached.

Panoche Creek and Las Aquilas Creek run adjacent to portions of the Project Footprint but are contained entirely within the VFCL (Figure 3, Appendix A). They are ephemeral creeks that are dry in the summer. Smaller washes and drainages feed these larger creeks. The Project Footprint supports several seasonally flooded pools and stock ponds, predominantly in the northern portion of the Project Footprint along unnamed washes. Habitat for aquatic species and breeding habitat for amphibians within the Project Footprint is limited to the stock ponds and ephemeral pools.

There is no urban development on the Project Footprint or surrounding area. Two ranching communities are located within the Panoche Valley, Panoche and Llanada. Both communities are within two miles of the Project Footprint. The nearest rural community is Firebaugh, approximately 15 miles from the perimeter of the Project Footprint.

Prominent grass species within the Project Footprint include ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), red brome (*Bromus madritensis*), foxtail barley (*Hordeum murinum* ssp. *leporinum*), and rat-tail fescue (*Vulpia myuros*). Dominant forbs included broad-leaved filaree (*Erodium botrys*), red-stemmed filaree (*Erodium cicutarium*), shining peppergrass (*Lepidium nitidum* var. *nitidum*), and vinegarweed (*Trichostema lanceolatum*). Fiddleneck (*Amsinckia menziesii*), devils lettuce (*Amsinckia tessellata*), shepherds purse (*Capsella bursa-pastoris*), turkey mullein (*Eremocarpus setigerus*), and bur clover (*Medicago polymorpha*) were also common, especially along ranch roads. Areas which have not been previously disturbed by grazing or historic cultivation also include a variety of native wildflowers such as blow wives (*Achyrachaena mollis*), blue dicks (*Dichelostemma capitatum*), California gold fields (*Lasthenia californica*), yellow daisy tidy-tips (*Layia platyglossa*), and California creamcups (*Platystemon californicus*) (LOA 2009).

## 3.2 Conservation Lands

Project Conservation Lands include three areas totaling 24,176 acres that would be preserved in perpetuity for the benefit of the special status species, as well as many other species of wildlife including avian species.

### *3.2.1 Valley Floor Conservation Lands*

The VFCL (approximately 2,514 acres) are contiguous with the Project Footprint, and primarily consist of the non-native annual grassland habitat found within the Project Footprint with some seasonal ponds and vernal and ephemeral pools, as well as the seasonally dry Panoche and Los Aquilas Creeks. The VFCL also includes the entire 100-year floodplain within the Proposed Project boundary on the valley floor.

The dominant vegetation in the VFCL includes ripgut brome, soft chess, red brome, foxtail barley, rat-tail fescue, broad-leaved filaree, red-stemmed filaree, shining peppergrass, and vinegarweed. Fiddleneck, devils lettuce, shepherds purse, turkey mullein, and bur clover were also common, especially in disturbed areas. Areas which have not been previously disturbed include a variety of native wildflowers such as blow wives, blue dicks, California gold fields, yellow daisy tidy-tips, and California creamcups.

### *3.2.2 Valadeao Ranch Conservation Lands*

The VRCL (approximately 10,772 acres) are contiguous with the Project Footprint directly to the west, east, and northeast of the site (Figure 3, Appendix A). These lands are also contiguous with the VFCL and Silver Creek Ranch Conservation Lands (SCRCL). The VRCL include several seasonal drainages. Soils on this site are complex and range from sandy to sandy loam to clay loam to badlands. The VRCL contain approximately 2,945 acres with slopes between 0 and 11 percent. Elevations on the VRCL range from approximately 1,400 feet to 2,100 feet amsl. The property which is currently grazed is dominated by introduced annual grasslands (approximately 6,700 acres), which have a very similar species makeup to the Project Footprint and VFCL. This property also includes of ephedra shrubland (approximately 2,700 acres), barrens, and saltbush shrubland.

Ephedra shrublands within the VRCL range from nearly pure California ephedra (*Ephedra californica*) stands to highly diverse associations with typical desert shrubs. Occupied habitats occur from lower slopes and valley bottoms to rocky outcrops and alluvial slopes. This three to 15 foot tall shrub rarely achieves greater than 10 percent cover, but the cover provided varies little with soil type, aspect, or grazing pressure. It is generally the only shrub present in the often very broad transition from Ephedra shrublands to introduced annual grasslands.

Plant associations that are noted to occur within the *Ephedra* shrublands include *Artemisia californica - Senecio flaccidus* scrub, *Eastwoodia elegans - Ephedra californica* scrub, *Ericameria linearifolia - Ephedra californica* scrub, *Ericameria linearifolia - Ericameria nauseosa* scrub, *Ericameria linearifolia - Gutierrezia californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Artemisia californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Ephedra californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Gutierrezia californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Yucca whipplei* scrub, and *Gutierrezia californica - Ephedra californica* scrub. Ephedra shrublands occur in the VRCL portion of Las Aquilas Creek in small patches along ridgelines, steep slopes with a northern aspect, lower slopes, ephemeral drainages, and steep, rocky, and thin-soiled south-facing slopes.

Barrens are ridgelines and south or (rarely) west-facing very steep slopes that exhibit a precipitous drop-off in vegetative cover. In terms of vegetation, the assembled species diversity at barrens is very low, nearly all species are relatively short-lived annuals, shrubs and trees are absent, and introduced annual grasses become minor components of the species mix. Barrens most commonly interrupt Introduced Annual Grasslands, where the transition was often observed to occur over the space of several feet. Two plant associations were identified within the barrens: *Erodium cicutarium - Plantago erecta* and *Holocarpha obconica - Vulpia microstachys*.

The saltbush shrubland habitat consists of nearly pure to mixed stands of saltbush (*Atriplex polycarpa*) associations. Occupied habitats range from white clay soils on hills immediately west of Little Panoche Road to rocky outcrops and alluvial slopes experiencing high ground creep rates near ridgelines east of the road. In all observed occurrences on hills, the aspect of greatest saltbush cover is southern. This two to three foot tall shrub also attains dominance within several of the ephemerally flooded washes, where sandier soils are more common. It is always the most common shrub canopy contributor near seasonal springs and seeps that exhibit saline character.

Two plant associations exist on the VRCL: *Atriplex polycarpa - Eriogonum fasciculatum* var. *polifolium* and *Atriplex polycarpa - Isocoma acradenia* var. *bracteosa*. *Atriplex polycarpa - Eriogonum fasciculatum* var. *polifolium* occurs on slopes, appearing as mainly open ground with scattered shrubs. Shrub canopy closure averages 5 to 10 percent, with scattered clumps of 20 percent closure. Canopy density is greatest on south-facing slopes, where *Eriogonum fasciculatum* is often more prevalent, and on slopes that are steep or slippery enough to exclude grazing. The herbaceous layer is largely absent, resembling barrens that are often present on adjacent slopes of similar aspect. Shrub canopies are confined to wash edges due to trampling by cattle, and average cover rarely exceeds 10 percent (County of San Benito, 2010).

### *3.2.3 Silver Creek Ranch Conservation Lands*

The SCRCL (approximately 10,890 acres), which is currently being grazed with livestock, is located southeast of the Project Footprint (Figure 3, Appendix A). The northwestern-most corner of the proposed SCRCL is contiguous with a portion of the VRCL. Elevations on the SCRCL range from 900 to 2,200 feet amsl. Soils on the SCRCL are less complex than those found on the VRCL and are generally characterized as well drained and moderately permeable. SCRCL contains approximately 5,765 acres with slopes between 0 and 11 percent.

SCRCL are dominated by non-native species (approximately 8,400 acres), with the same species found on the Project Footprint and on the other conservation lands distributed sparsely over the landscape. The other major habitats on these conservation lands include ephedra shrubland (approximately 2,260 acres) with similar species noted on the VRCL and riparian/wetland habitat.

The riparian habitats occur along the Panoche and Silver Creeks. The Silver Creek riparian vegetation, where it briefly intersects the SCRCL, indicates a seasonally wet, somewhat saline habitat subject to annual or occasional energetic flows. The riparian corridor has become dominated by invasive tamarisk (*Tamarix* sp.). Tamarisk has developed semi-open to impassable stands in a 30 to 100 foot wide corridor. The population extends well off-site, both upstream and downstream. In this area, saltgrass (*Distichlis spicata*) appears to be the native species most tolerant of the soil salinity and groundwater drawdown effects of heavy tamarisk infestation, and often forms meadow-like swards between the tamarisk thickets.

Panoche Creek is a gaining reach as it crosses through the SCRCL. The streambed upstream off the site was observed to be completely dry and largely devoid of plants for at least three miles. Within the surveyed area, this arroyo-like habitat quickly transitions to zonal wetlands characterized by gaseous springs, highly reduced soils, and marsh or meadow vegetation. The Panoche Creek riparian zone, which ranges from 100 feet to 500 feet in width, may provide the only reliable, naturally occurring surface water for much of the year. The dominant plants are consistently arrayed, with vegetation classified as emergent *Typha* marsh (*Typha* Herbaceous Alliance) centrally, *Schoenoplectus americanus* mid-marsh (*Schoenoplectus americanus* Herbaceous Alliance) at the outer saturated edge, and *Distichlis spicata* meadow (*Distichlis spicata* Herbaceous Alliance) extending across the moistened to seasonally drying soils at the riparian edge and *Frankenia salina* and *Juncus mexicanus*. Trees are largely absent, as are species adapted to a floating or submerged habitats (County of San Benito, 2010).

## 3.3 Literature Review and Initial Site Assessment (Tiers 1 and 2)

Existing information of avian resources in the vicinity of the Project Footprint was reviewed prior to the development of this ACS. Information sources included the California Natural Diversity Database (CNDDB), the National Audubon Society's Important Bird Area database (National Audubon Society 2013) and Christmas Bird Count (CBC) database, and habitat assessments and field-based evaluations determining the potential for special status species as well as observation that were made during site visits between 2009 through 2013.

### *3.3.1 Special Status Avian Species*

The review of existing information and literature pertaining to avian special status species occurrences on the Project Footprint, combined with field-based habitat evaluations of the potential for special status avian species occurrence, revealed 15 avian species that have been observed on or near the Project Footprint or have potential to occur on the Project Footprint. Table 1 presents a list of the special status avian species and their potential for occurrence on the Project Footprint. Species were considered special status if they are currently afforded federal or state protection or have Species of Special Concern status with the USFWS or CDFW.

**Table 1. Potential special status bird species of the Panoche Valley Solar Facility.**

| Common/Scientific Name | State Status | Federal Status | Potential to Occur on Project Footprint |
|---|---|---|---|
| Tricolored Blackbird<br>*Agelaius tricolor* | SSC (breeding) | NA | Present (non-breeding observation) |
| Grasshopper Sparrow<br>*Ammodramus savannarum* | SSC (breeding) | NA | Moderate |
| Golden Eagle<br>*Aquila chrysaetos* | FP | BGEPA | Present (non-breeding observation) |
| Short-Eared Owl<br>*Asio flammeus* | SSC (breeding) | NA | Moderate |
| Long-Eared Owl<br>*Asio otus* | SSC (breeding) | NA | Moderate |
| Burrowing Owl<br>*Athene cunicularia* | SSC (breeding) | NA | Present |
| Swainson's Hawk<br>*Buteo swainsonii* | ST | NA | Low |
| Mountain Plover<br>*Charadrius montanus* | SSC (wintering) | NA | Present |
| Northern Harrier<br>*Circus cyaneus* | SSC (breeding) | NA | Present (non-breeding observation) |
| White-Tailed Kite<br>*Elanus leucurus* | FP | NA | Low |
| California Condor<br>*Gymnogyps californianus* | SE and FP | FE | Low |
| Bald Eagle<br>*Haliaeetus leucocephalus* | SE and FP | BGEPA | Not Likely To Occur |
| Loggerhead Shrike<br>*Lanius ludovicianus* | SSC (breeding) | NA | Present (non-breeding observation) |
| Oregon Vesper Sparrow<br>*Pooecetes gramineus affinis* | SSC (wintering) | NA | High |
| Yellow-Headed Blackbird<br>*Xanthocephalus xanthocephalus* | SSC (breeding) | NA | Not Likely To Occur |

State Status: SE – State Endangered, ST – State Threatened, FP – State Fully Protected, SSC – Species of Special Concern
Federal Status: FE – Federal Endangered, BGEPA – Bald and Golden Eagle Protection Act, NA – Not Applicable

### *3.3.2 Important Bird Area*

The Panoche Valley is considered an Important Bird Area (Panoche Valley IBA) (National Audubon Society 2013) due to the notable high concentrations of wintering raptors, large sparrow flocks, resident population of Burrowing Owls (*Athene cunicularia*), and other grassland avian species. The Project Footprint consists of 2,506 acres located within the 91,399-acre Panoche Valley IBA covering portions of Merced, Fresno, and San Benito Counties (National Audubon Society 2013). Grasshopper Sparrows (*Ammodramus savannarum*) and Short-eared Owls (*Asio flammeus*) use the Panoche Valley as breeding habitat, as both have been almost eliminated as nesters elsewhere in the San Joaquin Valley. During the winter, Mountain Plovers (*Charadrius montanus*) use the grassland habitat within the Panoche Valley IBA as foraging areas. The Panoche Valley IBA is one of the few areas within the state where this species still winters in semi-natural habitat. Hundreds of Tricolored Blackbirds (*Agelaius tricolor*) breed each year at Little Panoche Reservoir near Interstate 5, which is approximately nine miles north of the northernmost extent of the Project Footprint (National Audubon Society 2013). The Panoche Valley was noted to be an Audubon Important Bird Area of global concern because it is important for the wintering Mountain Plover (CDFG 2010).

### *3.3.3 Christmas Bird Count Data*

The Christmas Bird Count (CBC) is a 24-hour census of birds administered by the National Audubon Society that is performed annually in the early winter by volunteers to gather avian population data. The surveys of the CBC count circles, which are 15 miles in diameter, are conducted in the period from December 14 to January 5 each year (National Audubon Society). The center of the Panoche Valley CBC survey circle is located two miles north of the junction of Panoche Valley Road and Little Panoche Valley Road. The Panoche Valley CBC count circle includes the Project Footprint and the VFCL and a majority of the VRCL and the SCRCL.

From 2003 through 2011 the CBC data indicated an average of 80 avian species per survey season. The entire period between 2003 and 2011 is noted to have approximately 127 total species observed. The entire list of species observed is shown in Appendix B.

## 3.4 Previous Avian Surveys, Methods, and Results (Tiers 2 and 3)

Focused avian surveys and general wildlife surveys have been conducted on the Project Footprint and conservation lands from 2009 to 2014. Data collected during wildlife reconnaissance and transect surveys, Golden Eagle/raptor aerial nest surveys; Golden Eagle point counts and Utilization Distribution Assessments (UDA) provide information on baseline avian conditions at the Project Site and surrounding area. Additionally, incidental observations of special status avian species were recorded during these surveys and other previous biological surveys conducted on the Project Footprint and conservation lands.

### *3.4.1 Golden Eagle*

**<u>Point Count Surveys</u>**

Point count surveys focusing on Golden Eagles were conducted at established point count stations (Cooperrider et al. 1986; Hamel et al. 1996; Ralph et al. 1993; Ralph et al. 1995) every other week between the weeks of September 3, 2013 until January 24, 2014 for a total of 11 survey events. Six point count stations were located within Project Footprint/VFCL (Figure 4, Appendix A) to ensure a minimum spatial coverage of at least 30 percent of the Project Footprint (USFWS 2013). Six point count stations were also located within the VRCL and the SCRCL. Three point count stations were located in the VRCL (Figure 5 Appendix A) and three point count stations in the SCRCL (Figure 6 Appendix A). The coverage for the VRCL and SCRCL was less than 30 percent, but provided adequate observations of Golden Eagle use in these areas for general comparison purposes.

The survey locations were established by creating point count stations within an 800 meter (2,625 feet) radius observation area. The center point of each plot was geo-referenced using a global positioning system (GPS) unit. The point count surveys consisted of observers recording detections of Golden Eagles from the point count stations for two hours at each point count station (Figures 4, and 5 Appendix A). Observations were recorded on point count field forms (Pagel et al. 2010; USFWS 2013). The Golden Eagle surveys were conducted between daylight hours (sunrise to sunset) on a bi-weekly basis from September 3, 2013 to January 24, 2014. During the fall migration, when possible, surveys were completed during midday to increase sampling efficiency by temporally stratifying surveys to cover the midday period during migration (CA Energy Commission 2007; USFWS 2013).

The data collected during each point count station survey beyond the typical conditions information (e.g. date, time, temperature, wind speed and direction, and visibility) included the number of Golden Eagles seen, age class, activity/behavior, flight paths, estimated flight height and location in plot, and general description of observations.

With the data from the point count surveys, the age classes of the Golden Eagles were broken down into juvenile eagles, immature or sub-adult eagles, adult eagles, or unknown (eagles where age class could not be determined due to distance, etc.). The activity/behavior data collected noted the prevalent behavior during each one-minute interval as soaring flight (circling broadly with wings outstretched), unidirectional flapping gliding, kiting-hovering, stooping or diving at prey, stooping or diving in an agonistic context with other eagles or other bird species, undulating/territorial flight, perched, or other. The flight path data included Golden Eagles inside, as well as outside the point count plot. The flights were recorded on the point count data forms for each point count station (Appendix C).

*Project Footprint/Valley Floor Conservation Lands*

The Golden Eagle observations in the Project Footprint/VFCL totaled 43 Golden Eagles, with 15 observations within the point count plot boundaries and 28 observations outside the plot boundaries for the entire survey season. These observations were also categorized by their age class. The Golden Eagles observation on the Project Footprint/VFCL were made up of four juveniles, three inside the point count plot boundaries and one observation outside the plot boundaries. There were two sub-adult Golden Eagles observed within the point count plot boundaries and none outside. The surveys also found 14 adult Golden Eagles observations within the Project Footprint/VFCL areas, with seven adults being seen inside the plot boundaries, and seven adult

Golden Eagles observed outside the plot boundaries. Furthermore, there were 33 Golden Eagles observations where the age class could not be determined and were categorized as unknown (Table 1). A majority of the unknown age class observations were due to the distance between the observer and the Golden Eagles. Additional information can be located in the Panoche Valley Solar Point Count Survey Study Report for Golden Eagles located in Appendix C of this Plan.

The point count station with the highest number of observations of Golden Eagles, both inside and outside the plot boundaries, was the station located in the northwestern portion of the Project Footprint/VFCL (P-01) (Figure 4 Appendix A) with a total of 23 Golden Eagle observations (10 inside/13 outside). Note that the high number of Golden Eagles observations at this point count station was due to numerous Golden Eagles observed utilizing the hills of the VRCL and the hills to the west of the VRCL for perching, foraging, etc. An additional event elevated the number of Golden Eagles observed at this point. During the second survey event (September 17-19, 2013), seven Golden Eagles were observed feeding on a carcass of a dead animal (i.e. cattle) during the entire point count survey period (Table 2). The point count station with the lowest number of Golden Eagle observations during the survey season was the point count station located in the southeastern portion of the Project Footprint/VFCL (P-06) (Figure 4 Appendix A) with no Golden Eagles observed during any of the point count surveys. Additional information can be located in the Panoche Valley Solar Point Count Survey Study Report for Golden Eagles located in Appendix C of this Plan.

Of the 15 Golden Eagles observations within the Project Footprint/VFCL point count plots, over half of the observations (eight Golden Eagles) were seen within the month of September. As previously stated, during the second survey event (September 17-19, 2013), seven Golden Eagles were observed feeding on a carcass of a dead animal during the entire point count survey period. The next highest number of observations during a month was the events in October with four Golden Eagles. The observation numbers for the other months included two observations in January, one Golden Eagle observation in December, and no observations of Golden Eagles in November within the Project Footprint/VFCL during the point count surveys. Additional information can be located in the Panoche Valley Solar Point Count Survey Study Report for Golden Eagles located in Appendix C of this Plan.

*Valadeao Ranch Conservation Lands*

The Golden Eagle observations in the VRCL totaled 11 Golden Eagles with four observations within the point count plot boundaries and seven observations outside the plot boundaries for the entire survey season (Appendix C). These observations were also categorized by their age class. The Golden Eagle observations on the VRCL were made up of two juveniles, all inside the point count plot boundaries. There were no sub-adult Golden Eagles observed within the point count plot boundaries or outside the plot boundaries. The surveys also found two adult Golden Eagle observations within the VRCL areas, all being seen inside the plot boundaries. Furthermore, there were seven unknown age class observations that were observed outside the plot boundaries. The unknown age class observations were due to the distance between the observer and the Golden Eagles.

The point count station with the highest number of observations of Golden Eagles, both inside and outside the plot boundaries was located in the central portion of the VRCL (V-02) (Figure 5 Appendix

A) with a total of seven Golden Eagles observations (two inside/five outside). The point count stations within the VRCL with the lowest number of Golden Eagles observations during the survey season was the point count station located in the southern and northern portions of the VRCL (V-01 and V-03) (Figure 5 Appendix A) with two Golden Eagle observations each during the entire study (Appendix C).

Of the four Golden Eagle observations within the VRCL observed within the point count plots, 75 percent of the observations (three Golden Eagles) were seen within the month of September (Table 4). The next highest number of observations during a month was the events in January with one Golden Eagle observation. For the months of October, November, and December, no observations of Golden Eagles were made within the VRCL during the point count surveys. Additional information can be located in the Panoche Valley Solar Point Count Survey Study Report for Golden Eagles located in Appendix C of this Plan.

*Silver Creek Ranch Conservation Lands*

The Golden Eagle observations in the SCRCL totaled seven Golden Eagles with four observations within the point count plot boundaries and three observations outside the plot boundaries for the entire survey season (Figure 6 Appendix A). These observations were also categorized by their age class. The Golden Eagle observations on the SCRCL had no juvenile or sub-adult eagles inside or outside the point count plot boundaries. The surveys found four adult Golden Eagle observations within the SCRCL areas with three observations inside the plot boundaries and one observation outside the plot boundaries. Furthermore, there were three unknown age class observations with one observation inside the plot boundaries and two observations outside the plot boundaries. The unknown age class observations were due to the distance between the observer and the Golden Eagles (Appendix C).

The point count station in the SCRCL with the highest number of observations of Golden Eagles, both inside and outside the plot boundaries was S-03 (Figure 6 Appendix A) SCRCL with a total of four Golden Eagle observations (2 inside/2 outside) (Appendix C). The point count station with the lowest number of Golden Eagle observations during the survey season was located in the western portion of the SCRCL (S-01) (Figure 6 Appendix A) with no Golden Eagles observed during all of the point count surveys.

Of the four Golden Eagle observations within the SCRCL observed within the point count plots, 75 percent of the observations (three Golden Eagles) were seen within the month of January. The next highest number of observations during a month was the events in October with one Golden Eagle observation. For the months of September, November, and December, no observations of Golden Eagles were made within the SCRCL during the point count surveys.

Overall, the results of the point count surveys included a total of 61 observations of Golden Eagles. This total includes 23 individual observations of Golden Eagles seen within the point count plot boundaries and 38 observations outside the plot boundaries.

The results of the point count surveys indicated that 93 percent of the Golden Eagle observations made within the Project Footprint and VFCL point count station boundaries were from the western

point count stations, which are in close proximity to the hills located within the western portion of the VRCL. Of the 15 total Golden Eagle observations made during the entire study within point count plots, approximately 47 percent of those observations were seen during a single survey event (September 17-19, 2013), where seven Golden Eagles were observed feeding on a carcass of a dead animal within the proposed Project Footprint. The data gathered during this fall migration/winter survey period indicates that unless there is an attractant (i.e. food) found within the Project Footprint and the VFCL, that Golden Eagles' usage of the Project Footprint is nominal. Additional information can be located in the Panoche Valley Solar Point Count Survey Study Report for Golden Eagles located in Appendix C of this Plan.

**2010 Golden Eagle Non-Breeding Season Surveys and Raptor Survey**

The 2010 surveys, conducted during a non-breeding period, were specifically targeted for Golden Eagle occupancy via individual and nest sightings according to the USFWS Interim Guidelines for Golden Eagle Surveys. Two qualified observation biologists flew over the Project Footprint and areas within a 10-mile radius of the Project. Fifteen Golden Eagle nests were observed within the 10-mile radius of the Project. Four of those nests showed evidence of having fledged young. The survey noted no Golden Eagle nests occurring within two miles of the Project Footprint boundary and no other raptor or *Corvus* spp. found within the Project Footprint. The number of nests and species observed are indicated in Table 2.

**Table 2. Raptor species' nest and/or individuals observed during 2010 Aerial Survey.**

| Species | Number of Nests/Individuals |
|---|---|
| Turkey Vulture | 1 |
| Red-tailed Hawk | 24 |
| Golden Eagle | 15 |
| Prairie Falcon | 17 |
| Common Barn Owl | 1 |
| Great-horned Owl | 1 |

**2013 – 2014 Golden Eagle/Raptor Nesting Survey**

As per guidance provided by the USFWS, an initial round of helicopter surveys was performed over a 10-day period during the early breeding season, from January 15 to 24, 2014. The second round of aerial surveys were conducted over a 7-day period from April 2 to 8, 2014, when active nests were expected to contain eggs or young nestlings.

All surveys were conducted by qualified observers in a helicopter operated by a pilot experienced in conducting aerial Golden Eagle nesting surveys. Survey methodology described in USFWS Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Eagle Management and Permit Issuance (Pagel et al. 2010) was followed to the extent possible. The biologists conducted an aerial examination of all appropriate nesting habitats with ten miles of the Project Footprint. During aerial surveys, the observers searched for large stick nests of Golden Eagles and other raptors on cliff faces, rocky outcrops, trees, transmission towers, and other suitable nesting substrates.

A total of 492 nests were documented by Bloom Biological, Inc. (BBI) within the nesting study survey area, including 46 Golden Eagle nests. Nests classified as belonging to species other than Golden Eagles included nests of 226 Common Ravens (*Corvus corax*), 146 Red-tailed Hawks (*Buteo jamaicensis*), 62 Prairie Falcons (*Falco mexicanus*), eight Barn Owls (*Tyto alba*), three Great Horned Owls (*Bubo virginianus*), and one Turkey Vulture (*Cathartes aura*).

It was estimated that the 46 Golden Eagle nests discovered during this survey effort comprise approximately 30 breeding territories, some of which contain one or more alternate nests. The actual number of territories could be slightly higher or lower than 30, and the exact number of territories depends, in part, on how alternate nests of a single territory are defined. Golden Eagle nesting density (and territory size) is driven primarily by habitat quality, with higher nesting density in better quality habitat. Given that habitat quality in the nesting study survey area varies from quite high (in the northwestern quadrant, where most nests were located), to quite low, in extreme eastern portions, it would not be surprising for nests in some areas to be located as close together as one mile, or even rarely 0.5 miles, particularly in the areas of better quality habitat.

In total, nine Golden Eagle nests were classified as "used" in the 2014 season, each representing a separate territory. Thus, nesting occurred in almost one-third (9 of about 30) of the territories identified in this survey. Of these nine nests, eggs are presumed to have been laid in at least four. Adults were observed on nests in incubating posture and two un-incubated eggs were observed in (presumed failed) nests in April. Finally, two chicks were observed being tended to by a female Golden Eagle in early April. Of the remaining five Golden Eagle nests that were identified as active in 2014, none were known to contain eggs or nestlings as of the April 8$^{th}$ survey date. A nest was considered active if any of the following three conditions was met: (1) fresh (live or dead) sticks had been added during the current nesting season, (2) the nest was found to contain eggs or young (dead or alive), or (3) an adult was observed on the nest in an incubating (or brooding) posture. Given that Golden Eagles in this region normally lay eggs on or before this date, it is very unlikely that any of these five nests went on to successfully fledge young during the 2014 nesting season.

No Golden Eagle nests were identified within three miles of the Project Footprint, though four nests were located within four miles of the Project Footprint. Two of these four nests were active in 2014, though neither nest was ever found to contain eggs or nestlings. The next closest active Golden Eagle nest to the Project in 2014 was located approximately 5.79 miles north-northwest of the Project Footprint.

### *3.4.2 Miscellaneous Avian Observations*

The wildlife and plant field reconnaissance surveys conducted in April 2009 of the Project Footprint and conservation lands noted miscellaneous observations of Greater Roadrunner (*Geococcyx californianus*), Burrowing Owl, Anna's Hummingbird (*Calypte anna*), Loggerhead Shrike (*Lanius ludovicianus*), Yellow-billed Magpie (*Pica nuttalli*), American Crow (*Corvus brachyrhynchos*), and Common Raven. Additional surveys in February 2010 noted raptor species made up of Turkey Vulture, Northern Harrier (*Circus cyaneus*), Red-tailed Hawk (*Buteo jamaicensis*), Ferruginous Hawk (*Buteo regalis*), Golden Eagle, American Kestrel (*Falco sparverius*), and Prairie Falcon.

Additional miscellaneous avian species observed during various biological surveys for the Project from 2009 to 2015 included the American Pipit (*Anthus rubescens*), Barn Swallow (*Hirundo rustica*), Violet-green Swallow (*Tachycineta thalassina*), Mountain Plover, Killdeer (*Charadrius vociferus*), Long-billed Curlew (*Numenius americanus*), Brewer's Blackbird (*Euphagus cyanocephalus*), Mourning Dove (*Zenaida macroura*), Barn Owl, Cooper's Hawk (*Accipiter cooperii*), Lesser Nighthawk (*Chordeiles acutipennis*), Western Kingbird (*Tyrannus verticalis*), Say's Phoebe (*Sayornis saya*), California Horned Lark (*Eremophila alpestris actia*), Rock Wren (*Salpinctes obsoletus*), Mountain Bluebird (*Sialia currucoides*), Hermit Thrush (*Catharus guttatus*), California Thrasher (*Toxostoma redivivum*), European Starling (*Sturnus vulgaris*), Savannah Sparrow (*Passerculus sandwichensis*), Lark Sparrow (*Chondestes grammacus*), Sagebrush Sparrow (*Artemisiospiza nevadensis*), White-crowned Sparrow (*Zonotrichia leucophrys*), Red-winged Blackbird (*Agelaius phoeniceus*), Tricolored Blackbird (*Agelaius tricolor*), Western Meadowlark (*Sturnella neglecta*), Yellow-rumped Warbler (*Setophaga coronata*), Lesser Goldfinch (*Spinus psaltria*), Great Egret (*Ardea alba*), California Quail (*Callipepla californica*), House Finch (*Haemorhous mexicanus*), and Purple Finch (*Carpodacus purpureus*).

# 4.0 AVIAN IMPACT ASSESSMENT (TIER 3)

This section outlines the potential risks to avian species and supports the implementation of avoidance and minimization measures and compensatory mitigation. There is not a significant amount of information pertaining to the impacts of PV solar energy developments on avian resources. Some components of solar development (overhead lines, transmission lines, project lighting) are common to other types of energy developments, and the mechanisms of bird impacts resulting from those project components may be applicable to solar energy development. Potential risks to avian species can be broken into several categories: lighting, collision, noise, electrocution and habitat loss.

## 4.1 Lighting

For avian species around a solar facility, increased lighting during low-light periods can cause some species to leave the area and can disrupt foraging, breeding, or other activities. The lighting from construction and O&M may disturb the nighttime rest and sleep periods of diurnal avian species, including most passerine birds, causing them to abandon nests that are otherwise undisturbed. Nest site selection by some avian species may also be affected by light, resulting in nests being established farther from light sources (Deda et. al., 2007 Longcore and Rich, 2004).

During construction, lighting from construction vehicles during nighttime hours, external lights on support buildings, and down-shielded temporary lighting necessary for worker safety during nighttime construction. During operation of the Project majority of the lighting will be motion-censored, although constant low level lighting will be required at the O&M building. During operation truck lights associated with nighttime security will also occur. All lighting will point downward and be shielded to preserve dark skies.

Given the lack of artificial night lighting in the area surrounding the Project Footprint prior to construction of the solar facility, the overall change in ambient lighting conditions could disturb the

nesting and foraging activities of birds. However with the avoidance and minimization measures discussed in Section 5.0, the effects of lighting will be reduced to less than significant levels.

Polarized light pollution has the potential for effects on habitat selection, egg laying foraging, navigation and orientation, predation, and population dynamics of numerous species (Horvath et al. 2009). Artificial surfaces such as the PV panels planned within the Project Footprint could reflect light and become polarization signals to which different species are attracted. The highly polarizing nature of solar panels may negatively affect the ability of animals to judge suitable habitats and egg laying sites, especially for organisms normally associated with water; artificial polarizing surfaces can be more attractive than water due to a stronger polarization signature. This can result in the attraction of insects which either waste resources (time and energy) on the surfaces, lay eggs on them resulting in reproductive failure, become easy targets for predators, or dehydrate and die (Horvath et al., 2009). Many insect families, including mayflies (*Ephemeroptera*), stoneflies (*Trichoptera*), dipterans, and horse and deer flies (*Tabanidae*) are very attracted to the polarized light reflected by solar panels and will lay eggs above solar panels (Horvath et al. 2010).

This could have a negative effect if avian predators that are attracted by and feed on these insect, benefit from the abundance of prey attracted to these artificial surfaces, or become prey themselves. For instance, nest predators such as Common Raven that would gather near aquatic insect congregations that are attracted by the polarized light reflected by solar panels could represent an enhanced predatory risk for the eggs and chicks of other avian species that nest in the immediate vicinity of the Project such as California Horned Larks (Keller 2010).

At this time, due to little conclusive scientist evidence, it is unknown the level of effect the polarization light pollution on insectivorous birds. PVS may be required to add additional avoidance, minimization or mitigative measures to reduce impacts to a less than significant level due to the results of the monitoring reports.

## 4.2 Collision

Avian interactions with transmission lines and panels and the risks those interactions impose vary greatly by location within the Project Footprint. Bird collisions with power lines generally occur when a power line or other aerial structure transects a daily flight path used by a concentration of birds or migrants traveling at reduced altitudes (Brown, 1993). Collision rates generally increase in low light conditions; during inclement weather, such as rain or snow; during strong winds; and during panic flushes when birds are startled by a disturbance or are fleeing from danger. Collisions are more probable near wetlands, valleys that are bisected by power lines, and within narrow passes where power lines run perpendicular to flight paths.

Passerines (e.g., songbirds) and waterfowl (e.g., mallard ducks) are known to collide with wires (APLIC, 2012), particularly during nocturnal migrations or poor weather conditions (Avery et al., 1980). Passerines and waterfowl tend to fly under power lines, while larger species generally fly over lines and risk colliding with higher static lines. Also, many smaller birds tend to reduce their flight activity during poor weather conditions (Avery et al., 1978). Due to the limited amount of overhead power lines (e.g. feeder and distribution lines) proposed for the Project, and the construction of those structures and lines will be in constructed with Avian Power Line Interaction Committee

(APLIC) guidelines (2012), the effects of collision with power lines should be reduced to less than significant levels.

In addition to the collision risk to overhead power lines there is the possibility that the polarized glare or the "lake effect" can occur with huge photovoltaic projects (Kagan et al. 2014). An open upland environment with a large expanse of reflective panels could emulate a large body of water. Avian species such as coots, grebes, and cormorants that utilize open water as their primary habitat have been noted to land due to confusion of the solar panels with water (Kagan et al. 2014). This landing could lead to potential blunt force impact trauma or stranding from landing on artificial reflectors (Keller 2010).

PVS will conduct post-construction monitoring on the Project Footprint (Section 6.0). The monitoring would estimate the overall annual avian injury, harm, or potential mortality associated with the solar facility; determine the species impacted at the solar facility; and determine whether there is spatial differentiation within the solar field. If the San Benito County and regulatory agencies deemed the mortality excessive, PVS would take corrective actions as noted in the 2015 Final Supplemental Environmental Impact Report (FSEIR).

### 4.3 Noise

Increased noise from heavy equipment, during construction and O&M activities could alter bird behavior (e.g., foraging, breeding) including disturbance that could lead to nest failure or abandonment. The construction activities would include PV panel assembly, grading and recontouring; support post, panel, electrical equipment installation, and perimeter road construction.

Noise generated by the pile-drivers and other heavy equipment would be expected to result in temporary threshold shifts in hearing sensitivity. Threshold shifts could last for an extended period of time; loss of hearing could result in increased mortality as certain avian species relies on its ability to detect prey by sound and communicate with conspecifics such as the Burrowing Owl. Noise and vibrations could also disrupt intraspecific communication and cause the owls to leave burrows, where they may be more susceptible to predation or Project-related injury or mortality (County of San Benito 2010).

Noise associated with construction activities may temporarily displace avian species from the Project Footprint and/or immediate Project vicinity. Foraging impacts associated with noise-driven displacement may become evident. Declines in foraging efficiency would be more evident in cleared or disturbed areas than in undisturbed habitat. Noise tolerance varies amongst avian species. Some species are attributed with robust adaptive abilities, while others demonstrate sensitivity to anthropogenic disturbances. Thus, impacts to species, resultant of construction-related noise disturbances, is possible. However, under the implementation of species-specific avoidance and minimization practices, as outlined by Mitigation Measures **BR-6.1** (Pre-construction Surveys for Nesting and Breeding Birds and Implementation of Avoidance Measures), **BR-13.1** (Focused Pre-construction Burrowing Owl Surveys and Implementation of Avoidance Measures) and **BR-16.2**

(Minimize Impacts of Foundation Support Installations) of the FSEIR (County of San Benito 2015), causation of mortality due to elevated noise levels is unlikely.

Only minor noise at insignificant levels would be created during operation at the proposed facility. This noise would be created by security patrols, maintenance crews, wash crews, and the sound of electrical equipment, such as the inverters and transformers. Security and maintenance staff would routinely traverse the site in lightweight vehicles and all-terrain vehicles. Panel washing crews would be scheduled to clean the panels twice per year. They would traverse the site in a small all-terrain vehicle which would be fitted with a trailer containing a water tank and pump to operate a high-pressure sprayer.

## 4.4 Electrocution

Avian species are known to be electrocuted by electrical power lines, energized substation/switchyard and interconnect structures found within the Project Footprint due to two known factors (APLIC 2006):

- Topography, vegetation, availability prey and other behavioral or biological factors.
- Inadequate separation between two energized conductors or and energized conductor and the grounding hardware.

Electrical utility lines could result in electrocution of avian species such as large raptor and members of the Family *Corvidae* (e.g. crows and ravens) that have wing-spans large enough to simultaneously contact two energized conductors or an energized conductor and grounded hardware. Furthermore, nests built in areas that do not have adequate clearances or coverings are susceptible to arcing of electrical charges that could result in fire as well as an electrocution of adults and young. Therefore, any structures with energized jumper wires or hardware, such as transformers, can be especially hazardous, even to small birds, as they contain numerous, closely-spaced energized parts (APLIC 2006).

The biggest potential for electrocution to avian species on the Project Footprint will be from the energized equipment in the substation and switch station. The substation will be located directly adjacent to the existing PG&E transmission line. The substation output will be connected to a 230-kV switching station which will be owned and operated by PG&E; the switching station will provide protective relays and breakers to manage interface with the 230-kV grid system.

PVS will construct all electrical facilities including transmission and distributions lines, substations and switchyards in accordance with guidelines set forth in the *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006* (APLIC 2006), to avoid and/or minimize any avian electrocution risks as a result of the construction and operation of the Project. Details of design components will be indicated on all construction plans which will be submitted with the construction permit application to the County of San Benito. PVS will incorporate new versions of APLIC guidelines and update designs or implement new measures as needed during the Project's operations provided these actions do not require the purchase or replacement of previously

constructed electrical or transmission line structures. Therefore, with those measures in place, electrocution to avian species including large raptors would be unlikely.

## 4.5 Habitat Loss

The construction and operation of the Project will result in modification of approximately 2,506 acres of habitat due to the construction and operation of the solar array complexes, an O&M building, a project perimeter road, electricity collection lines, DC-AC inverters, an electrical substation and switching station. Breeding and wintering bird composition on the Project Footprint appears to be typical of densities found in annual brome grasslands of central California. The annual, non-native grassland habitat found within the Project Footprint that will be impacted is not significantly unique or limited on the landscape. Avian species should have other comparable or better breeding, foraging and roosting opportunities within the surrounding areas including the proposed Conservation Lands that will be protected through avoidance and minimization measures as well as conservation easements for compensatory mitigation of proposed impacts within the Project Footprint.

Upon the completion of construction, annual grassland vegetation will recover in interstitial spaces between arrays and along the Project edges between arrays and the perimeter fence. In addition, annual vegetation will recover under panels that may be capable of supporting foraging and nesting activity by some species.

The implementation of avoidance and minimization measures set forth in the 2015 FSEIR would reduce impacts to avian species due to habitat loss.

The Project will also implement a conservation package consisting of the permanent preservation and management of three large parcels of land to offset potential habitat impacts totaling approximately 24,176 acres. These Conservation Lands will be enhanced and managed for the species through implementation of a Habitat Management Plan. The lands were selected to provide local mitigation for habitat losses, preserve core populations of special status species and create permanent movement corridors with adjacent BLM controlled lands.

With the protection of these Conservation Lands, PVS shall compensate for permanent impacts to foraging and nesting habitat for avian species with the creation of permanent conservation easements. Conservation easements shall provide habitat preservation. Preserved habitat shall be of equal or greater quality after any restoration activity compared to the impacted habitat within the Project Footprint. This mitigation may occur on lands used simultaneously as mitigation for impacts to other species.

## 4.6 Potential Impacts to Special Status Avian Species

The Project area provides potential habitat for cover, breeding, foraging for 15 special status bird species (Section 3.3.1, Table 1). Of those 15 species, there is the potential for 13 of those species to use the Project Footprint for nesting and foraging. Those species are: Mountain Plover, Golden Eagle, California Condor (*Gymnogyps californianus*), Burrowing Owl, Tricolored Blackbird, Grasshopper Sparrow, Short-eared Owl, Long-eared Owl (*Asio otus*), Swainson's Hawk (*Buteo*

*swainsonii*), Northern Harrier, White-tailed Kite (*Elanus leucurus*), Loggerhead Shrike, and Oregon Vesper Sparrow (*Pooecetes gramineus affinis*). Additional information on impacts to each of the abovementioned species is presented below.

### *4.6.1 Mountain Plover*

Nearly the entire 2,506 acre Project Footprint provides suitable wintering habitat for Mountain Plovers. The Panoche Valley is an important wintering area for Mountain Plovers in central California. Due to impacts to Mountain Plover habitat, PVS will provide compensatory mitigation for permanent impacts to habitat for wintering Mountain Plovers with the creation of permanent conservation easements (Conservation Lands). Some of the approximately 24,176 acres of high quality Conservation Lands will provide habitat preservation in perpetuity at or above a ratio of 1:1 for wintering habitat acreage subject to impacts associated with construction of the Project. Preserved habitat shall be of equal or greater quality after any restoration activity compared to the impacted habitat. This mitigation may occur on lands used simultaneously as mitigation for impacts to other species.

Therefore, any potential for injury, mortality, or disturbance, or loss or degradation of wintering foraging habitat as a result of permanent or temporary construction-related activities would constitute a potential impact to the Mountain Plover. However, implementation of Mitigation Measures noted in Sections 4.6.4 and 4.6.5 as well as other avoidance and minimization measures (Section 5.0) would reduce potential impacts to Mountain Plovers to less than significant levels.

### *4.6.2 Golden Eagle*

Based on the point count, UDA, and aerial nesting survey information noted in Section 3.4.1 and incidental observations, it is apparent that Golden Eagles forage around the Panoche Valley throughout the year. The overall activity levels within the Project Footprint appear low with a majority of the activity taking place on adjacent conservation lands with significant slopes and elevations ranging from approximately 1,400 feet to 2,100 feet amsl. Additionally, as found during the point count and the UDA studies, unless there is an attractant (i.e. food, carcass) found within the Project Footprint and the VFCL, the Golden Eagles usage of the site is nominal. The UDA study also indicated that the Golden Eagles are mostly flying across or through the Panoche Valley (i.e. Project Footprint/VFCL) to other habitats to forage or perch.

Furthermore, the 2010 aerial nesting study identified no Golden Eagle nests within two miles of the Project Footprint. In 2014, the nesting study identified no Golden Eagle nests within three miles of the Project Footprint. The next closest active Golden Eagle nest to the Project in 2014 was located approximately 5.79 miles north-northwest of the Project Footprint.

PVS will adhere to the avoidance measures and conservation approach described below. During construction and operation the maintenance avoidance and minimization measures are expected to result in the avoidance of direct adverse effects to Golden Eagles. Furthermore, the proposed compensatory mitigation as stated below will ensure that any impacts to Golden Eagle foraging habitat is mitigated to the approved ratio determined by the appropriate state and federal agencies. With implementation of these measures and particularly the compensatory mitigation, effects will

be avoided, minimized, and mitigated, resulting in no net loss to the Golden Eagle population in the vicinity of the Project.

The Conservation Lands will provide habitat preservation, in perpetuity at a ratio of 2:1 or greater for all impacted Golden Eagle foraging habitat impacted. Preserved habitat is of equal quality compared to the impacted habitat and will be equal or greater quality after any restoration activity compared to the impacted habitat. This mitigation may occur on lands used simultaneously as mitigation for impacts to other species. In addition, the implementation of Mitigation Measures as well as other avoidance and minimization measures (Section 5.0) would reduce potential impacts to Golden Eagles to less than significant levels.

### *4.6.3 California Condor*

No California condors have been observed in or near the Project Footprint during any surveys, though USFWS radio-tracking efforts have recorded California condors over the Project Footprint and/or Conservation Lands in the past. The Project Footprint contains 2,506 acres of potential foraging habitat for the California condors which would be impacted permanently as the result of Project implementation. The Project Footprint is surrounded by potential foraging habitat; the loss of this foraging habitat is so small compared to the remaining available habitat that it would not noticeably have an impact on the California condors. The Project Footprint does not contain suitable nesting habitat for California condors.

The Conservation Lands represent 24,176 acres of potential foraging habitat for the California condors that would be preserved in perpetuity. There is no suitable nesting habitat for the condor on any of the Conservation Lands. Should a condor land within the Project Footprint or Valley Floor Conservation Lands, all work shall be stopped within 500 feet of the condor until the bird has left the area on its own. If the bird fails to leave the area because of injury or other factors PVS shall contact the USFWS, CDFW and/or San Benito County for direction. Should a condor(s) be incidentally observed roosting within 0.5 miles of the construction area, no construction activity shall occur between 1 hour before sunset to 1 hour after sunrise, or until the condors leave the area. Should condors be found nesting within 1.5 miles of the construction area, no construction activity will occur until further authorization from the USFWS. All California condor sightings in the Project area will be reported directly to the USFWS by the County qualified biologist.

Any Project-related electric distribution and substation structures will be constructed using APLIC-based avian protection guidelines. Therefore, with the implementation of Mitigation Measures stated in the FSEIR (MM BR-6.1 and BR-12.2) as well as other avoidance and minimization measures (Section 5.0) potential impacts to condors would be reduced to less than significant levels.

### *4.6.4 Burrowing Owl*

Nearly the entire 2,506 acres Project Footprint provides suitable foraging, nesting, and roosting habitat for Burrowing Owls. Numerous observations of Burrowing Owls have been made within the Project Footprint and Conservation Lands, and there are several CNDDB (2014) records of Burrowing Owls within a 10-mile radius of the Project Footprint.

The loss of occupied Burrowing Owl habitat and the loss of individuals (including eggs or young) as a result of construction and operation could result in impacts to this species in the Panoche Valley.

Open grasslands that recover in suitable interstitial spaces between arrays and along the Project perimeter will provide suitable habitat for this species during the operations phase. Avoidance and minimization measures noted in Section 5.0 and the Mitigation Measures found in the 2015 FSEIR for the Burrowing Owl and other species will avoid, minimize, and mitigate for any negative effects on the owl. The Mitigation Measures include the following provisions,

No more than 30 days and no less than 14 days prior to the commencement of initial ground disturbing activities, the Applicant shall implement focused pre-construction reconnaissance level surveys for burrowing owls. Surveys shall be conducted prior to the initiation of ground disturbance and be conducted by County-approved, qualified biologist(s) with experience surveying for burrowing owls. Surveys for burrowing owls shall be conducted in conformance with the *Staff Report on Burrowing Owl Mitigation* (CDFG, 2012) protocols. Surveys shall be completed within all areas proposed for ground disturbance and shall include the following avoidance measures:

1. Occupied burrows shall not be disturbed during the nesting season (1 February through 31 August) unless a qualified County-approved biologist verifies through non-invasive methods that either the birds have not begun egg-laying and incubation or that juveniles from the occupied burrows are foraging independently and are capable of independent survival. Owls present on site after 1 February will be assumed to be nesting unless evidence indicates otherwise. If western burrowing owls are present at the site, a qualified biologist will determine whether an exclusion zone can be established in accordance with the Staff Report on Burrowing Owl Mitigation (CDFG, 2012) protocols. This protected buffer area will remain in effect until 31 August, or based upon monitoring evidence, until the young owls are foraging independently or the nest is no longer active. If a buffer consistent with the staff report (CDFG, 2012) cannot be established, an experienced burrowing owl biologist will develop a site-specific plan (i.e., a plan that considers the type and extent of the proposed activity, the duration and timing of the activity, the sensitivity and habituation of the owls, and the dissimilarity of the proposed activity with background activities) to minimize the potential to affect the reproductive success of the owls. If a biologist experienced with burrowing owl determines the relocation of owls is necessary, a passive relocation effort may be conducted in coordination with CDFW as appropriate. During the nonbreeding season (generally 1 September–31 January), a qualified biologist may passively relocate burrowing owls found within construction areas in accordance with Staff Report on Burrowing Owl Mitigation (CDFG, 2012). Prior to passively relocating burrowing owls, a Burrowing Owl Exclusion Plan shall be prepared by a qualified biologist in accordance with Appendix E of the *Staff Report on Burrowing Owl Mitigation* (CDFW, 2012). The Burrowing Owl Exclusion Plan shall be submitted to the CDFW for review prior to

implementation, or as otherwise required by the CDFW during the permitting process.

2. For burrowing owls present during the non-breeding season (generally 1 September to 31 January), a 150-ft buffer zone will be maintained around the occupied burrow(s).
3. If there is any danger that owls will be injured or killed as a result of construction activity, during the non-breeding season, the birds may be Katz & Associates-evicted during the non-breeding season. Relocation of owls during the non-breeding season will be performed by a qualified biologist using one-way doors, which should be installed in all burrows within the impact area and left in place for at least two nights. These one-way doors will then be removed and the burrows excavated to ensure no burrowing owl is within the burrow and then backfilled immediately prior to the initiation of grading. To avoid the potential for owls evicted from a burrow to occupy other burrows within the impact area, one-way doors will be placed in all potentially suitable burrows within the impact area when eviction occurs.

PG&E will retain a qualified biologist to conduct preconstruction surveys for active burrows no more than 30 and no less than 14 days prior to the start of construction in accordance with the Staff Report on Burrowing Owl Mitigation (CDFG, 2012).

If western burrowing owls are present at the site, a qualified biologist will work with staff to determine whether an exclusion zone can be established in accordance with the Staff Report on Burrowing Owl Mitigation (CDFG, 2012). If it cannot, an experienced burrowing owl biologist will develop a site-specific plan (i.e., a plan that considers the type and extent of the proposed activity, the duration and timing of the activity, the sensitivity and habituation of the owls, and the dissimilarity of the proposed activity with background activities) to minimize the potential to affect the reproductive success of the owls. If a biologist experienced with burrowing owl determines the relocation of owls is necessary, a passive relocation effort may be conducted as described below, in coordination with CDFW as appropriate. During the nonbreeding season (generally 1 September–31 January), a qualified biologist may passively relocate burrowing owls found within construction areas. Prior to passively relocating burrowing owls, a Burrowing Owl Exclusion Plan shall be prepared by a qualified biologist in accordance with Appendix E of the Staff Report on Burrowing Owl Mitigation (CDFW, 2012). The Burrowing Owl Exclusion Plan shall be submitted to the CDFW for review as required.

The biologist shall accomplish such relocations using one-way burrow doors installed and left in place for at least two nights; owls exiting their burrows will not be able to re-enter. Then, immediately before the start of construction activities, the biologists shall remove all doors and excavate the burrows to ensure that no animals are present the burrow. The excavated burrows shall then be backfilled. To prevent evicted owls from occupying other burrows in the impact area, the biologist shall, before eviction occurs, (1) install one- way doors and backfill all potentially

suitable burrows within the impact area, and (2) install one-way doors in all suitable burrows located within approximately 50 feet of the active burrow, then remove them once the displaced owls have settled elsewhere. When temporary or permanent burrow-exclusion methods are implemented, the following steps shall be taken:

Prior to excavation, a qualified biologist shall verify that evicted owls have access to multiple, unoccupied, alternative burrows, located nearby (within 250 feet) and outside of the projected disturbance zone. If no suitable alternative natural burrows are available for the owls, then, for each owl that is evicted, at least two artificial burrows shall be installed in suitable nearby habitat areas. Installation of any required artificial burrows preferably shall occur at least two to three weeks before the relevant evictions occur, to give the owls time to become familiar with the new burrow locations before being evicted. The artificial burrow design and installation shall be described in the Burrowing Owl Exclusion Plan per Appendix E of the Staff Report on Burrowing Owl Mitigation (CDFW, 2012).

Passive relocation of burrowing owls shall be limited in areas adjacent to Project activities that have a sustained or low-level disturbance regime; this approach shall allow burrowing owls that are tolerant of Project activities to occupy quality, suitable nesting and refuge burrows. The use of passive relocation techniques in a given area shall be determined by a qualified biologist who may consult with CDFW, and shall depend on existing and future conditions (e.g., time of year, vegetation/topographic screening, and disturbance regimes).

In addition, PVS will compensate for permanent impacts to Burrowing Owls or their habitat through the recording of easements for the Conservation Lands (24,176 acres). The Conservation Lands will be of equal or greater habitat quality after any restoration activity compared to the affected habitat. In accordance with California Burrowing Owl Consortium (1995) guidelines, an area of 6.5 acres per pair will be preserved and managed for this species. This mitigation may occur on lands used simultaneously as mitigation for impacts to other species. Given the habitat requirements for several of the Covered Species overlaps with burrowing owl, separate management activities would not be necessary. Therefore, with the implementation of Mitigation Measures as well as other avoidance and minimization measures (Section 5.0); potential impacts to Burrowing Owls would be reduced to less than significant levels.

### *4.6.5 Tricolored Blackbird*

Tricolored Blackbirds have been observed (non-breeding observation) on the Proposed Project site and suitable foraging habitat for Tricolored Blackbirds is present throughout, although nesting habitat (i.e., cattail marshes, blackberry thickets, thistle stands) is absent. A large Tricolored Blackbird colony is known to occur approximately eight miles north of the Project Footprint at Little Panoche Reservoir (CNDDB, 2014).

These Blackbirds could forage in all areas of the Project Footprint and could be directly affected by the construction of the solar arrays, buildings, substation, and other infrastructure or activities.

Therefore, the Project has the potential to impact Tricolored Blackbirds foraging habitat. Incidental observations made during previous field surveys, confirmed the presence of potentially foraging Tricolored Blackbirds within the Project Footprint/Conservation Lands (County of San Benito 2010). Due to the extent of suitable foraging habitat, the overlap of the species' ranges with the Panoche Valley, and historic (CNDDB 2014) records, it appears that the Project Footprint is part of a larger annual grassland area within the Panoche Valley that is used as foraging habitat by Tricolored Blackbirds.

Any injury, mortality, or a substantial loss or degradation of foraging habitat as a result of permanent or temporary construction-related activities would constitute an impact to the Tricolored Blackbird. Implementation of mitigation measures found in the FSEIR require PVS to retain a qualified, County-approved Designated Biologist to conduct pre-construction surveys for non-breeding birds designated as California Species of Special Concern (BR-7b.1 of the FSEIR) in areas proposed for ground disturbance prior to ground-disturbing activities would result in avoidance and minimization of potential impacts to Tricolored Blackbirds that may forage on the Project Footprint. With the implementation of mitigation measures BR-G.1, BR-G.2, BR-6.1, BR-7a.1 as well as other avoidance and minimization measures (Section 5.0), potential impacts to Tricolored Blackbirds would be reduced to less than significant levels within the Project Footprint.

### *4.6.6 Grasshopper Sparrow*

The grassland habitats of the Project Footprint are heavily grazed, and therefore generally lack the heterogeneous structure this species typically prefers. However, suitable conditions may occur within the Proposed Project site during some years, especially following periods of above average rainfall. Grasshopper Sparrows are known to have nested in the Proposed Project vicinity (National Audubon Society 2013) and the Panoche Valley Solar Project is within the range of this species. Although Grasshopper Sparrows could occur on the Project Footprint or Conservation Lands, there are no CNDDB (2014) records of them occurring with a 10-mile radius of the Project Footprint. Biological surveys conducted on the Project Footprint and Conservation Lands from 2009 through 2014, did not detect Grasshopper Sparrows.

Any potential for injury, mortality, or disturbance (particularly of nesting Grasshopper Sparrows), or loss or degradation of nesting or foraging habitat as a result of permanent or temporary construction-related activities would constitute a potentially impact to the Grasshopper Sparrow. With the implementation of mitigation measures noted in Sections 5.0 and the additional mitigation measure that requires PVS to retain a qualified, County-approved Designated Biologist to conduct pre-construction surveys for nesting and breeding birds (BR-6.1 of the FSEIR) and pre-construction surveys for non-breeding birds designated as California Species of Special Concern (BR-7b.1 of the FSEIR) in areas proposed for ground disturbance, prior to ground-disturbing activities that would result in potential impacts to Grasshopper Sparrows on the Project Footprint. With the implementation of these mitigation measures as well as other avoidance and minimization measures (Section 5.0), potential impacts to Grasshopper Sparrows would be reduced to less than significant levels within the Project Footprint.

### *4.6.7 Short-Eared Owl*

Short-eared Owls require open country that supports concentrations of rodents (e.g. voles) and adequate herbaceous cover to conceal their ground nests from predators. Suitable habitats may include irrigated alfalfa or grain fields, ungrazed grasslands and old pastures (Shuford 2008). The grassland habitats of the Project Footprint are heavily grazed, and therefore generally lacking the structure this species typically prefers for nesting. However, suitable conditions may occur within the Project Footprint during some years, especially in response to vole population irruptions following exceptional rain years (Shuford 2008). Conditions on the Project Footprint or Conservation Lands on the site are more xeric than short-eared owls prefer during most years. There are no CNDDB (2014) records of short-eared owl occurring with a 10-mile radius of the Project Footprint. Biological surveys conducted on the Project Footprint and Conservation Lands from 2009 through 2014 did not detect short-eared Owls.

With the implementation of mitigation measures noted in Sections 5.0 and the additional mitigation measure that requires PVS to retain a qualified, County-approved Designated Biologist to conduct pre-construction surveys for nesting and breeding birds (BR-6.1 of the FSEIR) and pre-construction surveys for non-breeding birds designated as California Species of Special Concern (BR-7b.1 of the FSEIR) in areas proposed for ground disturbance, prior to ground-disturbing activities that would result in potential impacts to short-eared Owls on the Project Footprint. With the implementation of these mitigation measures as well as other avoidance and minimization measures (Section 5.0), potential impacts to Short-eared Owls would be reduced to less than significant levels within the Project Footprint.

### *4.6.8 Long-Eared Owl*

Long-eared Owls prefer to nest in conifer, oak, riparian, pinyon-juniper, and desert woodlands that are open or are adjacent to grasslands, meadows, or shrublands. Key habitat components are some dense cover for nesting and roosting, suitable nest platforms, and open foraging areas (Shuford 2008). Suitable foraging habitat for long-eared owls is present throughout the Project Footprint, although only marginally suitable nesting habitat is present in the few trees associated with structure or small *Eucalyptus* sp. groves planted for shading of cattle. Long-eared Owls have been observed nesting approximately three miles north of the Project Footprint at Mercy Hot Springs. The Panoche Valley is within the range of this species and they could forage on the Project Footprint, however, nesting is unlikely. No observations of long-eared owls have been made during any biological surveys conducted on the Project Footprint or adjacent Conservation Lands from 2009 to 2014.

Any potential for injury, mortality, or disturbance (particularly of nesting Long-eared owls), or loss or degradation of habitat as a result of permanent or temporary construction-related activities would constitute a potentially significant impact to the Long-eared Owl. With the implementation of Mitigation Measures noted in Sections 5.0 and the additional mitigation measure that requires PVS to retain a qualified, County-approved Designated Biologist to conduct pre-construction surveys for nesting and breeding birds (BR-6.1 of the FSEIR) and pre-construction surveys for non-breeding birds designated as California Species of Special Concern (BR-7b.1 of the FSEIR) in areas proposed for ground disturbance, prior to ground-disturbing activities that would result in potential impacts to

Long-eared Owls on the Project Footprint. With the implementation of these mitigation measures as well as other avoidance and minimization measures (Section 5.0), potential impacts to Long-eared Owls would be reduced to less than significant levels within the Project Footprint.

### *4.6.9 Swainson's Hawk*

The Swainson's Hawk breeds in the western United States and Canada and winters in South America as far south as Argentina. The hawk is adapted to the open grasslands, it has become increasingly dependent on agriculture, especially alfalfa crops, as native communities are converted to agricultural lands. Nearly the entire 2,506 acres Project Footprint could provide suitable foraging habitat for Swainson's Hawks. Three small *Eucalyptus* sp. stands present on the Project Footprint represent marginal potential nesting habitat. The trees in these stands are not mature and this species of hawk does not typically select eucalyptus as nest sites. The most recent status surveys did not locate any Swainson's Hawk nests in San Benito County and indicated on range maps that the Panoche Valley is outside of the current known range for the species, although the Panoche Valley is in the historic range (Anderson et. al. 2007). Additional potentially suitable nest trees are found outside the Project Footprint. If Swainson's Hawks were to nest in the vicinity, they could use the site for foraging. This hawk migrates to South America for the winter. Swainson's Hawks have not been detected during any biological surveys conducted on the Project Footprint or Conservation Lands from 2009 and 2014 including the aerial nesting surveys completed in 2010 and 2013/2014 and no CNDDB observations of this hawk species within over three miles of the Project Footprint (CNDDB, 2014).

Any potential for injury, mortality, or disturbance, or loss or degradation of habitat as a result of permanent or temporary construction-related activities would constitute a potentially significant impact to the Swainson's hawk. With the implementation of Mitigation Measures noted in Sections 5.0 and the additional mitigation measure that requires PVS to retain a qualified, County-approved Designated Biologist to conduct pre-construction surveys for nesting and breeding birds (BR-6.1 of the FSEIR) and pre-construction surveys for non-breeding birds designated as California Species of Special Concern (BR-7b.1 of the FSEIR) in areas proposed for ground disturbance, prior to ground-disturbing activities that would result in potential impacts to Swainson's Hawks on the Project Footprint. With the implementation of these mitigation measures as well as other avoidance and minimization measures (Section 5.0), potential impacts to Swainson's Hawks would be reduced to less than significant levels within the Project Footprint.

### *4.6.10 Northern Harrier*

Northern Harriers breed and forage in a variety of open, treeless habitats that provide a sufficient vegetative cover, an abundance of preferred prey. In California, harriers can be found in freshwater marshes, brackish and saltwater marshes, wet meadows, weedy borders of lakes, rivers and streams, annual and perennial grasslands (including those with vernal pools), weed fields, ungrazed or lightly grazed pastures, some croplands, sagebrush flats, and desert sinks. Northern harriers require adequate herbaceous cover to conceal their ground nests from predators typically, patches of dense, often tall, vegetation in undisturbed areas (Shuford 2008).

Nearly the entire 2,506 acres Project Footprint currently provides suitable foraging habitat for Northern Harriers due to observations of harriers foraging over the Project Footprint and Conservation Lands. However, the grassland habitats of the Project Footprint are heavily grazed, and therefore generally lacking the structure this species typically prefers for nesting. However, suitable conditions for nesting could occur within the Project Footprint during some years following exceptional rain years (Shuford 2008) with altered grazing management. As stated previously, Northern Harriers have been detected foraging on the Project Footprint and Conservation Lands, but no nesting Northern Harriers have been observed during any biological surveys conducted on the Project Footprint or Conservation Lands from 2009 and 2014 including the aerial nesting surveys completed in 2010 and 2013/2014.

Any potential for injury, mortality, or disturbance (particularly of nesting Northern Harriers), or loss or degradation of habitat as a result of permanent or temporary construction-related activities during the right conditions would constitute a potentially impact to the Northern Harrier. With the implementation of mitigation measures noted in Sections 5.0 and the additional mitigation measure that requires PVS to retain a qualified, County-approved Designated Biologist to conduct pre-construction surveys for nesting and breeding birds (BR-6.1 of the FSEIR) and pre-construction surveys for non-breeding birds designated as California Species of Special Concern (BR-7b.1 of the FSEIR) in areas proposed for ground disturbance, prior to ground-disturbing activities that would result in potential impacts to Northern Harriers on the Project Footprint. With the implementation of these mitigation measures as well as other avoidance and minimization measures (Section 5.0), potential impacts to Northern Harriers would be reduced to less than significant levels within the Project Footprint.

#### *4.6.11 White-Tailed Kite*

The White-tailed Kite is found in California throughout the year associated with coastal and valley lowlands where it is mostly found foraging and nesting near agricultural areas. This kite needs substantial groves of dense, broad-leafed deciduous trees used for nesting and roosting (Zeiner et. al. 1990). Some of the 2,506 acre Project Footprint or nearby properties could be considered foraging habitat for White-tailed Kites. However, a majority of the grassland habitats of the Project Footprint and Conservation Lands are heavily grazed, and therefore lack the preferred habitat for foraging and any nearby structure this species typically prefers for nesting with the exception of some riparian areas along Silver and Panoche Creeks in the SCRCL. Furthermore, no observations of White-tailed Kites foraging over the Project Footprint, Conservation Lands or in its immediate vicinity during any biological surveys conducted from 2009 and 2014 including the aerial nesting surveys completed in 2010 and 2013/2014. In addition, there have been no CNDDB observations of White-tailed Kites within 10 miles of the site (CNDDB, 2014).

Any potential for injury, mortality, or disturbance (particularly of nesting White-tailed Kites), or loss or degradation of habitat as a result of permanent or temporary construction-related activities during the right conditions would constitute a potentially significant impact to the White-tailed Kite. With the implementation of mitigation measures noted in Sections 5.0 and the additional mitigation measure that requires PVS to retain a qualified, County-approved Designated Biologist to conduct pre-construction surveys for nesting and breeding birds (BR-6.1 of the FSEIR) and pre-construction surveys for non-breeding birds designated as California Species of Special Concern (BR-7b.1 of the

FSEIR) in areas proposed for ground disturbance, prior to ground-disturbing activities that would result in potential impacts to White-tailed Kites on the Project Footprint. With the implementation of these mitigation measures as well as other avoidance and minimization measures (Section 5.0), potential impacts to White-tailed Kites would be reduced to less than significant levels within the Project Footprint.

#### *4.6.12 Loggerhead Shrike*

Suitable foraging habitat for Loggerhead Shrikes is present throughout the Project Footprint, and there is abundant prey for this species (e.g. small lizards, grasshoppers); however, only marginally suitable nesting habitat is present in the few trees associated with structures on or adjacent to the Project Footprint. Shrubs that may be used by this species are not present on the Project Footprint, but are abundant on Conservation Lands. This species could occur in all areas of the Project Footprint and could be directly affected by the construction of the solar arrays, buildings, substation, and other infrastructure or activities. Therefore, the Project has the potential to impact Loggerhead Shrikes, impede their movement, and alter occupied habitat. Field surveys have confirmed the presence of Loggerhead Shrikes within the Project Footprint and adjacent Conservation Lands.

Any potential for injury, mortality, or disturbance (particularly of nesting Loggerhead Shrikes), or loss or degradation of habitat as a result of permanent or temporary construction-related activities would constitute a potentially significant impact to the Loggerhead Shrike. With the implementation of mitigation measures noted in Sections 5.0 and the additional mitigation measure that requires PVS to retain a qualified, County-approved Designated Biologist to conduct pre-construction surveys for nesting and breeding birds (BR-6.1 of the FSEIR) and pre-construction surveys for non-breeding birds designated as California Species of Special Concern (BR-7b.1 of the FSEIR) in areas proposed for ground disturbance, prior to ground-disturbing activities that would result in potential impacts to Loggerhead Shrikes on the Project Footprint. With the implementation of these mitigation measures as well as other avoidance and minimization measures (Section 5.0), potential impacts to Loggerhead Shrikes would be reduced to less than significant levels within the Project Footprint.

#### *4.6.13 Oregon Vesper Sparrow*

The Oregon Vesper Sparrow is considered an obligate grassland species that feeds on both invertebrates and seeds procured on the ground and in vegetation (Shuford 2008). The habitat of Oregon vesper sparrows wintering in California is mainly open ground with little vegetation or grown to short grass and low annuals, including stubble fields, meadows, and road edges (Shuford 2008). Suitable winter foraging habitat is present throughout the Project Footprint and the Conservation Lands. Although Oregon Vesper Sparrow could occur on the Project Footprint and Conservation Lands, there are no CNDDB (2014) records of them occurring with a 10-mile radius of the Project Footprint. Biological surveys conducted on the Project Footprint and Conservation Lands from 2009 through 2014, did not detect Oregon Vesper Sparrow. However, the results of the Audubon Society's Christmas Bird Count in the Panoche Valley from 2003 through 2011 did indicate Vesper Sparrows (*Pooecetes gramineus*) but did not indicate the subspecies. These observations could very well be Oregon Vesper Sparrows.

Any potential for injury, mortality, or disturbance, or loss or degradation of wintering foraging habitat as a result of permanent or temporary construction-related activities would constitute a potentially significant impact to the Oregon Vesper Sparrow. With the implementation of mitigation measures noted in Sections 5.0 and the additional mitigation measure that requires PVS to retain a qualified, County-approved Designated Biologist to conduct pre-construction surveys for non-breeding birds designated as California Species of Special Concern (BR-7b.1 of the FSEIR) in areas proposed for ground disturbance, prior to ground-disturbing activities that would result in potential impacts to Oregon Vesper Sparrows on the Project Footprint. With the implementation of these mitigation measures as well as other avoidance and minimization measures (Section 5.0), potential impacts to Oregon Vesper Sparrows would be reduced to less than significant levels within the Project Footprint.

### 4.7 Cumulative Impacts

Analysis of cumulative effects typically considers the effects of a proposed project in combination with the effects of past, present, and reasonably foreseeable projects. To date, no other solar projects have been built in the vicinity of the Panoche Valley Solar Project and to the knowledge of PVS; no solar facilities are planned for construction in the future. However, if in the future a solar facility is planned in the vicinity of the Panoche Valley Solar Project, that project will be subject to the same regulations, and will be required to ensure that their effects on avian species are avoided, minimized, and mitigated. Therefore, the cumulative effects on avian species in the general vicinity, directly or indirectly would be considered less than significant.

## 5.0 AVOIDANCE, MINIMIZATION, AND MORTALITY REDUCTION MEASURES

This section identifies minimization and mortality measures that will be incorporated during construction and O&M of the Project.

### 5.1 General Avoidance and Minimization Measures

PVS will implement the following best management practices (BMPs) and avoidance and minimization measures in order to minimize potential impacts on avian species. These measures are also described in the FSEIR for the Panoche Valley Solar Project.

- Prior to any project activities on the site (i.e., surveying, mobilization, fencing, grading, or construction), a Worker Environmental Education Program (WEEP) shall be implemented by a qualified biologist or qualified biologists. Both the biologist(s) and the WEEP shall be subject to County approval. The WEEP shall be put into action prior to the beginning of any project activities and implemented throughout the duration of project construction. The WEEP shall include, at a minimum, the following items,
    - Training materials and briefings shall include but not be limited to: a discussion of the Federal and State Endangered Species Acts, Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act; the consequences of non-compliance with

these acts; identification and values of plant and wildlife species and significant natural plant community habitats; a contact person and phone number in the event of the discovery of dead or injured wildlife; and a review of mitigation requirements.

- A discussion of hazardous substance spill prevention and containment measures.

- A discussion of measures to be implemented for avoidance of the sensitive resources discussed above and the identification of an on-site contact on in the event of the discovery of sensitive species on the site. This will include a discussion on microtrash and its potential harmful effects on California condors.

- Protocols to be followed when road kill is encountered in the work area or along access roads to minimize potential for additional mortality of scavengers and the identification of an on-site representative to whom the road kill will be reported. Road kill shall be reported to the appropriate local animal control agency within 24 hours.

- Maps showing the known locations of special-status wildlife, populations of rare plants and sensitive vegetative communities, seasonal depressions and known waterbodies, wetland habitat, exclusion areas, and other construction limitations (e.g., limited operating periods). These features shall be included on the projects plans and specifications drawings.

- Literature and photographs or illustrations of potentially occurring special-status plant and/or wildlife species (e.g. Golden Eagles and California condors) will be provided to all project contractors and heavy equipment operators.

- The Applicant shall provide to the County of San Benito evidence that all on-site construction and security personnel have completed the WEEP prior to the start of site mobilization. A special hardhat sticker or wallet size card shall be issued to all personnel completing the training which shall be carried with the trained personnel at all times while on the project site. All new personnel shall receive this training and may work in the field for no more than five days without participating in the WEEP. A log of all personnel who have completed the WEEP training shall be kept on site.

- A weather protected bulletin board or binder shall be centrally placed or kept on site (e.g., in the break room, construction foreman's vehicle, construction trailer) for the duration of the construction. This board or binder will provide key provisions of regulations or project conditions as they relate to biological resources or as they apply to grading activities. This information shall be easily accessible for personnel in all active work areas.

- Develop a stand-alone version of the WEEP, that covers all previously discussed items above, and that can be used as a reference for maintenance personnel during project operations.

- Before commencing on-site construction activities, PVS will submit to CDFW and USFWS, the name, qualifications, business address, and contact information of one or more County-approved biologists. The Permittee shall ensure that each County-approved biologist is knowledgeable and experienced in the biology, and natural history of the special status avian species that could occur on the Project. The County-approved biologist(s) shall be responsible for monitoring construction activities to minimize and fully mitigate or avoid the take of avian species and to minimize disturbance of foraging habitat. The County-approved biologist may appoint biological monitors to perform biological surveys or provide oversight of ground disturbing activities as needed in their place. All biological monitors that work on-site will receive instruction from and report to the County-approved biologist(s).

- The Applicant shall provide to the County of San Benito evidence that all on-site construction and security personnel have completed the WEEP prior to the start of site mobilization. A special hardhat sticker or wallet size card shall be issued to all personnel completing the training which shall be carried with the trained personnel at all times while on the project site. All new personnel shall receive this training and may work in the field for no more than five days without participating in the WEEP. A log of all personnel who have completed the WEEP training shall be kept on site.

- Prior to surface disturbance or other covered activity, a County-approved biologist shall conduct a special status species education program (tailgate briefing) for all Project personnel, which familiarizes the PVS employees and contractors with occurrence and distribution of special status species in areas impacted by the Project; take avoidance measures being implemented during the Project; and BMPs. This program is designed to ensure all personnel who work at the Project are aware of and can identify the avian special status species and the measures implemented to protect this species. An employee environmental awareness program will be administered to all new employees and to all other employees every two years. Upon completion of the program, the employees are given a badge that is required for admittance onto the Project site. Badges will include the employee's picture and will be color-coded and dated in order to show that the employee is current with required training.

- Prior to surface disturbance or other covered activity, PVS will conduct pre-construction surveys for non-breeding birds designated as California Species of Special Concern. PVS shall retain a County-approved biologist to conduct pre-construction surveys for avian species designated as California Species of Special Concern in areas proposed for ground disturbance prior to ground-disturbing activities. The timing of surveys shall be determined in consultation with CDFW.

- Prior to surface disturbance or other covered activity, PVS will conduct pre-construction surveys for nesting and breeding birds and implementation of avoidance measures. Prior to any on-site any site disturbance (i.e., mobilization, staging, grading or construction) during the breeding season for any birds that could occur on the Project Footprint, the PVS shall retain a County-approved qualified biologist to conduct pre-construction surveys for nesting birds. Surveys for nesting birds shall be conducted within the recognized breeding season in all areas within 500 feet of solar arrays, staging areas, substation sites, and access road

locations. Surveys for raptors shall be conducted for all areas between February 1 and August 15. The required survey dates may be modified based on local conditions, as determined by the County-approved biologist, with the approval of the County of San Benito.

- If breeding birds (non-raptors) with active nests (incubating eggs or fledging young) are found prior to or during construction, a biological monitor, under the supervision of a County-approved biologist, shall establish a 300-foot buffer around the nest for ground-based construction activities and no activities will be allowed within the buffer(s) until the young have fledged from the nest or the nest fails. If raptors with active nests are found, a 500-foot buffer for raptors will be placed around the nest until the young have fledged the nest or the nest is deemed to have failed. If nesting Golden Eagles are identified, a 0.5-mile no activity buffer will be implemented. The exception to these stated buffers is clarified below in Section 6.1 of this document.

- A County-approved biologist or a biological monitor shall be present while ground-disturbing activities are occurring. In addition to conducting preconstruction surveys, the biologist(s) shall aid crews in satisfying "take" avoidance criteria and implementing mitigation measures; will document (weekly) all pertinent information concerning Project effects on protected avian species; and shall assist in minimizing the adverse effects of Project activities on protected avian species.

- PVS shall appoint a company representative (Environmental Manager) who will be the contact source for any employee or contractor who inadvertently kills or injures a protected avian species or who finds a dead, injured, or entrapped protected avian species. The representative will be identified during the pre-performance educational briefing.

- County-approved biologists and biological monitors are empowered to order cessation of activities if take avoidance and/or mitigation measures are violated and will notify the Environmental Manager immediately.

- Unless County-approved biologist(s) allow alterations to routes, all Project vehicles shall be confined to designated project roads or prominently staked and/or flagged access routes that are surveyed prior to use.

- Any project-related electric distribution and substation structures will be constructed following applicable APLIC-based avian protection guidelines (2006).

- New light sources will be minimized, and lighting will be designed (e.g., using downcast lights) to limit the lighted area to the minimum necessary.

- If nesting golden eagles are identified, a 0.5-mile no activity buffer will be implemented in accordance with the Eagle Conservation Plan (subject to approval by the USFWS and CDFW). Should condors be found roosting within 0.5 miles of the construction area, no construction activity shall occur between 1 hour before sunset

to 1 hour after sunrise, or until the condors leave the area. Should condors be found nesting within 1.5 miles of the construction area, no construction activity will occur until further authorization from the USFWS. All California condor sightings in the project area will be reported directly to the USFWS by the County qualified biologist.

- The County-approved biologist(s) shall keep an accurate tally of the number of sensitive avian resources that are affected by construction activities. Additionally, biologist(s) shall estimate the number of nest damaged, relocated, or nest that were deemed by the County-approved biologist to have abandoned/failed due to construction activities. Total number of nests affected (e.g. nest damaged, relocated, abandoned/failed) by the construction shall be reported in the post-activity compliance reports and entered into a central database developed expressly for that purpose.

- Any contractor, employee(s), or other personnel who inadvertently kills or injures any avian species, including state and federal endangered, threatened, species of concern or state fully protected, shall immediately report the incident to the Environmental Manager or County-approved biologist. In the case of a protected species, the Environmental Manager or County-approved biologist will contact CDFW and/or USFWS immediately in the case of a dead, injured, or entrapped listed avian species. The County-approved biologist will also document all circumstances of death, injury or entrapment of protected avian species. The County-approved biologist will: 1) take all reasonable steps to enable the individual animal to escape should it be entrapped; 2) contact CDFW, USFWS, or other appropriate authorities to identify an approved rehabilitation center and appropriate capture and transport techniques should the covered animal be injured; and 3) document circumstances of death in writing and if possible photograph the dead animal in situ prior to moving.

- If a protected avian species is injured or take occurs from Project related activities during construction or operations, the County-approved biologist shall be immediately notified and initial notification shall be made to CDFW by calling the Regional Office and providing information on the location, species, number of animals injured or killed, and the Permit Number. Following the initial notification, the County-approved biologist shall prepare written documentation of the information reported by telephone. Permittee shall send CDFW a written report within two calendar days. The report will include the date, time and location of the finding or incident, location of the carcass, and if possible provide a photograph, and any other pertinent information.

- Any other avian species (excluding protected avian species) found dead incidentally (outside surveys window or transects described in Section 6.2.1 below), will be identified, photographed, and documented in the same manner as the regular surveys. These incidental findings will be noted as incidental discoveries and will not be entered into the statistical calculation of mortality rate.

- The Applicant shall evaluate and implement feasible foundation installation systems to minimize noise and vibration that would affect ground-dwelling wildlife.

- All spills of hazardous materials shall be cleaned up immediately in accordance with the Project's Spill Prevention Control Plan.

- Pets are prohibited at the Project Footprint and Conservation Lands with the exception of working dogs. Working dogs that assist ranchers or those used for San Joaquin kit fox scat detection are not considered pets. Any working dog entering the Project Footprint will be required to provide proof of inoculations to prevent disease transmission.

- Firearms are prohibited within the Project Footprint.

- All food-related trash, such as wrappers, cans, bottles, bags, and food scraps shall be disposed of daily in containers with secure covers and regularly removed from the Project Footprint.

- Use of rodenticides and herbicides in areas impacted by the Project will be restricted to use within the prescriptions of the Noxious Weed and Invasive Plant Control Plan. Applications will be applied by licensed applicators in accordance with label directions and other restrictions mandated by federal, state, and local requirements.

- Project vehicles shall be confined to existing roads, construction roads, perimeter road, and transportation corridors between panels. Vehicle travel is not permitted off of designated transportation routes, except in the case of emergency or as approved by the designated biologist. A speed limit of 15 miles per hour (mph) will be adhered to on the Project Footprint.

- Upon completion of any section of the Project, all areas that are significantly disturbed and not necessary for future operations, shall be stabilized to resist erosion, and revegetated and re-contoured if necessary, and will follow goals and methods in the Habitat Restoration and Revegetation Plan to promote restoration of the area to pre-Project conditions.

## 5.2 Other Avian Specific Avoidance and Minimization Measures

To minimize impacts to nesting birds, this conservation strategy includes nesting bird deterrent methods within and adjacent to active construction areas, including substations, laydown yards, and in or on construction-related equipment. PVS or their subcontractors may use all legally available measures to deter initiation of nest building on equipment and structures vital to Project construction. Effective deterrent methods within work areas will reduce the likelihood of avian nests becoming established on Project construction-related materials, equipment, and buildings; thereby reducing potential for impacts to nesting birds due to Project construction. All nesting bird deterrent methods will be evaluated and implemented by PVS or its subcontractors. These methods will be evaluated by the County-approved biologist to assure compliance with the applicable mitigation measures, permits, and regulations.

Specific locations for the use of exclusionary or deterrent devices will be determined in coordination with PVS' Environmental Manager and the County-approved biologist. All nesting deterrents below

are intended to prevent nesting attempts and do not include the use of devices that prevent nesting from continuing once a nest is built.

The deterrent methods listed below, either on their own or in combination with other measures, can be effective in discouraging bird nesting within and immediately adjacent to construction areas. The effectiveness of deterrents will be evaluated for the duration of construction and adapted accordingly based on input from PVS' Environmental Manager and the County-approved biologist. PVS will submit a summary of the deterrents used and perceived effectiveness in the Monthly Compliance Report to the USFWS, CDFW and San Benito County during construction.

### *5.2.1 Vegetation Removal*

Removing potential nesting habitat is the first component in effectively excluding nesting birds within the Project Footprint's construction area. To the extent feasible prior to the onset of the nesting bird season and after pre-construction surveys, construction areas will be cleared of vegetation (e.g. trees) to reduce potential conflicts between construction activities and nesting birds during the breeding season.

If trees or existing poles/towers are to be removed as part of Project related construction activities they will be done so outside of the nesting season to avoid additional impacts to nesting raptors. If removal during the nesting season can't be avoided then trees and existing poles/towers the biological monitor must confirm that the nest is vacant prior to its removal. If nests are found within these structures and contain eggs or young the biological monitor shall allow no activities within a 300-foot buffer for nesting birds and/or a 500-foot buffer for raptors until the young have fledged the nest.

### *5.2.1 Tarps*

Where practical, equipment and materials can be covered with tarps; however, tarps must be tied down firmly to secure them against strong winds, and will not be open at the bottom because some species, Rock Wrens in particular, will access the equipment or material from the bottom. Tarps will be inspected at least once per week to identify and correct any openings that may allow cavity-nesting bird species to enter. If openings are found, the tarps will be inspected for trapped wildlife before re-closure.

### *5.2.1 Mesh Netting*

An alternative to tarps is mesh netting to cover equipment, stored materials and equipment, and partially constructed support facilities helps prevent birds from accessing potential nesting sites within the construction areas. Inspections and maintenance of netting will be performed daily to avoid impacts to birds and other wildlife species.

The size of the mesh grid can vary depending on the sizes of birds that are being excluded. Given the diversity of birds that could nest within construction areas across the Project Footprint, a 0.75-inch sized mesh may be suitable for excluding the greatest number of birds, including small birds such as House Finches.

To increase the effectiveness of the mesh netting as a bird exclusion device, equipment or other objects will be completely covered leaving no gaps in the netting through which birds could enter and build a nest under the netting. Mesh netting if used, will be inspected daily to identify and repair any rips or gaps in the netting that could allow birds to pass through, and to look for wildlife that may have become trapped in the netting. If wildlife are observed inside or trapped in the mesh netting, the Environmental Manager or County-approved biologist will be contacted immediately. The County-approved biologist or biological monitor will also inspect netting during monitoring to assure that birds or other wildlife have not become trapped under the netting. Care will be taken to avoid excessive netting on the ground to minimize potential for lizard and snakes to become entangled.

### *5.2.2 Bird Spikes*

Use of plastic or stainless steel spikes can be effective in certain applications to discourage birds from perching on structures and thus deterring nest establishment. Bird spikes typically consist of groupings of stainless steel or UV-resistant polycarbonate spikes that are spaced in such a way as to prevent birds from landing and gaining a foothold on the surface to which the spikes are adhered.

Bird spikes are designed to be affixed to structures to provide longer-term deterrents to birds. Such devices are not likely practical for use on equipment, material storage areas, or contractor yards.

### *5.2.3 Material and Pipe Covers*

Sheltered spaces such as pipes or stacks of stored materials provide potential nesting sites for some birds. To reduce the likelihood that birds will build nests in these areas materials can be covered with mesh netting or tarps (discussed above) or pipe covers. Routinely covering equipment and stored materials is a standard management practice that can be effective in deterring birds from nesting in these areas.

### *5.2.1 Colored Gravel*

Use of colored gravel in construction areas that would typically be rocked and maintained for a long term (e.g., in yards and substations) can be effective in discouraging ground nesting birds. The eggs of ground nesting birds are patterned in a manner to be camouflaged against naturally colored substrates such as soil or pebbles. By covering the ground surface with colored gravel that contrasts sharply with the color of the birds' eggs, ground-nesting birds can be effectively discouraged from nesting in such locations.

## 6.0 CONSTRUCTION AND POST-CONSTRUCTION MONITORING (TIER 4)

Construction and post-construction monitoring will facilitate documentation of any impacts (e.g. fatalities, injury, and disturbance) that might occur and will identify factors associated with potential avian impacts, which might warrant additional avoidance and minimization measures or improvement or elimination of avoidance and minimization measures found to be ineffective. Implementation of the proposed monitoring program will provide information to the USFWS, CDFW, San Benito County, and PVS to assist in the evaluation of the effectiveness of the avoidance and

minimization measures. As part of the Project's monitoring and reporting program, post-construction monitoring and reporting will be completed to determine whether baseline evaluations of impacts on avian species, including Golden Eagles, are consistent with operational outcomes. All workers will participate in WEEP training. This training will assist workers with identifying nests and documenting avian interactions, including mortalities, within the Project Footprint.

Because a significant amount of information pertaining to the methods for surveying PV solar facilities for avian mortalities is not available, several documents were reviewed to assist in the development of this and other sections of this plan. The documents include *Centinela Solar Energy Project Bird and Bat Conservation Strategy* (2012) and *Genesis Solar Revised Bird and Bat Conservation Strategy* (2014).

## 6.1 Breeding Monitoring and Nesting Management

As noted above, PVS will conduct surveys for nesting and breeding birds and implementation of avoidance measures. Prior to any site disturbance (i.e., mobilization, staging, grading or construction) during the breeding season, PVS will retain a County-approved biologist to conduct pre-construction surveys for nesting birds. Surveys for nesting birds shall be conducted within the recognized breeding season in all areas within 500 feet of solar arrays, staging areas, substation sites, and access road locations for the Project. The surveys will be completed with a frequency of every two weeks during the breeding season utilizing various methods such as point counts/transects as deemed necessary by the County-approved biologist. Surveys for raptors shall be conducted for all construction areas including a 500 feet buffer areas around the Project Footprint between February 1 and August 15 utilizing the frequency and methods as deemed necessary by the County-approved biologist. The required survey dates may be modified based on local conditions, as determined by the County-approved biologist, with the approval of the County of San Benito.

If breeding birds with active nests are found prior to or during construction, a biological monitor shall establish a 300-foot buffer and a 500-foot buffer for raptors until the young have fledged the nest or the nest fails.

The prescribed buffers may be adjusted to reflect existing conditions including ambient noise, topography, and disturbance with the approval of the County as appropriate. Appropriate buffers will be determined by the County-approved biologist(s) and the determination of buffer widths will be site- and species/guild specific and data-driven and not based on generalized assumptions, and will consider the following factors:

- Nesting chronologies
- Geographic/topographic location
- Existing ambient conditions (human activity within line of sight, such as traffic, construction, and noise)
- Type and extent of disturbance (e.g., noise levels and quality)

- Visibility of disturbance
- Duration and timing of disturbance
- Influence of other environmental factors
- Species' site-specific level of habituation to the disturbance, and
- Common and abundant species

As stated above, standard buffer widths recommended for the Project are 300 feet for non-raptor species and 500 feet for raptors. Any exception to the standard buffers will be determined on site by the County-approved biologist(s) and will be based on the factors listed above. The modified buffers are expected to avoid and minimize the potential for Project-related nest abandonment and failure of fledging, and minimize any disturbance to the nesting behavior. If the County-approved biologist determines that Project activities cause or contribute to a bird being flushed from a nest or other signs of disturbance of a nesting bird at a level that has potential to cause nest failure, the modified buffer will be re-evaluated and revised or increased if necessary. Due to common and abundant avian species and avian species that have become habituated to disturbance, these modified buffers can be considered "no-work/no-stop buffers". For example, a modified buffer could allow for only drive-through access with reduced speed. Once a nest buffer is established, the monitoring frequency and construction restrictions for each nest will depend on the bird's sensitivity to disturbance from the specific work activity.

The biological monitor(s) shall conduct regular monitoring of the nest(s) (weekly at a minimum), but frequency will vary depending on the assessment of the County-approved biologist, to determine success/failure and to ensure that unapproved Project activities are not conducted within the buffer(s) until the nesting cycle is complete or the nest fails. The biological monitor(s) shall be responsible for documenting the results of the surveys and ongoing monitoring and will provide a copy of the monitoring reports for impact areas to the respective agencies.

Surveys shall be conducted to include all structural components of the solar arrays and related structures as well as all construction equipment. If birds are found to be nesting in facility structures, buffers as described above shall be implemented. If birds are found to be nesting (incubating eggs or fledging young) in construction equipment, it is possible that the equipment may not be used until the young have fledged the nest, the nest is deemed as failed, no young are present, or until after the breeding season has passed. However, if deemed necessary by the County-approved biologist, an active bird nest can be removed from construction equipment as long as the species is a non-raptor or special status species active nest and concurrence from the USFWS and/or CDFW is received.

If for any reason an active bird nest (incubating eggs or fledging young) must be removed during the nesting season, the PVS shall provide written documentation providing concurrence from the USFWS and/or CDFW authorizing the nest removal and/or relocation. Additionally PVS shall provide a written report documenting the removal efforts. The report shall include what actions were taken

to avoid removing the nest, the location of the nest if relocation is possible, what species is being removed/relocated.

If trees or existing poles/towers are to be removed as part of Project-related construction activities they will be done so outside of the nesting season to avoid additional impacts to nesting raptors. If removal during the nesting season can't be avoided then trees and existing poles/towers, a biological monitor must confirm that the trees, poles or existing nests are vacant prior to its removal. If nests are found within these structures and contain eggs or young the biological monitor shall allow no activities within a 300-foot buffer for nesting birds and/or a 500-foot buffer for raptors until the young have fledged the nest with exception of modified buffers as described above.

## 6.2 Mortality Monitoring

The post-construction mortality monitoring will be comprised of three different types of monitoring. The first is the mortality monitoring which consists of regular, systematic searches of sample blocks of PV solar panels that will be used to estimate the overall annual avian mortality rate associated with the solar facility; determine the species impacted at the solar facility; and determine whether there is spatial differentiation within the Project Footprint during the initial two years of operation. The second monitoring involves the searches of the perimeter fence and power support structures (e.g. switching station) by personnel who have received specialized training. The data gathered during this monitoring will not be used to generate estimates of mortality rates. The post-construction mortality monitoring is anticipated to begin at the start of the first full seasonal interval after the Project is considered fully operational (i.e., sending power to the electrical grid) and this plan has been approved by the appropriate local, state and federal agencies. The post-construction monitoring programs will be completed for a minimum of two years after the Project is considered fully operational (USFWS 2010).

### *6.2.1 Mortality Monitoring*

This section of the Plan describes the procedures for the standard mortality monitoring for avian species on the Project Footprint during post-construction monitoring. The monitoring consists of avian carcass searches conducted at sample blocks of PV solar panels. The number of avian mortalities observed during the monitoring searches would provide a minimum number of fatalities for the Project. This is due to the fact that not all avian mortalities that could occur on the Project Footprint would be found during the monitoring. The use of searcher efficiency trials and carcass persistence trials, described below, would assist in the bias attributable to carcass removal by scavengers and searcher efficiency. The annual mortality rates will then be estimated using statistical methods that adjust the number of avian carcasses found for these bias trials. The annual mortality rates will be calculated for all bird species combined, small (≤ 10 inches) and large (>10 inches) birds, raptors, and special-status avian species regulated by the CDFW and USFWS. The regulated species are listed in Table 1 and also includes other special-status bird species that may be incidentally encountered within the Project Footprint. In some cases, the sample size for a species group of interest, such as eagles or other sensitive species, may be too small to allow for the calculation of accurate mortality estimates. In those circumstances, the total avian mortalities detected during the standard and O&M searches will be total of individual observed which would be substituted in place of rate estimates (see Fatality Rate Estimation below).

The methods below are from wind energy projects (USFWS 2012), because a significant amount of information pertaining to the causes or patterns of avian mortalities associated with solar PV projects is not available. Due to the adaptive nature of this plan, the methodology of the monitoring may be changed to increase the effectiveness and efficiency of the monitoring (e.g., search interval, number of PV rows searched, plot size, analytical method).

**Sampling Intensity and Duration**

The post-construction mortality monitoring will consist of surveys of 20 percent of the approximately 1,629 acres of the Project Footprint acreage that will be developed with PV arrays and will be conducted for two after the Project is considered fully operational . After the second year of monitoring, PVS in consultation with the USFWS and CDFW will evaluate the results and determine whether additional years of monitoring are necessary. To avoid bias in the mortality estimate, the survey areas will be divided equally between the two portions of the Project, the dividing line will be Little Panoche Road (Figure 2, Appendix A). The areas to be surveyed will be determined by the County-approved biologist six months prior to the estimated fully operational date. All monitoring surveys will be performed by two or more searchers driving transects at no more than five miles per hour on all-terrain vehicles or on foot. If deemed necessary by the County-approved biologist, a closed roof vehicle can be used for safety reasons.

Because the area beneath the PV solar panels will be mostly level and clear of any tall vegetation, the monitoring surveys will consist of searching the space between every other row of panels, and visually scanning the space to the next transect which is approximately 100 feet (30 meters) on each side of the transect within the survey areas. If tall vegetation is present within the survey boundaries, the vegetation will have to be managed to ensure that no potential carcasses would be obscured. Extra attention will be given to the area immediately around the foundations of the solar panel structures, which are the only structures on the ground that might obscure a carcass from view. The same transects will be surveyed in all years of monitoring to avoid confounding effects from location in the solar field with variation among years.

The survey year will be divided into four seasons to allow for the inclusion of seasonal searcher efficiency probabilities and carcass persistence times. Post-construction mortality monitoring will occur over a 4-day period each month during the first year of operation. Initially, all transects will be sampled for four consecutive days at the beginning of each month for 24 months (Strickland et al. 2011). The search interval may be adjusted to reduce bias, if needed, based on searcher efficiency and carcass persistence after the first full year of searches, in coordination with CDFW and USFWS.

Seasons will be defined as follows for sampling:

- Spring: March 1 to May 31
- Summer: June 1 to August 15
- Fall: August 16 to November 15
- Winter: November 16 to February 28

**Mortality Documentation**

During the initial preparation for each round of carcass surveys, a preparatory survey will be conducted to remove any avian carcasses that have occurred before each round of the surveys is initiated. The mortality surveys will be used to determine the overall estimated mortality rate for birds for the Project. These rates serve as the basis for all comparisons of fatalities, indicators of relationships with site characteristics and environmental variables, and evaluation of mitigation measures implemented at the time of project construction (Strickland et al. 2011). Any carcasses found will be documented and removed in the same manner as those found during the regular carcasses searches. These carcasses will not be included in the statistical analysis because the protocol requires a known search interval.

Surveyors will assume that avian carcasses found within the survey areas are due to the solar facility unless the cause of death can be clearly attributed to a non-facility cause. Avian carcasses found during the carcass surveys will be marked with a unique number, and species, sex, and age if possible will be documented. In addition, the date, time found, Global Positioning System (GPS) location coordinates, condition (e.g., intact, scavenged, feather spot), surveyor, and any comments pertaining cause of death or other pertinent information will be collected. All of the carcasses found whether during the preparatory or regular surveys will be photographed in place. Once the carcasses are documented (with the exception of eagles, state and federal listed species, and/or fully protected species such as California condor and white-tailed kite which will be left where found and agencies notified) will be collected and placed in a dedicated freezer for the surveys.

Any carcasses found incidentally (outside surveys window or transects), will be identified, photographed, and documented in the same manner as the regular surveys. These incidental findings will be noted as incidental discoveries and will not be entered into the statistical calculation of mortality rate.

**Carcass Persistence Trials**

Carcass persistence trials estimates the amount of time an avian carcass will remain before it disappears due to scavenging or other means (e.g., wind and surface water or decomposition). Carcass persistence trials will be conducted in each season to evaluate seasonal differences in carcass persistence and possible differences in the size of the species being scavenged.

Carcasses to be utilized during the persistence trials will be selected to best represent the size of a range of avian species. If sufficient carcasses have been collected as fatalities at the Project, and are sufficiently fresh, they will be used for these trials. If additional carcasses are needed, commercially available carcasses will be substituted. For large birds, carcasses may include domestic waterfowl, pheasant, or similar species legally obtained from game farms. For small birds, carcasses may include European starlings, house sparrows, or other non-native species not legally protected. Assuming adequate carcass availability, one carcass persistence trial will be conducted during each of the seasons with a goal of at least 5 carcasses of each bird size class (5 large birds and 5 small bird) placed per season.

Estimates of the probability that a carcass persisted between search intervals and therefore was available to be found by searchers, will be used to adjust carcass counts for bias using methods presented in *An Estimator of Wildlife Fatality from Observed Carcasses* (Huso 2011) or equivalent analysis method.

**Surveyor Efficiency Trials**

The ability of surveyors to find carcasses is influenced by a number of factors (e.g. skill of an individual surveyor, vegetation composition and carcass characteristics). The objective of surveyor efficiency trials is to estimate the percentage of mortalities that the surveyors will be able to locate. Estimates of searcher efficiency are then used to adjust carcass counts for detection bias. Surveyor efficiency trials will be conducted in all seasons to account for seasonal differences in surveyor efficiency. The carcass species used in the trials and marking and placement techniques will be the same as those in the carcass persistence trials.

Surveyor efficiency trials will begin when carcass searches start. The surveyors conducting the searches will not know when trials are being conducted or the location of the efficiency trial carcasses. Trials will be conducted multiple times throughout each season and will incorporate testing of each member of the field crew. The surveyor will not know in advance when or where they are being tested. Assuming adequate carcass availability, a goal of at least 5 carcasses of each size class (5 large birds and 5 small birds) will be placed per season for surveyor efficiency trials.

**Mortality Rate Estimation**

To calculate the Project's estimated mortality rate (mortalities/megawatt/year) and the total Project fatalities, PVS will utilize the same methods as noted in the carcass persistence trials. The mortality rate will be calculated for large birds, small birds, raptors (including eagles), and special-status species if at least 10 fatalities within the subgroups are found.

The estimation of mortality rates will incorporate fatalities documented during the carcass searches adjusted for bias. Specifically, estimates will take into account:

- Search interval;
- Observed number of carcasses found during searches during the monitoring year for which operation of the facility cannot be ruled out as the cause of death;
- Carcass persistence, expressed as the probability that a carcass is expected to remain in the study area (persist) and be available for detection by the searchers during carcass persistence trials; and
- Surveyor efficiency, expressed as the probability of trial carcasses found by surveyors during searcher efficiency trials.

### *6.2.1 Operation and Maintenance Monitoring*

Operation and maintenance monitoring will consist of searches of areas such as the substation, switching station, area around the O&M building, and the perimeter fence by operations personnel trained in finding and reporting avian mortalities.

Because of this low probability of collisions to these structures, they will be surveyed once each month (search interval of 30 days). Searches will be conducted by operations personnel trained in avian identification and survey techniques. Each survey will consist of the surveyor driving the perimeter fence at approximately five miles per hour on an all-terrain vehicle or other open vehicle or on foot. No surveys will be conducted where it is determined to be unsafe to operations personnel. The surveyors will record observations on the designated reporting form. Any carcasses found that are located in equipment or otherwise deemed to be a safety hazard will be removed ensure safe operation of the facility. All observations will be noted, photographed, and mapped. Personnel will coordination after surveys are complete with the biologist conducting mortality to discuss and document findings.

## 6.3 Polarized Light and Insectivorous Bird Study

As part of the monitoring for impacts to avian species, a polarized light and insectivorous bird study will be developed in compliance with BR-14.2. This study will be developed to include at a minimum: detailed specifications regarding data requirements, including protocols for collection and identification of insect eggs found on solar panels and a rationale for a data collection schedule.

This study including detailed protocols will be developed in coordination with appropriate wildlife agencies prior to the implementation of the study. The study will include all appropriate data requirements and protocols as described in BR-14.2.

**Sampling Intensity and Duration**

During the construction of the solar facility and for one year following the start of operation, a County-approved biologist shall perform quarterly polarized light and insectivorous study and submit an annual report on the study to the County describing the dates, durations, and results of monitoring and data collection. The first a polarized light and insectivorous bird construction monitoring study will take place after approximately twenty-five percent of the proposed PV panels have been installed. Additional details of the study in the annual reports will be determined by the County in consultation with CDFW and/or USFWS.

**Documentation**

Annual reports will be prepared that provide a detailed description of any project-related bird or wildlife deaths or injuries detected during the monitoring study or at any other time. The reports will analyze any Project-related bird fatalities or injuries detected, and provide recommendations (in consultation with the County) for future monitoring and any adaptive management actions needed.

**Thresholds**

Mitigation Measure BR-14.2 states that thresholds for avian mortality and potential impacts of polarized light from solar panels is causing reproductive failure of aquatic insect populations at high enough levels to adversely affect insectivorous special-status birds, will be determined by the County in consultation with CDFW and/or USFWS prior to approval of this Plan. However, there is not sufficient scientific data to establish thresholds at this time. Therefore, PVS will consult with CDFW, USFWS, and San Benito County following submittal of each quarterly report to determine whether implementation of the mitigation measures as provided in Section 5.0 of this Plan are appropriate.

# 7.0 REPORTING

## 7.1 Construction

During the construction of the solar facility, the County-approved biologist will submit a report describing dates, durations, and results of monitoring and data collection in the Monthly Compliance Report to the USFWS, CDFW and San Benito County. The Monthly Compliance Report which describes all natural resources information for the construction of the solar facility will also provide a detailed description of any Project-related avian mortalities or injuries detected. In addition, as noted above, during the construction of the solar facility, a County-approved biologist shall perform the polarized light and insectivorous study quarterly once twenty-five percent of the proposed PV panels have been installed and submit annual report(s) of the study to the County describing the dates, durations, and results of monitoring and data collection.

## 7.2 Post-Construction

The County-approved biologist will prepare and submit quarterly reports to the USFWS, CDFW, and San Benito County during the first two years of operations. Quarterly monitoring reports will provide the dates, duration, and results of monitoring, including a detailed description of any Project-related avian mortalities or injuries detected during the monitoring study or at any other time; identify any avian species that was killed or injured, the location within the solar facility of any avian species killed or injured; and describe adaptive management measures implemented to avoid or minimize deaths or injuries. Original data sheets, photographs, and relevant shape files (if any) will be attached to the reports.

Following the completion of the fourth quarter of each year of monitoring, the Environmental Manager or County-approved biologist will prepare an annual report that summarizes the year's data, analyzes any Project-related avian mortalities or injuries detected, and provides recommendations for future monitoring and any adaptive management actions needed. The report will be submitted to the USFWS, CDFW, and San Benito County no later than January 31$^{st}$ to report the previous year's findings.

After two years of data collection, the Environmental Manager or County-approved biologist will prepare an overall report that describes the study design and results of the avian mortality monitoring. This second year report will serve as the last quarterly report for the second year of

monitoring, as well as the overall report that covers both years of monitoring. This report will also be used to determine if monitoring can be terminated through consultation with USFWS, CDFW, and the County.

In addition to the mortality monitoring, for one year following the start of the solar farm operation, a County-approved biologist shall perform a polarized light and insectivorous study and submit the report on the study to the County describing the dates, durations, and results of monitoring and data collection.

# 8.0 ADAPTIVE MANAGEMENT (TIER 5)

The purpose of adaptive management in the context of the Project's management and monitoring of avian resources is to provide ways to further improve protection, management, enhancement, and other conservation actions of avian resources on the Project Footprint.

## 8.1 Regulatory Policy Changes

PVS will work together with the USFWS, CDFW, and San Benito County to ensure the Project complies with all applicable legal requirements or to apply necessary changes to this Plan.

## 8.2 Post-Construction Agency Consultation

To facilitate evaluations of impacts on regional avian populations, study results will be provided to USFWS, CDFW and/or San Benito County as noted above. PVS will be available for annual meetings with USFWS, CDFW and/or San Benito County to discuss Project-related issues under the jurisdiction of each agency.

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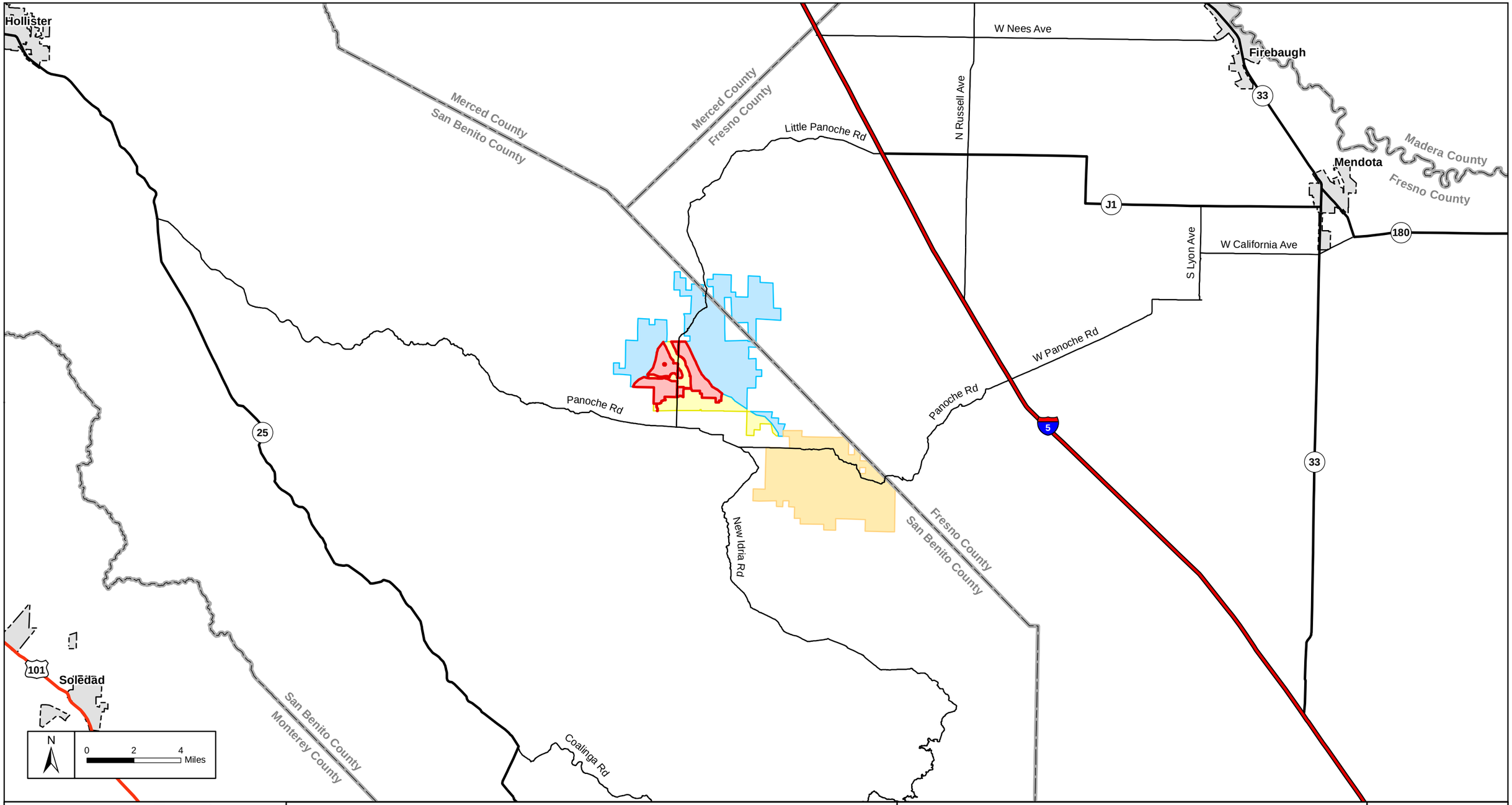
# APPENDICES

# Appendix A

Figures

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PARTNERS, LLC

**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands
- City

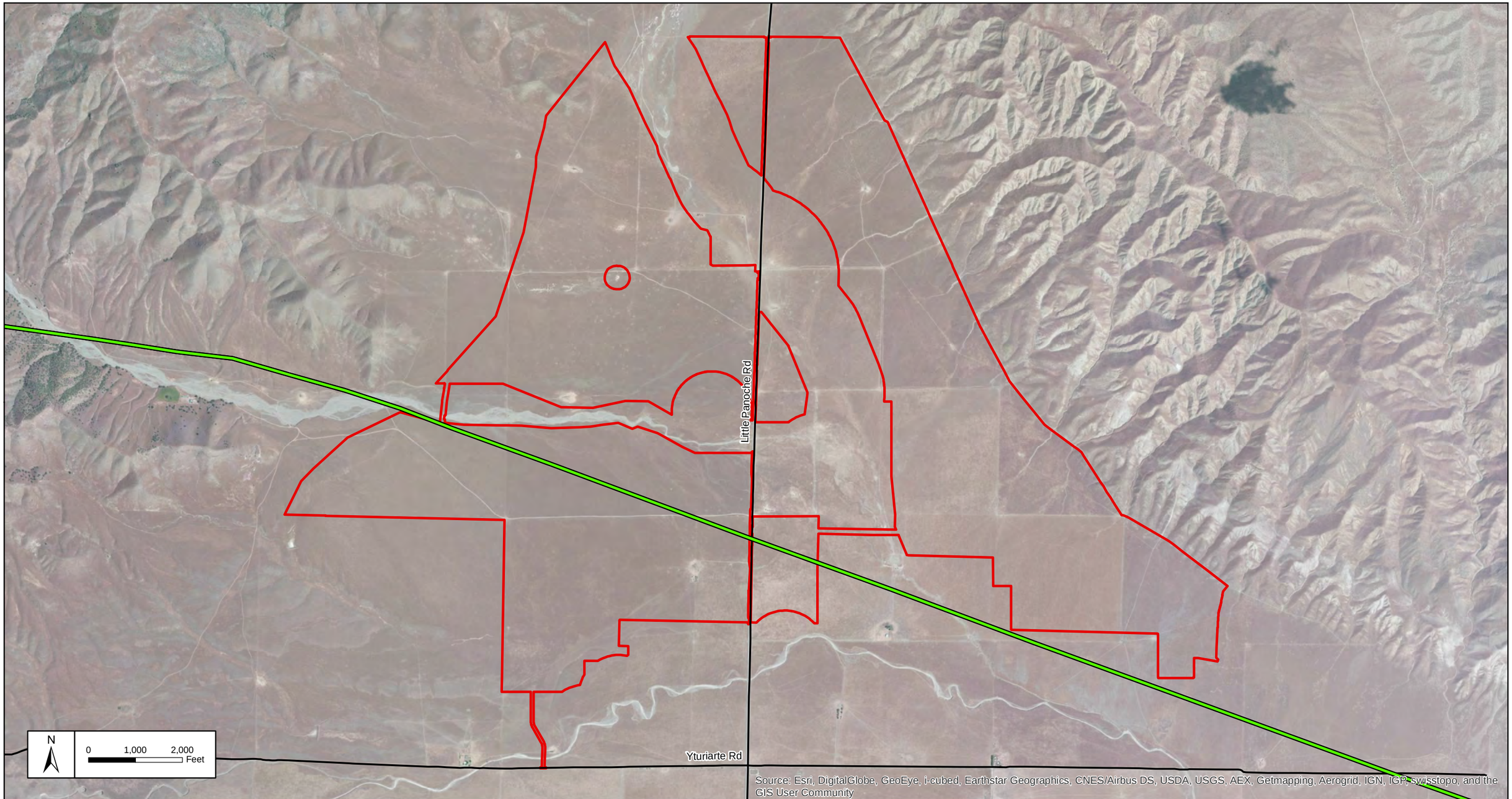
# Panoche Valley Solar Project

## Project Location

FIGURE

1

JH 2014-12-02

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**Legend**

Project Footprint

Existing Transmission Line

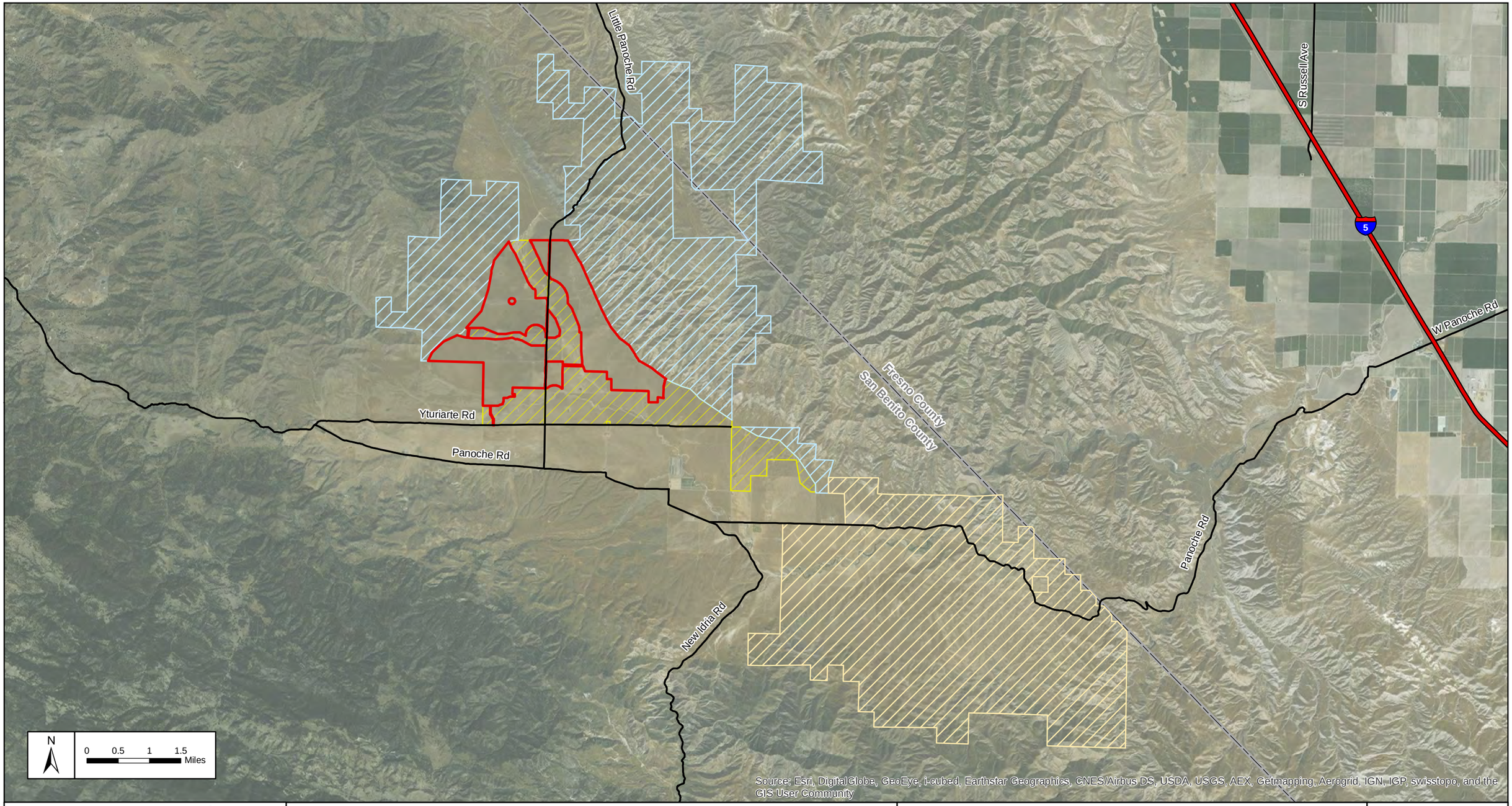
# Panoche Valley Solar Project

## Project Footprint

FIGURE

2

JH 2014-12-02

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- Silver Creek Ranch Conservation Lands

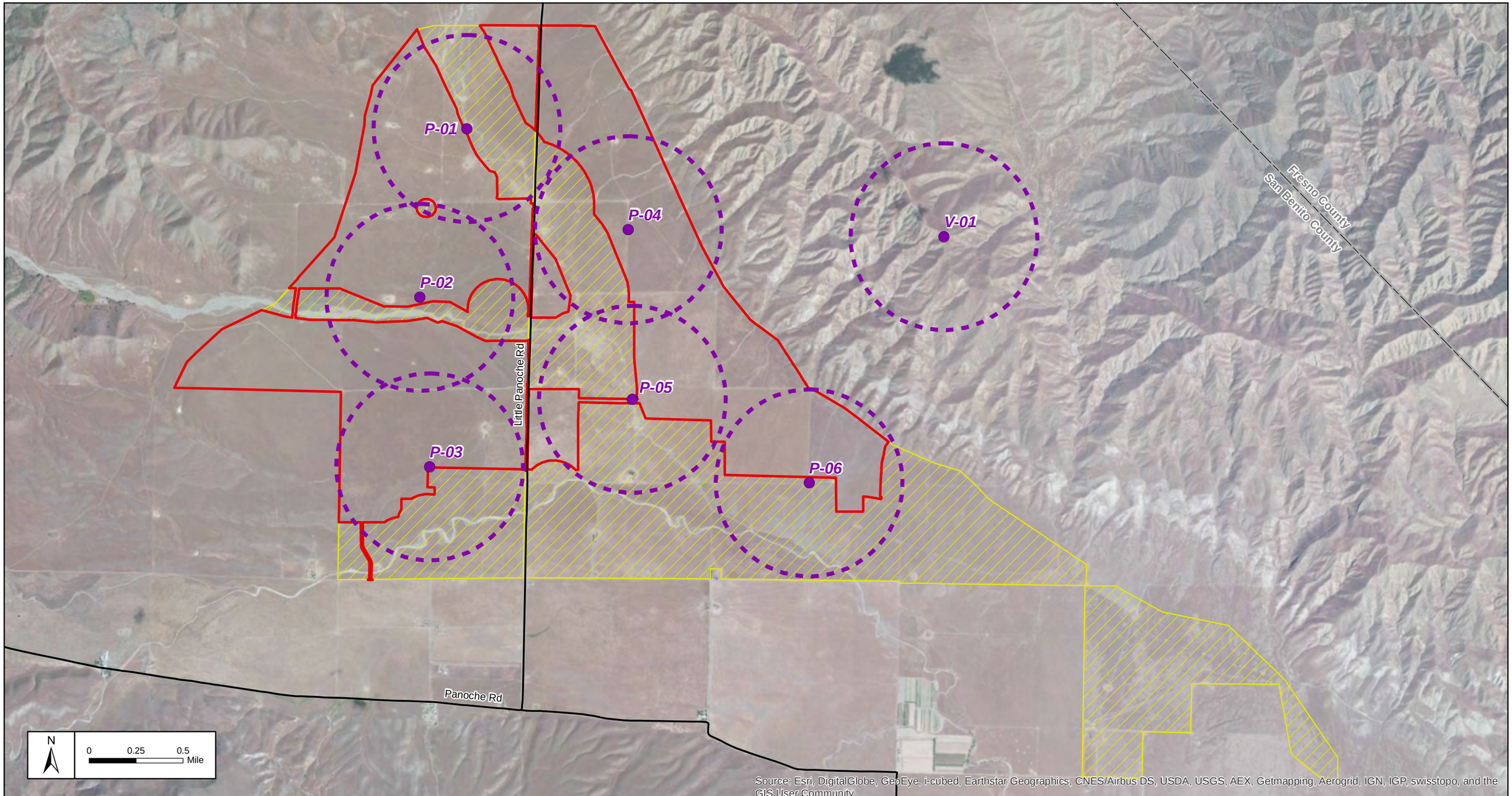
# Panoche Valley Solar Project

## Project Footprint and Conservation Lands

FIGURE

3

JH 2014-12-02

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**Legend**

- Point Count Station
- 800-meter Observation Area
- Project Footprint
- Valley Floor Conservation Lands

# Panoche Valley Solar Project

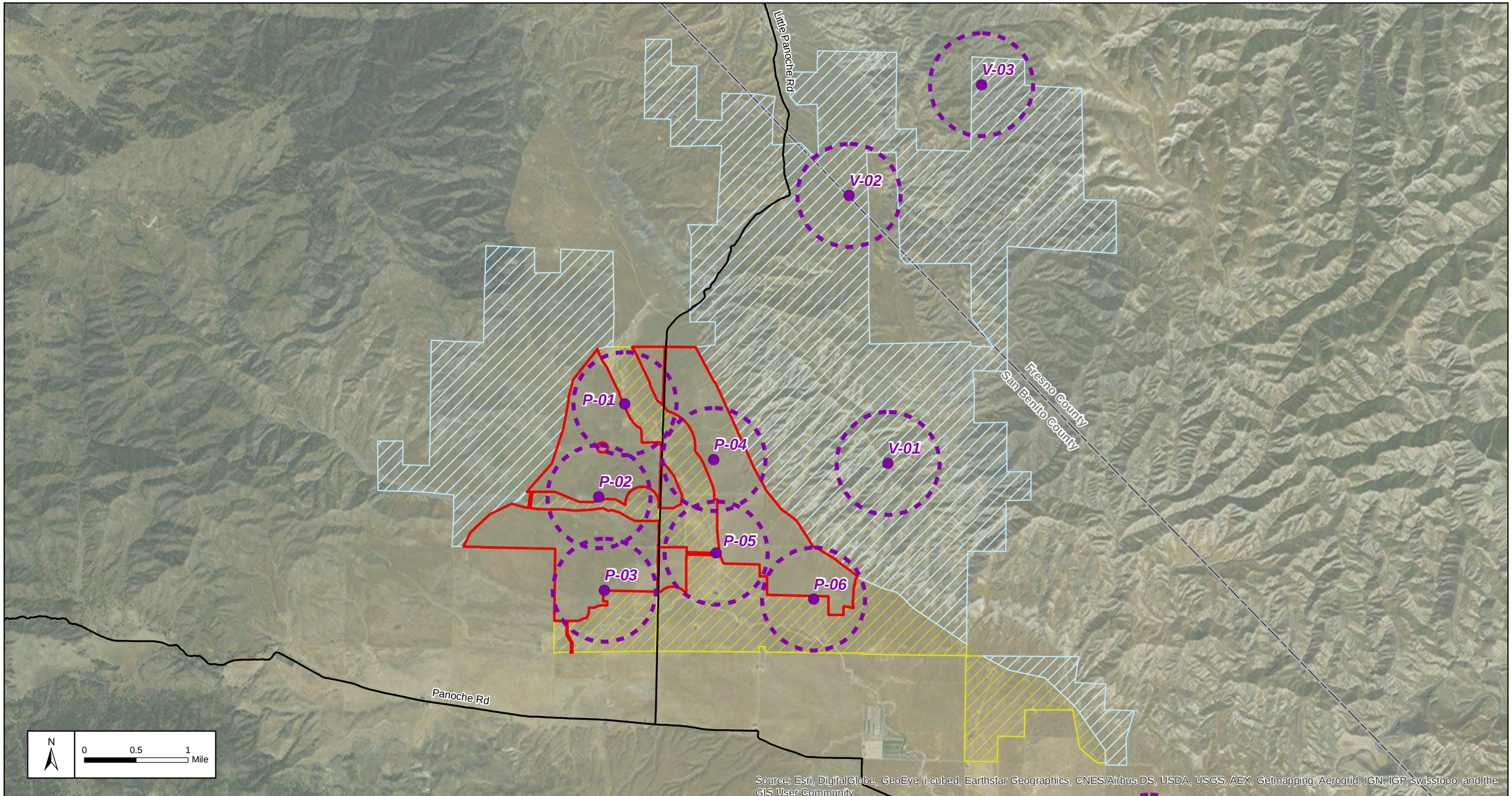
## Point Count Stations

Project Footprint and Valley Floor Conservation Lands

FIGURE

4

JH 2014-12-02

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**Legend**

- Point Count Station
- 800-meter Observation Area
- Project Footprint
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands

# Panoche Valley Solar Project

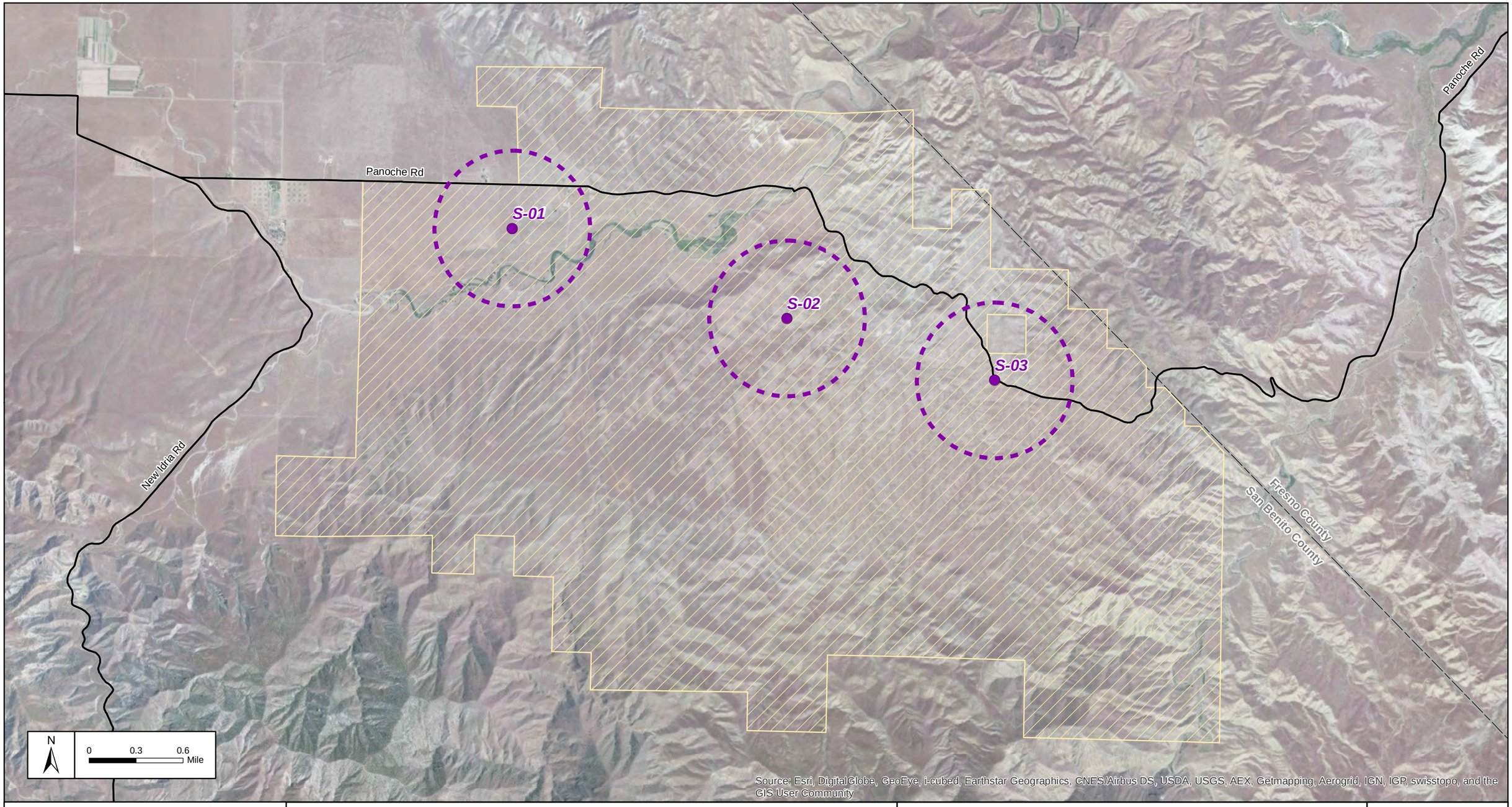
## Point Count Stations

Valadeao Ranch Conservation Lands

FIGURE

5

JH 2014-12-02

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**Legend**

- Point Count Station
- 800-meter Observation Area
- Silver Creek Ranch Conservation Lands

# Panoche Valley Solar Project

## Point Count Stations

Silver Creek Ranch Conservation Lands

FIGURE

6

JH 2014-12-02

# Appendix B

Avian Species Observed During 2003-2011 Audubon Christmas Bird Counts

**Avian Species Observed During the 2003 through 2011 Audubon Society Christmas Bird Count**

| | | |
|---|---|---|
| Mallard<br>*Anas platyrhynchos* | Long-eared Owl<br>*Asio otus* | Northern Mockingbird<br>*Mimus polyglottos* |
| American Green-winged Teal<br>*Anas crecca* | Short-eared Owl<br>*Asio flammeus* | Sage Thrasher<br>*Oreoscoptes montanus* |
| Canvasback<br>*Aythya valisineria* | White-throated Swift<br>*Aeronautes saxatalis* | California Thrasher<br>*Toxostoma redivivum* |
| Ring-necked Duck<br>*Aythya collaris* | Anna's Hummingbird<br>*Calypte anna* | European Starling<br>*Sturnus vulgaris* |
| Common Goldeneye<br>*Bucephala clangula* | Lewis's Woodpecker<br>*Melanerpes lewis* | American Pipit<br>*Anthus rubescens* |
| Hooded Merganser<br>*Lophodytes cucullatus* | Acorn Woodpecker<br>*Melanerpes formicivorus* | Cedar Waxwing<br>*Bombycilla cedrorum* |
| Common Merganser<br>*Mergus merganser* | Red-breasted Sapsucker<br>*Sphyrapicus ruber* | Phainopepla<br>*Phainopepla nitens* |
| Red-breasted Merganser<br>*Mergus serrator* | Nuttall's Woodpecker<br>*Picoides nuttallii* | Orange-crowned Warbler<br>*Oreothlypis celata* |
| Chukar<br>*Alectoris chukar* | Downy Woodpecker<br>*Picoides pubescens* | Yellow-rumped Warbler<br>*Dendroica coronata* |
| Ring-necked Pheasant<br>*Phasianus colchicus* | Hairy Woodpecker<br>*Picoides villosus* | Yellow-rumped (Audubon's) Warbler<br>*Dendroica coronata* |
| California Quail<br>*Callipepla californica* | Northern Flicker<br>*Colaptes auratus* | Yellow-rumped (Myrtle) Warbler<br>*Dendroica coronata* |
| Pied-billed Grebe<br>*Podilymbus podiceps* | Northern (Red-shafted) Flicker<br>*Colaptes auratus* | Townsend's Warbler<br>*Dendroica townsendi* |
| Great Blue Heron (Blue form)<br>*Ardea herodias* | Black Phoebe<br>*Sayornis nigricans* | Spotted Towhee<br>*Pipilo maculatus* |
| Great Egret<br>*Ardea alba* | Say's Phoebe<br>*Sayornis saya* | California Towhee<br>*Melozone crissalis* |
| Turkey Vulture<br>*Cathartes aura* | Cassin's Kingbird<br>*Tyrannus vociferans* | Rufous-crowned Sparrow<br>*Aimophila ruficeps* |
| Bald Eagle<br>*Haliaeetus leucocephalus* | Loggerhead Shrike<br>*Lanius ludovicianus* | Chipping Sparrow<br>*Spizella passerina* |
| Northern Harrier<br>*Circus cyaneus* | Hutton's Vireo<br>*Vireo huttoni* | Vesper Sparrow<br>*Pooecetes gramineus* |
| Sharp-shinned Hawk<br>*Accipiter striatus* | Western Scrub-Jay<br>*Aphelocoma californica* | Lark Sparrow<br>*Chondestes grammacus* |
| Cooper's Hawk<br>*Accipiter cooperii* | Clark's Nutcracker<br>*Nucifraga columbiana* | Sage Sparrow<br>*Amphispiza belli* |

| | | |
|---|---|---|
| Red-shouldered Hawk<br>*Buteo lineatus* | Yellow-billed Magpie<br>*Pica nuttalli* | Lark Bunting<br>*Calamospiza melanocorys* |
| Red-tailed Hawk<br>*Buteo jamaicensis* | American Crow<br>*Corvus brachyrhynchos* | Savannah Sparrow<br>*Passerculus sandwichensis* |
| Ferruginous Hawk<br>*Buteo regalis* | Common Raven<br>*Corvus corax* | Fox Sparrow<br>*Passerella iliaca* |
| Golden Eagle<br>*Aquila chrysaetos* | Horned Lark<br>*Eremophila alpestris* | Song Sparrow<br>*Melospiza melodia* |
| American Kestrel<br>*Falco sparverius* | Tree Swallow<br>*Tachycineta bicolor* | Lincoln's Sparrow<br>*Melospiza lincolnii* |
| Merlin<br>*Falco columbarius* | Violet-green Swallow<br>*Tachycineta thalassina* | Harris's Sparrow<br>*Zonotrichia querula* |
| Prairie Falcon<br>*Falco mexicanus* | Chestnut-backed Chickadee<br>*Poecile rufescens* | White-crowned Sparrow<br>*Zonotrichia leucophrys* |
| Virginia Rail<br>*Rallus limicola* | Oak Titmouse<br>*Baeolophus inornatus* | Golden-crowned Sparrow<br>*Zonotrichia atricapilla* |
| Sora<br>*Porzana carolina* | Bushtit<br>*Psaltriparus minimus* | Dark-eyed (Oregon) Junco<br>*Junco hyemalis* |
| American Coot<br>*Fulica americana* | Red-breasted Nuthatch<br>*Sitta canadensis* | Red-winged Blackbird<br>*Agelaius phoeniceus* |
| Killdeer<br>*Charadrius vociferus* | White-breasted Nuthatch<br>*Sitta carolinensis* | Tricolored Blackbird<br>*Agelaius tricolor* |
| Mountain Plover<br>*Charadrius montanus* | Brown Creeper<br>*Certhia americana* | Western Meadowlark<br>*Sturnella neglecta* |
| Greater Yellowlegs<br>*Tringa melanoleuca* | Rock Wren<br>*Salpinctes obsoletus* | Brewer's Blackbird<br>*Euphagus cyanocephalus* |
| Long-billed Curlew<br>*Numenius americanus* | Canyon Wren<br>*Catherpes mexicanus* | Brown-headed Cowbird<br>*Molothrus ater* |
| Wilson's Snipe<br>*Gallinago delicata* | Bewick's Wren<br>*Thryomanes bewickii* | small blackbird sp.<br>*Icterinae* |
| Rock Pigeon<br>*Columba livia* | House Wren<br>*Troglodytes aedon* | Purple Finch<br>*Carpodacus purpureus* |
| Eurasian Collared-Dove<br>*Streptopelia decaocto* | Marsh Wren<br>*Cistothorus palustris* | House Finch<br>*Carpodacus mexicanus* |
| Mourning Dove<br>*Zenaida macroura* | Ruby-crowned Kinglet<br>*Regulus calendula* | Pine Siskin<br>*Spinus pinus* |
| Greater Roadrunner<br>*Geococcyx californianus* | Western Bluebird<br>*Sialia mexicana* | Lesser Goldfinch<br>*Spinus psaltria* |
| Barn Owl<br>*Tyto alba* | Mountain Bluebird<br>*Sialia currucoides* | Lawrence's Goldfinch<br>*Spinus lawrencei* |
| Western Screech-Owl<br>*Megascops kennicottii* | Hermit Thrush<br>*Catharus guttatus* | American Goldfinch<br>*Spinus tristis* |

| | | |
|---|---|---|
| Great Horned Owl<br>*Bubo virginianus* | American Robin<br>*Turdus migratorius* | House Sparrow<br>*Passer domesticus* |
| Northern Pygmy-Owl<br>*Glaucidium gnoma* | Varied Thrush<br>*Ixoreus naevius* | |
| Burrowing Owl<br>*Athene cunicularia* | Wrentit<br>*Chamaea fasciata* | |

# Appendix C

Panoche Valley Solar Point Count Survey Study Report

# Panoche Valley Solar Point Count

# Survey Study Report

Panoche Valley Solar Project
San Benito County, California
April 2014

*Image Courtesy of Michael Bumgardner*

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## Abbreviations and Acronyms

| | |
|---|---|
| °F | Degrees Fahrenheit |
| AMSL | Above Mean Sea Level |
| BBCS | Bird and Bat Conservation Strategy |
| CNPS | California Native Plant Species |
| Duke Energy | Duke Energy Renewables |
| ECP | Eagle Conservation Plan |
| FEIR | Final Environmental Impact Report |
| GOEA | Golden eagle |
| GPS | Global positioning system |
| km | kilometer |
| MW | Megawatt |
| Project Footprint | The portion of the Proposed Project that includes the solar arrays and associated roads and equipment, totaling 2,492 acres. |
| Proposed Project | Panoche Valley Solar Project |
| PVS | Panoche Valley Solar, LLC |
| SCRCL | Silver Creek Ranch Conservation Lands |
| UDA | Utilization Distribution Assessment |
| USFWS | United States Fish and Wildlife Service |
| UTM | Universal Transverse Mercator |
| VFCL | Valley Floor Conservation Lands |
| VRCL | Valadeao Ranch Conservation Lands |

# 1.0 Project Introduction and Background

Panoche Valley Solar, LLC (PVS) is proposing to construct the proposed Panoche Valley Solar Project (Proposed Project). PVS is proposing to construct the Proposed Project to operate an up to 399-Megawatt (MW) solar photovoltaic energy generation facility in San Benito County, California (Figure 1). The Proposed Project would be located approximately three-quarters of a mile north of the intersection of Panoche Road and Little Panoche Road, in eastern San Benito County (Figure 2). The Proposed Project site is comprised of approximately 2,492 acres in the Panoche Valley and would also include approximately 24,185 acres of high quality Conservation Lands that are contiguous with the Proposed Project area (Figure 3).

On June 13, 2013, PVS consulted with the United States Fish and Wildlife Service (USFWS)-Ventura office concerning the requirement to prepare an Eagle Conservation Plan (ECP) and a Bird and Bat Conservation Strategy (BBCS) for the Proposed Project. It was determined during this discussion, the data presented in the 2010 Final Environmental Impact Report (FEIR) was dated, insufficient in coverage, and was conducted too late in the season. USFWS recommended a Phase II site-specific golden eagle (GOEA; *Aquila chrysaetos*) study be conducted (USFWS 2013).

This report documents the survey results of GOEA occurrence, frequency, and behavior conducted during the migratory and wintering phase (September through January) within the Proposed Project area and associated conservation lands in the Panoche Valley (Figure 3). The conservation lands include three large parcels of land to offset potential impacts as part of a conservation package consisting of the permanent preservation and management of those parcels. These parcels are called the Valley Floor Conservation Lands, the Valadeao Ranch Conservation Lands, and the Silver Creek Ranch Conservation Lands (Figure 3).

Additionally, aerial surveys conducted in January and March were completed to determine the number and locations of occupied nests and the approximate centers of occupied nesting territories of GOEA within a 10-mile radius centered on the Project Footprint. The results of these studies will be summarized in a separate report. Results of the combined studies will be used to prepare the ECP and the BBCS.

## 2.0 Study Purpose and Need

The Point Count and Utilization Distribution Assessment (UDA) studies were completed to provide baseline data on GOEA occurrence, frequency, and behavior to present results of spatial and temporal site use and potential risk based on time spent within the Proposed Project area.

## 3.0 Study Area

The Study Area includes the Proposed Project which is generally located approximately three-quarters of a mile north of the intersection of Panoche Road and Little Panoche Road, in eastern San Benito County. This location is approximately two miles southwest of the Fresno County Line and the Panoche Hills, and approximately 15 miles west of Interstate 5 and the San Joaquin Valley. The Project Footprint is located within Township 15S, Range 10E, Sections 3-4, 8-11, and 13-16 of the United States Geologic Survey's Cerro Colorado, Llanada, Mercy Hot Springs, and Panoche 7.5-minute topographic quadrangle maps. In addition to the Project Footprint, the Study Area also includes the Conservation Lands associated with the Proposed Project, which are located in both San Benito and Fresno counties within Township 15S, Range 10E, Sections 3-4, 8-10, 13-16, and 25; Township 15S, Range 11E, Section 19; Township 14S, Range 10E, Sections 21-27, and 32-36; Township 14S, Range 11E, Sections 19, and 29-32; Township 15S, Range 10E, Sections 1-8, and 10-14; Section 15S, Township 11E, Sections 6-7, 19-20, and 26-36; and Township 16S, Range 11E, Sections 1-6, and 8-12 (Figure 3).

The Study Area is comprised almost entirely of annual, non-native grasslands used mainly to graze cattle and sheep. The Study Area experiences a Mediterranean climate with dry hot summers and cool wet winters. However, this region does not experience heavy rainfall. Annual precipitation in the general vicinity of the site ranges from eight to ten inches per year. Approximately 85 percent of precipitation falls between October and March. Temperatures average approximately 80 degrees Fahrenheit (˚F) in the summer and 40˚F in the winter, mid-summer temperatures are often over 100˚F, and winter lows can be close to freezing. Nearly all precipitation infiltrates into the site's soils and flows in creeks and drainages when soil capacity has been reached.

The Study Area for this GOEA survey includes the habitats within the following areas:

- Project Footprint
- Conservation Lands associated with the project including the Valley Floor (VFCL), Valadeao Ranch (VRCL), and Silver Creek Ranch (SCRCL)areas

***Project Footprint***

The Project Footprint consists of the area within the fence line of the proposed solar facility and is composed of approximately 2,492 acres of rangeland. Historically, the Project Footprint was used for crop production; however, in the past approximately 40 years, the site has been used for cattle grazing. The site is surrounded by rangeland and bordered by hills of the Gabilan Range to the west and the Panoche Hills to the east. The topography of the site dips gently down to the east-southeast. The site elevation ranges from approximately 1,200 feet above mean sea level (amsl) near the southeast end of the site to approximately 1,400 feet amsl near the west end.

Prominent grass species within the Project Footprint include ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), red brome (*Bromus madritensis*), foxtail barley (*Hordeum murinum* ssp. *leporinum*), and rat-tail fescue (*Vulpia myuros*). Dominant forbs included broad-leaved filaree (*Erodium botrys*), red-stemmed filaree (*Erodium cicutarium*), shining peppergrass (*Lepidium nitidum var. nitidum*), and vinegarweed (*Tricostema lanceolatum*). Fiddleneck (*Amsinckia menziesii*), devils lettuce (*Amsinckia tessellata*), shepherds purse (*Capsella bursa-pastoris*), turkey mullein (*Eremocarpus setigerus*), and bur clover (*Medicago polymorpha*) were also common, especially along ranch roads. Areas which have not been previously disturbed by grazing or historic cultivation also include a variety of native wildflowers such as blow wives (*Achyrachaena mollis*), blue dicks (*Dichelostemma capitaum*), California gold fields (*Lasthenia californica*), yellow daisy tidy-tips (*Layia platyglossa*), and California creamcups (*Platystemon californicus*).

***Valley Floor, Silver Creek Ranch and Valadeao Ranch Conservation Lands***

Project Conservation Lands include 3 areas totaling 24,185 acres that would be preserved in perpetuity for the benefit of the GOEA, as well as many other species of wildlife. An additional 2,523 acres interspersed throughout and adjacent to the Project Footprint would be left undisturbed and designated as the VFCL. In addition to the designation of the VFCL, the Proposed Action will include two large ranches for conservation purposes. These ranches, the VRCL (10,772 acres) and the SCRCL (10,890 acres), are contiguous with the Project site and each other (Figure 3).

Valley Floor Conservation Lands

The VFCL (approximately 2,523 acres) are contiguous with the Project Footprint, and primarily consist of the non-native annual grassland habitat found within the Project Footprint with some seasonal ponds and vernal and ephemeral pools, as well as the seasonally dry Panoche and Los Aquilas Creeks. The VFCL also includes the entire 100-year floodplain within the Proposed Project boundary on the valley floor.

The dominant vegetation in the VFCL includes ripgut brome, soft chess, red brome, foxtail barley, rat-tail fescue, broad-leaved filaree, red-stemmed filaree, shining peppergrass, and vinegarweed. Fiddleneck, devils lettuce, shepherds purse, turkey mullein, and bur clover were also common, especially in disturbed areas. Areas which have not been previously disturbed include a variety of native wildflowers such as blow wives, blue dicks, California gold fields, yellow daisy tidy-tips, and California creamcups.

Valadeao Ranch Conservation Lands

The VRCL (approximately 10,772 acres) are contiguous with the Project Footprint directly to the west, east, and northeast of the site (Figure 3). These lands are also contiguous with the VFCL and Silver Creek Ranch Conservation Lands (SCRCL). The VRCL include several seasonal drainages. Soils on this site are complex and range from sandy to sandy loam to clay loam to badlands. The VRCL contain approximately 2,945 acres with slopes between 0 and 11 percent. Elevations on the VRCL range from approximately

1,400 feet to 2,100 feet above mean sea level (amsl). The property which is currently grazed is dominated by introduced annual grasslands (approximately 6,700 acres), which have a very similar species makeup to the Project Footprint and VFCL. This property also mostly consists of ephedra shrubland (approximately 2,700 acres), barrens, and saltbush shrubland.

Ephedra shrublands within the VRCL range from nearly pure California ephedra (*E. californica*) stands to highly diverse associations with typical desert shrubs. Occupied habitats occur from lower slopes and valley bottoms to rocky outcrops and alluvial slopes. This 3 to 15 foot tall shrub rarely achieves greater than 10 percent cover (absolute), but the cover provided varies little with soil type, aspect, or grazing pressure. It is generally the only shrub present in the often very broad transition from Ephedra shrublands to Introduced Annual Grasslands.

Plant associations that are noted to occur within the Ephedra shrublands include *Artemisia californica - Senecio flaccidus* scrub, *Eastwoodia elegans - Ephedra californica* scrub, *Ericameria linearifolia - Ephedra californica* scrub, *Ericameria linearifolia - Ericameria nauseosa* scrub, *Ericameria linearifolia - Gutierrezia californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Artemisia californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Ephedra californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Gutierrezia californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Yucca whipplei* scrub, and *Gutierrezia californica - Ephedra californica* scrub. Ephedra Shrublands occur in the VRCL portion of Las Aquilas Creek in small patches along ridgelines, steep slopes with a northern aspect, lower slopes, ephemeral drainages, and steep, rocky, and thin-soiled south-facing slopes.

Barrens are ridgelines and south or (rarely) west-facing very steep slopes that exhibit a precipitous drop-off in vegetative cover. In terms of vegetation, the assembled species diversity is very low, nearly all species are relatively short-lived annuals, shrubs and trees are absent, and introduced annual grasses become minor components of the species mix. Barrens most commonly interrupt Introduced Annual Grasslands, where the transition was often observed to occur over the space of several feet. Two plant associations were identified within the barrens: *Erodium cicutarium - Plantago erecta* and *Holocarpha obconica - Vulpia macrostachys*.

The saltbush shrubland habitat consists of nearly pure to mixed stands of saltbush (*Atriplex polycarpa*) associations. Occupied habitats range from white clay soils on hills immediately west of Little Panoche Road to rocky outcrops and alluvial slopes experiencing high ground creep rates near ridgelines east of the road. In all observed occurrences on hills, the aspect of greatest *Atriplex polycarpa* cover is southern. This two to three foot tall shrub also attains dominance within several of the ephemerally flooded washes, where sandier soils are more common. It is always the most common shrub canopy contributor near seasonal springs and seeps that exhibit saline character.

Two plant associations exist on the VRCL: *Atriplex polycarpa - Eriogonum fasciculatum* var. *polifolium* and *Atriplex polycarpa - Isocoma acradenia* var. *bracteosa*. *Atriplex polycarpa - Eriogonum fasciculatum* var. *polifolium* occurs on slopes, appearing as mainly open ground with scattered shrubs. Shrub canopy

closure averages 5 to 10 percent, with scattered clumps of 20 percent closure. Canopy density is greatest on south-facing slopes, where *Eriogonum fasciculatum* is often more prevalent, and on slopes that are steep or slippery enough to exclude grazing. The herbaceous layer is largely absent, resembling barrens that are often present on adjacent slopes of similar aspect. Shrub canopies are confined to wash edges due to trampling by cattle, and average cover rarely exceeds 10 percent.

Silver Creek Ranch Conservation Lands

The SCRCL (approximately 10,890 acres), which is currently being with grazed with livestock, is located southeast of the Project Footprint (Figure 3). The northwestern-most corner of the proposed SCRCL is contiguous with a portion of the VRCL. Elevations on the SCRCL range from 900 to 2,200 feet amsl. Soils on the SCRCL are less complex than those found on the VRCL and are generally characterized as well drained and moderately permeable. SCRCL contains approximately 5,765 acres with slopes between 0 and 11 percent.

SCRCL are dominated by non-native species (approximately 8,400 acres), with the same species found on the Project Footprint and on the other conservation lands, distributed sparsely over the landscape. The other major habitats on this conservation lands includes ephedra shrubland (approximately 2,260 acres) with similar species noted on the VRCL and riparian/wetland habitat.

The riparian habitats occur along the Panoche and Silver Creeks. The Silver Creek riparian vegetation, where it briefly intersects the SCRCL, indicates a seasonally wet, somewhat saline habitat subject to annual or occasional energetic flows. The riparian corridor has become dominated by invasive tamarisk (*Tamarix* sp.). Tamarisk has developed semi-open to impassable stands in a 30 to 100 foot wide corridor. The population extends well off-site, both upstream and downstream. In this area, saltgrass (*Distichlis spicata*) appears to be the native species most tolerant of the soil salination and groundwater drawdown effects of heavy tamarisk infestation, and often forms meadow-like swards between the tamarisk thickets.

Panoche Creek is a gaining reach as it crosses through the SCRCL. The streambed upstream off the site for at least three miles was observed to be completely dry and largely devoid of plants. Within the surveyed area, this arroyo-like habitat quickly transitions to zonal wetlands characterized by gaseous springs, highly reduced soils, and marsh or meadow vegetation. The Panoche Creek riparian zone, which ranges from 100 feet to 500 feet in width, may provide the only reliable, naturally occurring surface water for much of the year. The dominant plants are consistently arrayed, with vegetation classified as emergent *Typha* marsh (*Typha* Herbaceous Alliance) centrally, *Schoenoplectus americanus* mid-marsh (*Schoenoplectus americanus* Herbaceous Alliance) at the outer saturated edge, and *Distichlis spicata* meadow (*Distichlis spicata* Herbaceous Alliance) extending across the moistened to seasonally drying soils at the riparian edge and *Frankenia salina* and *Juncus mexicanus*. Trees are largely absent, as are species adapted to a floating or submerged habitat.

# 4.0 Methodology

Per the USFWS recommendations, the GOEA studies followed the Wind Energy Guidelines in Tier 3, Stage 2 of which includes site-specific surveys and assessments in anticipation of ECP preparation (USFWS 2013). These site specific surveys included:

- Point Count Surveys (i.e., fixed-radius circular plot surveys) within the project footprint and Conservation Lands (conducted summer, fall, and winter of 2013/2014);
- Utilization Distribution Assessment (UDA) within the project footprint and VFCL (conducted summer, fall, and winter of 2013/2014); and
- Aerial survey of Project-area nesting population, location, and number of occupied eagle nests within a 10 mile radius of the Proposed Project center (results provided in separate report).

## 4.1 Point Count Surveys

The surveys for GOEA resources were conducted through the use of point counts that were conducted at established point count stations (Cooperrider et al. 1986; Hamel et al. 1996; Ralph et al. 1993; Ralph et al. 1995). Six point count stations were located within Project Footprint and VFCL (Figure 4) to ensure a minimum spatial coverage of at least 30 percent of the Project Footprint (USFWS 2013). Six point count stations were also located within the VRCL and the SCRCL (Figures 5 and 6). Three point count stations were located in the VRCL (Figure 5) and three point count stations in the SCRCL (Figure 6). The coverage for the VRCL and SCRCL is less than 30 percent, but provides adequate observations of GOEA use in these areas.

The survey locations were established by creating point count stations within an 800 meter (2,625 feet) radius observation area. The center point of each plot was geo-referenced using a global positioning system (GPS). The boundary of each point count plot was identified via distinct natural or any anthropogenic features at several points for distance reference.

The point count surveys consisted of observers recording GOEA detections from the point count stations for two hours at each point count station (Figures 4, 5, and 6) and recorded on point count field forms (Appendix A) (Pagel et al. 2010; USFWS 2013). The GOEA surveys were conducted between daylight hours (sunrise to sunset) on a bi-weekly basis from September 3, 2013 to January 24, 2014. During the fall migration, when possible, surveys were completed during midday to increase sampling efficiency by temporally stratifying surveys to cover the midday period during migration (CA Energy Commission 2007; USFWS 2013).

During the point count surveys, the observers, which were trained and their skills tested for GOEA observations (e.g. species, age class, activity), stayed with their vehicle to remain inconspicuous, which decreased the possibility that an individual eagle would avoid observers, which could reduce the

likelihood of detection. The observers performed systematic scans of the point count plot using binoculars alternated with unaided eye scans to detect GOEA.

The data collected during each point count station survey beyond the typical conditions information (e.g. date, time, temperature, wind speed and direction, and etc.) included the number of GOEA seen, age class, GOEA activity/behavior, flight paths, estimated flight height and location in plot, and general description of observations.

The age class of the GOEA were broken down into juvenile eagles (first year), immature or subadult eagles (second to fourth year), adult eagles (fifth year or greater), or unknown (eagles where age class could not be determined due to distance, etc.). The activity/behavior data collected noted the prevalent behavior during each one-minute interval as soaring flight (circling broadly with wings outstretched); unidirectional flapping gliding; kiting-hovering; stooping or diving at prey; stooping or diving in an agonistic context with other eagles or other bird species; undulating/territorial flight; perched; or other. The flight path data included GOEA inside, as well as outside the plot. The flights were recorded on the point count data forms for each point count station (Appendix B).

In addition to the GOEA point count surveys and the UDA data, any miscellaneous observations information gathered during the 2013 PVS giant kangaroo rat and blunt- nosed leopard lizard surveys, conducted in March through September, 2013, was also used to supplement the point count/UDA data (Appendix C).

## 4.2 Utilization Distribution Assessment (UDA)

In addition to the point count surveys, a UDA for GOEA was completed during the survey season. The UDA was completed to document the GOEA spatial distribution of use on the Proposed Project Footprint. The observation data was noted on field maps (Appendix B) and then convert the data into GIS formats for analyses. The field maps were created by placing a grid of square cells, each 0.5 x 0.5 kilometer (km), which was framed by a Universal Transverse Mercator (UTM) system across a map of the PVS Project Footprint to record eagle observations in each 0.25 $km^2$ cell (Figure 7).

The Project Footprint/VFCL was divided into non-overlapping observation sectors centered on a designated Observation Point, each with a vantage point. The point count stations were utilized for the UDA Observation Points (Figure 7). These locations afforded an unobstructed viewing of the grid cells to more than one km in all directions. The UDA observation periods were conducted for two hours and were added to each point count survey period for the Project Footprint/VFCL. The UDA was not conducted on the VRCL and the SCRCL since they are outside of the Project Footprint.

During the UDA, when necessary, the observers worked together with the use of hand-held radios from separate vantage points to pinpoint the location(s) of GOEA through triangulation. This communication between observers also eliminated the duplication of GOEA sightings. The data recorded by the

observers during the UDA included GOEA activity/behavior and flight path and location. The prevalent activity/behavior of each GOEA was recorded in one-minute interval as soaring flight (circling broadly with wings outstretched); unidirectional flapping gliding; kiting-hovering; stooping or diving at prey; stooping or diving in an agonistic context with other eagles or other bird species; undulating/territorial flight; perched; or other. The flight paths and location data was recorded on the gridded field maps (Appendix B), using topographic features or distance indicators as location references.

The data was analyzed by simply counting the number of flights intersecting each cell. If the data set had been larger, a specific GOEAs distribution of use would have been estimated by using standard kernel analyses (USFWS 2013).

# 5.0 Discussion, Analysis and Results

This discussion, analysis, and results section presents a compilation of the data that was gathered during the surveys point count and UDA surveys for GOEA. As stated previously, the surveys for GOEA resources were conducted through use of point counts and UDA surveys at 12 established stations within the PVS Project Footprint; Conservation lands associated with the Project include the Valley Floor, Valadeao Ranch, and Silver Creek Ranch areas.

Survey events occurred every other week between the weeks of September 3, 2013 until January 24, 2014, for a total of 11 survey events. Each survey event was made up of 12 point counts surveys that lasted 2 hours each and 6 UDA surveys which were also 2 hours each. The total hours surveying for GOEA during each survey event was 36 hours. This gives an overall total of 396 hours of survey time within the Project area. The overall sightings of GOEA during the surveys, excluding the aerial surveys, was 94. Weather was generally conducive to GOEA surveys; temperatures ranged between 20-97˚F, and winds ranged between 0 and 19.5 miles per hour (mph), though were typically less than 8 mph, nothing but a trace of rain throughout the surveys, and visibility that ranged from 80% to 100% (Appendix D).

## 5.1 Point Count Surveys

As stated previously, six point count stations (P-01 to P-06) were located within Project Footprint and VFCL (Figure 4), and six point count stations were located within Valadeao Ranch and Silver Creek Ranch Conservation Lands (Figures 5 and 6). Three point count stations were located in the VRCL (Figure 5) and three point count stations in the SCRCL (Figure 6).

The results of the point count surveys included a total of 61 observations of GOEA. This total includes 23 individual observations of GOEA seen within the point count plot boundaries and 38 observations outside the plot boundaries (Tables 1 and 2).

**Table 1. Total GOEA by Survey Event**

| Survey Event | Total GOEA Observed (inside and out of boundaries) | Observation Location (Inside Point Count/Outside) | Juvenile GOEA (Inside Point Count/Outside) | Subadult GOEA (Inside Point Count/Outside) | Adult (Inside Point Count/Outside) | Unknown Age (Inside Point Count/Outside) |
|---|---|---|---|---|---|---|
| 1st (September 3 -5, 2013 ) | 10 | 2/8 | 0/0 | 0/0 | 2/0 | 0/8 |
| 2nd (September 17-19, 2013) | 21[1] | 9/12 | 2/0 | 1/0 | 3/2 | 2/10 |
| 3rd October 2-4, 2013 | 1 | 1/0 | 0/0 | 0/0 | 1/0 | 0/0 |
| 4th October 15-17, 2013 | 5 | 3/2 | 0/0 | 0/0 | 3/2 | 0/0 |
| 5th October 28-30, 2013 | 4 | 1/3 | 0/1 | 0/0 | 1/1 | 0/1 |
| 6th November 11-13, 2013 | 7 | 0/7 | 0/0 | 0/0 | 0/1 | 0/6 |
| 7th November 25-27, 2013 | 3 | 0/3 | 0/0 | 0/0 | 0/0 | 0/3 |
| 8th December 9-11, 2013 | 2 | 1/1 | 0/0 | 0/0 | 0/0 | 1/1 |
| 9th December 21-23, 2013 | 2 | 0/2 | 0/0 | 0/0 | 0/2 | 0/0 |
| 10th January 7-9, 2014 | 5 | 5/0 | 2/0 | 1/0 | 1/0 | 1/0 |
| 11th January 22-24, 2014 | 1 | 1/0 | 0/0 | 0/0 | 1/0 | 0/0 |

[1] - Data includes several GOEA (approx. 7 GOEA) that were feeding on a carcass of a dead cow inside the project boundary and GOEA stayed at carcass during point count and UDA.

**Table 2. GOEA by Point Count Station**

| | Project Footprint/Valley Floor CL | | | | | | Valadeao Ranch CL | | | Silver Creek Ranch CL | | | Age Class Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Age Class** | **P-01** | **P-02** | **P-03** | **P-04** | **P-05** | **P-06** | **V-01** | **V-02** | **V-03** | **S-01** | **S-02** | **S-03** | |
| Juvenile | 2/1[1] | 0/0 | 0/0 | 1/0 | 0/0 | 0/0 | 0/0 | 2/0 | 0/0 | 0/0 | 0/0 | 0/0 | 6 |
| Sub-Adult | 1/0 | 0/0 | 1/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 2 |
| Adult | 5/2 | 2/2 | 0/2 | 0/0 | 0/1 | 0/0 | 2/0 | 0/0 | 0/0 | 0/0 | 1/0 | 2/1 | 20 |
| Unknown | 2/10 | 0/3 | 1/0 | 0/0 | 0/7 | 0/0 | 0/0 | 0/5 | 0/2 | 0/0 | 1/1 | 0/1 | 33 |
| Total – Inside/Out | 10/13[2] | 2/5 | 2/2 | 1/0 | 0/8 | 0/0 | 2/0 | 2/5 | 0/2 | 0/0 | 2/1 | 2/2 | |
| **Total** | 23 | 7 | 4 | 1 | 8 | 0 | 2 | 7 | 2 | 0 | 3 | 4 | 61 |

[1] - Numbers of GOEA observed inside point count plot/outside point count plot
[2] - Data includes several GOEA that were feeding on a carcass of what appeared to be a dead animal inside the P-01 boundaries.

Project Footprint/Valley Floor Conservation Lands

The GOEA observations in the Project Footprint/VFCL totaled 43 GOEA, with 15 observations within the point count plot boundaries and 28 observations outside the plot boundaries for the entire survey season. These observations were also categorized by their age class (Table 2). The GOEA observation on the Project Footprint/Valley Floor Conservation Lands were made up of four juveniles, three inside the point count plot boundaries and one observation outside the plot boundaries. There were two subadult GOEA observed within the point count plot boundaries and none outside. The surveys also found 14 adult GOEA observations within the Project Footprint/Valley Floor Conservation Lands areas, with 7 adults being seen inside the plot boundaries, and 7 adult GOEA observed outside the plot boundaries. Furthermore, there were 23 GOEA observations where the age class could not be

determined and were categorized as unknown (Table 2). A majority of the unknown age class observations were due to the distance between the observer and the GOEA.

The point count station with the highest number of observations of GOEA, both inside and outside the plot boundaries, was P-01 (Figure 4) with a total of 23 GOEA observations (10 inside/13 outside) (Table 2). Note that the reasons for the high number of GOEA observations at this point count station was due to numerous GOEA observed utilizing the hills of the VRCL and the hills to the west of the VRCL for perching, foraging, etc. An additional event elevated the number of GOEA observed at this point. During the second survey event (September 17-19, 2013), 7 GOEA were observed feeding on a carcass of a dead animal (i.e. cattle) during the entire point count survey period (Table 1). The point count station with the lowest number of GOEA observations during the survey season was P-06 (Figure 4) with no GOEA observed during all of the point count surveys (Table 2).

Of the 15 GOEA observations within the Project Footprint/Valley Floor Conservation Lands observed within the point count plots, over half of the observations (8 GOEA) were seen within the month of September (Table 3). As previously stated, during the second survey event (September 17-19, 2013), 7 GOEA were observed feeding on a carcass of a dead animal during the entire point count survey period. The next highest number of observations during a month was the events in October with four GOEA (Table 3). The observation numbers for the other months included two observations in January, one GOEA observation in December, and no observations of GOEA in November within the Project Footprint/Valley Floor Conservation Lands during the point count surveys (Table 3).

**Table 3.Survey Event Results for Project Footprint/Valley Floor Conservation Lands**

| Survey Event | P-01 | P-02 | P-03 | P-04 | P-05 | P-06 | Total |
|---|---|---|---|---|---|---|---|
| 1st (September 3 -5, 2013 ) | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 2nd (September 17-19, 2013) | 7[1] | 0 | 1 | 0 | 0 | 0 | **8** |
| 3rd (October 2-4, 2013) | 1 | 0 | 0 | 0 | 0 | 0 | **1** |
| 4th (October 15-17, 2013) | 1 | 2 | 0 | 0 | 0 | 0 | **3** |
| 5th (October 28-30, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 6th (November 11-13, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 7th (November 25-27, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 8th (December 9-11, 2013) | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| 9th (December 21-23, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 10th (January 7-9, 2014) | 1 | 0 | 0 | 1 | 0 | 0 | **2** |
| 11th (January 22-24, 2014) | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| **Total** | **10** | **2** | **2** | **1** | **0** | **0** | **15** |

[1] - Data includes several GOEA that were feeding on a carcass of a dead animal inside the plot boundary.

Valadeao Ranch Conservation Lands

The GOEA observations in the VRCL totaled 11 GOEA with 4 observations within the point count plot boundaries and 7 observations outside the plot boundaries for the entire survey season (Table 2). These observations were also categorized by their age class. The GOEA observations on the Valadeao Ranch Conservation Lands were made up of 2 juveniles, all inside the point count plot boundaries. There were no subadult GOEA observed within the point count plot boundaries or outside the plot boundaries. The surveys also found 2 adult GOEA observations within the Valadeao Ranch Conservation Lands areas with all being seen inside the plot boundaries. Furthermore, there were 7 unknown age class observations that were observed outside the plot boundaries. The unknown age class observations were due to the distance between the observer and the GOEA.

The point count station with the highest number of observations of GOEA, both inside and outside the plot boundaries was V-02 (Figure 5) with a total of 7 GOEA observations (2 inside/5 outside) (Table 2). The point count stations with the lowest number of GOEA observations during the survey season was V-01 and V-03 (Figure 5) with 2 GOEA observations each (Table 2). V-01 had 2 GOEA observations inside the plot boundaries, and V-03 had 2 observed outside the plot boundaries (Table 2).

Of the 4 GOEA observations within the VRCL observed within the point count plots, 75% of the observations (3 GOEA) were seen within the month of September (Table 4). The next highest number of observations during a month was the events in January with 1 GOEA observation. For the months of October, November, and December, no observations of GOEA were made within the VRCL during the point count surveys (Table 4).

**Table 4. Survey Event Results for Valadeao Ranch/Silver Creek Ranch Conservation Lands**

| Survey Event | V-01 | V-02 | V-03 | S-01 | S-02 | S-03 | Total |
|---|---|---|---|---|---|---|---|
| 1st (September 3 -5, 2013 ) | 2 | 0 | 0 | 0 | 0 | 0 | 2 |
| 2nd (September 17-19, 2013) | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 3rd (October 2-4, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4th (October 15-17, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5th (October 28-30, 2013) | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 6th (November 11-13, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7th (November 25-27, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8th (December 9-11, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9th (December 21-23, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10th (January 7-9, 2014) | 0 | 1 | 0 | 0 | 2 | 0 | 3 |
| 11th (January 22-24, 2014) | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| **Total** | **2** | **2** | **0** | **0** | **2** | **2** | **8** |

Silver Creek Ranch Conservation Lands

The GOEA observations in the SCRCL totaled 7 GOEA with four observations within the point count plot boundaries (Figure 6) and 3 observations outside the plot boundaries for the entire survey season. These observations were also categorized by their age class (Table 2). The GOEA observations on the SCRCL had no juvenile or subadult eagles inside or outside the point count plot boundaries. The surveys found 4 adult GOEA observations within the SCRCL areas with 3 observations inside the plot boundaries and one observation outside the plot boundaries. Furthermore, there were 3 unknown age class observations with 1 observation inside the plot boundaries and 2 observations outside the plot boundaries (Table 2). The unknown age class observations were due to the distance between the observer and the GOEA.

The point count station in the SCRCL with the highest number of observations of GOEA, both inside and outside the plot boundaries was S-03 (Figure 6) with a total of 4 GOEA observations (2 inside/2 outside) (Table 2). The point count stations with the lowest number of GOEA observations during the survey season was V-01 and V-03 (Figure 6) with 2 GOEA observations each. V-01 had 2 GOEA observations inside the plot boundaries and V-03 had 2 observed outside the plot boundaries (Table 2). The point count station with the lowest number of GOEA observations during the survey season was S-01 (Figure 2) with no GOEA observed during all of the point count surveys.

Of the 4 GOEA observations within the SCRCL observed within the point count plots, 75% of the observations (three GOEA) were seen within the month of January (Table 4). The next highest number of observations during a month was the events in October with 1 GOEA observation. For the months of September, November, and December, no observations of GOEA were made within the SCRCL during the point count surveys (Table 4).

## 5.2 Utilization Distribution Assessment (UDA)

Like the Point Count Survey events, the UDA Survey events occurred every other week between the weeks of September 3, 2013 until January 24, 2014 for a total of 11 survey events. Each survey event was made up of 6 UDA surveys from designated Observation Points (Figure 7) for 2 hours each. The total hours surveying for GOEA during the UDA study was 132 hours of survey time within the Project Footprint/VFCL.

The results of the UDA surveys included a total of 33 observations of GOEA (Table 5) which includes observations inside the Project Footprint/ VFCL (the UDA Study Area) and outside the UDA Study Area. Of those 33 observations, 16 GOEA observations were recorded within the UDA Study Area (Table 5) with 5 identified as adult GOEA, 3 as subadult GOEA, 4 as juvenile GOEA, and 4 birds were not able to be identified by age class (Table 6).

**Table 5. Total UDA Observations**

| Date of Observation | UDA Observation Point | Observation Location - In or Out of UDA Study Area | Age Class | Flight Height (feet) | Observation Minutes |
|---|---|---|---|---|---|
| 9/4/2013 | P-06 | In | SA | 150 | 5 |
| 9/17/2013[1] | P-01 | In | UK | 0[2] | 10 |
| 9/17/2013 | P-01 | In | UK | 0 | 120 |
| 9/17/2013 | P-01 | In | AD | 0 | 80 |
| 9/17/2013 | P-01 | Out | UKN | 200-300 | 16 |
| 9/17/2013 | P-01 | Out | UKN | 200-300 | 16 |
| 9/17/2013 | P-01 | Out | UKN | 200-300 | 16 |
| 9/17/2013 | P-01 | In | JUV | 0 | 52 |
| 9/17/2013 | P-01 | Out | UKN | 350 | 11 |
| 9/17/2013 | P-01 | In | UKN | 0 | 15 |
| 9/17/2013 | P-01 | In | UKN | 0 | 8 |
| 9/17/2013 | P-02 | In | JUV | NR | 6 |
| 9/18/2013 | P-05 | In | AD | 120 | 4 |
| 9/18/2013 | P-06 | Out | UKN | 100 | 13 |
| 10/3/2013 | P-03 | In | AD | 150-300 | 2 |
| 10/3/2013 | P-03 | Out | JUV | 150-300 | 2 |
| 10/3/2013 | P-03 | Out | AD | 150-300 | 2 |
| 10/3/2013 | P-05 | Out | JUV | 800 | 2 |
| 10/16/2013 | P-03 | Out | AD | 50-200 | 6 |
| 10/16/2013 | P-03 | Out | AD | 50-200 | 6 |
| 10/16/2013 | P-03 | Out | UKN | 150-200 | 3 |
| 10/16/2013 | P-03 | Out | UKN | 150-200 | 3 |
| 10/16/2013 | P-04 | In | JUV | 400 - 800 | 7 |
| 10/28/2013 | P-01 | Out | UKN | 250 | 1 |
| 10/30/2013 | P-02 | In | SA | 200 - 1,000 | 13 |
| 11/12/2013 | P-06 | In | AD | 150 | 3 |
| 11/12/2013 | P-06 | In | AD | 100 | 3 |
| 12/9/2013 | P-02 | Out | UK | 1100 | 6 |
| 12/21/2013 | P-04 | Out | JUV | NR | 19 |
| 12/21/2013 | P-04 | Out | JUV | NR | 30 |
| 12/21/2013 | P-04 | Out | AD | NR | 5 |
| 1/8/2014 | P-01 | In | SA | 0 | 120 |
| 1/22/2014 | P-02 | In | JUV | 200 | 4 |

AD – Adult, SA – Subadult, JUV – Juvenile, UKN – Unknown age, NG – Not Recorded

[1] - Data includes several GOEA that were feeding on a carcass of what appeared to be a dead animal inside the P-01 boundaries on September 17, 2013.

[2] – 0 feet flight height indicates perched on ground or rock.

**Table 6. UDA Survey Overview by Age Class/Survey Point within Study Area**

| Age Class | P-01 | P-02 | P-03 | P-04 | P-05 | P-06 | Totals by Age Class |
|---|---|---|---|---|---|---|---|
| Juvenile | 1 | 2 | 0 | 1 | 0 | 0 | 4 |
| Sub-Adult | 1 | 1 | 0 | 0 | 0 | 1 | 3 |
| Adult | 1 | 0 | 1 | 0 | 1 | 2 | 5 |
| Unknown | 4 | 0 | 0 | 0 | 0 | 0 | 4 |
| Total per Observation Station | 7[1] | 3 | 1 | 1 | 1 | 3 | |

[1] - Data includes several GOEA that were feeding on a carcass of what appeared to be a dead cow inside the P-01 boundaries.

Table 5 indicates the majority of the GOEA observations came from outside the UDA Study Area near Observation Points P-01 and P-03 (Figure 7). This is due to numerous sightings of GOEA observed utilizing the hills of the western portion of the VRCL and the hills beyond the western portion of the VRCL for perching, foraging, etc.

During the UDA surveys there were 452 observation minutes of GOEA inside the UDA Study Area and 157 observation minutes of GOEA outside the UDA Study Area for a total of 609 observation minutes for the entire study period. Note that totals for the UDA study included several GOEA that were observed feeding on a carcass of a dead animal (cattle) inside the UDA Study Area near P-01 within Grid Cell 79 (Figure 7) and remained on the carcass a majority of the UDA survey event on September 17, 2013. These observations made up 63% (285 observation minutes) of the observation time for GOEA for the UDA Study. In addition, the observation time (120 observation minutes) for a subadult eagle noted on January 8, 2014, that perched on the hillside for the entire UDA survey period near P-01, make up 90% of the observation minutes made during the entire study within the UDA Study Area.

The average observed flight height noted during the study, excluding perched GOEA, for all observations of GOEA made during the UDA surveys, was approximately 300 feet above ground level. The average flight height for the GOEA observations noted inside the UDA Study Area was similar with an average flight above ground level of approximately 270 feet (Table 5).

Lastly, due to the small size of the data set, only 16 GOEA flight observations that utilized 57 grid cells within the UDA Study Area (Figure 8), a standard kernel analyses was unable to be utilized. The data was analyzed by calculating the number of flights intersecting an individual grid cell (Figure 8). With exception of the several GOEA observed feeding on a carcass in Grid Cell 79, the cells noted to be utilized by GOEA within the Study Area indicates that the GOEA are not using the southwest and south central areas of the Project Footprint and VFCL. They did not frequent the northern portion of the Project Footprint/VFCL, as well. However, Figure 8 does show that the GOEA are utilizing the hills in the VRCL on both the eastern and western sides of the Study Area for perching, foraging, etc. This area's usage was also noted during the point count surveys.

## 6.0 Conclusion

This report provides the findings of the 2013/2014 Phase II site-specific surveys (USFWS 2013) for GOEA for the Panoche Valley Solar Project. Point Count and UDA studies were completed to provide baseline data on GOEA occurrence, frequency, and behavior to present results of spatial and temporal site use and potential risk based on time spent within the Proposed Project area, which will assist in the preparation of the BBCS and the ECP.

The results of the point count surveys indicated that 93% of the GOEA observations made within the Project Footprint and VFCL point count station boundaries were from the western point count stations, which are in close proximity to the hills located within the western portion of the VRCL (Figure 4). Of the total 15 GOEA observations made during the entire study within point count plots, approximately 47% of those observations were seen during a single survey event (September 17-19, 2013), where 7 GOEA were observed feeding on a carcass of a dead animal within the proposed Project Footprint. This indicates that unless there is an attractant (i.e. food) found within the Project Footprint and the VFCL, that GOEA usage is nominal.

With exception of the several GOEA observed feeding on a carcass in the northeast corner of the UDA Study area, the cells noted to be utilized by GOEA within the UDA Study Area indicates that the GOEA are not using the northern, southwest, and south central areas of the Project Footprint and VFCL. The UDA Study does show, as seen in the point count surveys, that the GOEA are utilizing the hills in the VRCL on both the eastern and western sides of the Study Area for perching, foraging, etc. In addition, the study indicated that flight heights noted inside the UDA Study Area averaged approximately 270 feet with exception of the GOEA noted feeding on the carcass during a September survey event. This shows that the eagles mostly are flying across or through the Panoche Valley (i.e. Project Footprint and VFCL) to other habitat to forage or perch.

## 7.0 References

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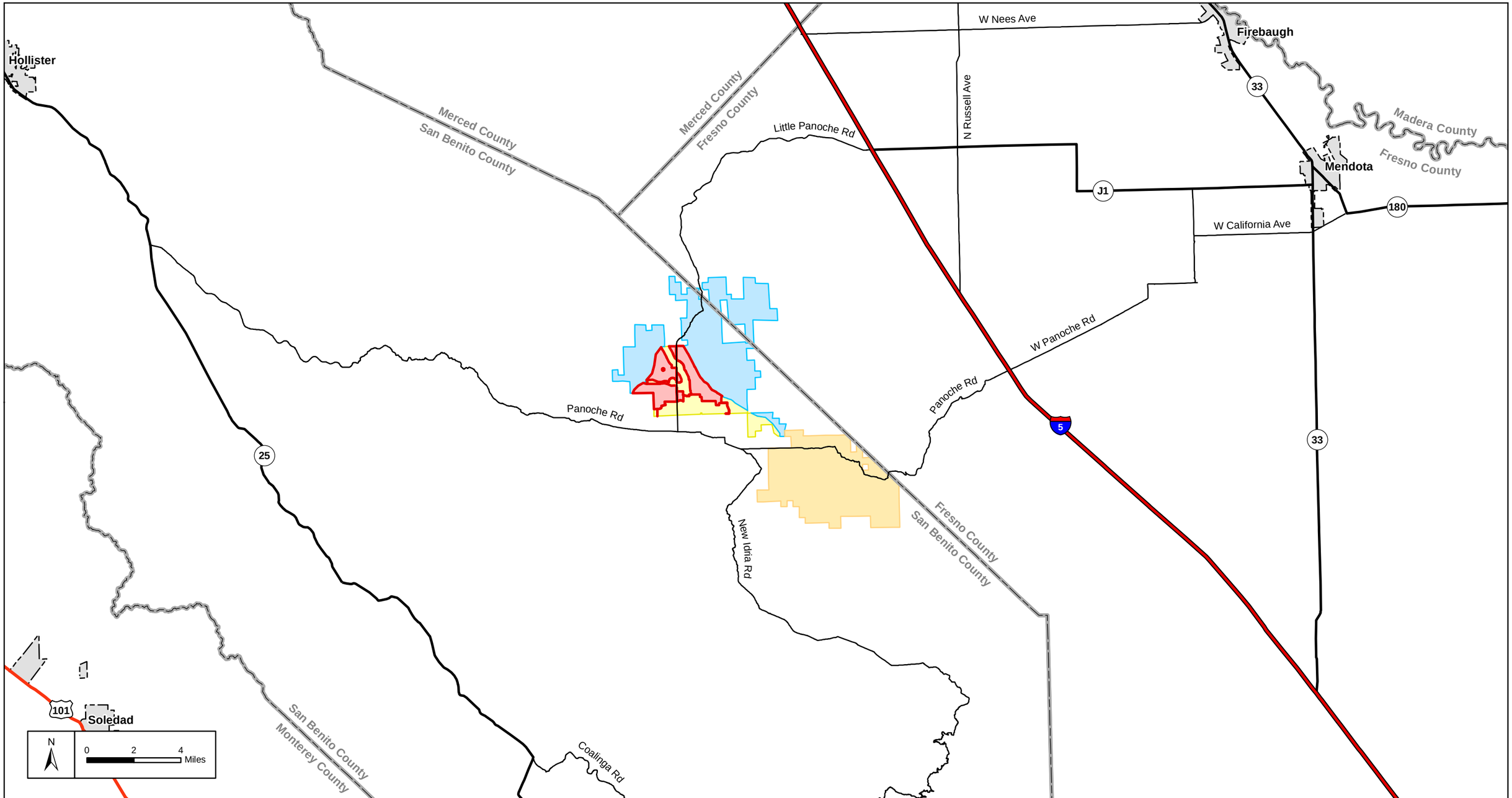
# FIGURES

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**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands
- City

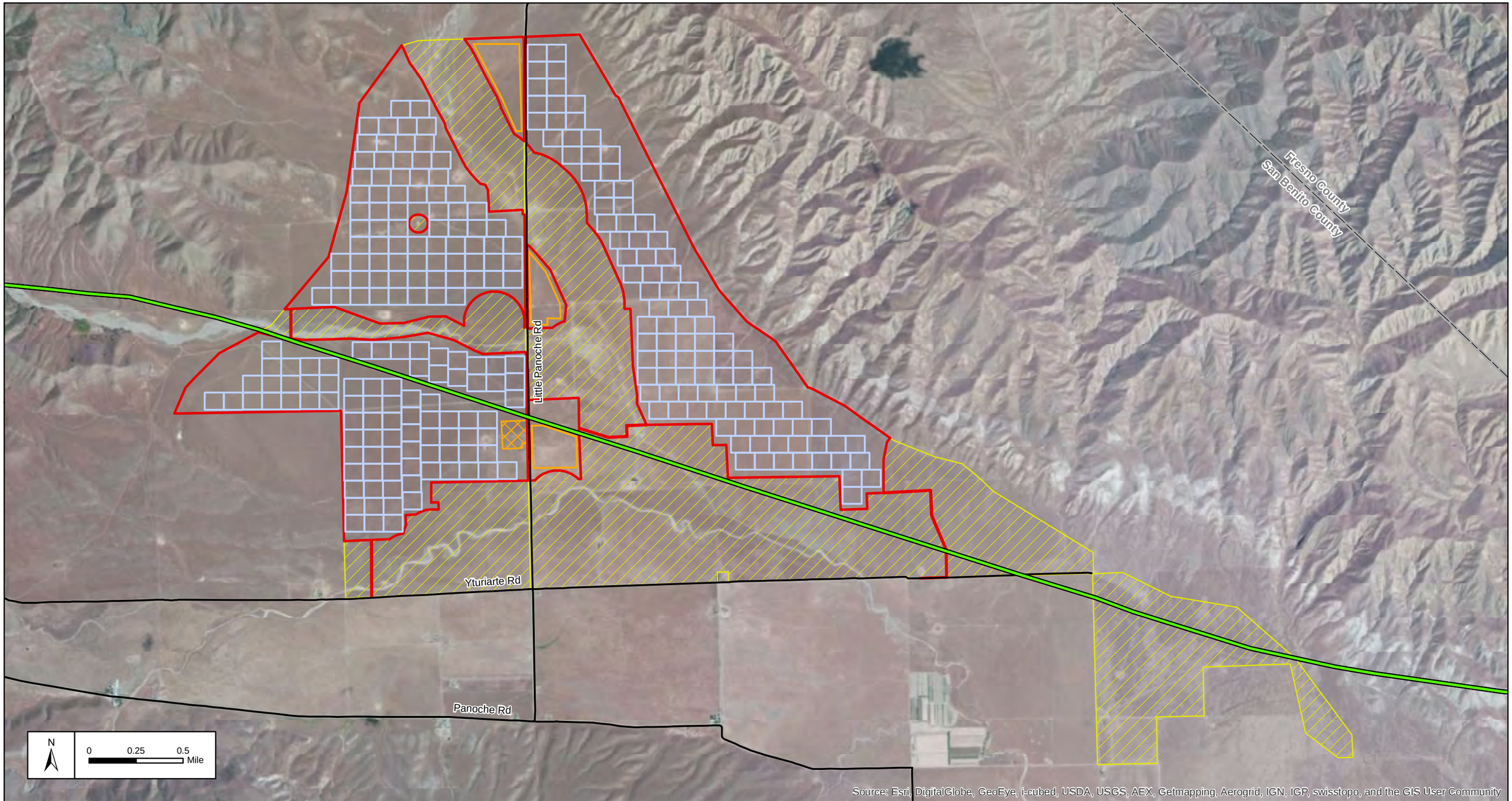
# Panoche Valley Solar Project

## Project Location

FIGURE

1

JH 2014-03-18

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**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Proposed Panel Block
- Existing Transmission Line
- Project Substation
- Laydown Yard

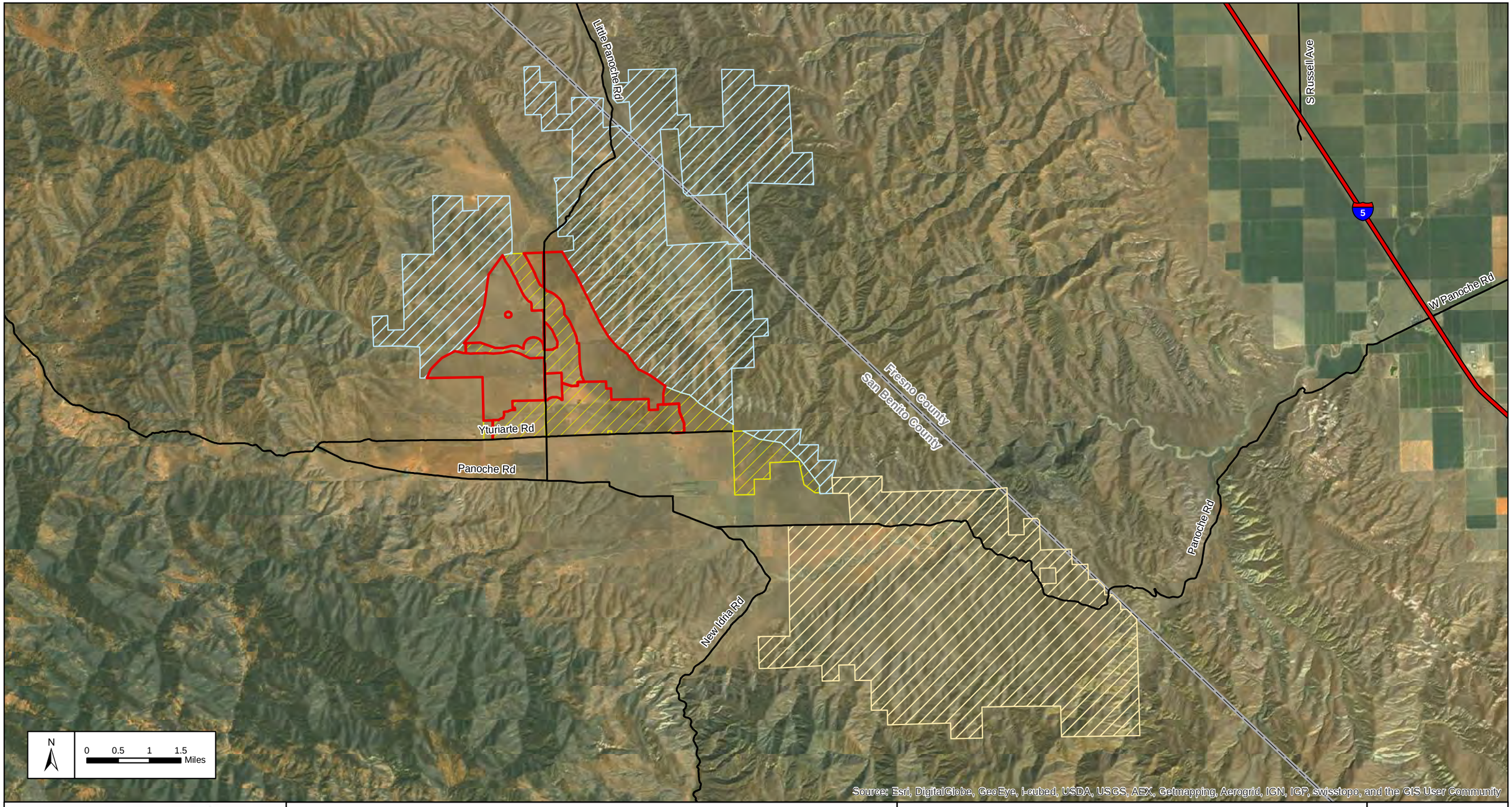
# Panoche Valley Solar Project

## Proposed Layout

FIGURE

2

JH 2014-03-17

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**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands

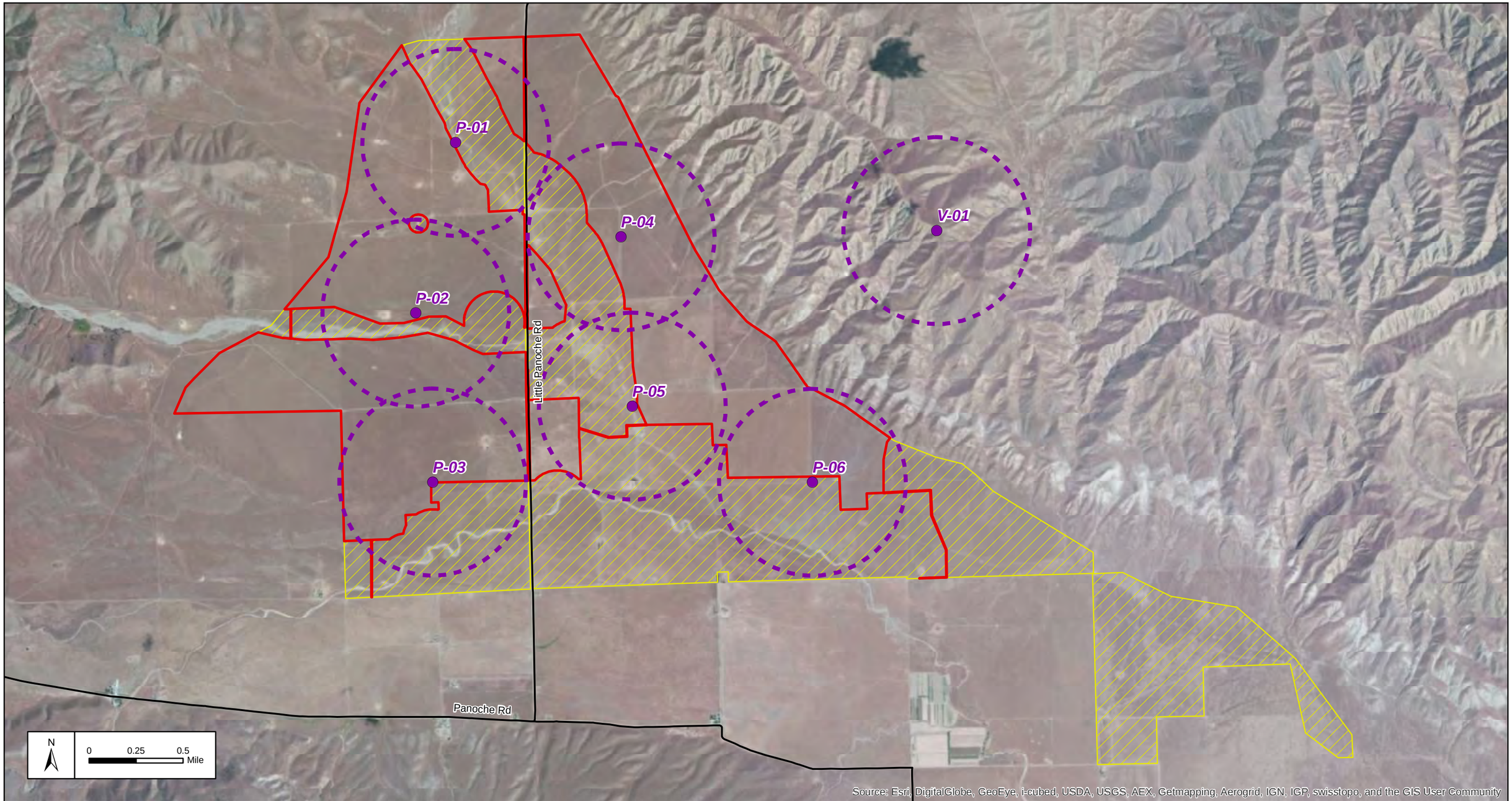
# Panoche Valley Solar Project

## Project Footprint and Conservation Lands

FIGURE

3

JH 2014-03-18

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**Legend**

- Point Count Station
- 800-meter Observation Area
- Project Footprint
- Valley Floor Conservation Lands

# Panoche Valley Solar Project

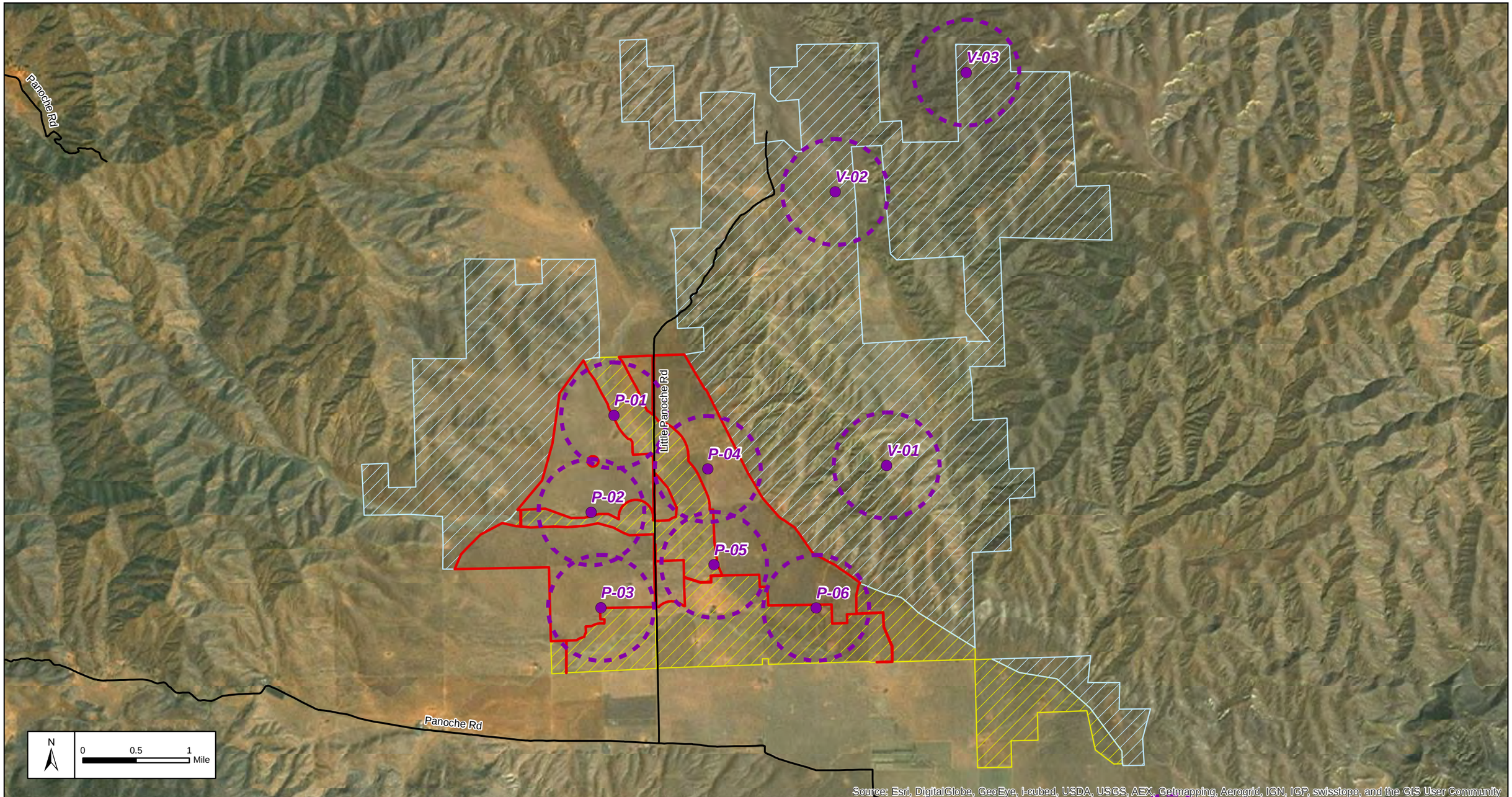
## Point Count Stations

Project Footprint and Valley Floor Conservation Lands

FIGURE

4

JH 2014-03-17

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**Legend**

- Point Count Station
- 800-meter Observation Area
- Project Footprint
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands

# Panoche Valley Solar Project

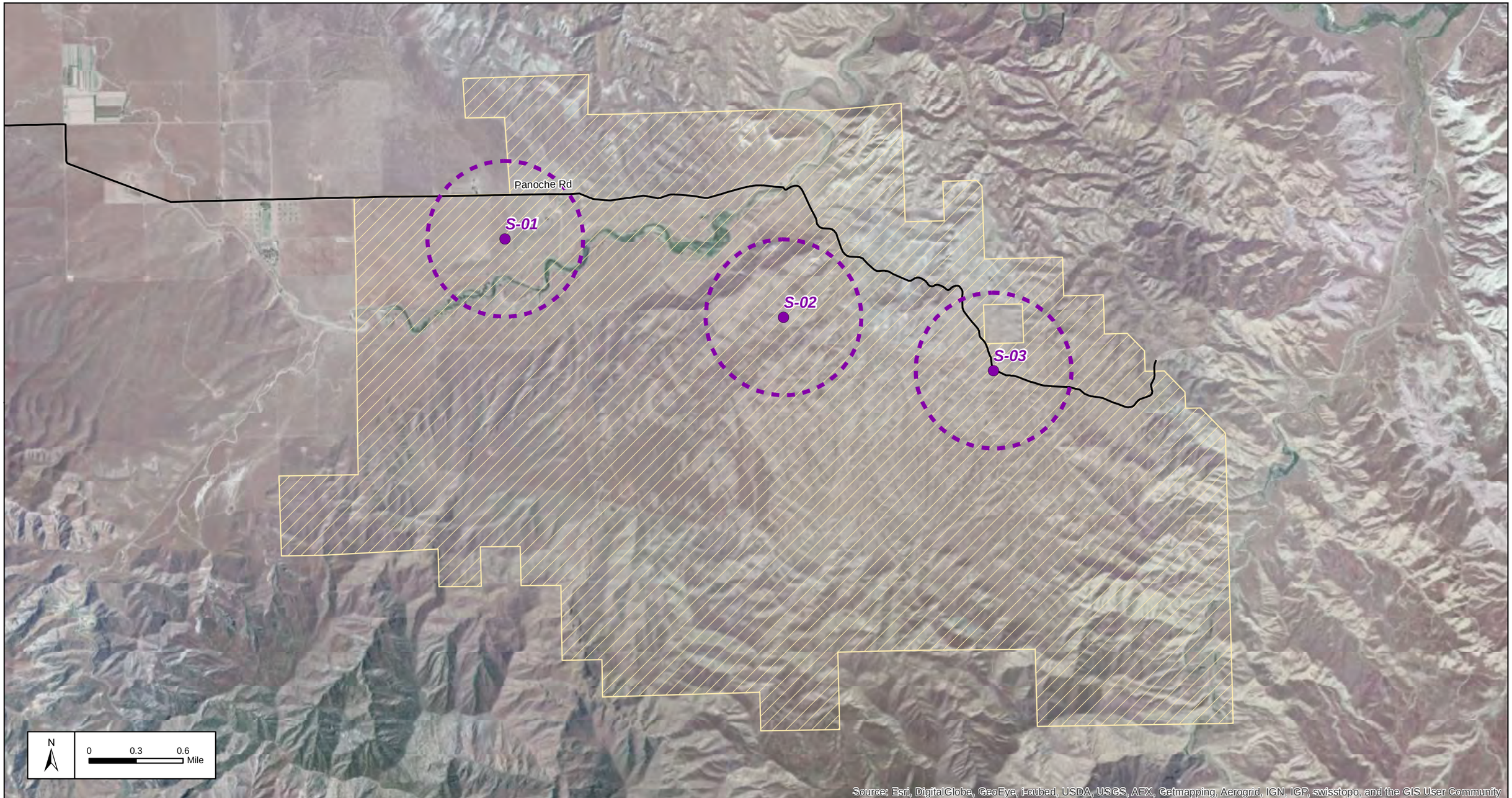
## Point Count Stations

Valadeao Ranch Conservation Lands

FIGURE

5

JH 2014-03-17




305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

**Legend**

- Point Count Station
- 800-meter Observation Area
- Silver Creek Ranch Conservation Lands

# Panoche Valley Solar Project

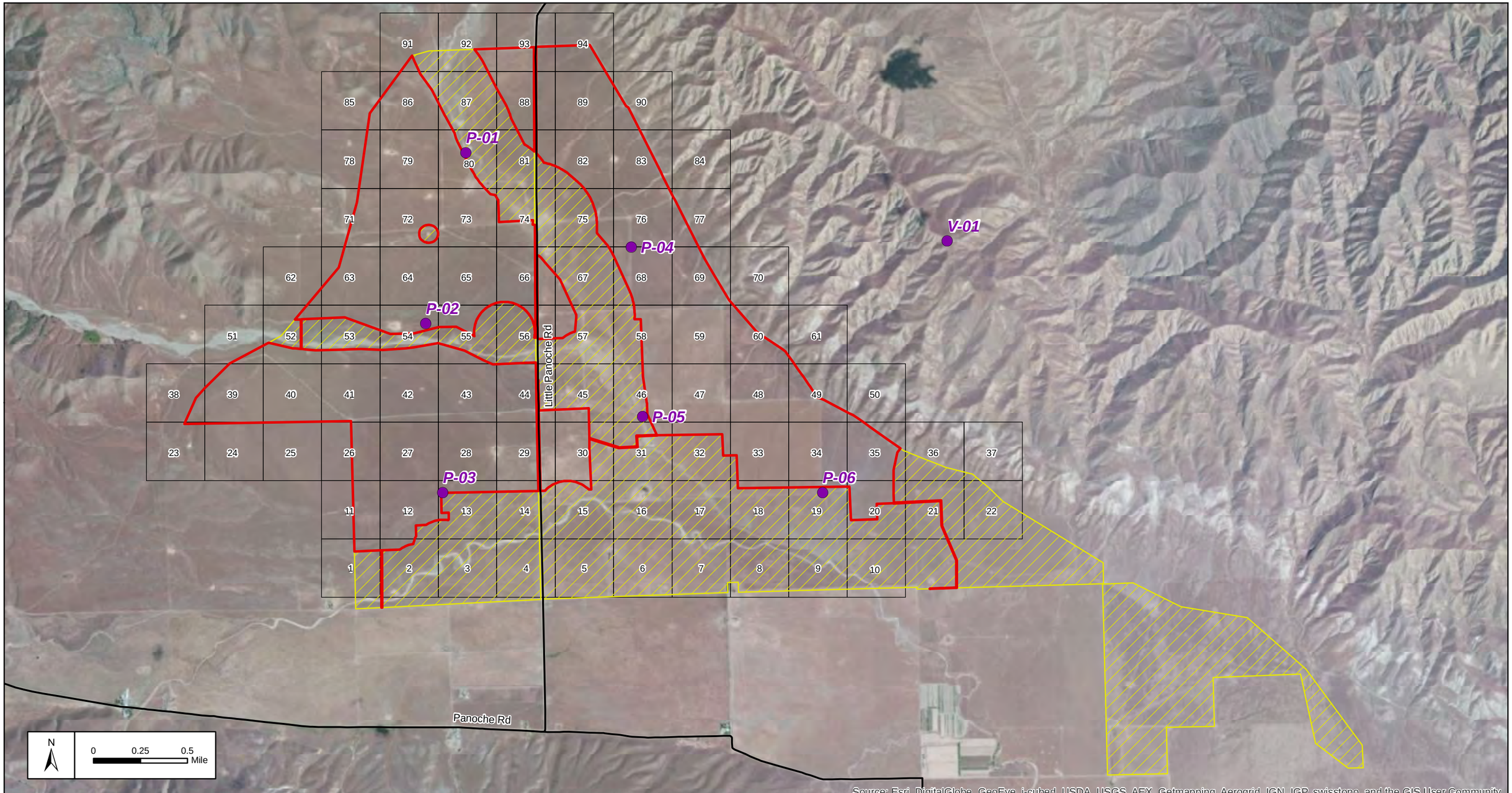
## Point Count Stations

Silver Creek Ranch Conservation Lands

FIGURE

6

JH 2014-03-17

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**Legend**

- UDA Observation Point
- Project Footprint
- Valley Floor Conservation Lands
- 0.5 x 0.5 Kilometer Grid Cell

# Panoche Valley Solar Project

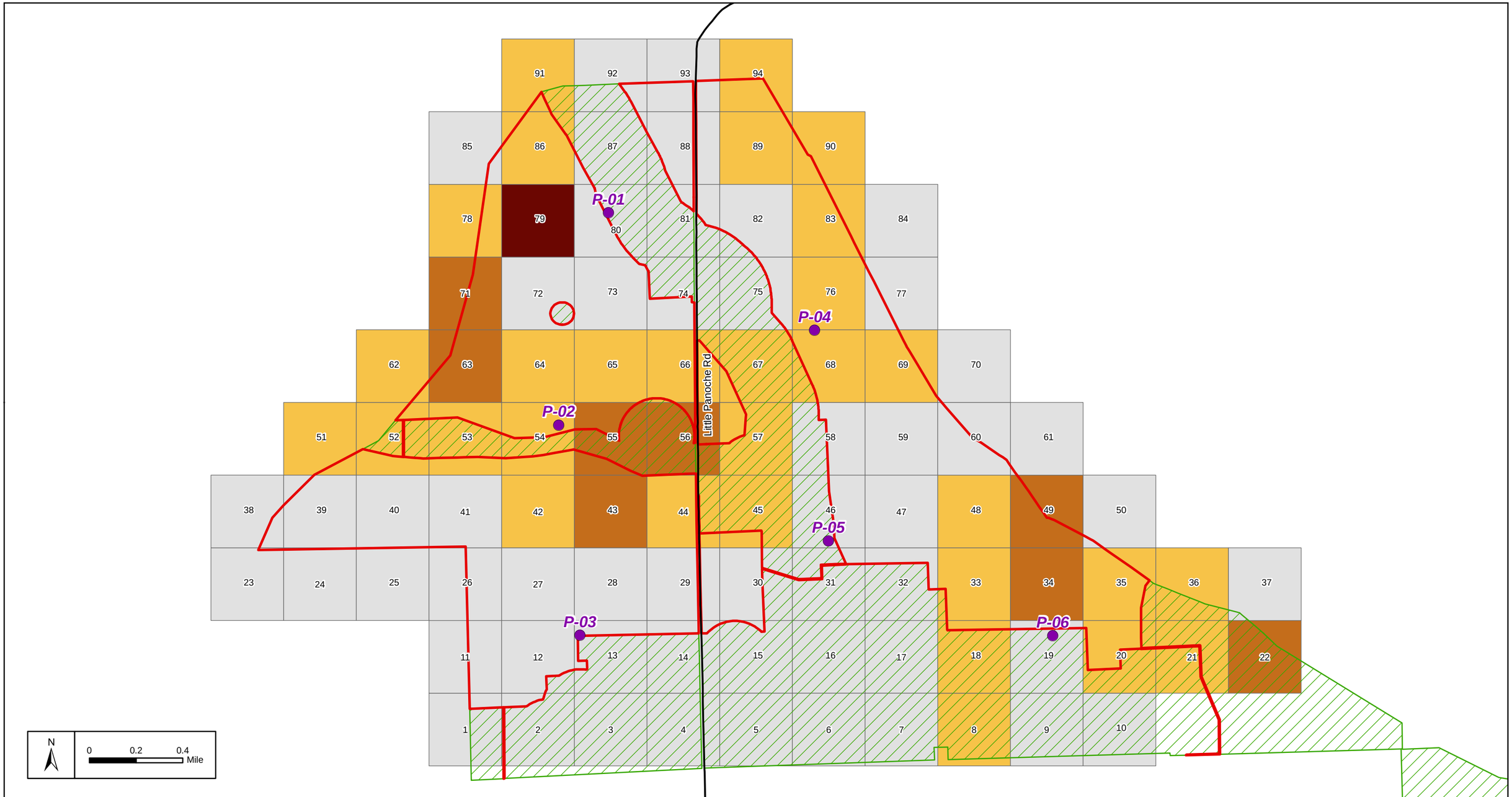
## UDA Observation Points

Project Footprint and Valley Floor Conservation Lands

FIGURE

7

JH 2014-03-17

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**Legend**

- UDA Observation Point
- Project Footprint
- Valley Floor Conservation Lands

**Number of Times a Grid Cell was Utilized by GOEA**

- 0
- 1
- 2 - 3
- 4 - 7

# Panoche Valley Solar Project

## UDA Study Results

FIGURE

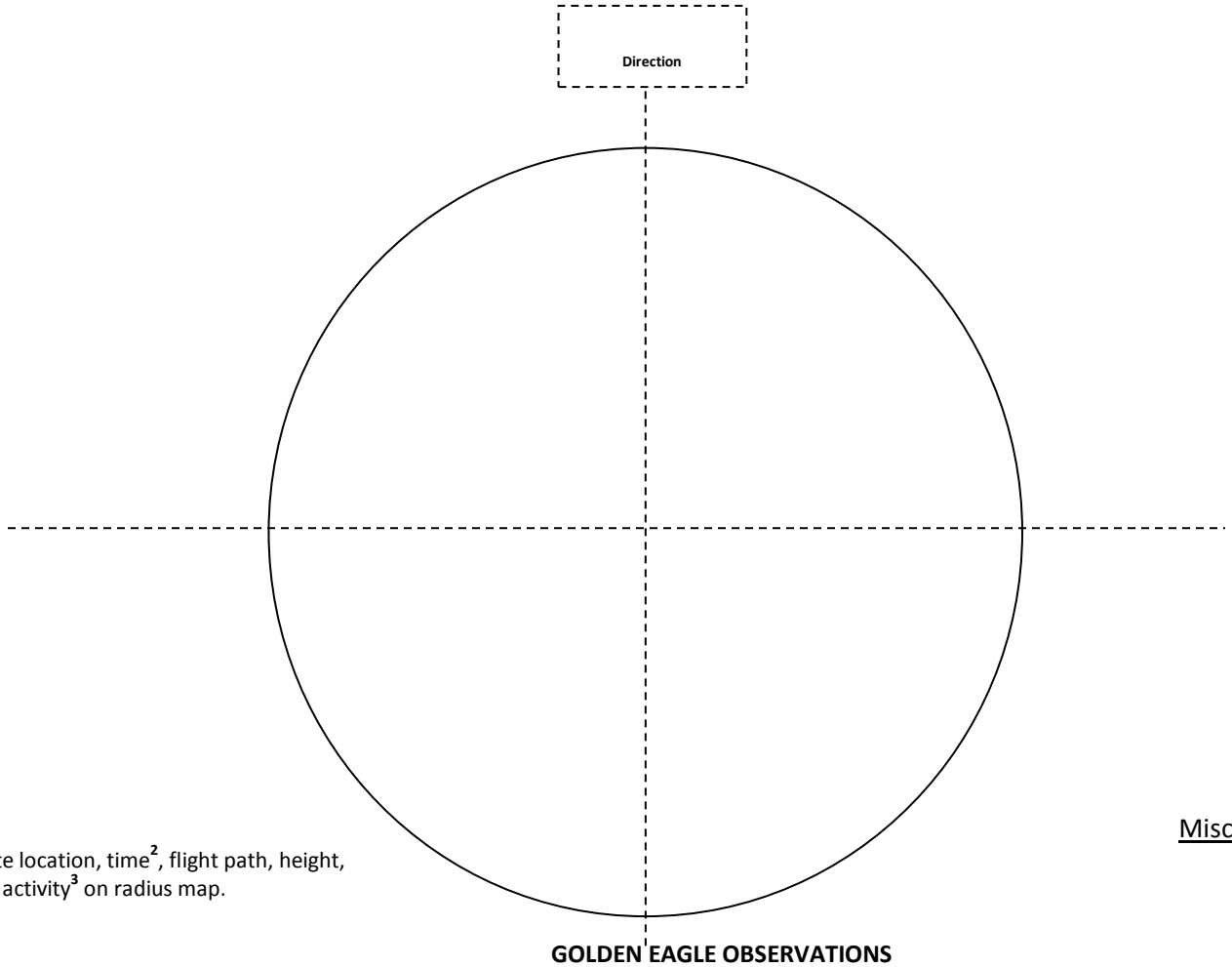
8

JH 2014-03-17

# APPENDICES

# APPENDIX A
# FIELD FORMS

| Panoche Valley Solar Golden Eagle 800 Meter Point Count Survey | | |
|---|---|---|
| Point Count Station Number | Start Time | Temp Start °F |
| Date (mm/dd/yy) | End Time | Temp End °F |
| Observer(s) | Precip. (amt. last 24hr) | Visibility (% clear)[1] |
| Wind (mph/direction) | Cloud Cover (% cloudy) | |




Indicate location, time[2], flight path, height, and activity[3] on radius map.

Misc. Obs

**GOLDEN EAGLE OBSERVATIONS**

| GOEA # | Age Class[4] | Obs Time Start/End | Eagle Minutes | Description of Observation/Comments |
|---|---|---|---|---|
| | | | | |
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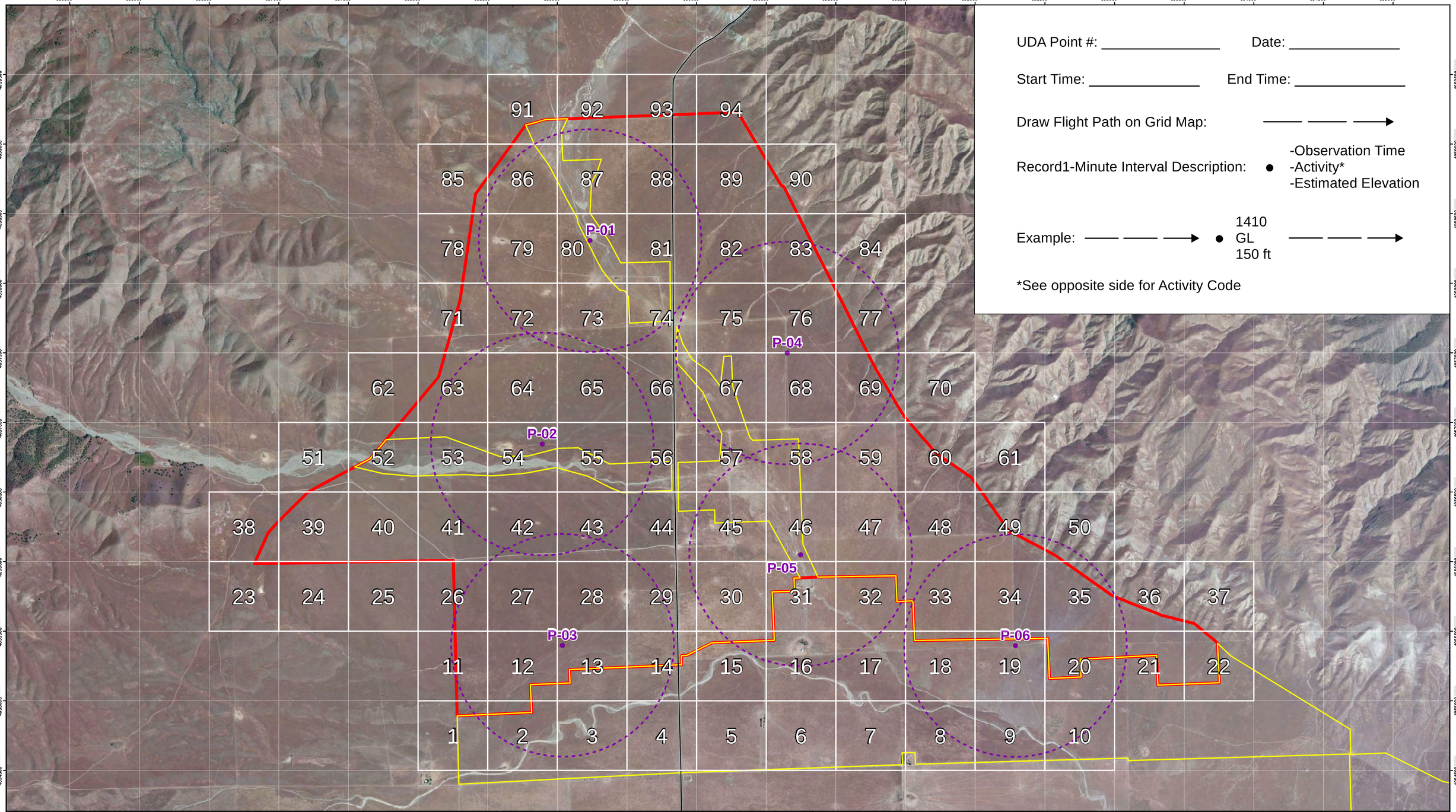
[1]Percent clear within 800 meter and 200 meter vertical
[2]Prevalent behavior noted at one minute intervals
[3]Activity - PE (Perched), SO (Linear Soaring/Gliding), CS (Circle soaring), FL (Flapping), HU (Hunting), HO (Hovering/Kiting), and OT (Other).
[4]Age Class – JUV (Juvenile), SA (Sub-adult), and AD (Adult)




UDA Point #: _____ Date: _____

Start Time: _____ End Time: _____

Draw Flight Path on Grid Map: ——— ——— ⟶

Record1-Minute Interval Description: ● -Observation Time -Activity* -Estimated Elevation

Example: ——— ——— ⟶ ● 1410 GL 150 ft ——— ——— ⟶

*See opposite side for Activity Code

Energy Renewal PARTNERS, LLC

BR
9/11/2013

**Legend**

- Approximate Project Boundary
- Valley Floor Conservation Lands
- Survey Point Location
- 800 meter Observation Area

# Duke Energy Renewables
# Panoche Valley Solar Project

## Golden Eagle Utilization Distribution Assessment (UDA) Grid Map

N

0 1,000 2,000
Feet

| Panoche Valley Solar Golden Eagle Utilization Distribution Assessment (UDA) | | | |
|---|---|---|---|
| **UDA Point Number** | **Start Time:** | **Temp Start: °F** | **Wind (mph/direction)** |
| **Date (mm/dd/yy)** | **End Time:** | **Temp End: °F** | **Observer(s)** |

**GOLDEN EAGLE OBSERVATIONS**

| GOEA # | Age Class[1] | Obs Time Start/End | Eagle Minutes | Description of Observation[2]/Comments[3] |
|---|---|---|---|---|
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Indicate location, time, flight path, estimated height, and activity[2] on grid map (opposite side).

KEY

[1]Age Class – JUV (Juvenile), SA (Sub-adult), and AD (Adult)

[2]Includes prevalent behavior/activity noted at one minute intervals. Activity description includes - PE (Perched), SO (Linear Soaring/Gliding), CS (Circle Soaring), FL (Flapping), HU (Hunting), HO (Hovering/Kiting), and OT (Other).

[3]Include grid numbers utilized from attached grid map

# APPENDIX B
# COMPLETED FIELD FORMS
# ELECTRONIC FORMAT

# APPENDIX C
# MISCELLANEOUS GOLDEN EAGLE OBSERVATIONS

## Miscellaneous Golden Eagle Observations during other Surveys

| Date | GOEA Observations |
|---|---|
| 5/13/2013 | 1 |
| 5/25/2013 | 1 |
| 5/26/2013 | 2 |
| 5/28/2013 | 1 |
| 5/29/2013 | 1 |
| 6/17/2013 | 1 |
| 6/22/2013 | 1 |
| 7/6/2013 | 1 |
| 7/8/2013 | 1 |
| 8/4/2013 | 1 |
| 8/9/2013 | 2 |
| 8/29/2013 | 1 |
| 9/5/2013 | 3 |
| 9/7/2013 | 2 |

# APPENDIX D
# WEATHER DATA

| Survey Date | Weather Conditions |
|---|---|
| September 3, 2013 | Temp 83-95° Fahrenheit (F)<br>Wind 6.5-10.4 miles per hour (mph) N<br>Cloud Cover 25%<br>Precipitation 0 inches (in)<br>Visibility 100% |
| September 4, 2013 | Temp 66-97°F<br>Wind 1.5-6.6 mph N<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| September 5, 2013 | Temp 70-96°F<br>Wind 6.1 – 7.4 mph E<br>Cloud Cover 100%<br>Precipitation 0 in.<br>Visibility 95% |
| September 17, 2013 | Temp 61-72.3°F<br>Wind 15.4 mph W<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| September 18, 2013 | Temp 64-79°F<br>Wind 7.9-13.2 mph NNW<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| September 19, 2013 | Temp 64-93.5°F<br>Wind 0.6 mph N<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| October 2, 2013 | Temp 59-70°F<br>Wind 3.2 mph SW<br>Cloud Cover 10%<br>Precipitation 0 in.<br>Visibility 100% |
| October 3, 2013 | Temp 52-66°F<br>Wind 1-12.7 mph S<br>Cloud Cover 0%<br>Precipitation 0 in. |

| Survey Date | Weather Conditions |
|---|---|
| | Visibility 100% |
| October 4, 2013 | Temp 53-68°F<br>Wind 1.4 mph E<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| October 15, 2013 | Temp 52-84°F<br>Wind 1.1 – 5.9 mph S<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| October 16, 2013 | Temp 51.5-85°F<br>Wind 0-5 mph S<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| October 17, 1913 | Temp 77-90°F<br>Wind 1.1-5 mph S<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| October 28, 2013 | Temp 48-62°F<br>Wind 8.9-19.5 mph W<br>Cloud Cover 35%<br>Precipitation Trace<br>Visibility 100% |
| October 29, 2013 | Temp 53.4-75°F<br>Wind 3.6-6 mph NW<br>Cloud Cover 98%<br>Precipitation 0 in.<br>Visibility 90% |
| October 30, 2013 | Temp 42-67°F<br>Wind 0.9 -7 mph S<br>Cloud Cover 10%<br>Precipitation 0 in.<br>Visibility 100% |
| November 12, 2013 | Temp 58-64.4°F |

| Survey Date | Weather Conditions |
|---|---|
| | Wind 1-6 mph N<br>Cloud Cover 80%<br>Precipitation Trace<br>Visibility 100% |
| November 13, 2013 | Temp 49-74.6°F<br>Wind 2-8.1 mph N<br>Cloud Cover 5%<br>Precipitation Trace<br>Visibility 100% |
| November 14, 2013 | Temp 52-76°F<br>Wind 1 -5 mph NW<br>Cloud Cover 15%<br>Precipitation 0 in.<br>Visibility 100% |
| November 25, 2013 | Temp 32-73°F<br>Wind 0.8-3.6 mph SE<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 80% |
| November 26, 2013 | Temp 46-66°F<br>Wind 1-4 E<br>Cloud Cover 90%<br>Precipitation 0 in.<br>Visibility 100% |
| November 27, 2013 | Temp 41-64°F<br>Wind 1 mph W<br>Cloud Cover 35%<br>Precipitation 0 in.<br>Visibility 100% |
| December 9, 2013 | Temp 20-50.3°F<br>Wind 1-1.7 mph SE<br>Cloud Cover 0%<br>Precipitation 0 in<br>Visibility 100% |
| December 10, 2013 | Temp 27-51.6°F<br>Wind 1-5 mph NE<br>Cloud Cover 0% |

| Survey Date | Weather Conditions |
|---|---|
| | Precipitation 0 in<br>Visibility 100% |
| December 11, 2013 | Temp 31.4-53°F<br>Wind 0.9-2.7 mph W<br>Cloud Cover 0%<br>Precipitation 0 in<br>Visibility 100% |
| December 21, 2013 | Temp 33-40°F<br>Wind 2.5- 7.5 mph W<br>Cloud Cover 0%<br>Precipitation 0 in<br>Visibility 100% |
| December 22, 2013 | Temp 30-49°F<br>Wind 0.6-8.2 mph N<br>Cloud Cover 0%<br>Precipitation 0 in<br>Visibility 100% |
| December 23, 2013 | Temp 43-60°F<br>Wind 0.6-2 mph W<br>Cloud Cover 0%<br>Precipitation 0 in<br>Visibility 100% |
| January 7, 2014 | Temp 39-69°F<br>Wind 1-5 mph E<br>Cloud Cover 75%<br>Precipitation 0 in.<br>Visibility 100% |
| January 8, 2014 | Temp 36-71°F<br>Wind 0-5 mph S<br>Cloud Cover 50%<br>Precipitation 0 in.<br>Visibility 100% |
| January 9, 2014 | Temp 41-47°F<br>Wind 0-5 mph N<br>Cloud Cover 50%<br>Precipitation 0 in.<br>Visibility 100% |

| Survey Date | Weather Conditions |
|---|---|
| January 22, 2014 | Temp 38-66°F<br>Wind 1-4 mph N<br>Cloud Cover 40%<br>Precipitation 0 in.<br>Visibility 100% |
| January 23, 2014 | Temp 47-68°F<br>Wind 3-6 mph NW<br>Cloud Cover 5%<br>Precipitation 0 in.<br>Visibility 100% |
| January 24, 2014 | Temp 48-65°F<br>Wind 0-10 mph S<br>Cloud Cover 90%<br>Precipitation 0 in.<br>Visibility 100% |

# APPENDIX E
# PHOTOGRAPHS

Photo 1. General habitat view of Valley Floor Conservation Lands (VFCL) and Project Site near P-01 looking southwest.

Photo 2. General habitat view of Project Footprint in vicinity of P-03 looking northeast toward P-04 and P-05.

Photo 3. General habitat view of Project Footprint in vicinity of P-03 looking southwest.

Photo 4. General view from Little Panoche Road toward P-05 with the Valadeao Ranch in background looking east/northeast.

Photo 5. General view of Project Footprint and VFCL looking west toward P-02 and the western Valadeao Ranch property.

Photo 6. General view of Project Footprint and VFCL looking southwest from V-01 on the eastern Valadeao Ranch property.

Photo 7. General habitat view of eastern Valadeao Ranch property looking northeast from V-01.

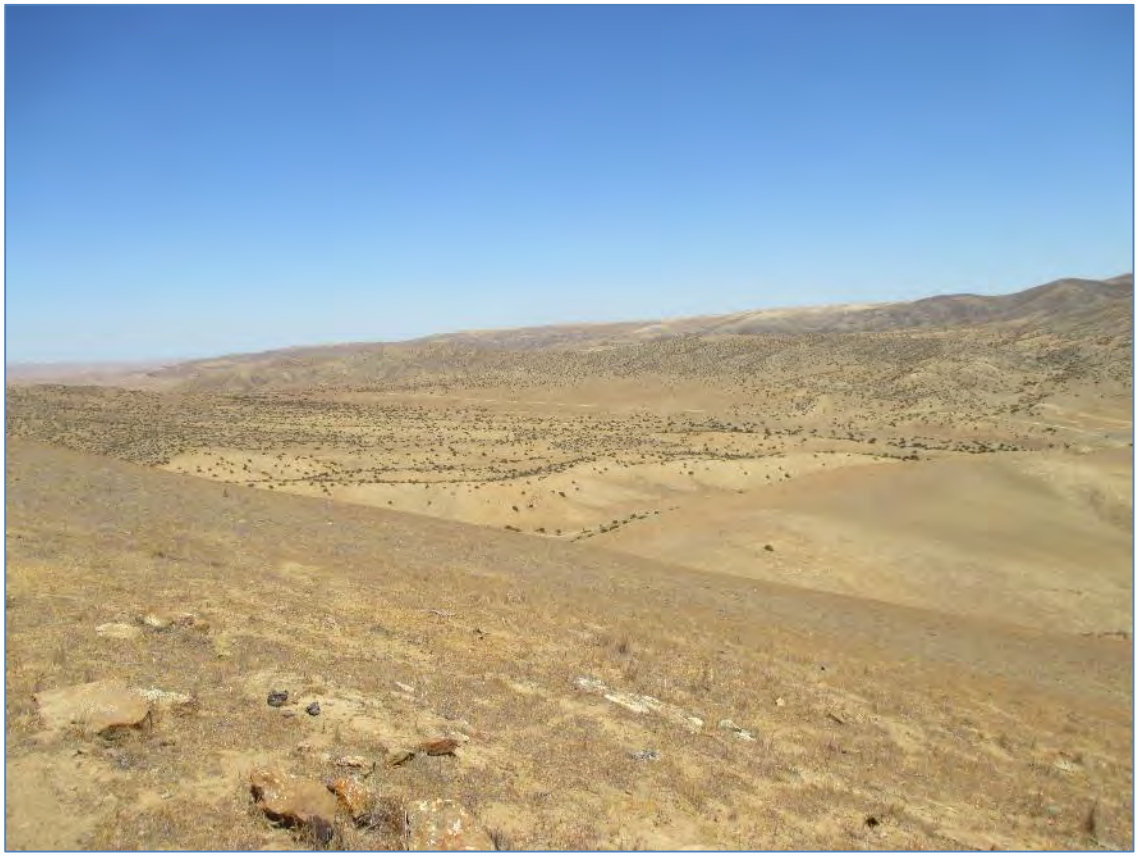

Photo 8. General habitat view of eastern Valadeao Ranch property looking north/northeast from V-01.

Photo 9. General habitat view of eastern Valadeao Ranch property looking east near V-02.

Photo 10. General habitat view of eastern Valadeao Ranch property near V-02.

Photo 11. General habitat view of the Silver Creek Ranch property looking northwest back towards S-01.

Photo 12. General habitat view of the Silver Creek Ranch property near S-02.

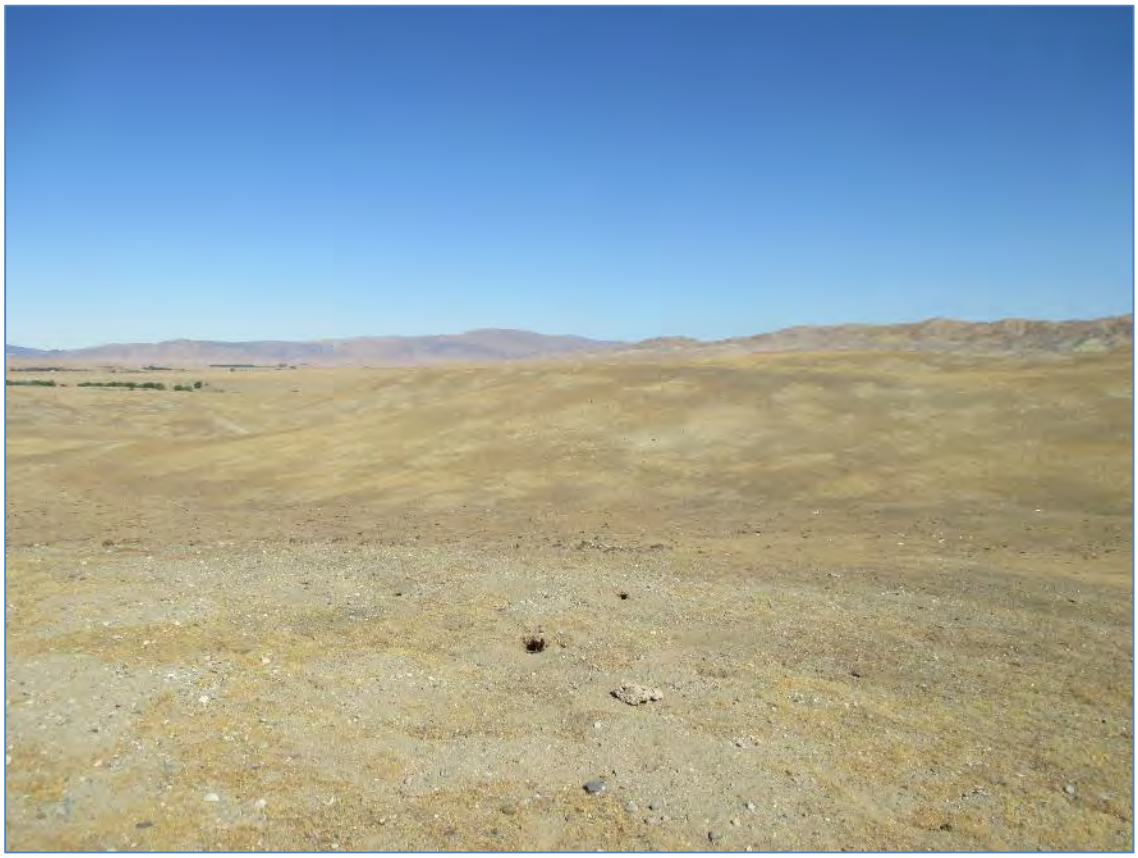

Photo 13. Additional habitat view of the Silver Creek Ranch property near S-02.

# Appendix D

Resume of Plan Preparer

# James A. McRacken

Senior Scientist

Mr. McRacken has over 26 years of experience in wildlife studies including avian, mammal, and reptile and amphibian surveys, jurisdictional streams and wetlands delineations, as well as federal, state, and local permitting activities. During his career, he has conducted wildlife surveys, including rare, threatened, and endangered (RTE) plant and wildlife species, wetland evaluations, habitat and substrate assessments, and various National Environmental Policy Act (NEPA) related assessments for multiple branches of the federal government. He has also conducted wetland compensation design and monitoring to support development and hydropower and transportation projects.

In the area of protected species and wildlife studies, he has conducted and managed protected species assessments on projects throughout the eastern U.S. In addition, he has conducted U.S. Fish and Wildlife Service formal and informal consultations for protected species and provided client representation during the Endangered Species Act permitting. Mr. McRacken's major studies include wildlife habitat studies associated with avian studies – including waterfowl, raptor, breeding, and migratory bird surveys, as well as bat acoustic and trapping studies.

Mr. McRacken's wetland experience includes assessing, surveying, and managing wetland projects at over 270 sites throughout the eastern and southeastern United States. He has permitted impacts to jurisdictional waters of the U.S., including wetlands, impacts under the Nationwide Permit, and Individual Permit programs throughout the southeastern U.S. Mr. McRacken has provided client representation in court as an expert witness and at regulatory meetings for wetland permitting issues.

Selected project experience is summarized below.

**Panoche Valley Solar Facility Project (247 MW) - Ongoing**

California, Duke Energy Renewables, LLC

Served as a Senior Scientist by conducting biological surveys such as protected species surveys for golden eagle, burrowing owls, San Joaquin kit fox, giant kangaroo rat, blunt-nosed leopard lizard, San Joaquin antelope squirrel, and various other terrestrial animal on the project footprint and conservation lands. Also responsible for the preparation of the Clean Water Act Section 404 Individual Permit and the Section 404(b)(1) Alternative Analysis for submittal to the USACE, and the preparation of the Biological Assessment report for submittal to the USFWS as part of the Section 7 Endangered Species Act consultation. Additional support included preparation of the California Department of Fish and Wildlife Endangered Species Act Incidental Take Permit Application (2081) for state protected species as well as the Lake or Streambed Alteration Agreement permit application, Weed Control Plan, Avian Conservation

**Education**

B.S. Biology/Naturalist,
Appalachian State University, 1989

**Specialized Training and Certifications**

Anabat Acoustic Monitoring Techniques - Bat Sense/Bats R Us

Bat Acoustic Monitoring Training - Bat Conservation International

Bat Conservation and Management Training – BCI

Bat Study Techniques - Indiana Bat - Bat Conservation and Management, Inc.

Basic Wetlands Training Program - The National Wetland Science Training Cooperative

Federal Highway Administration NEPA Training Program - FHWA and GDOT

Endangered Species Act Section 7 Consultation Training - Duncan & Duncan WEST

USACE Nationwide Permit Training - The Wetland Training Institute

Stream Restoration Trainings – NC State University

Florida Department of Environmental Protection Jurisdictional Wetland Identification Training

Florida Department of Environmental Protection Controlled Prescribed Burning Interagency Training – Florida Division of Forestry

Strategy, Eagle Conservation Plan, and the Wetland Mitigation and Monitoring Plan for the Project.

**Avian Survey of the Los Vientos III, IV, V and Rio Bravo Wind Farms - Ongoing**
Texas, Duke Energy Renewables, LLC

Served as Senior Scientist responsible for the Breeding, Migratory and Wintering Bird Study for the proposed wind farm in south Texas. The purpose of the avian study was to characterize the existing breeding, migratory, and wintering avian communities of the project area and to estimate the temporal and spatial use of the project area by birds, especially raptors, and also to create risk indices for bird assemblages (large and small birds).

**Avian/Eagle Surveys of the Frontier City Wind Farm - Ongoing**
Oklahoma, Amshore, LLC

Served as Senior Scientist responsible for the Breeding, Migratory and Wintering Bird Study for the proposed wind farm in northern Oklahoma. The purpose of the avian study was to characterize the existing breeding, migratory, and wintering avian communities of the project area and to estimate the temporal and spatial use of the project area by birds, especially raptors, and also to create risk indices for bird assemblages (large and small birds).

**Bat Acoustic Surveys Associated With W.S. Lee Nuclear Station and Make-Up Pond C**
Cherokee County, South Carolina, Duke Energy Carolinas, LLC

Served as Project Manager and Senior Scientist responsible for the acoustic bat surveys on the proposed nuclear station and the adjacent Make-Up Pond C parcel. The purpose of this study was to characterize the existing bat communities of the Project areas and assess the potential project-related impacts on the federally protected Northern Long-eared Bat (*Myotis septentrionalis*). The study focused on representative and high-value roosting and foraging habitat areas located within Project areas.

**Bat Acoustic Surveys Associated With the Oconee and Catawba Nuclear Stations and the W. S. Lee Combined Cycle Power Plant**
Oconee, York, and Anderson Counties, South Carolina, Duke Energy Carolinas, LLC

Served as Project Manager and Senior Scientist responsible for the acoustic bat surveys on the Oconee and Catawba Nuclear Stations and the W. S. Lee Combined Cycle Power Plant. The purpose of this study was to assess the potential project-related impacts on the federally protected Northern Long-eared Bat (*Myotis septentrionalis*) within areas of the power plants where development was planned.

The study focused on representative and high-value roosting and foraging habitat areas located within Project areas.

**Keowee-Toxaway Hydroelectric Relicensing Project (FERC No. 2503), Avian Study**
Oconee, South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager responsible for the development of the comprehensive study plan and the field studies that characterize the avian resources within the Federal Energy Regulatory Commission (FERC) Project Boundary. Study objectives were to survey and evaluate existing breeding, resident, and migratory avian populations; survey and identify the presence of any avian state or federal rare, threatened or endangered species; assess any effects of current and any proposed Project-related hydropower operations on the breeding and migratory species and communities; and provide information to assist in developing any potential mitigation measures. Results of the avian study will be filed as part of Exhibit E in the overall FERC hydroelectric relicensing application.

**Toledo Bend Relicensing Project, Red-cockaded Woodpecker Foraging Habitat Assessment**
Texas and Louisiana, Sabine River Authority

Served as Task Manager responsible for the assessment of potential foraging habitat within the 0.5 mile foraging buffer around the red-cockaded woodpecker (*Picoides borealis*) nesting cluster found adjacent to the Toledo Bend Reservoir. Results of the study will be used in the FERC hydroelectric relicensing process.

**Toledo Bend Relicensing Project, Terrestrial Special-Status and Species Assessment Studies**
Texas and Louisiana, Sabine River Authority

Served as Task Manager responsible for surveys, planning, coordinating, and managing the Terrestrial Special-Status and Species Assessment studies for inclusion into the Integrated Licensing Process (ILP) application to FERC. These studies focused on federally and state protected species such as the Louisiana pine snake (*Pituophis ruthveni*) and the red-cockaded woodpecker that could be found adjacent to the Toledo Bend Reservoir. Results of the studies will be filed as part of Exhibit E in the overall FERC hydroelectric relicensing application.

**Avian Survey of the William States Lee III Nuclear Station**
Cherokee County, South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager and Senior Scientist responsible for the Breeding and Migratory Bird Study. The purpose of the avian study was to characterize the existing breeding and migratory avian communities of the approximately 2,068 acres project

area and assess the potential project-related impacts on the breeding and migratory species and communities. The study focused on representative and high-value habitat areas located within the project area. The study also provided information that assisted in development of potential mitigation measures and any occurrences of state or federally protected avian species.

**Avian Survey of the Railroad Corridor between Gaffney and the William States Lee III Nuclear Station**

Cherokee County, South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager and Senior Scientist responsible for the Breeding and Migratory Bird Study. The purpose of the avian study was to characterize the existing breeding and migratory avian communities of the project area and assess the potential project-related impacts on the breeding and migratory species and communities. The study focused on representative and high-value habitat areas located within approximately 6.8 miles (10.9 km) within a 100-foot (30.5 m)-wide corridor that would connect to the existing railroad line in Gaffney, South Carolina, to the proposed William States Lee III Nuclear Station. In addition, a survey to determine the presence/absence of breeding raptors (hawks, owls, and eagles) along the proposed railway was performed. The study also provided information that assisted in development of potential mitigation measures and any occurrences of state or federally protected avian species.

**Breeding and Migratory Avian Species Associated With London Creek**

Cherokee County, South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager and Senior Scientist responsible for the Breeding and Migratory Bird Study. The purpose of this study was to characterize the existing breeding and migratory avian communities of the Project area and assess the potential project-related impacts on the breeding and migratory species and communities. The study focused on representative and high-value habitat areas located within Project area. The study also provided information that assisted in development of potential mitigation measures and any occurrences of state or federally protected avian species.

**Sutton Hydroelectric Project**

Braxton County, West Virginia, Brookfield Renewable Power Corporation

Served as Task Manager responsible for planning, conducting, and managing the terrestrial surveys for the project. Surveys included avian, bat mist netting and acoustic inventories, small and large mammal trapping and sampling, and reptile and amphibian assessments. Results of the studies were to be filed as part of Exhibit E in the overall FERC hydroelectric licensing application.

## James A. McRacken

Senior Scientist

**Catawba-Wateree Relicensing Project, Breeding and Migratory Bird Study**

North and South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager responsible for the Breeding and Migratory Bird Study. The work included the characterization of the existing breeding, resident, and migratory bird communities of the relicensing project area; assessing any effects of current and any proposed relicensing project-related hydropower operations on the breeding and migratory species and communities; and providing information to assist in developing any potential protection, mitigation, and enhancement (PM&E) measures.

**Tillery and Blewett Falls Lake Relicensing Project, Avian Assessment**

Anson and Richmond Counties, North Carolina, Progress Energy

Served as Project Scientist assisting in conducting the avian survey on existing impoundments to anticipate various relicensing scenarios. Work included field reconnaissance for transect locations and performing surveys of existing bird communities, which would be utilized to provide information to assist in developing any potential PM&E measures.

**John Scott Highway Indiana Bat Roost Survey**

Steubenville, Ohio, Ohio Department of Transportation

Served as a Senior Scientist responsible for conducting a survey at the John Scott Connector Safety Project in Steubenville, Ohio, for potential maternity roost and day roost trees for the Indiana Bat (*Myotis sodalis*). This survey was for an emergency Ohio Department of Transportation Project, which involved surveying of the proposed spoil laydown and access road for the Project.

**Linville Dam Embankment Seismic Stabilization Improvements (ESSI) Project**

North Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as wetland delineation and protected species surveys, stream surveys, stream and wetland mitigation, cultural resources oversight with Historic American Engineering Record (HAER) assessment. Responsible for the CWA Section 404 Individual Permit for submittal to the USACE and North Carolina Department of Environment and Natural Resources (NCDENR). Prepared Biological Assessment report for the Section 7 Endangered Species Act formal consultation regarding the dwarf-flowered heartleaf (*Hexastylis naniflora*). In addition, performed the erosion and control permitting as well as regulatory consultation.

## James A. McRacken

Senior Scientist

**Catawba Dam ESSI Project**

North Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as wetland delineation and protected species surveys, stream surveys, stream and wetland mitigation, cultural resources oversight with abandoned cemetery relocation, county watershed and shoreline protection permits, and sediment and erosion control permitting and regulatory inspections. Responsible for the Section 404 CWA Individual Permit for submittal to the USACE and several North Carolina agencies. Prepared Biological Assessment report for USFWS Section 7 Endangered Species Act informal consultation.

**Paddy Creek ESSI Project**

North Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as wetland delineation and protected species surveys, stream surveys, county watershed and shoreline protection permits, and nursery stock inventory evaluations. Also responsible for the CWA Section 404 Individual Permit for submittal to the USACE and several North Carolina agencies and Biological Assessment report preparation (Section 7 Endangered Species Act) USFWS formal consultation. In addition, performed the erosion and control permitting and compliance inspections as well as regulatory consultation.

**Catawba-Wateree Relicensing Project, Schweinitz's Sunflower Monitoring Study**

North Carolina, Duke Energy Carolinas, LLC

Served as Task Manager and Senior Scientist responsible for the yearly monitoring surveys and reports to document population size and health of the Schweinitz's sunflower (*Helianthus schweinitzii*), which is a federally endangered species. This monitoring is in association with Duke Energy's Catawba-Wateree Comprehensive Relicensing Agreement to prepare and institute a species protection plans for the sunflower, which was documented within the FERC Project Boundary.

**Lake Keowee/Little River Bypassed Reach Beaver Pond Leveler Installation**

Oconee County, South Carolina, Duke Energy Carolinas, LLC

Served as the Project Manager and Senior Scientist responsible for conducting biological surveys such as wetland delineation and protected species surveys for the installation of a pond leveling device for American beaver impacts to ensure dam safety. Also responsible for the Clean Water Act (CWA) Section 404 Nationwide Permit application for submittal to the U.S. Army Corps of Engineers (USACE) with Project concurrence letters to the U.S. Fish and Wildlife Service (USFWS) and South Carolina State Historic Preservation Office (SHPO).

## James A. McRacken

Senior Scientist

**Make-up Pond B Spillway Channel Repair on the William States Lee III Nuclear Station**

Cherokee County, South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager and Senior Scientist responsible for conducting biological surveys including wetland delineation, protected species surveys, and submittal of the Nationwide Permit application for impacts due to the necessary channel repair. The purpose of the project was to stabilize approximately 798 linear feet of the jurisdictional channel with engineered gabion mats to limit future erosion, protect against the planned flood event, and to ensure the adjacent meteorological tower is protected from slope subsidence.

**Paddy Creek Spillway Improvement Project (FERC No. 2232)**

Burke County, North Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as wetland delineation, protected species surveys, and management of cultural resources evaluations. Also responsible for the submittal of the Shoreline Protection Act permit submittal to Burke County Planning and Development Department.

**Caesars Head Mountain Transmission Line Environmental Review Project**

Greenville County, South Carolina, and Henderson County, North Carolina, Duke Energy Carolinas, LLC

Conducted field surveys along the existing 22-mile transmission line. Duties included delineating and mapping wetlands and streams, managing field staff, and managing project financials. Work also involved the senior review and signoff of all submitted materials to client.

**Bridgewater Powerhouse Penstock Tie-In Temporary Fish Relocation and Water Quality and Quantity Monitoring**

North Carolina, Duke Energy Carolinas, LLC

Served as Project Manager and Senior Scientist responsible for conducting a field effort to relocate stranded fish following penstock closure of the existing Bridgewater Powerhouse penstock. Duties involved project management, deployment of temperature loggers throughout a one-mile reach of the Linville River immediately downstream of the Linville Dam, oversight of Hydrolab (dissolved oxygen, etc.) measurements at each temperature monitoring location, and field collection of the fish utilizing backpack electrofishing and seining. Duties also included obtaining a Scientific Fish Collecting License/Permit through the North Carolina Wildlife Resource Council (NCWRC) prior to the field effort.

## James A. McRacken

Senior Scientist

**Cedar Cliff Hydroelectric Station Proposed Minimum Flow Powerhouse Permitting, East Fork Tuckasegee River Hydroelectric Project (FERC No. 2698)**

Jackson County, North Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as jurisdictional waters delineation and protected species surveys. Submitted and received a request for a finding of "no permit necessary" for the construction of the new Cedar Cliff Hydroelectric Station Proposed Minimum Flow Powerhouse. This work and request included an on-site field assessment to document the extent of the jurisdictional ordinary high water mark (OHWM) within the proposed construction area and submittal of the findings to the USACE.

**Lee Steam Station Combined Cycle Combustion Turbine Natural Resource Survey Project**

Anderson County, South Carolina, Duke Energy Carolinas, LLC

Performed field surveys for wetlands and protected species and provided senior report review on all information concerning the 325-acre site.

**Dan River Combined Cycle Combustion Turbine Environmental Survey Project**

Rockingham County, North Carolina, Duke Energy Carolinas, LLC

Consulted and provided senior-level review of all information concerning stream and wetland and natural resources on the 250-acre site. Provided permitting support between clients and agencies. Obtained all NEPA-related permits for project to proceed.

**Hawks Nest Hydroelectric Project**

West Virginia, Brookfield Renewable Power Corporation

Served as Terrestrial Lead responsible for the preparation of the wildlife and botanical resources, wetlands, riparian and littoral habitat, and terrestrial rare, threatened, and endangered species sections of the pre-application document.

**Keowee-Toxaway Hydroelectric Relicensing Project (FERC No. 2503), Bat Acoustic Study**

Oconee, South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager responsible for the Bat Acoustic Study. The work included the characterization of the bat species that utilize the relicensing project area; assessment of any effects of current and any proposed relicensing project-related hydropower operations on the bat populations; and providing information to assist in developing any potential protection, mitigation, and enhancement (PM&E) measures.

## James A. McRacken

Senior Scientist

**Buck Steam Station Combined Cycle Combustion Turbine Environmental Survey Project**

Rowan County, North Carolina, Duke Energy Carolinas, LLC

Consulted and provided senior-level review of all information concerning stream and wetland and natural resources on the 80-acre site. Consulted with client to re-position station footprint to minimize stream and wetland impacts. Provided permitting support between clients and agencies. Obtained all NEPA-related permits for project to proceed.

**Opekiska and Hildebrand Hydroelectric Project**

Monongalia County, West Virginia, Brookfield Renewable Power Corporation

Served as Terrestrial Lead responsible for the preparation of the wildlife and botanical resources, wetlands, riparian and littoral habitat, and terrestrial rare, threatened, and endangered species sections of the pre-application document.

**Island Point Substation Project, Wetlands Delineation**

Iredell County, North Carolina, Duke Energy Carolinas, LLC

Delineated 12 acres of proposed substation property for potentially jurisdictional waters of the U.S., including wetlands. Work also involved the senior review and signoff of all submitted materials to client and agencies.

**Hydroelectric Relicensing Project, Relicensing Application Field Studies and Application Development**

City of Spearfish, South Dakota

Served as Task Manager responsible for the Botanical and Wildlife Resources study for the relicensing application of the hydroelectric project on Spearfish Creek. Assisted other HDR scientists with the wildlife and protected species studies. In addition, assisted with the instream flow study.

**Gaston Shoals Hydroelectric Station Dam Stabilization and Probable Maximum Flood (PMF) Remediation Project**

South Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as wetland delineation, protected species surveys, and cultural resources evaluations. Responsible for the CWA Nationwide Permit for submittal to the USACE and South Carolina Department of Health and Environmental Control (SCDHEC).

## James A. McRacken

Senior Scientist

**Claytor Lake Hydroelectric Relicensing Project**

Virginia, Appalachian Power Company/American Electric Power

Served as Terrestrial Lead responsible for the preparation of the wildlife and botanical resources, wetlands, riparian and littoral habitat study plans for the Pre-Application Document.

**Myers-Pinch Gut 100kV Transmission Corridor and Substation Project**

North Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as wetland delineation and protected species surveys. Responsible for the CWA Nationwide Permit for submittal to the USACE and South Carolina Department of Health and Environmental Control. Prepared the Biological Assessment report (Section 7 Endangered Species Act) for the USFWS informal consultation regarding the dwarf-flowered heartleaf.

**Beaverdam Creek Sanitary Sewer Project**

Anderson County, South Carolina, Anderson County Utilities

Served as Senior Project Scientist responsible for performing wetland delineation and federal and state protected species surveys within the Project's corridor. Responsible for the appropriate state and federal permits and certifications from the USACE and the SCDHEC. In addition, developed alternative analyses, wetland mitigative actions, or monitoring requirements due to the impacts to waters of the U.S. including wetlands. In addition, provided expert witness services.

**Low Level Radiation Disposal Facility Siting Project, Biological Assessment and Permitting**

Richmond, Chatham, and Wake Counties, North Carolina, Chem-Nuclear

Served as Project Scientist and Task Manager. Conducted and assisted in several wildlife population studies for an Environmental Impact Statement needed for the proposed location of a low-level radioactive waste facility. The studies involved were small mammal trapping with capture-recapture of small rodents, flora plot surveys, large mammal spotlighting, scent station monitoring, transect study of the avian community, and reptile and amphibian study.

## James A. McRacken

Senior Scientist

**Yamaha Facility Siting Project, Environmental Assessment**

Alabama, Yamaha Motor Corporation, USA

Served as Project Scientist responsible for conducting biological surveys such as wetland delineation and endangered species assessment for Anthony's Riversnail (*Athearnia anthonyi*), and Section 404 permitting and site monitoring activities associated with the proposed engine testing facility.

**Phase III Natural Gas Pipeline Expansion Project**

Florida Gas Transmission Company, Central and East Coast Florida

Served as Spread Environmental Inspector/Advisor responsible for the supervision of the construction of an entire spread of the Florida Gas Transmission Company Phase III natural gas pipeline expansion project. The tasks included advising and instructing the construction contractor on state and federal environmental permit compliance issues; supervising the construction through environmentally sensitive natural features, such as wetlands and Outstanding Florida Waters; coordinating all construction and environmental activities with the appropriate federal, state, and local regulatory agencies; monitoring all hydrological and turbidity problems in construction areas that crossed either wetland or open water habitats; analyzing the hydrological and turbidity data for permit compliance; and interpreting the data to ensure total compliance or corrective measures.

**L&C Development Project, Environmental Studies**

South Carolina, L&C Development Corporation

Served as Project Manager and Senior Scientist responsible for conducting wetland and protected species surveys, ASTM Phase I environmental site assessments, and coordinating geotechnical and archaeology studies for potential commercial development sites.

**Sony Property, Environmental Assessment and Permitting**

Blythewood, South Carolina, Sony Corporation of America

Served as Senior Project Scientist responsible for performing the wetland delineation, assisting in the regulatory verification, and conducting a federal and state protected species survey on the subject property. Responsible for obtaining the appropriate permits and certifications from the USACE and SCDHEC. Performed wetland mitigation planning, implementation, and monitoring. In addition, represented Sony during a wetland-related dispute with a site development contractor, and fulfilled all mitigation requirements and coordinated with a local land trust conservancy group to arrange deeding of the remaining wetlands and associated upland buffers.

## James A. McRacken

Senior Scientist

**Marine Mammal Studies and Surveys**

Northeast Florida, Florida Department of Environmental Protection and University of Miami

Served as Biologist assisting in the research of pelagic and intracoastal Bottle-nosed Dolphin (*Tursiops truncatus*) populations in the waters of northeast Florida. This study consisted of dorsal fin photography for individual identification and data gathering to show migrant populations, movements, group interactions, and habitat usage. In addition, logged over 40 hours flying aerial surveys for manatees along the St. John's River for research on movements, habitat usage, and population studies. Additionally, flew surveys to locate the presence of the Northern Right Whale off the coast of North Florida. Mr. McRacken also created a manatee scar sketch catalogue for the northeastern field office of the Florida Department of Environmental Protection Florida Marine Research Institute and tracked tagged manatees using telemetry in northeastern Florida and southeastern Georgia.

# California Tiger Salamander
# Pre-construction Avoidance and Minimization Plan for the Panoche Valley Solar Facility Project
# San Benito County, California

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## Introduction

This Pre-construction Avoidance and Minimization Plan (Plan) has been prepared to establish the procedures for the potential salvage, handling, and relocation of California tiger salamander (*Ambystoma californiense*) (CTS) if encountered during pre-construction clearance surveys associated with the Panoche Valley Solar Farm Project (Project) in San Benito County, California (Figures 1 and 2). The Plan has been prepared pursuant to the mitigation measures in the *Final Environmental Impact Report for the Panoche Valley Solar Farm Project (CUP No. UP 1023-09; State Clearinghouse No. 2010031008)* (2010). It should be noted that this Plan precedes the U.S. Fish and Wildlife Service's (USFWS) issuance of the Biological Opinion for the Project and California Department of Fish and Wildlife's (CDFW) issuance of the California Fish and Game Code Section 2081 Incidental Take Permit (ITP) for the Project. As such, minor changes to this Plan may occur upon issuance of these documents.

## Legal Status

The CTS population segment which occurs in the vicinity of the Project is currently listed as threatened under the California Endangered Species Act and federal Endangered Species Act. The Project does not contain USFWS designated critical habitat for CTS. In addition, no Recovery Plan has yet been prepared for the species.

## Species Ecology

The CTS is a large, stocky, terrestrial salamander with a broad, rounded snout. Adults may reach a total length of 8.2 inches (Petranka 1998, Stebbins 2003). The CTS exhibits sexual dimorphism (e.g., males tend to be larger than females). As adults, CTS tend to have creamy yellow to white spotting on the sides that becomes much reduced on the dorsal surface of the animal, whereas other tiger salamander species have brighter yellow spotting that is heaviest on the dorsum.

The species occurs from near sea level up to approximately 3,900 feet in the Coast Ranges and up to approximately 1,600 feet in the Sierra Nevada foothills (Shaffer et al. 2004). Along the Coast Ranges, the species occurred from the vicinity of Santa Rosa in Sonoma County to near Buellton in Santa Barbara County. In the Central Valley and surrounding foothills, the species occurred from northern Yolo County southward to northeastern Kern County and northern Tulare County.

The CTS has an obligate biphasic life cycle (Shaffer et al. 2004). Although breeding, egg-laying, and development of the larval salamanders occur in vernal pools and other ponds, the species otherwise spends most of its post-metamorphic life in widely dispersed, underground retreats (Trenham et al. 2001, Shaffer et al. 2004). Subadult and adult CTS spend the dry summer and fall months of the year in the burrows of small mammals (e.g., California ground squirrel (*Otospermophilus beecheyi*) and Botta's pocket gopher (*Thomomys bottae*) (Storer 1925, Loredo and Van Vuren 1996, Petranka 1998, Trenham 1998a). These burrows provide

protection from the sun and dry winds that are associated with the dry California climate. Given that CTS utilize burrows created by other species (rather than dig their own burrows) and these burrows typically collapse within 18 months if not maintained, an active population of burrowing mammals is necessary to sustain sufficient underground refugia for the species (Loredo et al. 1996).

The burrows inhabited by CTS are not estivation sites. Studies have demonstrated that individuals move, feed, and remain active in their burrows during the summer months (Trenham 2001, Van Hattem 2004). Individuals may even move between closely located burrows (Trenham 2001). In addition, researchers have long inferred that individuals are feeding while underground since they arrive at breeding ponds in good condition and are heavier when entering the pond than when leaving the pond (Trenham 2001).

Dispersal and migration movements made by adult CTS can be grouped into three categories: (1) postmetamorphosis dispersal; (2) breeding migration; and (3) interpond dispersal. After metamorphosis, juveniles move away from breeding ponds into the surrounding upland habitat, where they live continuously for several years. At a study in Monterey County, it was found that upon reaching sexual maturity, most individuals returned to their natal (i.e., birth) pond to breed. However, 20 percent of the individuals dispersed to other ponds where they breed (Trenham et al. 2001). Following breeding, adult CTS return to the upland habitat, where they may live for one or more years before breeding again (Trenham et al. 2000).

CTS are known to travel relatively long distances from the breeding ponds into the surrounding upland habitat (something that is surprising given the small size of the species). Maximum distances moved are difficult to establish for the species, but an individual in Santa Barbara County was found approximately 1.3 miles from the nearest known breeding pond (S. Sweet in litt. 1998), suggesting that the species may be able to move up to distances of this magnitude. As previously mentioned, CTS are known to travel between breeding ponds. One study found that 20 to 25 percent of the individuals captured at one pond were later captured at other ponds approximately 1,900 and 2,200 feet away (Trenham et al. 2001). In addition to traveling long distances during breeding migrations or interpond dispersals, CTS may reside in burrows that are far from known breeding ponds. At one site in Contra Costa County, hundreds of CTS were captured 3 years in a row in upland habitat approximately 0.75 mile from the nearest known breeding pond (Orloff 2007).

Although observations show that CTS may travel far from breeding ponds, individuals typically reside in upland habitat that is closer to the breeding ponds. Evidence suggests that juvenile CTS disperse further into upland habitats than adult CTS. A trapping study conducted in Solano County during winter of 2002–2003 found that juveniles used upland habitats farther from breeding ponds than adults did (Trenham and Shaffer 2005). More juvenile individuals were captured at distances of 328, 656, and 1,312 feet from a breeding pond than at 164 feet. Approximately 20 percent of total captures were found 1,312 feet from a breeding pond. Fitting the data to a distribution curve demonstrates that 95 percent of juvenile individuals could be found within 2,099 feet, with the remaining 5 percent being found at even greater distances.

Preliminary results from the 2003–2004 trapping effort detected juvenile CTS at even greater distances, with a large proportion of the total CTS caught at 2,297 feet from the breeding pond (Trenham and Shaffer 2005). Surprisingly, most juveniles captured, even those at 2,100 feet, were still moving away from the ponds. Such variability in movements (particularly by juvenile CTS) may reflect a "hardwired" genetic behavior that increases the likelihood that a metapopulation will persist (particularly given the short and long-term ephemeral nature of vernal pool systems) if individuals travel longer distances where they may encounter other breeding ponds. This latter behavior and the known interpond dispersal behavior that has been demonstrated at some sites would appear to support this concept. Furthermore, interpond movements may also reduce local in-breeding depression, genetic drift, and founder effects that could occur if individuals only returned to their natal pond.

Postbreeding movements away from breeding ponds by adults appear to be much smaller. During postbreeding emigration, radio-telemetered adult CTS were tracked to burrows 62 to 813 feet from their breeding ponds (Trenham 2001). These reduced movements may be due to adult CTS having depleted physical reserves after breeding or due to the drier weather conditions that often occur during the period when adults leave the ponds. The reduced movement may also reflect the effects of the internally-placed radio-telemeter on the physiology of the individual. However, the shorter movement distances of adult CTS may also reflect the selective advantages of only moving as far away from the breeding pond as necessary to find suitable refugia (such that more energy goes into reproduction and less into travel).

Once CTS have moved into the surrounding upland habitat, most individuals use several successive burrows at increasingly greater distances from the pond. Although the studies discussed above provide an approximation of the distances that CTS move from their breeding ponds, movement in the upland habitat is believed to be driven by the local habitat features. Trenham (2001) found that radio-telemetered adults favored grassland with scattered large oaks over more densely wooded areas. A drift fence survey at a pond in Santa Barbara County found that many emigrating juveniles moved towards an adjacent strawberry field. However, no adults were captured returning to the pond from this direction. Nor did many CTS return to the pond from the direction of adjacent sandhill or eucalyptus habitats found in other quadrants. Most of the CTS returning to the pond were captured coming from a nearby, extensive overgrazed grassy flat (S. Sykes pers. comm. 2011). Furthermore, based on studies of radio-telemetered individuals, CTS do not appear to favor specific corridors for movement in the upland habitat (Trenham 2001). At two ponds completely encircled by drift fence and pit fall traps, captures of arriving adults and dispersing juveniles were distributed randomly around the ponds. Therefore, it appears that dispersal into the surrounding upland habitat occurs randomly with respect to direction and habitat types.

Once the fall or winter rains begin, individuals emerge from their burrow (typically on rainy nights) to feed and migrate to the breeding ponds (Shaffer et al. 1993). Adult salamanders mate in the ponds, after which the females lay their eggs in the water (Twitty 1941, Shaffer et al. 1993, Petranka 1998). Historically, the CTS utilized vernal pools as breeding ponds. However, many current breeding sites also include stock ponds. Females attach their eggs singly, or in rare

circumstances, in groups of two to four eggs to twigs, grass stems, other vegetation, or debris (Storer, 1925, Twitty 1941). In ponds with no or limited vegetation, they may be attached to objects such as rocks and boards that are located on the pond bottom (Jennings and Hayes, 1994). After breeding, adults leave the pond and enter small mammal burrows (Loredo et al. 1996, Trenham 1998a) where they may continue to exit and enter the burrows nightly for the next few weeks to feed (Shaffer et al. 1993). It should be noted that in drought years the seasonal ponds may not fill, and adults do not breed (Barry and Shaffer 1994).

CTS eggs hatch in 10 to 14 days, with newly hatched larvae ranging from 0.45 to 0.56 inch in total length (Petranka 1998). The larvae are entirely aquatic. They often rest on the bottom in shallow water, but may also be found at different depths in the water column in deeper water. The larvae are wary and when approached by potential predators, they dart into vegetation on the bottom of the pond (Storer 1925).

The larval stage of the CTS usually lasts 3 to 6 months as most seasonal ponds dry completely during the summer months (Petranka 1998). Amphibian larvae must develop to a critical minimum body size before they can metamorphose to the terrestrial stage (Wilbur and Collins 1973). Individuals collected near Stockton in the Central Valley during April varied from 1.88 to 2.32 inches in length (Storer 1925). Feaver (1971) found that larvae metamorphosed and left the breeding ponds 60 to 94 days after the eggs had been laid. Furthermore, larvae developed faster in smaller, more rapidly drying ponds. Thus, larvae and metamorphosing juveniles are larger in ponds that are inundated longer and are more likely to survive and reproduce (Semlitsch et al. 1988, Pechmann et al. 1989, Morey 1998, Trenham 1998b). The larvae will perish if the pond dries before metamorphosis is complete (Anderson 1968a, Feaver 1971). Vollmar (2002) found that vernal pools occupied by CTS larvae in Merced County averaged 14.8 inches in depth, while vernal pools that were unoccupied averaged 6.0 inches in depth. Pechmann et al. (1989) found a strong positive correlation between ponding duration and total number of metamorphosing juveniles in five salamander species. In Madera County, Feaver (1971) found that only 11 of 30 ponds sampled supported larval CTS, and five of these ponds dried before metamorphosis could occur. Therefore, out of the original 30 ponds, only 6 (20 percent) provided suitable conditions for successful reproduction that year. Size at metamorphosis is positively correlated with stored body fat and survival of juvenile amphibians, and negatively correlated with age at first reproduction (Semlitsch et al. 1988, Scott 1994, Morey 1998). In the late spring or early summer, before the ponds dry completely, metamorphosed juveniles leave the ponds and move into upland habitat. This emigration occurs in both wet and dry conditions (Loredo and Van Vuren 1996, Loredo et al. 1996). Unlike during their winter migrations, the wet conditions that CTS prefer do not generally occur during the months when their breeding ponds begin to dry. As a result, metamorphs may be forced to leave their ponds on rainless nights. Under these conditions, they may move only short distances to find suitable upland refugia (including leaf litter, desiccation cracks in the soil, and beneath boards or rocks in addition to small mammal burrows). These latter refugia are typically used temporarily and only until more suitable refugia can be found (i.e., small mammal burrows). Upon arrival of the next winter's rains, individuals may then move further within the upland habitat. Once juvenile CTS leave their breeding ponds, they may not return to breed for 4 to 5 years. However, they remain

active in the upland habitat and come to the surface during rainfall events to disperse or forage.

Lifetime reproductive success for CTS is low. Trenham et al. (2000) found that the average female produced 814 eggs (range of 413 to 1,340) each time it bred, bred 1.4 times in its lifetime, and produced 8.5 young that survived to metamorphosis per reproductive effort. This resulted in approximately 11 metamorphic offspring over the lifetime of the female. Two reasons for the low reproductive success associated with these data are that most individuals require 2 years to become sexually mature, but some individuals may be slower to mature and do not breed until they are 4 to 6 years old (Shaffer et al. 1993). While individuals may survive for more than 10 years, many breed only once, and in some populations, less than 5 percent of marked juveniles survive to become breeding adults (Trenham 1998b). With such low recruitment, isolated populations are susceptible to unusual, randomly occurring natural events as well as from human caused factors that reduce breeding success and individual survival. Factors that repeatedly lower breeding success in isolated ponds can quickly extirpate a population.

## Local Distribution

CTS larvae were observed in two nearby off-site water bodies during the 2009-2010 rainy season during protocol-level vernal pool branchiopod and CTS surveys (Ponds 3 and 12 on Figure 3). One of these water bodies is a large stock pond that still contained sufficient water on May 21, 2010 for ongoing development and metamorphosis of CTS larvae. Seven large CTS larvae were netted at this location. The second water body is a pool where small CTS larvae were first observed in February 2010 during the vernal pool branchiopod surveys. During the May 2010 CTS sampling event, there were several dozen larvae in the pool attempting to metamorphose (due to the drying of the pond). Some may have metamorphosed successfully, though 10 individuals were observed dead and desiccated in the shallow and muddy portions of the pool. CTS were not observed during protocol CTS larval surveys in two ponds located in the Valley Floor Conservation Lands (Ponds 8 and 9 on Figure 3) that historically were occupied by CTS (CDFW 2014). No CTS were observed within the boundaries of the Project Footprint during the 2009- 2010 rainy season. In addition, no CTS have been observed within the Project Footprint during any other onsite studies.

## Qualified Project Biologists

Qualified Project Biologists (i.e., biologists with current state and federal permits/authorizations to handle CTS and prior experience monitoring CTS) will be assigned to serve as monitors during Project pre-construction CTS clearance activities. The resumes of these biologists will be submitted to the USFWS and CDFW for approval at least 30 days prior to scheduled pre-construction CTS clearance activities that could result in the “take” of CTS. The agency-approved biologists are the only individuals who will be allowed to handle and relocate CTS if it becomes necessary. All Project Biologists will be under the direction of one or more Designated Biologists (i.e., biologists with decision-making authority).

## Pre-Construction Avoidance and Minimization Measures

To minimize the potential for "take" of CTS within the Project work area, the following measures will be implemented prior to the initiation of Project-related construction activities. Temporary wildlife exclusion fence (WEF) will be installed, as deemed necessary by the Project's Designated Biologist, around all Project work areas. The purpose of the WEF is to preclude special-status, small vertebrate species (e.g. California tiger salamander, giant kangaroo rat, blunt-nosed leopard lizard, etc.) from entering the Project work areas during pre-construction CTS clearance surveys where they could be killed, injured, or isolated. The WEF will also preclude CTS from entering the Project work area later during Project-related construction activities.

The Project Biologists will perform pre-construction clearance surveys in the CTS Pond Buffer areas that overlap with the Project Footprint areas planned for grading or excavation and identify suitable small mammal burrows or atypical refugia (e.g., concrete slabs, water tanks, man-made structures, etc.) that are present in the work area and provide potential upland refugia for CTS. These areas are illustrated on Figure 3 attached. Small mammal burrows that are suitable for CTS have generally been considered to be the burrows of California ground squirrel (*Otospermophilus beecheyi*) or Botta's pocket gopher (*Thomomys bottae*) (Barry and Shaffer 1994, Trenham 2001, Pittman 2005, Cook et al. 2006). Though less well documented, CTS have also been found heavily using kangaroo rat (*Dipodomys* spp.) burrows (S. Sweet, pers. comm.). Trenham (2001) found that even though rocks, logs, culverts and other potential refugia were available, radio-tracked CTS did not use them. It has been surmised that these other habitat features (including smaller mammal burrows) do not provide suitable temperature, humidity, or integrity for CTS. Trenham (2001) found radio-tracked CTS most often in burrows located in open grassland or underneath large oaks. Pittman (2005) found CTS in pocket gopher burrows located in short annual grassland, a boulder riprap mound with extensive pocket gopher activity, and in pocket gopher burrows under a large boulder. Bumgardner (personal observation) has observed CTS at the bottom of wooden debris piles and under concrete slabs, but always in association with larger small mammal burrows. As such, small mammal burrows that are considered suitable for CTS and appropriate to excavate within the Project Footprint will be limited to California ground squirrel, San Joaquin antelope squirrel (*Ammospermophilus nelsoni*), kangaroo rat, and Botta's pocket gopher burrows.

Studies of CTS have documented individuals in upland habitat out to at least 2.2 kilometers (1.37 miles) from the nearest known breeding pond (USFWS 2004, Trenham and Shaffer 2005, Orloff 2011, Searcy et al. 2013). These same studies show an inverse relationship between number of individuals and distance from the breeding pond (i.e., there are fewer individuals in the landscape with increasing distance from the breeding pond). The mean distance that individuals travel from their breeding pond varies with associated environmental variables (density of suitable refugia, barriers to movement, density of vegetation, differences in annual weather conditions, etc.). As such, predicting the distance from the breeding pond at which a given percentage of the population occurs (e.g., 95% of the population within 620 meters of the pond) is not feasible for the Project site based on data collected for other sites (mostly due to the

extremely dry conditions in the Panoche Valley). However, calculation of the Searcy and Shaffer (2011) ecophysiological maximum migration distance for CTS in the Panoche Valley, using rainfall data archived at the Western Regional Climate Center (http://www.wrcc.dri.edu/summary/Climsmcca.html), determined that all CTS associated with the identified breeding ponds in the valley should be found within 678 meters (2,223 feet) of the ponds (Figure 3) (see the March 30, 2015 Technical Memorandum prepared by Bumgardner Biological Consulting). Therefore, CTS burrow excavations for the Project will be conducted where ground-disturbing activities are proposed in the Project Footprint out to 700 meters (2,300 feet) from each identified breeding pond (Figure 3). Burrow excavations will be conducted in all areas to be graded (e.g., arrays, roads, buildings, mitigation pond creation, etc.). However, due to uncertainties in regards to the efficacy of the Searcy and Shaffer model as it relates to CTS in the Panoche Valley (mostly due to the lack of empirical data to validate the model), salvage and relocation of individuals will be extended an additional 300 meter beyond the 700 meter threshold predicted by the model (i.e., two contiguous 150 meter concentric rings) to 1,000 meters (3,281 feet). If no CTS are found within the additional 300 meters, no additional burrow excavations will be conducted for the associated breeding pond. However, if CTS are found within one or more of the 150 meter rings, additional burrow excavation will occur until there have been two contiguous 150 meter rings with no documented CTS occurrences. Under no circumstances will burrow excavations extend beyond 1,900 meters from any identified CTS breeding pond (i.e., the distance roughly correlated to the 1,866 meters found by Searcy and Shaffer (2011) to correspond to the 95% population threshold at the Jepsom Prairie Preserve in Solano County, California). Where burrow excavations for other special-status species (e.g., giant kangaroo rat) must be conducted outside of the above criteria, a Project Biologist will be in attendance to salvage and relocate CTS should it become necessary.

The pre-construction CTS clearance surveys will be conducted by two or more Project Biologists walking parallel, linear transects while watching for suitable burrows. Each suitable burrow that is found will be flagged with a pin flag and/or georeferenced with a GPS unit to facilitate return to and excavation of the burrow. Transect endpoints will be flagged (temporarily), transect segments will be no longer than 100 meters, and transect widths will be no wider than 10 meters to ensure that the surveys are conducted in a manner that provides 100 percent surface coverage. Field data sheets will be used to facilitate tracking of transects that have been surveyed or cleared.

Excavation of suitable small mammal burrows will be conducted as follows: All excavations will be conducted between April 1 and September 30 (during the CTS non-breeding season). At the discretion of the Designated Biologist, excavations may be allowed to proceed later into the year, but only if no substantial rain has fallen (rain event resulting in at least 2 millimeters of rainfall). Areas shown on grading plans that will be graded or excavated for arrays, roads, buildings, mitigation pond creation, and other project components will be staked to identify burrow excavation limits. The overlapping area of proposed grading and associated disturbance with upland habitat within will be marked in the field prior to beginning burrow excavations. If possible, each burrow excavation will be conducted by slowly removing the burrow (including any side tunnels) using hand tools (e.g., shovel, digging bar, garden trowel, masonry trowel,

etc.). If hand tools cannot be used safely due to soil compaction and/or burrow depth extending greater than two feet from the surface, burrows may be excavated using mechanical methods. Mechanical methods will include either hand power tools or a backhoe and/or hand tools (e.g., shovel, garden trowel, masonry trowel, etc.). Cloth, cylinder, capped pipe, or similar material that would protect the integrity of the burrow will be pushed into the burrow approximately 12 to 16 inches to plug the burrow and prevent animals from exiting the burrow during excavation (i.e., to prevent injury or mortality). The excavation sequence will then continue as follows:

- 6-12 linear inches of burrow will be removed at a time (e.g., while excavating with hand tools or with each bucket of the backhoe) under the supervision of the Project Biologist;
- the plug will be removed;
- the burrow will be checked for evidence of CTS or other animals;
- small hand tools will be used to reestablish the burrow opening (if necessary);
- the burrow will again be checked for evidence of CTS or other animals (if necessary); and
- the plug will be reinserted to start the process again.

All burrows (including side burrows) will be excavated to their endpoints and the excavation will then be backfilled, brought back to grade, and compacted using the same equipment that was used for excavation. It should be noted that some small mammal burrows (particularly California ground squirrel burrows) can be up to 30 feet in length and have associated side tunnels that are also substantial in length. Hence, the use of other techniques such as fiber optic scopes are ineffective in clearing burrows that are more than approximately five feet in length or that have side tunnels. However, scopes may be used to examine burrows prior to excavation to identify wildlife that may be encountered during excavation procedures.

Atypical refugia will be addressed separately during scheduled demolition of the structure(s). However, it is recommended that such demolition occur when adjacent burrow excavations are scheduled. A Project Biologist will be in attendance during the demolition to monitor for CTS.

If a burrow or atypical refugium is found to be occupied by CTS, the individual(s) present will be captured and relocated in accordance with this Plan. Giant kangaroo rats and San Joaquin antelope squirrels found during burrow excavations will be relocated consistent with the *Panoche Valley Solar Giant Kangaroo Rat Relocation Plan* and *Panoche Valley Solar San Joaquin Antelope Squirrel Relocation Plan* respectively. Other special-status species found during burrow excavations (e.g., San Joaquin kit fox, American badger, burrowing owl, etc.) will be allowed to passively leave the burrow and relocate to other adjacent habitat.

## Relocation Procedures

The relocation procedures in this Plan are based on the best available scientific information on CTS and other similar species. It should be noted that relocation plans for other projects often

moved CTS to locations as much as 1,000 feet from the location of capture with no consideration for how individuals navigate to their breeding or natal pond. However, CTS, as well as other *Ambystoma* spp. that breed in seasonal ponds, tend to move unidirectionally when dispersing or migrating. As such, any relocation that moves the individual off of its bearing may preclude it from moving to and finding its breeding or natal pond. Individuals that are unable to move to and find a suitable breeding pond are then likely lost as part of the local breeding population. The following relocation procedures considers how CTS are known to move across (i.e., navigate) the landscape.

- Bare hands (only) will be used during capture and handling,
- The Project Biologist will not use soaps, oils, creams, lotions, repellents, or solvents of any sort on their hands within two hours before and during periods when they are capturing and relocating CTS,
- Individuals will not be handled by the tail, head, or limbs,
- The location of capture will be geo-referenced with a GPS unit and the latitude and longitude coordinates will be recorded on a standardized field data sheet,
- The bearing between the capture location and nearest known CTS breeding pond will be determined and recorded on the standardized field data sheet,
- Containers used for holding or transporting individuals (generally 2-gallon buckets with lids) will not contain any standing water,
- Individuals will not be placed in positions/containers where they may physically contact other individuals,
- Captured individuals will be kept moist and cool in a bucket containing a damp sponge that is shaded from direct sun exposure,
- Captured individuals will be relocated to a suitable small mammal burrow outside the work area on the same bearing with the nearest known CTS breeding pond,
- Multiple captured individuals will not be released to the same repository, and
- Upon release of an individual it will be monitored by the Project Biologist until it is determined that it is in no imminent danger.

## Documentation and Reporting

All observations of federally-listed species within the work area will be recorded on California Natural Diversity Data Base (CNDDB) field data sheets and sent to the CDFW within 14 calendar days of the occurrence. Any harm, injury, or mortality (i.e., "take") of these species will be reported via phone and email to the USFWS and CDFW within 24 hours of the incident. The Designated Biologist will submit a pre-construction compliance report to the USFWS and CDFW documenting the excavation and backfill of all suitable burrows for CTS as well as relocation of individuals within 30 calendar days of completion of pre-construction CTS clearance activities. The report shall detail:

i. dates that pre-construction clearance activities occurred;

ii. pertinent information regarding the success of the Project in implementing the plan's avoidance and minimization measures;
iii. an explanation of failure to successfully implement such measures (if any);
iv. occurrences of incidental take of listed species (if any); and
v. other pertinent information.

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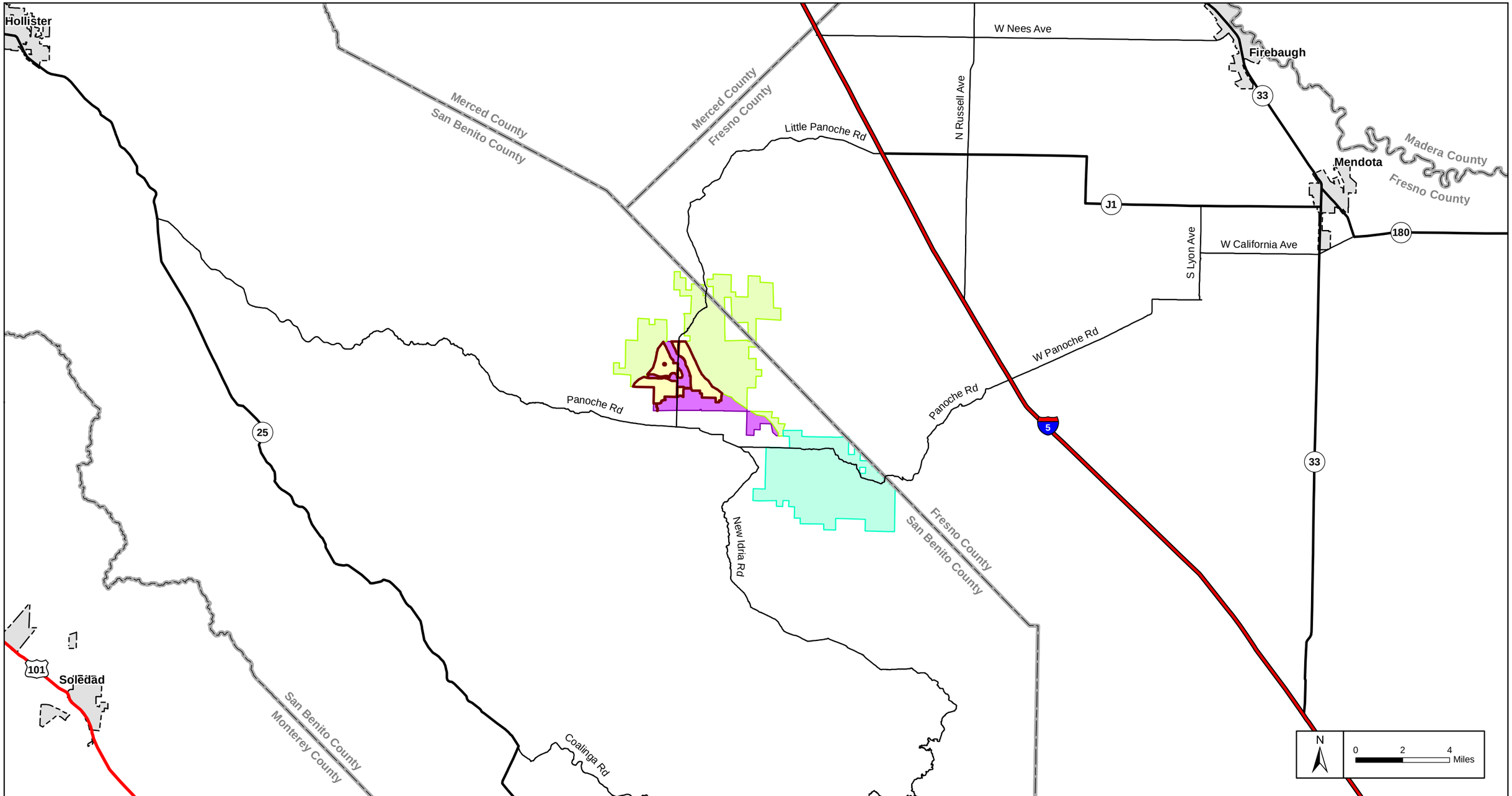


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**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands
- City

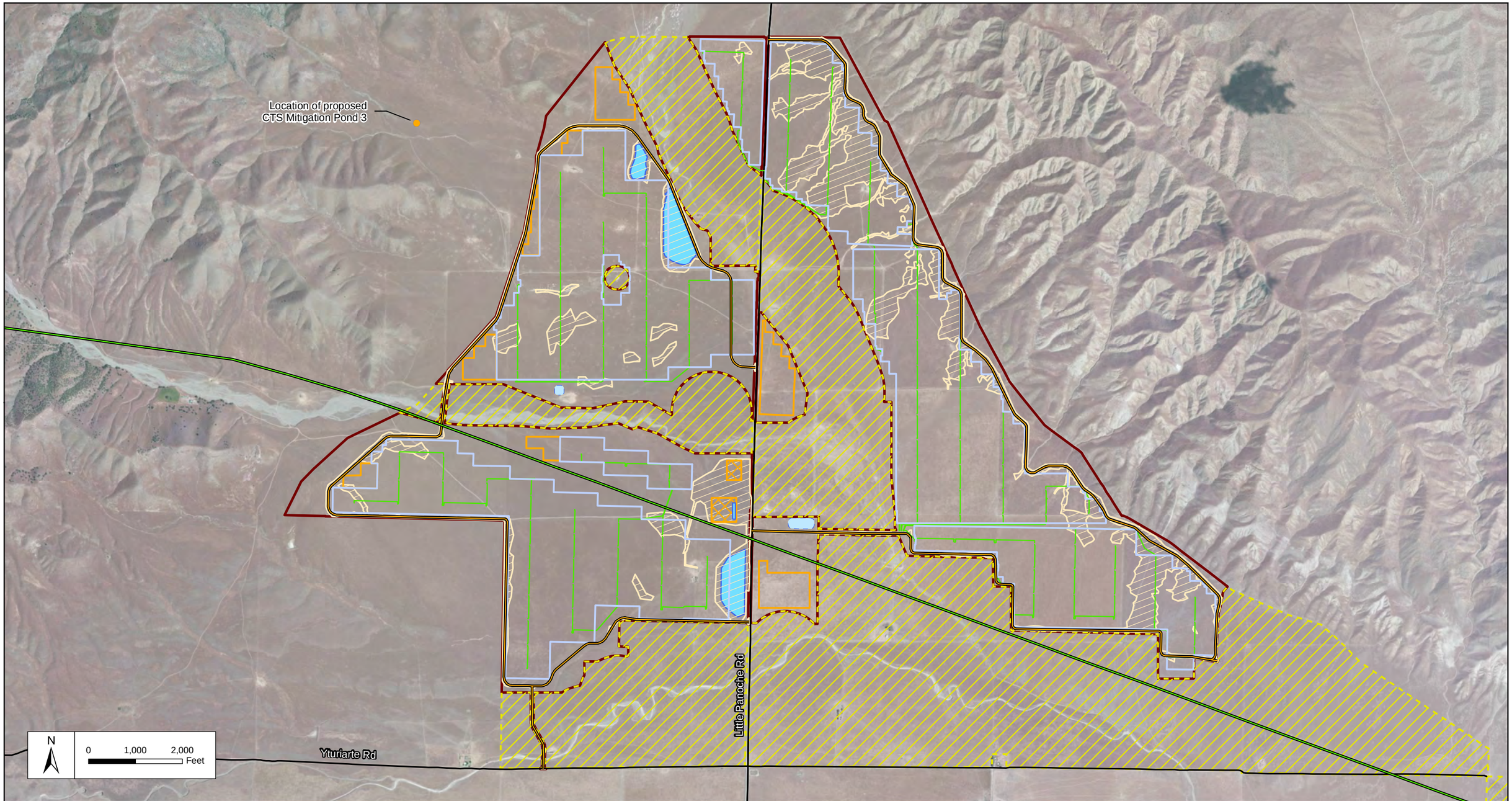
# Panoche Valley Solar Project

## Project Location

FIGURE

1

JH 2015-03-04

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**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Grading Area
- Proposed Panel Block
- Substation/Switchyard
- Laydown Yard
- Detention Pond
- Existing Transmission Line
- Perimeter Road
- AC Block Feeder
- Temporary Water Pond

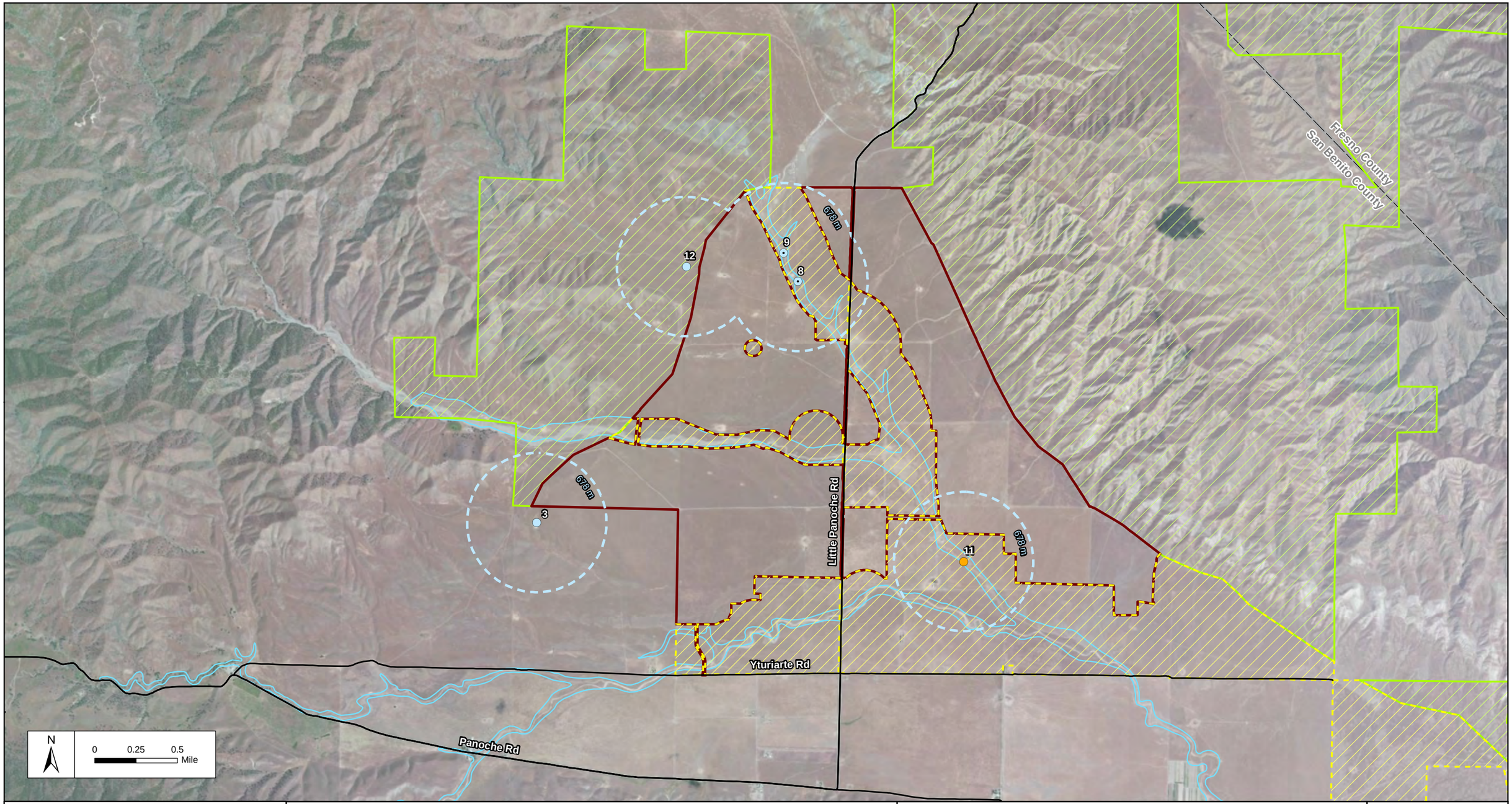
# Panoche Valley Solar Project

## Proposed Layout

FIGURE

2

JH 2015-03-11

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**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Historic CTS Breeding Pond
- Known CTS Breeding Pond
- Potential CTS Breeding Pond
- CTS Pond Buffer
- 100-Year Floodplain

# Panoche Valley Solar Project

## California Tiger Salamander Ponds with Buffers

FIGURE

3

JH 2015-03-16

# TECHNICAL MEMORANDUM

**TO:** James McRacken, Senior Biologist, Energy Renewal Partners

**FROM:** Michael Bumgardner, Bumgardner Biological Consulting

**SUBJECT:** Response to California Department of Fish and Wildlife Comment Related to Cal. Code Regs., tit. 14, § 783.2, subd. (a)(5) and the Incidental Take Permit Application (2081-2014-035-04) for the Panoche Valley Solar Farm

**DATE:** March 30, 2015

In regards to the February 9, 2015 comment from the California Department of Fish and Wildlife (CDFW) related to Cal. Code Regs., tit. 14, § 783.2, subd. (a)(5) and the *Incidental Take Permit Application (2081-2014-035-04) for the Panoche Valley Solar Farm* please see the following response. The comment reads as follows: "This section requires an analysis of whether and to what extent the project or activity for which the permit is sought could result in the taking of species to be covered by the permit. This section is incomplete because the Application does not describe all of the impacts to California tiger salamander (CTS). The Application discusses a stormwater detention basin east of one of the ponds, but the location of that detention basin is not disclosed. In addition, the Application does not quantify the types and extent of ground disturbances proposed in uplands occupied by the CTS. Lastly, the Application maps only a 1,969-ft buffer around breeding ponds and discusses impacts within only 2,300 feet (ft.) of the ponds. The Application bases the analysis on outdated estimates of upland habitat use by CTS. In 2011, Searcy and Shaffer estimated that 95% of a CTS population's reproductive value is within 6,125 ft. of the breeding pool, 90% is within 4,925 ft., and 50% is within 1,844 ft. CDFW considers those to be the best available estimates and should be the basis for assessing impacts and developing mitigation measures. Please map, describe the sources of, and quantify all proposed ground disturbances within each of the three buffer distances described by Searcy and Shaffer."

Use of the Searcy and Shaffer calculated CTS migration distances within which 50%, 90%, and 95% of the reproductive value of a breeding pond should be found, would result in the percentages and total acreage of available upland habitat reflected in Table 1 being adversely affected for the four identified CTS breeding ponds (i.e., known and historic ponds) if all underlying assumptions related to the calculation of the distance thresholds (as determined for the Jepsom Prairie Preserve) are also applicable to the Panoche Valley.

**TABLE 1. ACRES OF CTS ESTIVATION HABITAT AFFECTED BY THE PROJECT (BASED ON SEARCY & SHAFFER CALCULATED MIGRATION THRESHOLDS)**

| | Project Footprint | | Conservation Lands | | Private Land | |
|---|---|---|---|---|---|---|
| **Buffer** | **Acres** | **Percent** | **Acres** | **Percent** | **Acres** | **Percent** |
| 0 - 562 meters | 265.4 | 33.0% | 352.6 | 43.9% | 185.9 | 23.1% |
| 562 - 1501 meters | 914.2 | 25.6% | 1391.3 | 39.0% | 1266.1 | 35.4% |
| 1501 - 1866 meters | 312.5 | 17.3% | 801.0 | 44.5% | 688.3 | 38.2% |
| Cumulative Total | 1492.1 | 24.2% | 2544.9 | 41.2% | 2140.3 | 34.6% |

The Searcy and Shaffer (2011) model appears to be relatively robust when compared to the available data regarding CTS migration distances at other locations (e.g., Hastings Natural History Reservation in Monterey County, California). However, the Panoche Valley is drier (at the driest end of the spectrum for CTS) and has fewer potential movement nights during the CTS breeding season (based on the 2 millimeter (mm) rainfall threshold for CTS movement) than Jepsom Prairie Preserve and other sites addressed by Searcy and Shaffer (i.e., approximately 23% of the mean number of potential movement nights during immigration that were identified for Jepsom Prairie Preserve from 2005 to 2010) (see Table 2). As such, CTS in the Panoche Valley would be expected to move shorter total distances given fewer nights when there are suitable conditions for movement. Though there is no empirical data from the Panoche Valley to support this hypothesis, discussion with Christopher Searcy (personal communication, February 25 and 26, 2015) found no flaws in this logic.

Table 2 reflects rainfall data from the Panoche 2w weather station that is archived at the Western Regional Climate Center (http://www.wrcc.dri.edu/summary/Climsmcca.html). Specifically, Table 2 reflects the number of days per month for the months November through February from the years 1950-2014 in which cumulative rainfall for the day was 2 mm or greater (i.e., the threshold from the Searcy and Shaffer model for CTS movement). The Panoche 2w weather station is located at latitude/longitude 36.6066°/-120.8841° at the south end of the Panoche Valley (within a couple miles of the Project). Analysis of the data set for the years 1950-2014 and 2004-2014 resulted in the estimates of the mean number of potential movement days during immigration (inbound) and emigration (outbound) that are reflected in Table 3.

**TABLE 2. NUMBER OF DAYS WITH MINIMUM 2 MM RAINFALL AT PANOCHE 2W WEATHER STATION**

| Breeding Season | November | December | January | February |
|---|---|---|---|---|
| 1950-1951 | 4 | 4 | 3 | 2 |
| 1951-1952 | 2 | 9 | 9 | 2 |
| 1952-1953 | 3 | 10 | 3 | 0 |
| 1953-1954 | 0 | 1 | 5 | 2 |
| 1954-1955 | 2 | 4 | 5 | 3 |
| 1955-1956 | 3 | 8 | 8 | 2 |
| 1956-1957 | 0 | 1 | 5 | 5 |
| 1957-1958 | 2 | 4 | 4 | 7 |
| 1958-1959 | 1 | 1 | 3 | 7 |
| 1959-1960 | 0 | 1 | 3 | 7 |
| 1960-1961 | 5 | 1 | 2 | 1 |
| 1961-1962 | 4 | 3 | 6 | 10 |
| 1962-1963 | 0 | 1 | 2 | 4 |
| 1963-1964 | 3 | 1 | 2 | 0 |
| 1964-1965 | 6 | 7 | 5 | 1 |
| 1965-1966 | 4 | 4 | 1 | 2 |
| 1966-1967 | 6 | 5 | 4 | 0 |
| 1967-1968 | 4 | 5 | 3 | 4 |
| 1968-1969 | 5 | 5 | 10 | 9 |
| 1969-1970 | 1 | 3 | 10 | 3 |
| 1970-1971 | 6 | 7 | 2 | 1 |
| 1971-1972 | 1 | 4 | 1 | 1 |
| 1972-1973 | 5 | 4 | 7 | 11 |
| 1973-1974 | 4 | 5 | 4 | 0 |
| 1974-1975 | 1 | 3 | 0 | 9 |
| 1975-1976 | 0 | 0 | 0 | 6 |
| 1976-1977 | 3 | 2 | 5 | 1 |
| 1977-1978 | 2 | 6 | 8 | 8 |
| 1978-1979 | 2 | 1 | 10 | 7 |
| 1979-1980 | 2 | 4 | 9 | 10 |
| 1980-1981 | 0 | 1 | 5 | 4 |
| 1981-1982 | 6 | 3 | 6 | 2 |
| 1982-1983 | 7 | 4 | 8 | 8 |
| 1983-1984 | 6 | 6 | 2 | 2 |
| 1984-1985 | 6 | 6 | 3 | 2 |

| Breeding Season | November | December | January | February |
|---|---|---|---|---|
| 1985-1986 | 7 | 2 | 3 | 8 |
| 1986-1987 | 1 | 3 | 5 | 6 |
| 1987-1988 | 3 | 5 | 3 | 2 |
| 1988-1989 | 2 | 6 | 3 | 2 |
| 1989-1990 | 1 | 0 | 3 | 5 |
| 1990-1991 | 1 | 3 | 2 | 4 |
| 1991-1992 | 1 | 4 | 3 | 7 |
| 1992-1993 | 0 | 7 | 11 | 10 |
| 1993-1994 | 3 | 2 | 3 | 6 |
| 1994-1995 | 5 | 3 | 17 | 3 |
| 1995-1996 | 0 | 7 | 6 | 11 |
| 1996-1997 | 2 | 7 | 12 | 0 |
| 1997-1998 | 9 | 5 | 10 | 10 |
| 1998-1999 | 4 | 3 | 7 | 3 |
| 1999-2000 | 1 | 0 | 8 | 11 |
| 2000-2001 | 1 | 1 | 6 | 7 |
| 2001-2002 | 3 | 8 | 3 | 1 |
| 2002-2003 | 2 | 7 | 1 | 5 |
| 2003-2004 | 1 | 6 | 3 | 5 |
| 2004-2005 | 2 | 5 | 3 | 7 |
| 2005-2006 | 0 | 0 | 0 | 0 |
| 2006-2007 | 2 | 5 | 3 | 7 |
| 2007-2008 | 1 | 3 | 9 | 6 |
| 2008-2009 | 2 | 3 | 4 | 8 |
| 2009-2010 | 0 | 6 | 6 | 7 |
| 2010-2011 | 5 | 13 | 3 | 6 |
| 2011-2012 | 3 | 1 | 2 | 3 |
| 2012-2013 | 0 | 0 | 0 | 0 |
| 2013-2014 | 2 | 1 | 1 | 6 |
| Totals (1950-2014) | 170 | 250 | 303 | 299 |
| Average per Month (1950-2014) | 2.7 | 3.9 | 4.7 | 4.7 |
| Totals (2004-2014) | 17 | 37 | 31 | 50 |
| Average per Month (2004-2014) | 1.7 | 3.7 | 3.1 | 5 |

**TABLE 3. MEAN DAYS WITH AT LEAST 2 MM RAINFALL FOR THE IDENTIFIED PERIODS IN THE PANOCHE VALLEY[1, 2]**

| Data Period | Mean Potential CTS Movement Days |
|---|---|
| 1950 - 2014 | |
| Immigration (Nov 1 – Dec 15) | 4.7 |
| Emigration (Jan 16 – Feb 28) | 7.1 |
| 2004 - 2014 | |
| Immigration (Nov 1 – Dec 15) | 3.6 |
| Emigration (Jan 16 – Feb 28) | 6.6 |

Notes:

1 Similar to the Searcy and Shaffer (2011) model, it is assumed that most if not all CTS in the Panoche Valley are at the breeding ponds and not moving during approximately Dec 16 – Jan 15).

2 The calculation of mean number of potential movement nights for immigration (for each period of record) is calculated as the sum of the mean number of potential movement nights for November and 50% of the mean number of potential movement nights for December. The calculation of mean number of potential movement nights for emigration (for each period of record) is calculated as the sum of the mean number of potential movement nights for February and 50% of the mean number of potential movement nights for January.

Unless the CTS within the Panoche Valley are behaving in a manner that is different from the CTS populations that have been studied elsewhere in California, the available data suggests that individuals in the Panoche Valley are moving away from their breeding ponds no more than 678 m (2,223 ft.). This latter maximum migration distance corresponds to Searcy and Shaffer's ecophysiological maximum migration distance (calculated as the maximum sustainable migration rate [188.2 m/night] x maximum number of suitable movement nights [a mean of 3.6 nights during the CTS breeding seasons of the most recent 10-year period of record] where the number of available suitable movement nights during either immigration or emigration (whichever was smaller) was chosen as the maximum number of suitable movement nights for both immigration and emigration). This calculation suggests that virtually all CTS in the Panoche Valley should be located within 678 m (2,223 ft.) of the identified breeding ponds. If CTS in the Panoche Valley are behaving differently (i.e., in a way that allows them to migrate further than the above calculated ecophysiological maximum migration distance), the model and its assumptions should be considered insufficiently robust to apply to this location. As such, it is my opinion that the most applicable distance threshold for CTS in the Panoche Valley is 678 m (2,223 ft.) from the identified breeding ponds (i.e., the distance in which virtually all CTS in the Panoche Valley should be found). This distance is consistent with the Searcy and Shaffer (2011) model and

its assumptions, while the calculated migration distances associated with the 50%, 90%, and 95% population thresholds that were determined for the Jepsom Prairie Preserve are likely not (given the substantially fewer number of suitable movement nights in the Panoche Valley).

Use of the ecophysiological maximum migration distance, as determined for CTS in the Panoche Valley, results in a more defensible estimate of the CTS estivation habitat that is associated with the Project Footprint, dedicated conservation lands, and adjacent private land. For ease of use when implementing in-field avoidance and minimization measures related to CTS, the buffer within which the entire CTS population of the ponds should be found has been extended from 678 m to 700 m (see Table 4).

**TABLE 4. ACRES OF CTS ESTIVATION HABITAT AFFECTED BY THE PROJECT (BASED ON ECOPHYSIOLOGICAL MAXIMUM MIGRATION THRESHOLD FOR PANOCHE VALLEY)**

| | **Project Footprint** | | **Conservation Lands** | | **Private Land** | |
|---|---|---|---|---|---|---|
| **Buffer** | **Acres** | **Percent** | **Acres** | **Percent** | **Acres** | **Percent** |
| 0 - 700 meters | 389.3 | 33.3% | 485.7 | 41.6% | 292.4 | 25.0% |
| 0 - 1000 meters | 659.7 | 30.7% | 844.0 | 39.3% | 642.2 | 29.9% |
| 0 - 1900 meters | 1524.2 | 24.0% | 2616.9 | 41.2% | 2210.8 | 34.8% |

However, due to uncertainties in regards to the efficacy of the Searcy and Shaffer (2011) model as it relates to CTS in the Panoche Valley (mostly due to the lack of empirical data to validate the model), a conservative approach to CTS avoidance and minimization has been taken in regards to the Panoche Valley Solar Facility Project (see *March 2015 California Tiger Salamander Pre-Construction Avoidance and Minimization Plan for the Panoche Valley Solar Facility Project San Benito County, California*). This approach involves conducting burrow excavations where ground-disturbing activities are proposed within the Project Footprint to salvage and relocate CTS individuals within an additional 300 m beyond the 700 m threshold predicted by the model (Searcy and Shaffer 2011) (i.e., two contiguous 150 m concentric rings). If no CTS are found within the additional 300 m (1,000 m from the known breeding pond), no additional burrow excavations will be conducted. However, if CTS are found within one or more of the 150 m rings within the Project Footprint, additional burrow excavation will occur until there have been two contiguous 150 m rings with no documented CTS occurrences. Under no circumstances will burrow excavations extend beyond 1,900 m from an identified CTS breeding pond (i.e. the distance roughly correlated to the 1,866 m found by Searcy and Shaffer to correspond to the 95% population threshold at

the Jepsom Prairie Preserve in Solano County, California). Using the 1,000 m and 1,900 m thresholds, the amount of CTS estivation habitat associated with the Project Footprint, the dedicated conservation lands, and adjacent private land has been provided in Table 4. It should be noted that the 1,900 m threshold is considered a "worst case" for CTS mitigation implementation, while the 1,000 m threshold is considered the "best case" for CTS mitigation implementation.

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Searcy, C. A., and H. B. Shaffer. 2011. Determining the migration distance of a vagile vernal pool specialist: How much land is required for conservation of California tiger salamanders? Pages 73-87 in D. G. Alexander and R. A. Schlising (Editors), Research and Recovery in Vernal Pool Landscapes. Studies from the Herbarium, No. 16. California State University, Chico, CA.

# Eagle Conservation Plan

Panoche Valley Solar Energy Project

San Benito County, California

August 2015

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ACP | Advanced Conservation Practice |
| amsl | Above mean sea level |
| APLIC | Avian Power Line Interaction Committee |
| BGEPA | Bald and Golden Eagle Protection Act |
| BMPs | Best Management Practices |
| CDFW | California Department of Fish and Wildlife |
| CEC | California Energy Commission |
| CESA | California Endangered Species Act |
| CFR | Code of Federal Regulations |
| County | San Benito County |
| Guidance | Eagle Conservation Plan Guidance Module 1 – Land-based Wind Energy Version 2 Guidance |
| ECP | Eagle Conservation Plan |
| EIS | Environmental Impact Statement |
| ˚F | Fahrenheit |
| FR | Federal Regulation |
| GPS | global positioning system |
| km | kilometer |
| $km^2$ | square kilometer |
| MBTA | Migratory Bird Treaty Act |
| MW | megawatts |
| PG&E | Pacific Gas and Electric Company |
| Project Footprint | The portion of the Proposed Project that includes the solar arrays and associated roads and equipment, totaling 2,506 acres. |
| Proposed Project | Panoche Valley Solar Project |
| PVS | Panoche Valley Solar, LLC |
| SCRCL | Silver Creek Ranch Conservation Lands |
| UDA | Utilization Distribution Assessment |
| USACE | U.S. Army Corps of Engineers |
| USC | United States Code |
| USFWS | U.S. Fish Wildlife Service |
| UTM | Universal Transverse Mercator |
| VFCL | Valley Floor Conservation Lands |
| VRCL | Valadeao Ranch Conservation Lands |

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# 1.0 INTRODUCTION

## 1.1 Corporate Policy

Panoche Valley Solar, LLC (PVS) is committed to implementing feasible measures to avoid and minimize eagle mortality associated with construction, operation, and maintenance of the Panoche Valley Solar Facility (the Project) on Bald Eagles (*Haliaeetus leucocephalus*) and Golden Eagles (*Aquila chrysaetos*). These measures include but are not limited to siting considerations, panel design, best management practices, avoidance and minimization measures, potential incorporation of safety features into appurtenant facilities (e.g., transmission lines), compensatory mitigation, and adaptive management measures.

## 1.2 Regulatory Setting

### *1.2.1 Bald and Golden Eagle Protection Act*

The Bald and Golden Eagle Protection Act (BGEPA) is the primary law protecting eagles. The BGEPA (16 USC 668-668c) protects Bald and Golden Eagles by prohibiting the taking, possession, and commerce of such birds and establishes civil penalties for violation of this Act. BGEPA defines the action of "take" to include "pursue, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb," and prohibits take of individuals and their parts, nests, or eggs. The United States Fish and Wildlife Service (USFWS) expanded this definition by regulation to include the term "destroy" to ensure that "take" includes destruction of eagle nests. The term "disturb" is further defined by regulation as "to agitate or bother a Bald or Golden Eagle to a degree that causes, or is likely to cause, injury to an eagle, a decrease in productivity, or nest abandonment" (50 Federal Regulation [FR] 22.3).

The BGEPA is the primary federal authority charged with the management of Bald and Golden Eagles in the United States (U.S.). USFWS guidance on the applicability of current Eagle Act statutes and mitigation is currently under review. On November 10, 2009 the USFWS implemented new rules (74 FR 46835) governing the "take" of Golden and Bald Eagles. The new rules were released under the existing BGEPA which has been the primary regulation protection for eagle populations since 1940. All activities that may disturb or incidentally take an eagle or its nest as a result of an otherwise legal activity must be permitted by the USFWS under this act. The definition of "disturb" (72 FR 31132) includes "interfering with normal breeding, feeding, or sheltering behavior to the degree that it causes or is likely to cause decreased productivity or nest abandonment."

### *1.2.2 Migratory Bird Treaty Act*

The Federal Migratory Bird Treaty Act (MBTA) (Title 16 USC 703) prohibits killing, possessing, or trading in migratory birds except in accordance with regulations prescribed by the Secretary. This Act encompasses migratory birds which includes eagles, hawks, and owls, their occupied nests, and their eggs (16 USC 703; 50 Code of Federal Regulations [CFR] 21, 50 CFR 10). Most actions that result in taking of or the permanent or temporary possession of a protected species constitute violations of the MBTA. The MBTA also prohibits destruction of occupied or active (presences of eggs or young) nests. The Migratory Bird Permit Memorandum dated April 15, 2003, clarifies that destruction of most unoccupied bird nests is permissible under the MBTA; exceptions include nests of federally listed threatened or endangered migratory birds, colonial nesting species, Bald Eagles, and Golden Eagles. The USFWS is responsible for overseeing compliance with the MBTA.

### *1.2.3 National Environmental Policy Act*

NEPA is an act of Congress established to ensure that the environmental impacts of any federal action are fully considered and that appropriate steps are taken to mitigate potential environmental impacts. An Environmental Impact Statement (EIS) is being prepared for the Project in compliance with NEPA in order to analyze and disclose the potential impacts of the Project. The U.S. Army Corps of Engineers (USACE) is the lead agency responsible for preparing the EIS.

### *1.2.4 California Endangered Species Act*

The California Endangered Species Act (CESA) of 1970 states that all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation, will be protected or preserved. The CESA prohibits the take (hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill) of species listed under CESA. In addition, California Fish and Game Code Subsections 3503, 3503.5, and 3800 prohibit the possession, incidental take, or needless destruction of eagles and other birds, as well as their nests and eggs. California Fish and Wildlife Code Section 3511 lists birds including the Golden Eagle, that are "fully protected" as those that may not be taken or possessed except under specific permit.

## 1.3 Purpose of the Eagle Conservation Plan

PVS has prepared this Eagle Conservation Plan (ECP) to ensure that feasible avoidance and minimization measures are implemented into Project design, operation, and maintenance and that the Project remains in compliance with BGEPA requirements. This plan focuses primarily on Golden Eagles since there have been no historical or present sighting of Bald Eagles in the vicinity of the Project and no foraging or nesting habitat for the Bald Eagle exists within the Project Footprint.

Measures particularly relevant to Golden Eagles include avoiding artificial increases of the mammalian prey base, selecting a project site that does not support high-density eagle populations, and establishing standard setbacks from nest sites.

This ECP has been prepared to establish measures to be implemented by the Project that are "compatible with the preservation of the Bald Eagle and the Golden Eagle" as set forth in the Guidance (U.S. Fish and Wildlife Service 2013). The emphasis of the current guidance from the USFWS (e.g. *Eagle Conservation Plan Guidance Module 1 – Land-based Wind Energy Version 2*) is directed toward the establishment of new wind power projects[1], addressing the importance of siting these wind power projects at certain minimum distances from Golden Eagle use areas. There is currently no guidance modules directed toward the establishment of new solar power project; therefore this plan follows the guidance provided under wind power projects; however, not all guidelines apply to solar project. Although the Project does not include wind energy generation, PVS has agreed to establish an ECP for the Project to demonstrate compliance with the BGEPA and reduce any risk of potential injury or take. This compliance with the BGEPA comes in the form of:

[1]Important to note that guidelines are established for land based wind development and not designed for solar projects; however, wind guidelines are being applied which, in some cases, may not be applicable when calculating avian risks for solar projects.

- Conducting early pre-construction assessments to identify important eagle use areas potentially within the Project Footprint and surrounding Conservation Lands;
- Analyzing the pre-construction studies to estimate potential impacts on eagles;
- Avoiding and minimizing potential adverse effects to eagles due to the construction and operation of the Project; and
- Monitoring for impacts to eagles during the construction and operation of the solar facility.

## 1.4 Contents of this Eagle Conservation Plan

As stated above, this ECP has been developed in accordance with requirements set forth in the Eagle Conservation Plan Guidance Module 1 – Land-based Wind Energy Version 2 Guidance (the Guidance) (USFWS 2013) as no guidance model currently exists for solar power projects. The Guidance focuses on the development of ECPs in five stages, with each stage building on the prior stage. These stages include:

- Stage 1 – Site Assessment
- Stage 2 – Site-Specific Surveys and Assessment
- Stage 3 – Predicting Eagle Fatalities
- Stage 4 – Avoidance and Minimization of Risk Using Advanced Conservation Practices and Other Conservation Measures, and Compensatory Mitigation, and
- Stage 5 – Updating of the Fatality Prediction and Continued Risk-Assessment

A Stage 1 assessment will assist in the determination of whether the Project demonstrates any risk for Golden Eagles and will provide important information that will be used to determine what studies need to be completed during the Stage 2 assessment.

A Stage 2 study will assist in the identification of eagle use areas or migration concentration sites that could be affected by the Project and also assess the likelihood of disturbance or "take" of eagles. Out of the four types of surveys recommended for assessing risk to eagles at proposed projects, three were utilized for the Project.

As part of the Stage 2 assessment, on June 13, 2013, PVS initiated a conference call with the USFWS-Ventura office concerning the requirement to prepare an Eagle Conservation Plan (ECP) for the Project. PVS also asked if it could proceed with the ECP using the Golden Eagle survey data provided in the FEIR in 2010 (i.e., 15 nests within 10 miles of the project and project site use). During the conversation, the USFWS stated that while the 2010 nesting survey data helps elucidate the regional Golden Eagle nesting and use information, the study would be considered out dated, insufficient in the coverage area, and the study was conducted too late in the season (i.e., after the nesting season). The USFWS recommended that PVS conduct the following "Stage 2" (USFWS 2013) site-specific surveys in anticipation of ECP preparation:

- Point Count Surveys (i.e., fixed-radius circular plot surveys) within the Project Footprint and Conservation Lands. These Point Count Surveys were conducted during the summer, fall, and winter of 2013/2014 (Appendix A, Figures 4-6);

- Utilization Distribution Assessment within the Project Footprint and the Valley Floor Conservation Lands (VFCL). This study was conducted during the summer, fall, and winter of 2013/2014 (Appendix B); and

- Updated aerial survey of project-area nesting population including the location and number of occupied eagle nests. This survey was completed in January-March 2014, before leaf-on of the trees to assist in the identification of eagle nests. This updated survey would augment the Project's nest survey work conducted in 2010.

Therefore following the recommendations of the USFWS, the three surveys of eagles used within the Project Footprint included: (1) point count surveys; (2) utilization distribution assessment (UDA), which provided use intensity within the Project Footprint; and (3) surveys of nesting territory occupancy in the Project vicinity.

Stage 3 utilizes the data from Stage 2 to predict any risk associated with eagles by the Project. The assessment of risk can compare construction type (solar or wind energy), alternative siting, construction, and operational scenarios. Also included in this stage is the evaluation of whether a "disturbance take" is likely, and if so, how much disturbance is anticipated.

Stage 4 of this ECP will describe how the information gathered in the previous stages will be used to determine potential conservation measures and advanced conservation practices (ACPs) if necessary, to avoid or minimize any risk of impacts on eagles within the Project Footprint.

Stage 5 of this ECP will discuss, if deemed necessary, the need for conducting post-construction surveys that could be compared to the pre-construction surveys. Additionally, if necessary, this plan will also discuss the need for the Project to conduct post-construction monitoring to collect data that could be compared with the pre-construction findings for any potential disturbances or any related eagle fatalities.

In addition, if any monitoring is necessary in Stage 5, PVS will use this data to assess whether compensatory mitigation is necessary and adequate, and explore any operational changes that might be warranted at the solar project.

# 2.0 PROJECT INFORMATION

## 2.1 Project Location

The Project is located near the intersection of Panoche Road and Little Panoche Road, in eastern San Benito County and western Fresno County. The Project Footprint is located approximately two miles north of the intersection of Panoche Road and Little Panoche Road. This location is approximately two miles southwest of the Fresno County Line and the Panoche Hills, and approximately 15 miles west of Interstate 5 and the San Joaquin Valley. The Project Footprint would be located within Township 15S, Range 10E, Sections 3-4, 8-11, and 13-16 of the United States Geologic Survey's Cerro Colorado, Llanada, Mercy Hot Springs, and Panoche 7.5-minute topographic quadrangle maps.

In addition to the Project Footprint, the Conservation Lands associated with the Proposed Project are located within Township 15S, Range 10E, Sections 3-4, 8-10, 13-16, and 25; Township 15S, Range 11E, Section 19; Township 14S, Range 10E, Sections 21-27, and 32-36; Township 14S, Range 11E, Sections 19, and 29-32; Township 15S, Range 10E, Sections 1-8, and 10-14; Section 15S, Township 11E, Sections 6-7, 19-20, and 26-36; and Township 16S, Range 11E, Sections 1-6, and 8-12.

The Project Footprint is bordered by rangeland to the north and south, by the Gabilan Range to the west, and by the Panoche Hills to the east. The Project Footprint elevation ranges from approximately 1,200 feet above mean sea level (amsl) near the southeastern end of the project site to approximately 1,400 feet amsl near the western end of the project site. The Project Footprint was historically used for crop production, but during the past forty years the Project Footprint has been used for cattle grazing.

The Project area experiences a Mediterranean type climate with dry hot summers and cool wet winters. However, this region does not experience heavy rainfall. Annual precipitation in the general vicinity of the site ranges from eight to ten inches per year. Approximately 85 percent of precipitation falls between October and March. Temperatures average approximately 80 degrees Fahrenheit (˚F) in the summer and 40˚F in the winter, mid-summer temperatures are often over 100˚F, and winter lows can be close to freezing. Nearly all precipitation infiltrates into the site's soils and flows in creeks and drainages when soil capacity has been reached.

Panoche Creek and Las Aquilas Creek run between portions of the Project Footprint but are contained entirely within the Valley Floor Conservation Lands (Figure 2, Appendix A). They are ephemeral creeks that are dry in the summer. Smaller washes and drainages feed these larger creeks. The Project site supports several seasonally flooded pools and stock ponds, predominantly in the northern portion of the Project Footprint along unnamed washes. Habitat for aquatic species and breeding habitat for amphibians within the Project Footprint is limited to the stock ponds and ephemeral pools.

There is no urban development on the Project site or surrounding area. Two ranching communities are located within the Panoche Valley, Panoche and Llanada. Both communities are within two miles of the Project Footprint creating human disturbances that could also be a factor in no identified nest sites within two miles of the Proposed Project site. The nearest rural community is Firebaugh, approximately 15 miles from the perimeter of the Project Footprint.

Prominent grass species within the Project Footprint include ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), red brome (*Bromus madritensis*), foxtail barley (*Hordeum murinum* ssp. *leporinum*), and rat-tail fescue (*Vulpia myuros*). Dominant forbs included broad-leaved filaree (*Erodium botrys*), red-stemmed filaree (*Erodium cicutarium*), shining peppergrass (*Lepidium nitidum* var. *nitidum*), and vinegarweed (*Trichostema lanceolatum*). Fiddleneck (*Amsinckia menziesii*), devils lettuce (*Amsinckia tessellata*), shepherds purse (*Capsella bursa-pastoris*), turkey mullein (*Eremocarpus setigerus*), and bur clover (*Medicago polymorpha*) were also common, especially along ranch roads. Areas which have not been previously disturbed by grazing or historic cultivation also include a variety of native wildflowers such as blow wives (*Achyrachaena mollis*), blue dicks (*Dichelostemma capitatum*), California gold fields (*Lasthenia californica*), yellow daisy tidy-tips (*Layia platyglossa*), and California creamcups (*Platystemon californicus*).

## 2.2 Project Description

PVS proposes to construct and operate a 247 MW solar photovoltaic (PV) energy generating facility located in San Benito County, California (Figure 1, Appendix A). The Project Footprint consists of approximately 2,506 acres in the Panoche Valley of eastern San Benito County, California. The Project includes construction and operation of the PV solar array complexes, an operations and maintenance (O&M) building, perimeter roads including emergency access and egress, electricity collection lines, DC-AC inverters, an electrical substation and switching station, Pacific Gas & Electric (PG&E) telecommunication upgrades, and decommissioning of the Project. The Project also includes the permanent preservation and management of high quality Conservation Lands that are contiguous with the Project Footprint which will be protected in perpetuity (Figure 3, Appendix A). Additional information and Project Description can be found in the Project's 2015 Final Supplemental Environmental Impact Report (FSEIR).

## 2.3 Conservation Lands

Project Conservation Lands include three areas totaling 24,176 acres that would be preserved in perpetuity for the benefit of the Golden Eagles, as well as many other species of wildlife. The Conservation Lands are described below. The Conservation Lands will be managed under an approved Habitat Management Plan.

**Valley Floor Conservation Lands**

Approximately 2,514 acres of land that is interspersed throughout and adjacent to the Project Footprint would be left undisturbed and designated as the Valley Floor Conservation Land (VFCL). The VFCL are contiguous with the Project Footprint, and primarily consist of the non-native annual grassland habitat found within the Project Footprint with some seasonal ponds and vernal and ephemeral pools, as well as the seasonally dry Panoche and Los Aquilas Creeks (Figure 3, Appendix A). The VFCL also includes the entire 100-year floodplain within the valley floor.

The dominant vegetation in the VFCL includes ripgut brome, soft chess, red brome, foxtail barley, rat-tail fescue, broad-leaved filaree, red-stemmed filaree, shining peppergrass, and vinegarweed. Fiddleneck, devils lettuce, shepherds purse, turkey mullein, and bur clover were also common, especially in disturbed areas. Areas which have not been previously disturbed include a variety of native wildflowers such as blow wives, blue dicks, California gold fields, yellow daisy tidy-tips, and California creamcups.

**Valadeao Ranch Conservation Lands**

The Valadeao Ranch Conservation Lands (VRCL, approximately 10,772 acres) are contiguous with the Project Footprint directly to the west, east, and northeast of the site (Figure 3, Appendix A). These lands are also contiguous with the VFCL and Silver Creek Ranch Conservation Lands (SCRCL). The VRCL include several seasonal drainages. Soils on this site are complex and range from sandy to sandy loam to clay loam to badlands. The VRCL contain approximately 2,945 acres with slopes between 0 and 11 percent. Elevations on the VRCL range from approximately 1,400 feet to 2,100 feet amsl. The property which is currently grazed is dominated by introduced annual grasslands (approximately 6,700 acres), which have a very similar species makeup to the Project Footprint and VFCL. This property also includes ephedra shrubland (approximately 2,700 acres), barrens, and saltbush shrubland. The VRCL will continue to be grazed under an adaptive management plan in line with the Applicant's Habitat Management Plan.

Ephedra shrublands within the VRCL range from nearly pure California ephedra (*E. californica*) stands to highly diverse associations with typical desert shrubs. Occupied habitats occur from lower slopes and valley bottoms to rocky outcrops and alluvial slopes. This 3 to 15 foot tall shrub rarely achieves greater than 10 percent cover (absolute), but the cover provided varies little with soil type, aspect, or grazing pressure. It is generally the only shrub present in the often very broad transition from Ephedra shrublands to introduced annual grasslands.

Plant associations that are noted to occur within the Ephedra shrublands include *Artemisia californica - Senecio flaccidus* scrub, *Eastwoodia elegans - Ephedra californica* scrub, *Ericameria linearifolia - Ephedra californica* scrub, *Ericameria linearifolia - Ericameria nauseosa* scrub, *Ericameria linearifolia - Gutierrezia californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Artemisia californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Ephedra californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Gutierrezia californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Yucca whipplei* scrub, and *Gutierrezia californica - Ephedra californica* scrub. Ephedra shrublands occur in the VRCL portion of Las Aquilas Creek in small patches along ridgelines, steep slopes with a northern aspect, lower slopes, ephemeral drainages, and steep, rocky, and thin-soiled south-facing slopes.

Barrens are ridgelines located in the VRCL that have south or (rarely) west-facing very steep slopes that exhibit a precipitous drop-off in vegetative cover. In terms of vegetation, the assembled species diversity at barrens is very low, nearly all species are relatively short-lived annuals, shrubs and trees are absent, and introduced annual grasses become minor components of the species mix. Barrens most commonly interrupt Introduced Annual Grasslands, where the transition was often observed to occur over the space of several feet. Two plant associations were identified within the barrens: *Erodium cicutarium - Plantago erecta* and *Holocarpha obconica - Vulpia microstachys*.

The saltbush shrubland habitat consists of nearly pure to mixed stands of saltbush (*Atriplex polycarpa*) associations. Occupied habitats range from white clay soils on hills immediately west of Little Panoche Road to rocky outcrops and alluvial slopes experiencing high ground creep rates near ridgelines east of the road. In all observed occurrences on hills, the aspect of greatest saltbush cover is southern. This two to three foot tall shrub also attains dominance within several of the ephemerally flooded washes, where sandier soils are more common. It is always the most common shrub canopy contributor near seasonal springs and seeps that exhibit saline character.

Two plant associations exist on the VRCL: *Atriplex polycarpa - Eriogonum fasciculatum* var. *polifolium* and *Atriplex polycarpa - Isocoma acradenia* var. *bracteosa*. *Atriplex polycarpa - Eriogonum fasciculatum* var.

*polifolium* occurs on slopes, appearing as mainly open ground with scattered shrubs. Shrub canopy closure averages 5 to 10 percent, with scattered clumps of 20 percent closure. Canopy density is greatest on south-facing slopes, where *Eriogonum fasciculatum* is often more prevalent, and on slopes that are steep or slippery enough to exclude grazing. The herbaceous layer is largely absent, resembling barrens that are often present on adjacent slopes of similar aspect. Shrub canopies are confined to wash edges due to trampling by cattle, and average cover rarely exceeds 10 percent.

**Silver Creek Ranch Conservation Lands**

The Silver Creek Ranch Conservation Lands (SCRCL, approximately 10,890 acres), which is currently being grazed with livestock, is located southeast of the Project Footprint (Figure 3 Appendix A). The northwestern-most corner of the proposed SCRCL is contiguous with a portion of the VRCL. Elevations on the SCRCL range from 900 to 2,200 feet amsl. Soils on the SCRCL are less complex than those found on the VRCL and are generally characterized as well drained and moderately permeable. SCRCL contains approximately 5,765 acres with slopes between 0 and 11 percent.

SCRCL are dominated by non-native species (approximately 8,400 acres), with the same species found on the Project Footprint and on the other Conservation Lands distributed sparsely over the landscape. The other major habitats on these Conservation Lands include ephedra shrubland (approximately 2,260 acres) with similar species noted on the VRCL and riparian/wetland habitat.

The riparian habitats occur along the Panoche and Silver Creeks. The Silver Creek riparian vegetation, where it briefly intersects the SCRCL, indicates a seasonally wet, somewhat saline habitat subject to annual or occasional energetic flows. The riparian corridor has become dominated by invasive tamarisk (*Tamarix* sp.). Tamarisk has developed semi-open to impassable stands in a 30 to 100 foot wide corridor. The population extends well off-site, both upstream and downstream. In this area, saltgrass (*Distichlis spicata*) appears to be the native species most tolerant of the soil salinity and groundwater drawdown effects of heavy tamarisk infestation, and often forms meadow-like swards between the tamarisk thickets.

Panoche Creek is a gaining reach as it crosses through the SCRCL. The streambed upstream off the site was observed to be completely dry and largely devoid of plants for at least three miles. Within the surveyed area, this arroyo-like habitat quickly transitions to zonal wetlands characterized by gaseous springs, highly reduced soils, and marsh or meadow vegetation. The Panoche Creek riparian zone, which ranges from 100 feet to 500 feet in width, may provide the only reliable, naturally occurring surface water for much of the year. The dominant plants are consistently arrayed, with vegetation classified as emergent *Typha* marsh (*Typha* Herbaceous Alliance) centrally, *Schoenoplectus americanus* mid-marsh (*Schoenoplectus americanus* Herbaceous Alliance) at the outer saturated edge, and *Distichlis spicata* meadow (*Distichlis spicata* Herbaceous Alliance) extending across the moistened to seasonally drying soils at the riparian edge and *Frankenia salina* and *Juncus mexicanus*. Trees are largely absent, as are species adapted to a floating or submerged habitats.

# 3.0 LANDSCAPE AND SITE-SPECIFIC ASSESSMENT (STAGES 1 AND 2)

## 3.1 Overview of Eagle Biology

This section gives an overview of the biology of both the Golden Eagle and the Bald Eagle.

### *3.1.1 Golden Eagle*

The Golden Eagle is a large raptor with a wingspan between 73–87 inches and an average weight between 6.6–13.5 pounds. The eagle ranges throughout most of the northern Temperate Zone which includes arctic Canada and Alaska south through the western United States to central Mexico. The northern populations of Golden Eagles are short to medium distance diurnal migrants.

Golden Eagles can be found in a broad range of elevations in various habitats which include open and semi-open grasslands, shrub-steppes, forests, tundra, and desert habitats (Kochert et al. 2002). The eagles tend to avoid densely populated and agricultural areas for relatively open rangelands and undisturbed areas. Golden Eagles usually build their nests on cliff faces but will also build in trees, on the ground, or human-made structures such as observation towers, nesting platforms, and electrical transmission towers. Furthermore, Golden Eagle nests are most likely to occur in the vicinity of dense populations of ground squirrels, hares or other favored prey species. Besides hares and ground squirrels, Golden Eagles may take a wide variety of other prey, including larger birds, reptiles, mammals, and carrion. They have been observed hunting by diving from a high soar, but typically hunt by flying low to the ground while following the contours of the land. Golden Eagles have been noted to construct and maintain several alternative nests within their established breeding territories and rotating their use from year to year depending on breeding densities in the vicinity. Mated pairs will maintain or refurbish more than one nest each year, but reuse intervals may be several years or more (ICF 2014, Kochert et al. 2002).

Courtship and nest building in central California generally takes place from December through February. Golden Eagles normally lay only one brood a year that is made up of one to three eggs. The eggs are incubated for a period of between 41 to 45 days. Once hatched, the young stay in the nest for approximately 45 to 81 days between late May and early July (ICF 2014, Kochert et al. 2002).

### *3.1.2 Bald Eagle*

The Bald Eagle is a large raptor with a wingspan between 72-96 inches and an average weight of approximately 14 pounds. The female Bald Eagles are larger than males, and birds of northern states and provinces tend to be larger than those from the southern portions of the breeding range. The characteristic adult plumage consists of a white head and tail with a dark brown body. Juvenile eagles are completely dark brown and do not fully develop the majestic white head and tail until the fifth or sixth year (Buehler 2000, CDFW 2014). This eagle is found throughout North America in riparian areas associated with coasts, rivers, and lakes where it primarily feeds on fish. The Bald Eagle will also take a variety of birds, mammals, and turtles (both live and as carrion) when fish are not readily available.

Bald Eagles in winter may be found throughout most of California at lakes, reservoirs, rivers, and some rangelands and coastal wetlands. The breeding habitats found in California are mainly in mountain and foothill forests and woodlands near reservoirs, lakes, and rivers. Most of the Bald Eagle breeding territories in California are found in the northern section of the state, but the eagles also nest in scattered

locations in the central and southern Sierra Nevada Mountains and foothills, in several locations from the central coast range to inland southern California (CDFW 2014).

Breeding habitat usually consists of nests in tall trees or on cliffs near water. Nest trees include pines (*Pinus* spp.), spruce (*Picea* spp.), firs (*Abies* spp.), cottonwoods (*Populus* spp.), oaks (*Quercus* spp.), poplars (*Liriodendron* spp.), and beech (*Fagus* spp.). The same nest may be used year after year, or the birds may alternate between two nest sites in successive years (Terres 1995, Buehler 2000).

California's breeding populations display high fidelity to both breeding and wintering sites. Resident breeding pairs overwinter in California and do not disperse far from their nest sites, unless harsh weather drives them to lower elevations. Unlike northern breeding populations of Golden Eagles, Bald Eagles that breed in northwestern Canada and the United States migrate southward in large numbers to California to overwinter; these populations are most prevalent between September and March (ICF 2014). The breeding season for Bald Eagles lasts from January through August in California. Most Bald Eagles are sensitive to human disturbances and typically do not nest if there is evidence of human activity (ICF 2014). Bald Eagles normally lay only one brood a year that is made up of one to three eggs. The eggs are incubated for a period of between 34 to 36 days. Once hatched the young stay in the nest for approximately 56 to 98 days (Buehler 2000, Terres 1995).

## 3.2 History and Summary of Eagle Monitoring in the Panoche Valley

The only species of eagle observed in the Panoche Valley during surveys conducted as part of this solar project is the Golden Eagle. There have been no in-depth studies on Bald Eagles in the Panoche Valley due to the lack of habitat, no sightings during any of the over 25,000 hours of site surveys, and only anecdotal observations of the Bald Eagle in the Panoche Valley.

### *3.2.1 Historical Surveys*

Previous surveys within the Project region that noted Golden Eagles within the vicinity of the Project Footprint were from historical data from the National Audubon Society's Annual Christmas Bird Counts. There have been 45 Golden Eagles detected during the past 13 Christmas bird counts (1999-2012) in the Panoche Valley (National Audubon Society, 2014). That averages out to be approximately 3.46 per year observed within the count circle which includes all of the Project Footprint and the VFCL and a majority of the VRCL and the SCRCL.

### *3.2.2 Point Counts*

Point count surveys for Golden Eagles were conducted at established point count stations (Cooperrider et al. 1986; Hamel et al. 1996; Ralph et al. 1993; Ralph et al. 1995) every other week between the weeks of September 3, 2013 until January 24, 2014 for a total of 11 survey events. Six point count stations were located within Project Footprint/VFCL (Figure 4 Appendix A) to ensure a minimum spatial coverage of at least 30 percent of the Project Footprint (USFWS 2013). Six point count stations were also located within the VRCL and the SCRCL. Three point count stations were located in the VRCL (Figure 5 Appendix A) and three point count stations in the SCRCL (Figure 6 Appendix A). The coverage for the VRCL and SCRCL was less than 30 percent, but provided adequate observations of Golden Eagle use in these areas for general comparison purposes. Additional information can be found in the Panoche Valley Solar Point Count Survey Study Report for Golden Eagles located in Appendix B of this Plan.

The survey locations were established by creating point count stations within an 800 meter (2,625 feet) radius observation area. The center point of each plot was geo-referenced using a global positioning system (GPS) unit. The point count surveys consisted of observers recording detections of Golden Eagles from the point count stations for two hours at each point count station (Figures 4, 5, and 6 in Appendix A). Observations were recorded on point count field forms (Pagel et al. 2010; USFWS 2013). The Golden Eagle surveys were conducted between daylight hours (sunrise to sunset) on a bi-weekly basis from September 3, 2013 to January 24, 2014. During the fall migration, when possible, surveys were completed during midday to increase sampling efficiency by temporally stratifying surveys to cover the midday period during migration (CA Energy Commission 2007; USFWS 2013).

The data collected during each point count station survey beyond the typical conditions information (e.g. date, time, temperature, wind speed and direction, and etc.) included the number of Golden Eagles seen, age class, Golden Eagles' activity/behavior, flight paths, estimated flight height and location in plot, and general description of observations.

With the data from the point count surveys, the age classes of the Golden Eagles were broken down into juvenile eagles, immature or sub-adult eagles, adult eagles, or unknown (eagles where age class could not be determined due to distance, visibility, etc.). The activity/behavior data collected noted the prevalent behavior during each one-minute interval as soaring flight (circling broadly with wings outstretched), unidirectional flapping gliding, kiting-hovering, stooping or diving at prey, stooping or diving in an agonistic context with other eagles or other bird species, undulating/territorial flight, perched, or other. The flight path data included Golden Eagles observed inside, as well as outside the point count plot. The flights were recorded on the point count data forms for each point count station.

**Project Footprint/Valley Floor Conservation Lands**

The Golden Eagle observations in the Project Footprint/VFCL totaled 43 Golden Eagles, with 15 observations within the point count plot boundaries and 28 observations outside the plot boundaries for the entire survey season. These observations were also categorized by their age class. The Golden Eagles observation on the Project Footprint/VFCL were made up of four juveniles, three inside the point count plot boundaries and one observation outside the plot boundaries. There were two sub-adult Golden Eagles observed within the point count plot boundaries and none outside. The surveys also found 14 adult Golden Eagles observations within the Project Footprint/VFCL areas, with seven adults being seen inside the plot boundaries, and seven adult Golden Eagles observed outside the plot boundaries. Additional information can be located in the Panoche Valley Solar Point Count Survey Study Report for Golden Eagles located in Appendix B of this Plan.

The point count station with the highest number of observations of Golden Eagles, both inside and outside the plot boundaries, was the station located in the northwestern portion of the Project Footprint/VFCL (Figure 4 in Appendix A) with a total of 23 Golden Eagles observations (10 inside/13 outside). Note that the high number of Golden Eagle observations at this point count station was due to numerous Golden Eagles observed utilizing the hills of the VRCL and the hills to the west of the VRCL for perching, foraging, etc. During the second survey event (September 17-19, 2013), seven Golden Eagles were observed feeding on a carcass of a dead animal (i.e. cattle) during the entire point count survey period. The point count station with the lowest number of Golden Eagle observations during the survey season was the point count station located in the southeastern portion of the Project Footprint/VFCL (Figure 4 Appendix A) with no Golden Eagles observed during any of the point count surveys.

Of the 15 Golden Eagles observations within the Project Footprint/VFCL observed within the point count plots, over half of the observations (eight Golden Eagles) were seen within the month of September. As previously stated, during the second survey event (September 17-19, 2013), seven Golden Eagles were observed feeding on a carcass of a dead animal during the entire point count survey period. There were four Golden Eagle observations during October, one in December, and two observations in January. No observations of Golden Eagles were documented in November within the Project Footprint/VFCL.

**Valadeao Ranch Conservation Lands**

The Golden Eagle observations in the VRCL totaled 11 Golden Eagles with four observations within the point count plot boundaries and seven observations outside the plot boundaries for the entire survey season. These observations were also categorized by their age class. The Golden Eagle observations on the VRCL were made up of two juveniles, all inside the point count plot boundaries. There were no sub-adult Golden Eagles observed within the point count plot boundaries or outside the plot boundaries. The surveys also found two adult Golden Eagle observations within the VRCL areas within the plot boundaries. Furthermore, there were seven unknown age class observations that were observed outside the plot boundaries. The unknown age class observations were due to the distance between the observer and the Golden Eagles.

The point count station with the highest number of observations of Golden Eagles, both inside and outside the plot boundaries was located in the central portion of the VRCL (V-02) (Figure 5 Appendix A) with a total of seven Golden Eagles observations (two inside/five outside). The point count stations within the VRCL with the lowest number of Golden Eagles observations during the survey season was the point count station located in the southern and northern portions of the VRCL (V-01 and V-03) (Figure 5 Appendix A) with two Golden Eagle observations each during the entire study. Additional information is located in the Panoche Valley Solar Point Count Survey Study Report for Golden Eagles located in Appendix B of this Plan.

Of the four Golden Eagle observations within the VRCL observed within the point count plots, 75 percent of the observations (three Golden Eagles) were seen within the month of September. There was one observation during January. No observations were made within the VRCL during the point count surveys in October, November, and December. Additional information is located in the Panoche Valley Solar Point Count Survey Study Report for Golden Eagles located in Appendix B of this Plan.

**Silver Creek Ranch Conservation Lands**

The Golden Eagles observations in the SCRCL totaled seven Golden Eagles with four observations within the point count plot boundaries and three observations outside the plot boundaries for the entire survey season (Figure 6 Appendix A). The Golden Eagle observations on the SCRCL had no juvenile or sub-adult eagles inside or outside the point count plot boundaries. The surveys found four adult Golden Eagle observations within the SCRCL areas with three observations inside the plot boundaries and one observation outside the plot boundaries. There were three unknown age class observations with one observation inside the plot boundaries and two observations outside the plot boundaries. The unknown age class observations were due to the distance between the observer and the Golden Eagles.

The point count station in the SCRCL with the highest number of observations of Golden Eagles, both inside and outside the plot boundaries was S-03 (Figure 6 in Appendix A) SCRCL with a total of four Golden Eagle observations (2 inside/2 outside). The point count station with the lowest number of Golden Eagle

observations during the survey season was located in the western portion of the SCRCL (Figure 6 in Appendix A) with no Golden Eagles observed during all of the point count surveys.

Of the four Golden Eagle observations within the SCRCL point count plots, 75 percent of the observations (three Golden Eagles) were seen within the month of January. There was only one Golden Eagle observation in October and no observations of Golden Eagles during the point count in September, November, and December.

**Summary and Conclusion**

Overall, the results of the point count surveys included a total of 61 observations of Golden Eagles. This total includes 23 individual observations of Golden Eagles seen within the point count plot boundaries and 38 observations outside the plot boundaries. Additional information is located in the Panoche Valley Solar Point Count Survey Study Report for Golden Eagles located in Appendix B of this Plan.

The results of the point count surveys indicated that 93 percent of the Golden Eagles observations made within the Project Footprint and VFCL point count station boundaries were from the western point count stations, which are in close proximity to the hills located within the western portion of the VRCL. Of the 15 total Golden Eagle observations made within the Project Footprint and VFCL during the entire study within point count plots, approximately 47 percent of those observations were seen during a single survey event (September 17-19, 2013), where Golden Eagles were observed feeding on a carcass of a dead animal within the proposed Project Footprint. The data gathered during this fall migration/winter survey period indicates that unless there is an attractant (i.e. food) found within the Project Footprint and the VFCL, that Golden Eagles usage of the Project Footprint is minimal. Additional information is located in the Panoche Valley Solar Point Count Survey Study Report for Golden Eagles located in Appendix B of this Plan.

### *3.2.3 Utilization Distribution Assessment*

The Utilization Distribution Assessment (UDA) for Golden Eagles occurred every other week between the weeks of September 3, 2013 until January 24, 2014 for a total of 11 survey events. The UDA was completed to document the Golden Eagles' spatial distribution of use on the proposed Project Footprint. The observation data was noted on field maps and then the data was converted into GIS formats for analyses. The field maps were created by placing a grid of square cells, each 0.5 x 0.5 kilometer (km), which was framed by a Universal Transverse Mercator (UTM) system across a map of the Project Footprint to record eagle observations in each 0.25 $km^2$ cell.

The Project Footprint/VFCL was divided into non-overlapping observation sectors centered on a designated Observation Point, each with a vantage point. The previously mentioned point count stations were utilized for the UDA Observation Points (Figure 4 Appendix A). These locations afforded an unobstructed viewing of the grid cells to more than one km in all directions. The UDA was not conducted on the VRCL and the SCRCL since they are outside of the Project Footprint.

During the UDA, the data recorded by the observers included Golden Eagle activity/behavior and flight path and location. The prevalent activity/behavior of each Golden Eagle was recorded in one-minute intervals as soaring flight (circling broadly with wings outstretched), unidirectional flapping gliding, kiting-hovering, stooping or diving at prey, stooping or diving in an agonistic context with other eagles or other bird species, undulating/territorial flight, perched, or other. The flight paths and location data was

recorded on the gridded field maps, using topographic features or distance indicators as location references.

The data was analyzed by simply counting the number of flights intersecting each cell. If the data set had been larger, a specific Golden Eagles' distribution of use would have been estimated by using standard kernel analyses (USFWS 2013).

Each survey event was made up of six UDA surveys from designated Observation Points for two hours each. The total hours surveying for Golden Eagles during the UDA study was 132 hours of survey time within the Project Footprint/VFCL (the UDA Study Area).

The results of the UDA surveys included a total of 33 observations of Golden Eagles which includes observations inside the UDA Study Area and outside the UDA Study Area. Of those 33 observations, 16 Golden Eagles observations were recorded within the UDA Study Area with five identified as adult Golden Eagles, three as sub-adult Golden Eagles, four as juvenile Golden Eagles, and four birds were not able to be identified by age class.

The majority of the Golden Eagle observations came from outside the UDA Study Area near the Observation Points P-01 and P-03 (Figure 4 in Appendix A) located in the northwestern and southwestern portions of the UDA Study Area. This is due to numerous sightings of Golden Eagles observed utilizing the hills of the western portion of the VRCL and the hills beyond the western portion of the VRCL for perching, foraging, etc.

During the UDA surveys there were 452 observation minutes of Golden Eagles inside the UDA Study Area and 157 observation minutes of Golden Eagles outside the UDA Study Area for a total of 609 observation minutes for the entire study period. Note that totals for the UDA study included seven Golden Eagles that were observed feeding on a carcass of a dead animal (cattle) inside the UDA Study Area in the northwestern portion of the UDA Study Area and remained on the carcass for the entire duration of the UDA survey event on September 17, 2013. These observations made up 63% (285 observation minutes) of the observation time for Golden Eagles for the UDA Study. In addition, the observation time (120 observation minutes) for a sub-adult eagle that perched on the hillside for the entire UDA survey period in the northwestern portion of the UDA Study Area, noted on January 8, 2014, makes up 90 percent of the observation minutes made during the entire study within the UDA Study Area. These two events – seven birds foraging on a carcass and one perched on the hillside were 405 out of the 609 total minutes of observations and most other observations were outside the UDA Study Area.

The average observed flight height noted during the study for observations made during UDA surveys, excluding perched Golden Eagles, was approximately 300 feet above ground level. The average flight height for the Golden Eagles observations noted inside the UDA Study Area was similar with an average flight above ground level of approximately 270 feet.

Lastly, due to the small size of the data set (only 16 Golden Eagle flight observations that utilized 57 grid cells within the UDA Study Area) a standard kernel analyses could not be performed. The data was analyzed by calculating the number of flights intersecting an individual grid cell. The study indicated that flight heights noted inside the UDA Study Area averaged approximately 270 feet with exception of the Golden Eagles noted feeding on the carcass during the noted September survey event.

**Summary and Conclusion**

With exception of the seven Golden Eagles observed feeding on a carcass in the northeast corner of the UDA Study area, the cells utilized by Golden Eagles within the UDA Study Area indicates that the Golden Eagles are not using the northern, southwest, and south central areas of the Project Footprint/VFCL. They also did not frequent the northern portion of the Project Footprint/VFCL. The UDA Study does show, as seen in the point count surveys, that the Golden Eagles are utilizing the hills in the VRCL on both the eastern and western sides of the UDA Study Area for perching, foraging, etc.

Information gathered from the UDA surveys indicate Golden Eagles mostly fly across or through the Panoche Valley (i.e. Project Footprint/VFCL) to other habitat to forage or perch.

### *3.2.4 Nesting Survey*

Helicopter-based Golden Eagle surveys were conducted in August 2010 during a non-breeding summer period. The surveys were specifically targeted for Golden Eagle occupancy using individual and nest sightings according to the USFWS Interim Guidelines for Golden Eagle Surveys (Pagel et al. 2010). The survey was performed by two qualified biologists who flew surveys over the Project Footprint and Conservation Lands. Additionally surveys were performed within a 10-mile radius of the Project Footprint. During the flight, one biologist observed at all times while the other recorded and marked data when appropriate. During the surveys, 15 Golden Eagle nests were observed within the 10-mile radius of the Project Footprint. Four of those nests showed evidence of having young fledged in 2010. No Golden Eagle nests occurred within two miles of the Project Footprint.

To augment the previously noted 2010 nest survey effort, the USFWS recommended that the PVS conduct "Stage 2" aerial surveys of the Project area nesting population during a January-February (winter) time frame before leaf-on. The aerial surveys were conducted for Golden Eagles within ten miles of the Project Footprint in January and April 2014 (winter to spring), resulting in the documentation of 46 Golden Eagle nests and an estimated 30 Golden Eagle territories, with nine of them active, though none were located within three miles of the Project Footprint.

As per guidance provided by the USFWS, an initial round of helicopter surveys was performed over a 10-day period during the early breeding season, from January 15 to 24, 2014 (winter). The second round of aerial surveys were conducted over a 7-day period from April 2 to 8, 2014 (spring), when active nests were expected to contain eggs or young nestlings.

All surveys were conducted by qualified observers in a helicopter operated by a pilot experienced in conducting aerial Golden Eagle nesting surveys. Survey methodology described in USFWS *Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Eagle Management and Permit Issuance* (Pagel et al. 2010) was followed to the extent possible. The biologists conducted an aerial examination of all appropriate nesting habitats with ten miles of the Project Footprint. During aerial surveys, the observers searched for large stick nests of Golden Eagles and other raptors on cliff faces, rocky outcrops, trees, transmission towers, and other suitable nesting substrates.

A total of 492 nests were documented by Bloom Biological, Inc. (BBI) during the aerial survey, including 46 Golden Eagle nests. Nests classified as belonging to species other than Golden Eagles included nests of 226 Common Ravens (*Corvus corax*), 146 Red-tailed Hawks (*Buteo jamaicensis*), 62 Prairie Falcons (*Falco mexicanus*), eight Barn Owls (*Tyto alba*), three Great Horned Owls (*Bubo virginianus*), and one Turkey Vulture (*Cathartes aura*). Additional information can be located in the Panoche Valley Solar Facility - 2014 Final Golden Eagle Nesting Survey Report located in Appendix C of this Plan.

It was estimated that the 46 Golden Eagle nests discovered during this survey effort comprise approximately 30 breeding territories, some of which contain one or more alternate nests. The actual number of territories could be slightly higher or lower than 30, and the exact number of territories depends, in part, on how alternate nests of a single territory are defined. Golden Eagle nesting density (and territory size) is driven primarily by habitat quality, with higher nesting density in better quality habitat. Given that habitat quality in the Nesting Study Area varies from quite high (in the northwestern quadrant, where most nests were located), to quite low, in extreme eastern portions, it would not be surprising for nests in some areas to be located as close together as one mile, or even rarely 0.5 miles, particularly in the areas of better quality habitat.

In total, nine Golden Eagle nests were classified as active in the 2014 season, each representing a separate territory. Thus, active nesting occurred in almost one-third (9 of about 30) of the territories identified in this survey. Of these nine nests, eggs are presumed to have been laid in at least four. Adults were observed on nests in incubating posture and two un-incubated eggs were observed in (presumed failed) nests in April. Finally, two chicks were observed being tended to by a female Golden Eagle in early April. Of the remaining five Golden Eagle nests that were identified as active in 2014, none were known to contain eggs or nestlings as of the April 8$^{th}$ survey date. A nest was considered active if any of the following three conditions was met: (1) fresh (live or dead) sticks had been added during the current nesting season, (2) the nest was found to contain eggs or young (dead or alive), or (3) an adult was observed on the nest in an incubating (or brooding) posture. Given that Golden Eagles in this region normally lay eggs on or before this date, it is very unlikely that any of these five nests went on to successfully fledge young during the 2014 nesting season.

No Golden Eagle nests were identified within three miles of the Project Footprint, though four nests were located within four miles of the Project Footprint. Two of these four nests were considered attended in 2014, though neither nest was ever found to contain eggs or nestlings. The next closest active Golden Eagle nest to the Project in 2014 was located approximately 5.79 miles north-northwest of the Project Footprint. Additional information is located in the Panoche Valley Solar Facility - 2014 Final Golden Eagle Nesting Survey Report located in Appendix C of this Plan.

### *3.2.5 Summary and Conclusions*

**Golden Eagle**

With exception of the studies performed for the Panoche Valley Solar Project, Golden Eagle presence in the Panoche Valley has not been well studied, and the effects of other solar projects (e.g. Topaz solar facility) near the project have not been reported. Based on the point count, UDA, aerial nesting survey information and incidental observations, it is apparent that Golden Eagles forage in and around Panoche Valley throughout the year. However, studies conducted for the Project indicate most Golden Eagles are flying across or through the Panoche Valley (i.e. Project Footprint/VFCL) to other habitat to forage or perch with a majority of the activity taking place on adjacent Conservation Lands which have elevations ranging from approximately 1,400 feet to 2,100 feet amsl. The UDA Study does show, as seen in the point count surveys, that the Golden Eagles are utilizing the hills in the VRCL on both the eastern and western sides of the UDA Study Area for perching, foraging, etc, rather than the Project Footprint.

Because the Project Footprint does not support significant populations of ground squirrels and other diurnal prey species (James McRacken, observation, June 25, 2013 through July 16, 2013); the present land management practices; the slopes within the valley; the lack of potential nesting structures (e.g.

mature trees); and the distance from existing nesting location makes the Project and VFCL less attractive to foraging Golden Eagles. Additionally, as found during the point count and the UDA studies, unless there is an attractant (i.e. food, carcass) found within the Project Footprint and the VFCL, the Golden Eagles usage of the site is minimal. Therefore, the Project Footprint does not appear to be an "important eagle-use area" because the studies show that the site does not have eagle nests, significant foraging areas, and no landscape features that eagles rely on for breeding, sheltering, or feeding.

In addition, the 2010 aerial nesting study did not identify any Golden Eagle nests within two miles of the Project Footprint and the 2014 survey results indicate no Golden Eagle nests within three miles. The closest active Golden Eagle nest to the Project Footprint in 2014 was located approximately 5.79 miles north-northwest of the Project Footprint.

Overall, the body of information regarding Golden Eagle use, abundance, and behavior (fall and winter point count and UDA surveys) in the Panoche Valley provides sufficient baseline information and data to conduct a risk assessment for Golden Eagles consistent with the requirements and standards set forth in the USFWS Eagle Conservation Guidelines.

Based on the information collected in the studies summarized above it does not appear that the Project Footprint is located in an important eagle-use area.

**Bald Eagle**

With no historical studies focused on Bald Eagles and the lack of observations during the Golden Eagle point counts, UDA and nesting surveys, and anecdotal observations made during Christmas Bird Counts, it has been determined that there is no risk to the Bald Eagle associated with the Panoche Valley Solar Project. Therefore, no further discussions about Bald Eagles will be addressed in this document.

# 4.0 RISK ANALYSIS (STAGE 3)

Per the USFWS recommendations, the Golden Eagle studies followed the Land-based Wind Energy Guidelines in Tier 3 and Stage 2 of the Eagle Conservation Guidance which includes site-specific surveys and assessments in anticipation of preparing this Eagle Conservation Plan (USFWS 2013). Data from the studies was used to determine any mortality projections for the Project.

## 4.1 Nesting and Breeding

The Project's risk to nesting and breeding Golden Eagles is discountable. The only documented minimal foraging use of the Project Footprint was on an animal carcass during the studies conducted. This lack of foraging activity is likely due to relatively poor foraging conditions and sparse prey base. In the Project Footprint, there are a limited number of potential nesting trees (*Eucalyptus* sp.) which are not suitable due to their height and branch structure (Hunt et al. 1998) and no suitable cliffs present. The 2010 and 2014 nesting surveys have shown that no nesting has taken place within two miles of the Project Footprint. As a result, there should be no disturbance from pre-construction, construction, or operation and maintenance activities that might disturb nesting Golden Eagles. Although no loss of nesting territories is anticipated based on the Project Footprint's proximity to the nearest documented active nest sites, development within the Project Footprint could result in potential loss of unutilized poor quality foraging habitat.

## 4.2 Fatality Estimates

At the time of the ECP preparation, no fatality studies for Golden Eagles from nearby solar projects were known. A report (*Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis*) on bird mortality at three solar energy facilities in southern California was published by the National Fish and Wildlife Forensics Laboratory in April 2014. The facilities use different solar technologies, but avian mortality was documented at each site (Kagan et al. 2014). The study indicated that impacts to avian species from post-construction (i.e. operation) occurred at the Desert Sunlight Solar Farm in Riverside County, California. The study found avian fatalities were related to waterbirds and impact trauma from the solar cells. The result of the study indicated no raptor species fatalities, including Bald Eagles or Golden Eagles, were recorded at the photovoltaic solar study site even with numerous potentially active Golden Eagle nests found within a 10-mile radius of the Desert Sunlight Project. Overall, there does not appear to be outlying habitat elements, topographical features, or land use practices that would distinguish this Project from other photovoltaic solar facilities that would provide a discernable mortality risk for eagles.

Because there is no scientific evidence to suggest direct take of eagles will occur at a solar facility and potential impacts to the unutilized foraging habitat will be offset at greater than a 2:1 ratio (estimated to be approximately 9:1), no eagle fatalities are expected to result from the construction and operation of the Project.

## 4.3 Site Categorization Based on Mortality Risk to Eagles

The ECP Guidelines recommend a standardized approach to characterize risk and categorize the likelihood that a project will meet the standards for issuance of a programmatic eagle take permit.

Those categories are listed below.

- Category 1 — High risk to eagles/potential to avoid or mitigate impacts is low.
- Category 2 — High to moderate risk to eagles/opportunity to mitigate impacts.
- Category 3 — Minimal risk to eagles.

PVS is considered a Category 3 Project based on the risk analysis described above. PVS is considered minimal risk because the Project Footprint is not considered an important eagle use area or a fall migration concentration site from the results of the point count, UDA, and nesting studies. There is little to no risk of a direct take during Project construction or operation. The planned avoidance and minimization measures and compensatory mitigation for the unutilized foraging habitat loss will more than offset any Project related impacts. Additionally, it appears from recent surveys that no eagle nests or suitable nest sites are within two miles of the Project.

# 5.0 AVOIDANCE AND MINIMIZATION OF RISK, ADVANCED CONSERVATION PRACTICES, AND MITIGATION (STAGE 4)

PVS has adopted numerous avoidance and minimization measures, as well as compensatory mitigation for potential habitat loss, as part of its permitting and environmental compliance processes for the Project. The overall eagle conservation strategy includes two elements: 1) avoidance and minimization of risk, and 2) compensatory mitigation.

## 5.1 Project- and Population-Level Effects

### *5.1.1 Project-Level Effects*

Without a conservation strategy which includes avoidance measures for construction and operation, and compensatory mitigation for habitat loss, the Project could introduce hazards onto the landscape and create other hazardous conditions for Golden Eagles within the Project Footprint.

### *5.1.2 Population-Level Effects*

The construction of the Project will not have a significant impact on the overall population of Golden Eagles. The only impacts to Golden Eagles anticipated by the construction of the Project would be the loss of approximately 2,506 acres of unutilized minimal quality foraging habitat. The 2,506 acres of impacts is made up of 1,794 acres of permanent impacts and 712 acres of temporary impacts. The areas of temporary impacts will be restored after the construction of the Project. The Conservation Lands that will be set aside as mitigation will include foraging habitats utilized by Golden Eagles as stated in Section 3.0 of this document. These Conservation Lands will provide high quality habitat and will continue to support populations of Golden Eagles. Therefore the 24,176 acres of Conservation Land is suitable for Golden Eagle mitigation to compensate for any loss of existing potential foraging habitat caused from construction of the Project.

## 5.2 Construction and Operation and Maintenance-Related Avoidance and Minimization Measures

### *5.2.1 General Proposed Avoidance and Minimization Measures*

PVS will implement the following best management practices (BMPs) and avoidance and minimization measures to minimize potential impacts on Golden Eagles during construction. Many of these measures are also described in the 2015 FSEIR for the Panoche Valley Solar Project.

1. Before commencing on-site construction activities, PVS will submit to CDFW and USFWS, the name, qualifications, business address, and contact information of one or more County-approved, qualified biologists. The Permittee shall ensure that each County-approved, qualified biologist is knowledgeable and experienced in the biology, and natural history of the special status species such as the Golden Eagle on the Project. The County-approved, qualified biologist(s) shall be responsible for monitoring construction activities to help minimize and fully mitigate or avoid the take of Golden Eagles and to minimize disturbance of Golden Eagle foraging habitat. The County-approved, qualified biologist may appoint biological monitors to perform biological surveys or provide oversight of ground disturbing activities as needed in their place. All biological monitors

that work on-site will receive instruction from and report to the County-approved, qualified biologist(s).

2. Prior to surface disturbance or other covered activity, a County-approved, qualified biologist shall conduct a Workers Environmental Education Program on all resources and special status species (including Golden Eagles) for all Project personnel, which familiarizes the PVS employees and contractors with occurrence and distribution of Golden Eagles in areas impacted by the Action; take avoidance measures being implemented during the Project; and BMPs. This program is designed to ensure all personnel who work at the Project site are aware of and can identify Golden Eagles and the measures implemented to protect this species. An employee environmental awareness program will be administered to all employees prior to starting work on the Project.

3. Posters showing pictures of protected species, including Golden Eagles, with information and protocols to be followed will be placed in conspicuous locations (e.g. construction trailers). Verbiage will be in English and in Spanish.

4. A County-approved, qualified biologist or their representative shall be present while ground-disturbing activities are occurring. In addition to conducting preconstruction surveys, the biologist(s) shall aid crews in satisfying take avoidance criteria and implementing mitigation measures; will document (weekly) all pertinent information concerning effects on protected species; and shall assist in minimizing the adverse effects of construction activities on protected species.

5. County-approved, qualified biologists and biological monitors are empowered to order cessation of activities if take avoidance and/or mitigation measures are violated and will notify the Applicant's environmental representative immediately.

6. PVS shall appoint a company representative who will be the contact source for any employee or contractor who inadvertently kills or injures a protected species or who finds a dead, injured, or entrapped protected species. The representative will be identified during the pre-performance educational briefing.

7. All spills of hazardous materials shall be cleaned up immediately in accordance with the Applicant's Spill Prevention Control Plan.

8. Pets are prohibited at the Action site with the exception of working dogs. Working dogs that assist ranchers are not considered pets. Any working dog entering the Project Footprint will be required to provide proof of inoculations to prevent disease transmission.

9. Firearms are prohibited within the Project Footprint.

10. All food-related trash, such as wrappers, cans, bottles, bags, and food scraps shall be disposed of daily in containers with secure covers and regularly removed from the Project Footprint.

11. The use of herbicides in areas impacted by the Project will be restricted to use within the prescriptions of the Weed Control Plan. Applications will be applied by licensed applicators in accordance with label directions and other restrictions mandated by U.S. Environmental

Protection Agency, County Agricultural Commissioner, regional label prescriptions on use, California Department of Food and Agriculture, and other state and federal legislation.

12. Any project-related electric distribution and substation structures will be designed and constructed following Avian Power Line Interaction Committee (APLIC)-based avian protection guidelines (APLIC 2006), where applicable, and the Avian Conservation Strategy prepared for the Project. The APLIC-based avian protection guidelines are designed to reduce avian electrocution risks that result from avian interactions with electric utility facilities. The goals of the Avian Conservation Strategy are to develop measures that, when implemented for the Project, will avoid and reduce potential impacts to birds during construction, O&M, and decommissioning of the Project; develop if necessary, effective post-construction monitoring and adaptive management procedures to guide management actions for the life of the Project; and develop a protocol for communication and reporting to the appropriate state and federal agencies.

### *5.2.2 Other Proposed Avoidance and Minimization Measures*

The avoidance and minimization measures described below will be implemented during construction, operation, and maintenance (O&M) of the Project with regard to Golden Eagles. These additional measures are due to the requirements in the 2015 FSEIR.

1. PVS will conduct pre-construction surveys for nesting and breeding birds, including raptors. Surveys for nesting birds shall be conducted within the recognized breeding season in all areas within 500 feet of solar arrays, staging areas, substation sites, and access road locations. Surveys for raptors, shall be conducted for all areas between February 1 and August 15. If nesting Golden Eagles are identified, a 0.5-mile no activity buffer will be implemented. The required survey dates may be modified based on local conditions, as determined by the qualified biologist, with the approval of the County of San Benito.

   The prescribed buffers may be adjusted to reflect existing conditions including ambient noise, topography, and disturbance with the approval of the San Benito County as appropriate. The biological monitor(s) shall conduct regular monitoring of the nest to determine success/failure and to ensure that project activities are not conducted within the buffer(s) until the nesting cycle is complete or the nest fails. The biological monitor(s) shall be responsible for documenting the results of the surveys and ongoing monitoring and will provide a copy of the monitoring reports for impact areas to the respective agencies.

   Surveys shall be conducted to include all structural components of the solar arrays and related structures as well as all construction equipment. If raptors are found to be nesting in facility structures, buffers as described above shall be implemented.

2. To ensure the success of acquired mitigation lands, required for compensation of permanent impacts to vegetative communities and listed or special-status species, PVS shall retain a County-approved, qualified biologist to prepare a Habitat Management (HMP). The HMP will be submitted to the County of San Benito for approval, prior to the issuance of a construction permit.

3. PVS shall develop and implement measures to minimize O&M impacts and to significantly reduce fugitive dust emissions.

## 5.3 Advanced Conservation Practices (ACP)

Because there are no conservation measures that have been scientifically shown to reduce eagle disturbance at solar projects, the USFWS does not have any currently approved ACPs for solar energy projects. Therefore, no ACPs are proposed for this Project other than the practices noted above in Section 5.2 and the mitigation benefits of the Conservation Lands described below.

## 5.4 Mitigation

In addition to the avoidance and minimization measures described above, the Project will also implement a conservation package consisting of the permanent preservation and management of three large parcels of land (VFCL, VRCL, and SCRCL) to offset potential impacts to resources and species from Project construction totaling approximately 24,176 acres. These lands will be enhanced and managed for the species through implementation of a Habitat Management Plan. The lands were selected to provide local mitigation, preserve core populations of special status species and create permanent movement corridors with adjacent BLM controlled lands. Furthermore, as noted previously, the studies performed for Golden Eagles concluded that there was a greater use by Golden Eagle for foraging and roosting in the hills in the VRCL than within the Project or VFCL.

With the protection of these Conservation Lands, PVS shall compensate for permanent impacts to habitat for foraging Golden Eagles with the creation of permanent conservation easements. Conservation easements shall provide habitat preservation, in perpetuity at a ratio of 2:1 for all impacted acreage. These Conservation Lands are of equal or greater habitat quality and will support equal or greater populations of Golden Eagles, their prey species, and other available food sources such as carcasses. The avoidance, minimization and mitigation measures described above will reduce the potential risk to Golden Eagles and any potential impacts.

## 5.5 Effects of the Conservation Strategy

### *5.5.1 Methods*

The population studies which include the point count study, the UDA study, and the aerial nesting surveys were developed and completed for the Project to determine the possibility and extent of potential impacts of the Project on the resident and migratory populations of Golden Eagles that utilize the Panoche Valley.

### *5.5.2 Project and Population-Level Effects*

Project-level effects are expected to be minimal for the following reasons.

- The Project Footprint does not support significant populations of ground squirrels and other diurnal prey species for the Golden Eagle;
- As noted in the point count and the UDA studies, unless there is an attractant (i.e. animal carcass) found within the Project Footprint, that Golden Eagles usage of the Project Footprint is minimal. The UDA study also indicated that the Golden Eagles mostly are flying across or through the Panoche Valley to other habitat to forage or perch;

- The area is likely less attractive to foraging Golden Eagles due to lower prey availability, fewer perches to hunt from, poorer flight conditions for foraging (e.g. contour hunting), and greater levels of human disturbance within the valley;

- 2010 and 2014 aerial nesting study identified no Golden Eagle nests within two miles of the Project Footprint.

The Project will include all avoidance, minimization and mitigation measures pertaining to Golden Eagles and avoid the introduction of other hazards (e.g., prey attractants) into the Project to reduce the potential for Golden Eagle harassment, injury, or mortality. The mitigation strategy includes but is not limited to siting considerations, panel design, best management practices, incorporation of safety features into appurtenant facilities (e.g., transmission lines), compensatory mitigation, and adaptive management measures as described in the Project's 2015 FSEIR. The Project could result in an occasional indirect effect on individual eagles during operation; however, those effects are not anticipated to result in take.

The combination appropriately designed electrical facilities (e.g. APLIC guidelines), avoidance and minimization measures, and compensatory mitigation commitments (e.g. Conservation Lands) will result in no net loss to the Golden Eagle population from the Project's construction, operation, or maintenance. The addition of significant Conservation Lands could also benefit the existing and future Golden Eagle population. Therefore, the overall USFWS goal of maintaining stable or increasing breeding populations of Golden Eagles will be achieved.

### *5.5.3 Cumulative Effects*

Analysis of cumulative effects typically considers the effects of a proposed project in combination with the effects of past, present, and reasonably foreseeable projects. To date, no other solar projects have been built in the vicinity of the Panoche Valley Solar Project. However, if in the future a solar facility is planned in the vicinity of the Panoche Valley Solar Project, that project will be subject to the same regulations, and will be required to ensure their effects are avoided, minimized, and mitigated, and that there is no net loss to the eagle population. Through implementation of the mitigation and avoidance measures, the cumulative effects on Golden Eagles, directly or indirectly would be considered less than significant as a result of the Project.

## 5.6 Summary and Conclusions

PVS will implement applicable [avian] safe electrical facility design guidelines (e.g. APLIC guidelines), avoidance measures, and conservation approach described above. The construction, operation and maintenance avoidance and minimization measures are expected to result in avoidance of direct effects to Golden Eagles during construction and long-term operations. Furthermore, the proposed compensatory mitigation will ensure that any impacts to Golden Eagle foraging habitat is mitigated to appropriate ratio. With implementation of these measures and particularly the compensatory mitigation, effects will be avoided, minimized, and mitigated, resulting in no net loss to the Golden Eagle population in the vicinity of the Project and achieving the overall USFWS goal of maintaining stable or increasing breeding populations of Golden Eagles.

# 6.0 POST-CONSTRUCTION MONITORING (STAGE 5)

An Avian Conservation Strategy (ACS) has been prepared for the Project. This Plan follows the guidelines outlined by USFWS and APLIC. This Plan includes monitoring strategies that will be conducted for two years following the solar facility becoming fully operational. The Applicant will conduct avian surveys within the Project Footprint in accordance with the ACS Plan.

Post-construction monitoring will facilitate documentation of any impacts (e.g. fatalities, injury, and disturbance) that might occur and will identify factors associated with potential avian impacts, which might warrant additional avoidance and minimization measures or improvement or elimination of avoidance and minimization measures found to be ineffective. Implementation of the proposed monitoring program will provide information to the USFWS, CFWS, San Benito County and PVS to assist in the evaluation of the effectiveness of the avoidance and minimization measures. As part of the Project's monitoring and reporting program, post-construction monitoring and reporting will be completed to determine whether baseline evaluations of impacts on avian species, including Golden Eagles, are consistent with operational outcomes.

The County-approved, qualified biologist will submit annual reports to the USFWS, CDFW and San Benito County describing the dates, durations, and results of monitoring and data collection. Original data sheets, photographs, and relevant shape files (if any) will be attached to the reports.

After the first year of data collection the biologist will prepare an overall report that describes the study design and results of the monitoring in the Project Footprint. Coordination with applicable agencies (USFWS, CDFW, and the County) will determine if avian monitoring will continue after the first two years of operation.

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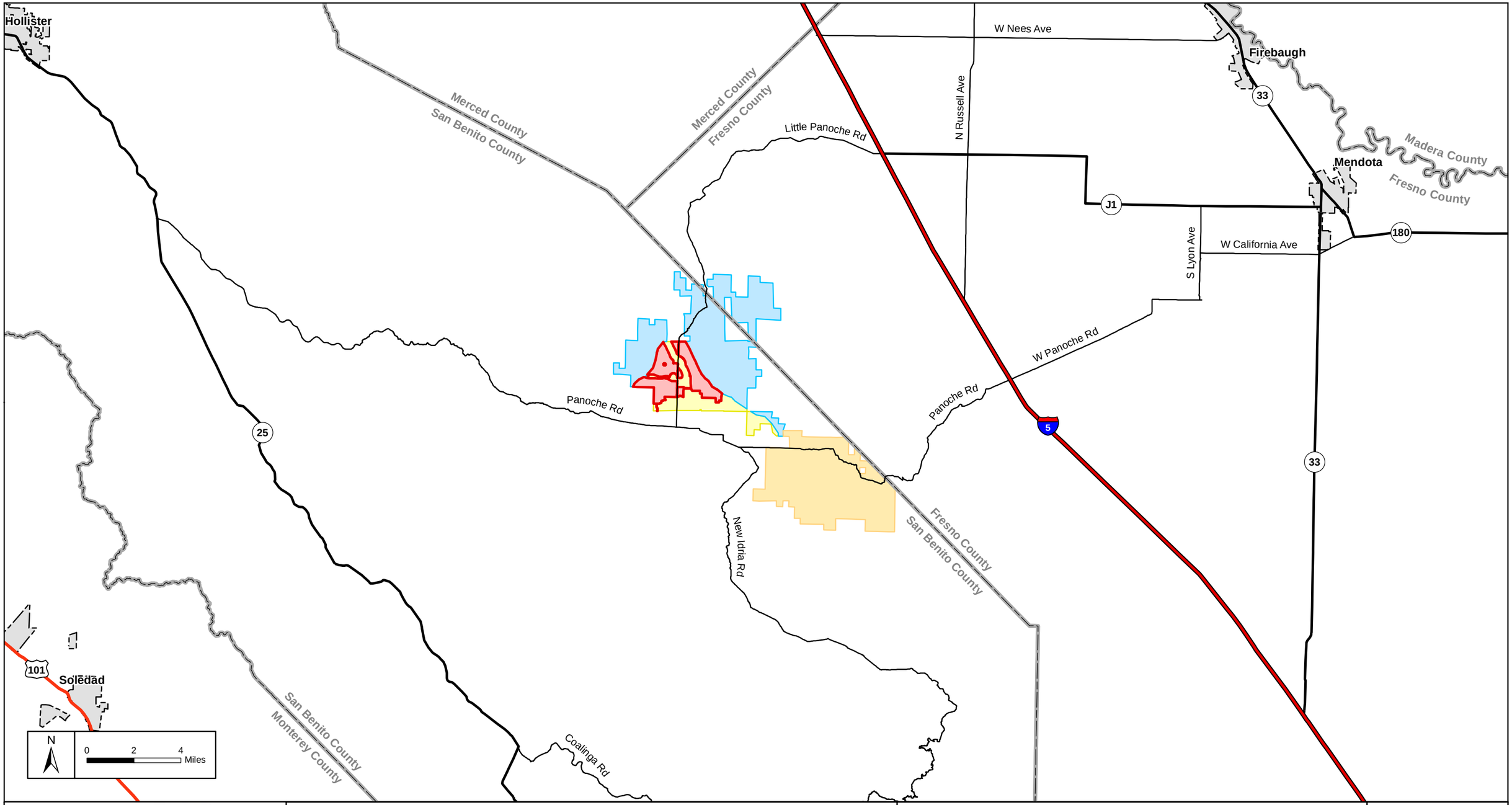
# APPENDICES

# Appendix A
Figures

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PARTNERS, LLC

**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands
- City

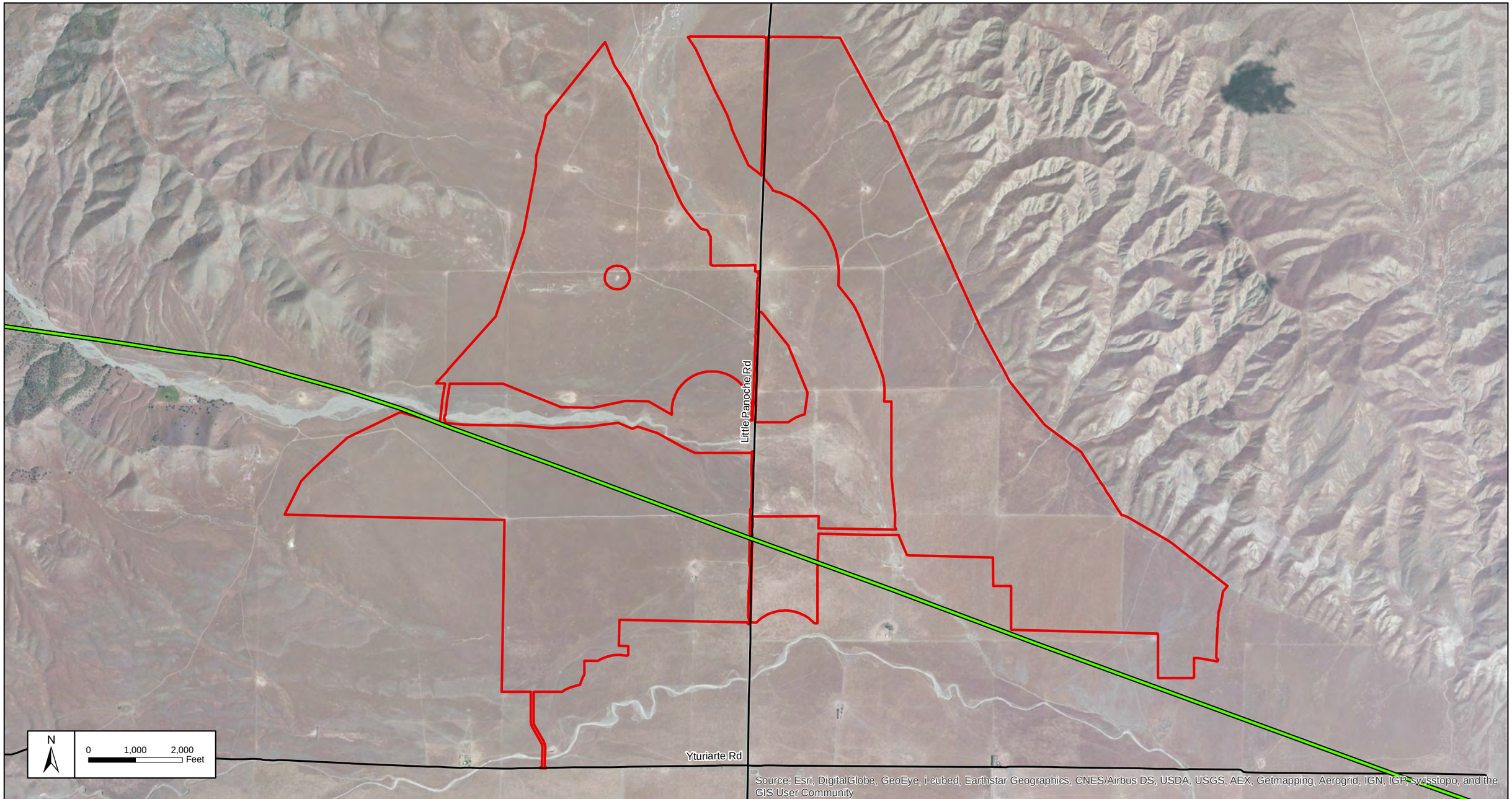
# Panoche Valley Solar Project

## Project Location

FIGURE

1

JH 2014-12-02

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**Legend**

Project Footprint

Existing Transmission Line

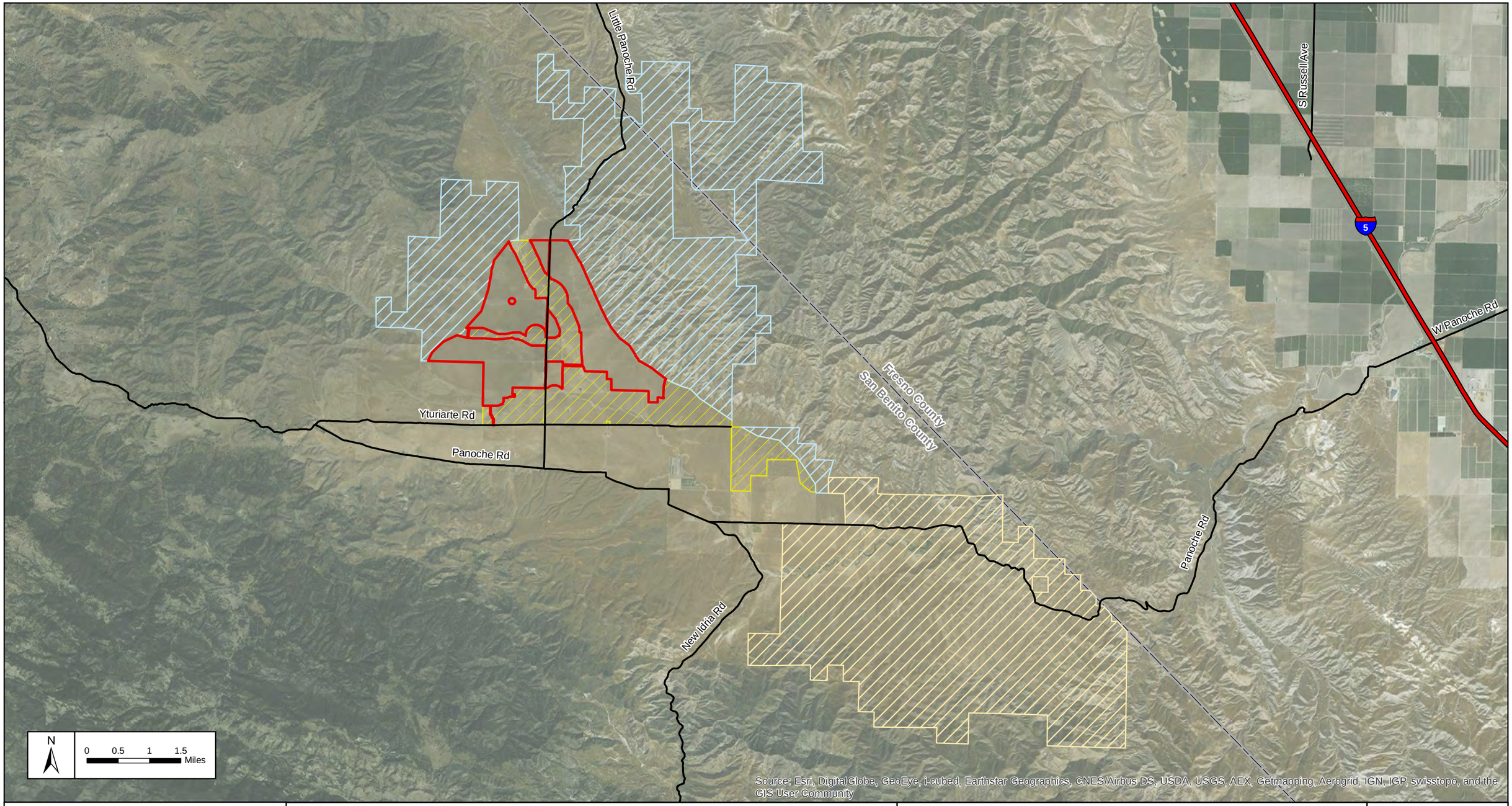
# Panoche Valley Solar Project

## Project Footprint

FIGURE

2

JH 2014-12-02

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**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands

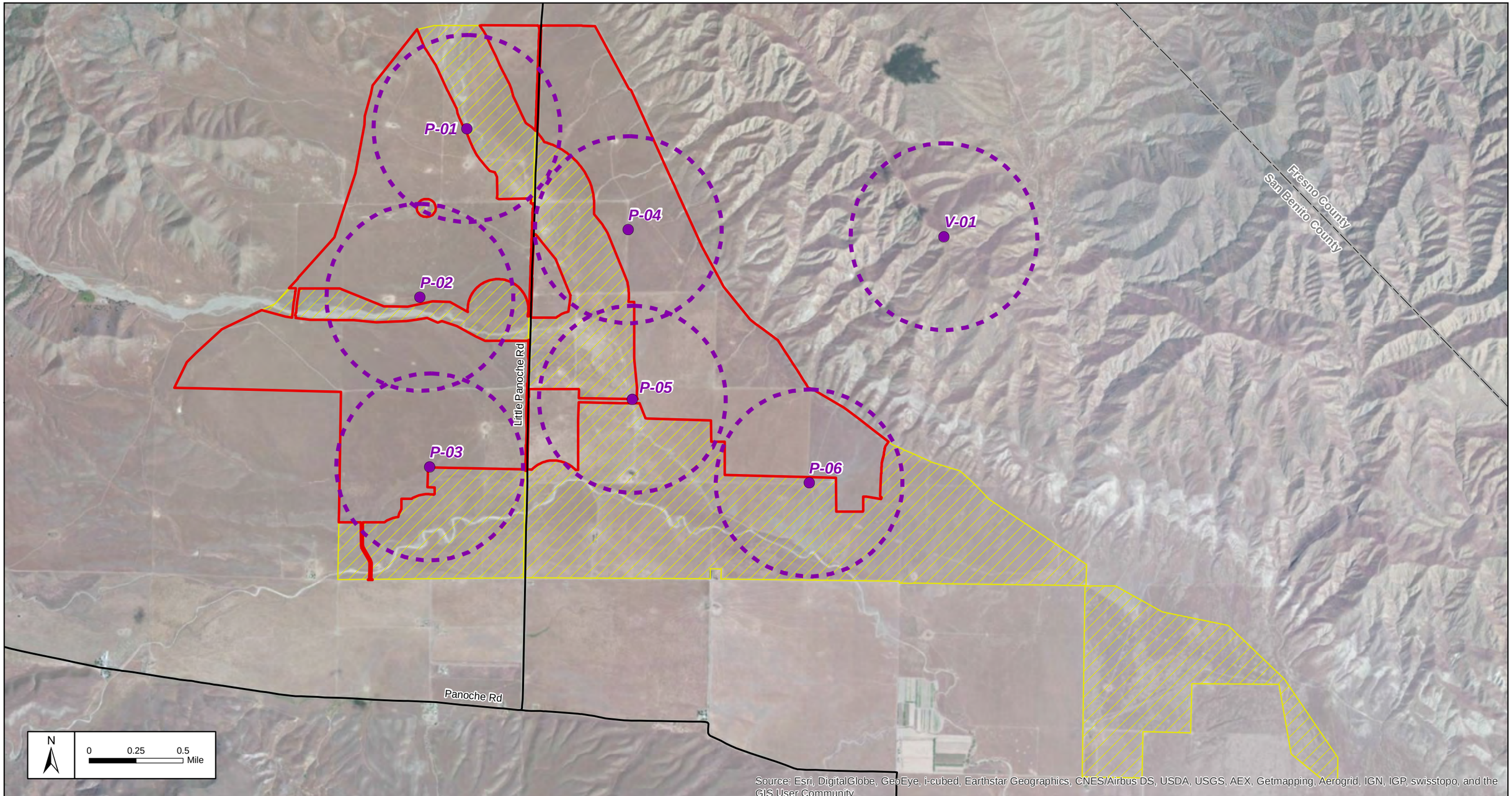
# Panoche Valley Solar Project

## Project Footprint and Conservation Lands

FIGURE

3

JH 2014-12-02

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**Legend**

- Point Count Station
- 800-meter Observation Area
- Project Footprint
- Valley Floor Conservation Lands

# Panoche Valley Solar Project

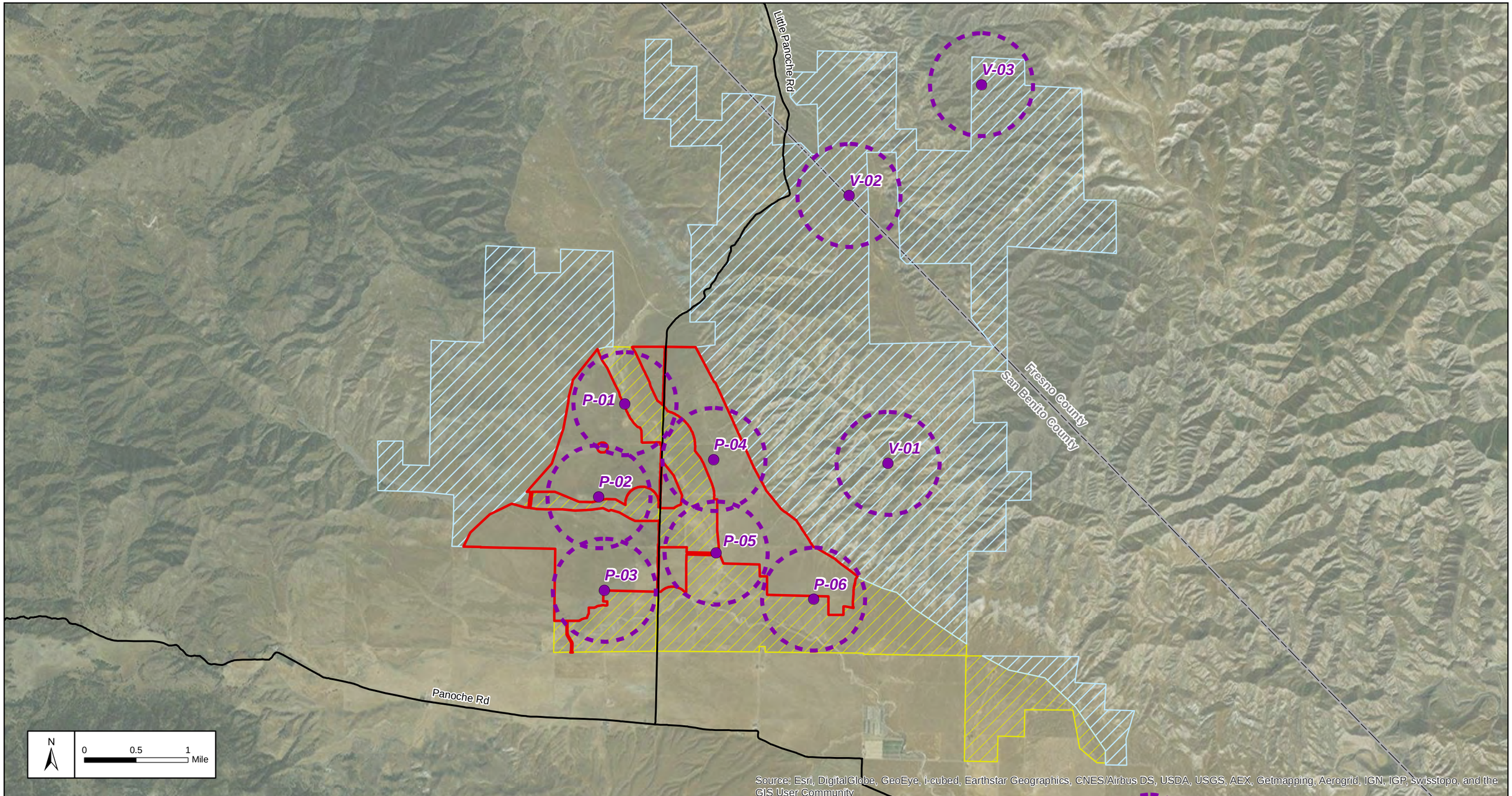
## Point Count Stations

Project Footprint and Valley Floor Conservation Lands

FIGURE

4

JH 2014-12-02

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**Legend**

- Point Count Station
- 800-meter Observation Area
- Project Footprint
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands

# Panoche Valley Solar Project

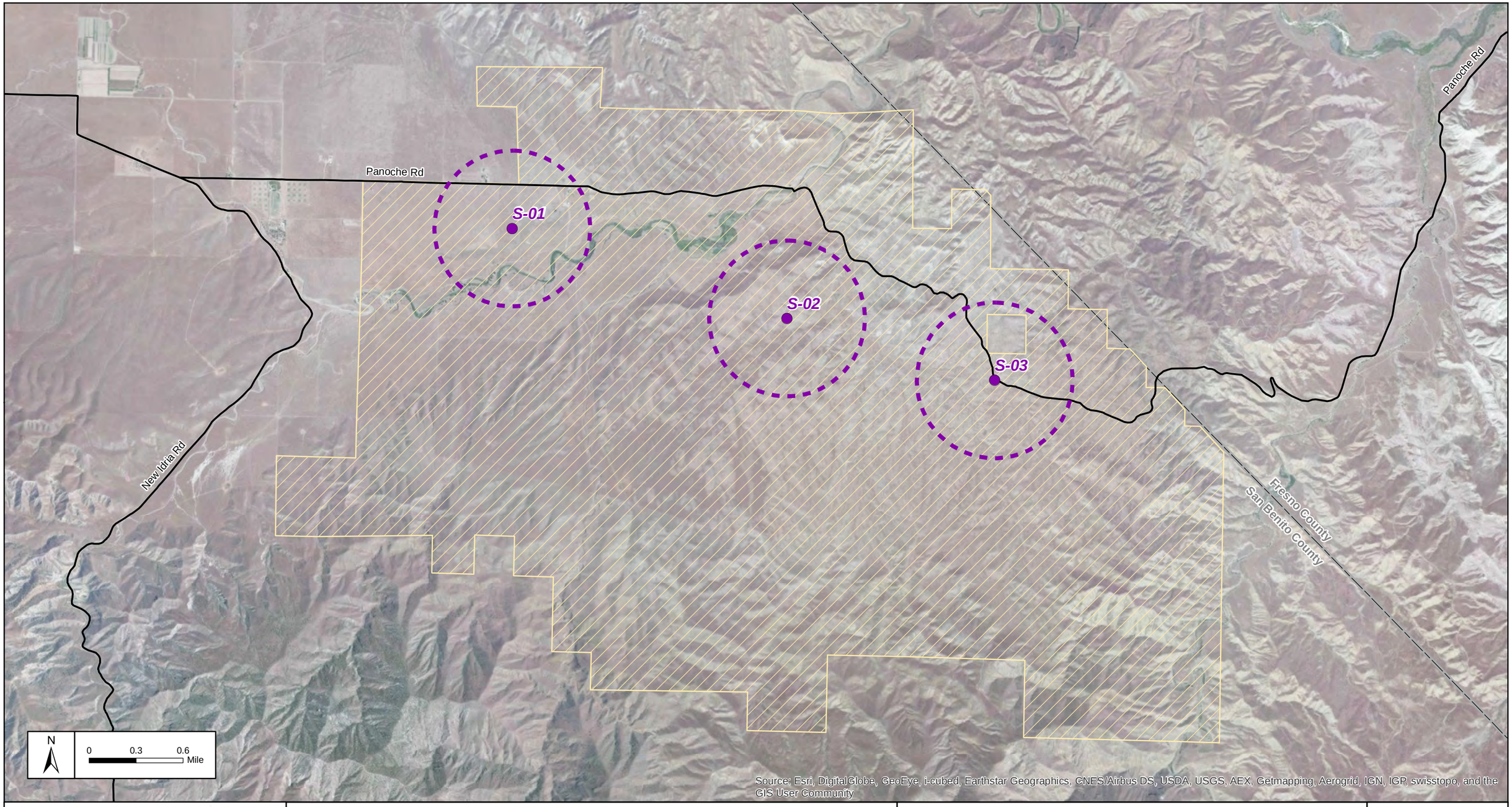
## Point Count Stations

Valadeao Ranch Conservation Lands

FIGURE

5

JH 2014-12-02

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**Legend**

- Point Count Station
- 800-meter Observation Area
- Silver Creek Ranch Conservation Lands

# Panoche Valley Solar Project

## Point Count Stations

Silver Creek Ranch Conservation Lands

FIGURE

6

JH 2014-12-02

# Appendix B

Panoche Valley Solar Point Count Survey Study Report

# Panoche Valley Solar Point Count

# Survey Study Report

Panoche Valley Solar Project
San Benito County, California
April 2014

*Image Courtesy of Michael Bumgardner*

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## Abbreviations and Acronyms

| | |
|---|---|
| °F | Degrees Fahrenheit |
| AMSL | Above Mean Sea Level |
| BBCS | Bird and Bat Conservation Strategy |
| CNPS | California Native Plant Species |
| Duke Energy | Duke Energy Renewables |
| ECP | Eagle Conservation Plan |
| FEIR | Final Environmental Impact Report |
| GOEA | Golden eagle |
| GPS | Global positioning system |
| km | kilometer |
| MW | Megawatt |
| Project Footprint | The portion of the Proposed Project that includes the solar arrays and associated roads and equipment, totaling 2,492 acres. |
| Proposed Project | Panoche Valley Solar Project |
| PVS | Panoche Valley Solar, LLC |
| SCRCL | Silver Creek Ranch Conservation Lands |
| UDA | Utilization Distribution Assessment |
| USFWS | United States Fish and Wildlife Service |
| UTM | Universal Transverse Mercator |
| VFCL | Valley Floor Conservation Lands |
| VRCL | Valadeao Ranch Conservation Lands |

# 1.0 Project Introduction and Background

Panoche Valley Solar, LLC (PVS) is proposing to construct the proposed Panoche Valley Solar Project (Proposed Project). PVS is proposing to construct the Proposed Project to operate an up to 399-Megawatt (MW) solar photovoltaic energy generation facility in San Benito County, California (Figure 1). The Proposed Project would be located approximately three-quarters of a mile north of the intersection of Panoche Road and Little Panoche Road, in eastern San Benito County (Figure 2). The Proposed Project site is comprised of approximately 2,492 acres in the Panoche Valley and would also include approximately 24,185 acres of high quality Conservation Lands that are contiguous with the Proposed Project area (Figure 3).

On June 13, 2013, PVS consulted with the United States Fish and Wildlife Service (USFWS)-Ventura office concerning the requirement to prepare an Eagle Conservation Plan (ECP) and a Bird and Bat Conservation Strategy (BBCS) for the Proposed Project. It was determined during this discussion, the data presented in the 2010 Final Environmental Impact Report (FEIR) was dated, insufficient in coverage, and was conducted too late in the season. USFWS recommended a Phase II site-specific golden eagle (GOEA; *Aquila chrysaetos*) study be conducted (USFWS 2013).

This report documents the survey results of GOEA occurrence, frequency, and behavior conducted during the migratory and wintering phase (September through January) within the Proposed Project area and associated conservation lands in the Panoche Valley (Figure 3). The conservation lands include three large parcels of land to offset potential impacts as part of a conservation package consisting of the permanent preservation and management of those parcels. These parcels are called the Valley Floor Conservation Lands, the Valadeao Ranch Conservation Lands, and the Silver Creek Ranch Conservation Lands (Figure 3).

Additionally, aerial surveys conducted in January and March were completed to determine the number and locations of occupied nests and the approximate centers of occupied nesting territories of GOEA within a 10-mile radius centered on the Project Footprint. The results of these studies will be summarized in a separate report. Results of the combined studies will be used to prepare the ECP and the BBCS.

## 2.0 Study Purpose and Need

The Point Count and Utilization Distribution Assessment (UDA) studies were completed to provide baseline data on GOEA occurrence, frequency, and behavior to present results of spatial and temporal site use and potential risk based on time spent within the Proposed Project area.

## 3.0 Study Area

The Study Area includes the Proposed Project which is generally located approximately three-quarters of a mile north of the intersection of Panoche Road and Little Panoche Road, in eastern San Benito County. This location is approximately two miles southwest of the Fresno County Line and the Panoche Hills, and approximately 15 miles west of Interstate 5 and the San Joaquin Valley. The Project Footprint is located within Township 15S, Range 10E, Sections 3-4, 8-11, and 13-16 of the United States Geologic Survey's Cerro Colorado, Llanada, Mercy Hot Springs, and Panoche 7.5-minute topographic quadrangle maps. In addition to the Project Footprint, the Study Area also includes the Conservation Lands associated with the Proposed Project, which are located in both San Benito and Fresno counties within Township 15S, Range 10E, Sections 3-4, 8-10, 13-16, and 25; Township 15S, Range 11E, Section 19; Township 14S, Range 10E, Sections 21-27, and 32-36; Township 14S, Range 11E, Sections 19, and 29-32; Township 15S, Range 10E, Sections 1-8, and 10-14; Section 15S, Township 11E, Sections 6-7, 19-20, and 26-36; and Township 16S, Range 11E, Sections 1-6, and 8-12 (Figure 3).

The Study Area is comprised almost entirely of annual, non-native grasslands used mainly to graze cattle and sheep. The Study Area experiences a Mediterranean climate with dry hot summers and cool wet winters. However, this region does not experience heavy rainfall. Annual precipitation in the general vicinity of the site ranges from eight to ten inches per year. Approximately 85 percent of precipitation falls between October and March. Temperatures average approximately 80 degrees Fahrenheit (˚F) in the summer and 40˚F in the winter, mid-summer temperatures are often over 100˚F, and winter lows can be close to freezing. Nearly all precipitation infiltrates into the site's soils and flows in creeks and drainages when soil capacity has been reached.

The Study Area for this GOEA survey includes the habitats within the following areas:

- Project Footprint
- Conservation Lands associated with the project including the Valley Floor (VFCL), Valadeao Ranch (VRCL), and Silver Creek Ranch (SCRCL)areas

***Project Footprint***

The Project Footprint consists of the area within the fence line of the proposed solar facility and is composed of approximately 2,492 acres of rangeland. Historically, the Project Footprint was used for crop production; however, in the past approximately 40 years, the site has been used for cattle grazing. The site is surrounded by rangeland and bordered by hills of the Gabilan Range to the west and the Panoche Hills to the east. The topography of the site dips gently down to the east-southeast. The site elevation ranges from approximately 1,200 feet above mean sea level (amsl) near the southeast end of the site to approximately 1,400 feet amsl near the west end.

Prominent grass species within the Project Footprint include ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), red brome (*Bromus madritensis*), foxtail barley (*Hordeum murinum* ssp. *leporinum*), and rat-tail fescue (*Vulpia myuros*). Dominant forbs included broad-leaved filaree (*Erodium botrys*), red-stemmed filaree (*Erodium cicutarium*), shining peppergrass (*Lepidium nitidum var. nitidum*), and vinegarweed (*Tricostema lanceolatum*). Fiddleneck (*Amsinckia menziesii*), devils lettuce (*Amsinckia tessellata*), shepherds purse (*Capsella bursa-pastoris*), turkey mullein (*Eremocarpus setigerus*), and bur clover (*Medicago polymorpha*) were also common, especially along ranch roads. Areas which have not been previously disturbed by grazing or historic cultivation also include a variety of native wildflowers such as blow wives (*Achyrachaena mollis*), blue dicks (*Dichelostemma capitaum*), California gold fields (*Lasthenia californica*), yellow daisy tidy-tips (*Layia platyglossa*), and California creamcups (*Platystemon californicus*).

***Valley Floor, Silver Creek Ranch and Valadeao Ranch Conservation Lands***

Project Conservation Lands include 3 areas totaling 24,185 acres that would be preserved in perpetuity for the benefit of the GOEA, as well as many other species of wildlife. An additional 2,523 acres interspersed throughout and adjacent to the Project Footprint would be left undisturbed and designated as the VFCL. In addition to the designation of the VFCL, the Proposed Action will include two large ranches for conservation purposes. These ranches, the VRCL (10,772 acres) and the SCRCL (10,890 acres), are contiguous with the Project site and each other (Figure 3).

Valley Floor Conservation Lands

The VFCL (approximately 2,523 acres) are contiguous with the Project Footprint, and primarily consist of the non-native annual grassland habitat found within the Project Footprint with some seasonal ponds and vernal and ephemeral pools, as well as the seasonally dry Panoche and Los Aquilas Creeks. The VFCL also includes the entire 100-year floodplain within the Proposed Project boundary on the valley floor.

The dominant vegetation in the VFCL includes ripgut brome, soft chess, red brome, foxtail barley, rat-tail fescue, broad-leaved filaree, red-stemmed filaree, shining peppergrass, and vinegarweed. Fiddleneck, devils lettuce, shepherds purse, turkey mullein, and bur clover were also common, especially in disturbed areas. Areas which have not been previously disturbed include a variety of native wildflowers such as blow wives, blue dicks, California gold fields, yellow daisy tidy-tips, and California creamcups.

Valadeao Ranch Conservation Lands

The VRCL (approximately 10,772 acres) are contiguous with the Project Footprint directly to the west, east, and northeast of the site (Figure 3). These lands are also contiguous with the VFCL and Silver Creek Ranch Conservation Lands (SCRCL). The VRCL include several seasonal drainages. Soils on this site are complex and range from sandy to sandy loam to clay loam to badlands. The VRCL contain approximately 2,945 acres with slopes between 0 and 11 percent. Elevations on the VRCL range from approximately

1,400 feet to 2,100 feet above mean sea level (amsl). The property which is currently grazed is dominated by introduced annual grasslands (approximately 6,700 acres), which have a very similar species makeup to the Project Footprint and VFCL. This property also mostly consists of ephedra shrubland (approximately 2,700 acres), barrens, and saltbush shrubland.

Ephedra shrublands within the VRCL range from nearly pure California ephedra (*E. californica*) stands to highly diverse associations with typical desert shrubs. Occupied habitats occur from lower slopes and valley bottoms to rocky outcrops and alluvial slopes. This 3 to 15 foot tall shrub rarely achieves greater than 10 percent cover (absolute), but the cover provided varies little with soil type, aspect, or grazing pressure. It is generally the only shrub present in the often very broad transition from Ephedra shrublands to Introduced Annual Grasslands.

Plant associations that are noted to occur within the Ephedra shrublands include *Artemisia californica - Senecio flaccidus* scrub, *Eastwoodia elegans - Ephedra californica* scrub, *Ericameria linearifolia - Ephedra californica* scrub, *Ericameria linearifolia - Ericameria nauseosa* scrub, *Ericameria linearifolia - Gutierrezia californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Artemisia californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Ephedra californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Gutierrezia californica* scrub, *Eriogonum fasciculatum* var. *polifolium - Yucca whipplei* scrub, and *Gutierrezia californica - Ephedra californica* scrub. Ephedra Shrublands occur in the VRCL portion of Las Aquilas Creek in small patches along ridgelines, steep slopes with a northern aspect, lower slopes, ephemeral drainages, and steep, rocky, and thin-soiled south-facing slopes.

Barrens are ridgelines and south or (rarely) west-facing very steep slopes that exhibit a precipitous drop-off in vegetative cover. In terms of vegetation, the assembled species diversity is very low, nearly all species are relatively short-lived annuals, shrubs and trees are absent, and introduced annual grasses become minor components of the species mix. Barrens most commonly interrupt Introduced Annual Grasslands, where the transition was often observed to occur over the space of several feet. Two plant associations were identified within the barrens: *Erodium cicutarium - Plantago erecta* and *Holocarpha obconica - Vulpia macrostachys*.

The saltbush shrubland habitat consists of nearly pure to mixed stands of saltbush (*Atriplex polycarpa*) associations. Occupied habitats range from white clay soils on hills immediately west of Little Panoche Road to rocky outcrops and alluvial slopes experiencing high ground creep rates near ridgelines east of the road. In all observed occurrences on hills, the aspect of greatest *Atriplex polycarpa* cover is southern. This two to three foot tall shrub also attains dominance within several of the ephemerally flooded washes, where sandier soils are more common. It is always the most common shrub canopy contributor near seasonal springs and seeps that exhibit saline character.

Two plant associations exist on the VRCL: *Atriplex polycarpa - Eriogonum fasciculatum* var. *polifolium* and *Atriplex polycarpa - Isocoma acradenia* var. *bracteosa*. *Atriplex polycarpa - Eriogonum fasciculatum* var. *polifolium* occurs on slopes, appearing as mainly open ground with scattered shrubs. Shrub canopy

closure averages 5 to 10 percent, with scattered clumps of 20 percent closure. Canopy density is greatest on south-facing slopes, where *Eriogonum fasciculatum* is often more prevalent, and on slopes that are steep or slippery enough to exclude grazing. The herbaceous layer is largely absent, resembling barrens that are often present on adjacent slopes of similar aspect. Shrub canopies are confined to wash edges due to trampling by cattle, and average cover rarely exceeds 10 percent.

Silver Creek Ranch Conservation Lands

The SCRCL (approximately 10,890 acres), which is currently being with grazed with livestock, is located southeast of the Project Footprint (Figure 3). The northwestern-most corner of the proposed SCRCL is contiguous with a portion of the VRCL. Elevations on the SCRCL range from 900 to 2,200 feet amsl. Soils on the SCRCL are less complex than those found on the VRCL and are generally characterized as well drained and moderately permeable. SCRCL contains approximately 5,765 acres with slopes between 0 and 11 percent.

SCRCL are dominated by non-native species (approximately 8,400 acres), with the same species found on the Project Footprint and on the other conservation lands, distributed sparsely over the landscape. The other major habitats on this conservation lands includes ephedra shrubland (approximately 2,260 acres) with similar species noted on the VRCL and riparian/wetland habitat.

The riparian habitats occur along the Panoche and Silver Creeks. The Silver Creek riparian vegetation, where it briefly intersects the SCRCL, indicates a seasonally wet, somewhat saline habitat subject to annual or occasional energetic flows. The riparian corridor has become dominated by invasive tamarisk (*Tamarix* sp.). Tamarisk has developed semi-open to impassable stands in a 30 to 100 foot wide corridor. The population extends well off-site, both upstream and downstream. In this area, saltgrass (*Distichlis spicata*) appears to be the native species most tolerant of the soil salination and groundwater drawdown effects of heavy tamarisk infestation, and often forms meadow-like swards between the tamarisk thickets.

Panoche Creek is a gaining reach as it crosses through the SCRCL. The streambed upstream off the site for at least three miles was observed to be completely dry and largely devoid of plants. Within the surveyed area, this arroyo-like habitat quickly transitions to zonal wetlands characterized by gaseous springs, highly reduced soils, and marsh or meadow vegetation. The Panoche Creek riparian zone, which ranges from 100 feet to 500 feet in width, may provide the only reliable, naturally occurring surface water for much of the year. The dominant plants are consistently arrayed, with vegetation classified as emergent *Typha* marsh (*Typha* Herbaceous Alliance) centrally, *Schoenoplectus americanus* mid-marsh (*Schoenoplectus americanus* Herbaceous Alliance) at the outer saturated edge, and *Distichlis spicata* meadow (*Distichlis spicata* Herbaceous Alliance) extending across the moistened to seasonally drying soils at the riparian edge and *Frankenia salina* and *Juncus mexicanus*. Trees are largely absent, as are species adapted to a floating or submerged habitat.

# 4.0 Methodology

Per the USFWS recommendations, the GOEA studies followed the Wind Energy Guidelines in Tier 3, Stage 2 of which includes site-specific surveys and assessments in anticipation of ECP preparation (USFWS 2013). These site specific surveys included:

- Point Count Surveys (i.e., fixed-radius circular plot surveys) within the project footprint and Conservation Lands (conducted summer, fall, and winter of 2013/2014);
- Utilization Distribution Assessment (UDA) within the project footprint and VFCL (conducted summer, fall, and winter of 2013/2014); and
- Aerial survey of Project-area nesting population, location, and number of occupied eagle nests within a 10 mile radius of the Proposed Project center (results provided in separate report).

## 4.1 Point Count Surveys

The surveys for GOEA resources were conducted through the use of point counts that were conducted at established point count stations (Cooperrider et al. 1986; Hamel et al. 1996; Ralph et al. 1993; Ralph et al. 1995). Six point count stations were located within Project Footprint and VFCL (Figure 4) to ensure a minimum spatial coverage of at least 30 percent of the Project Footprint (USFWS 2013). Six point count stations were also located within the VRCL and the SCRCL (Figures 5 and 6). Three point count stations were located in the VRCL (Figure 5) and three point count stations in the SCRCL (Figure 6). The coverage for the VRCL and SCRCL is less than 30 percent, but provides adequate observations of GOEA use in these areas.

The survey locations were established by creating point count stations within an 800 meter (2,625 feet) radius observation area. The center point of each plot was geo-referenced using a global positioning system (GPS). The boundary of each point count plot was identified via distinct natural or any anthropogenic features at several points for distance reference.

The point count surveys consisted of observers recording GOEA detections from the point count stations for two hours at each point count station (Figures 4, 5, and 6) and recorded on point count field forms (Appendix A) (Pagel et al. 2010; USFWS 2013). The GOEA surveys were conducted between daylight hours (sunrise to sunset) on a bi-weekly basis from September 3, 2013 to January 24, 2014. During the fall migration, when possible, surveys were completed during midday to increase sampling efficiency by temporally stratifying surveys to cover the midday period during migration (CA Energy Commission 2007; USFWS 2013).

During the point count surveys, the observers, which were trained and their skills tested for GOEA observations (e.g. species, age class, activity), stayed with their vehicle to remain inconspicuous, which decreased the possibility that an individual eagle would avoid observers, which could reduce the

likelihood of detection. The observers performed systematic scans of the point count plot using binoculars alternated with unaided eye scans to detect GOEA.

The data collected during each point count station survey beyond the typical conditions information (e.g. date, time, temperature, wind speed and direction, and etc.) included the number of GOEA seen, age class, GOEA activity/behavior, flight paths, estimated flight height and location in plot, and general description of observations.

The age class of the GOEA were broken down into juvenile eagles (first year), immature or subadult eagles (second to fourth year), adult eagles (fifth year or greater), or unknown (eagles where age class could not be determined due to distance, etc.). The activity/behavior data collected noted the prevalent behavior during each one-minute interval as soaring flight (circling broadly with wings outstretched); unidirectional flapping gliding; kiting-hovering; stooping or diving at prey; stooping or diving in an agonistic context with other eagles or other bird species; undulating/territorial flight; perched; or other. The flight path data included GOEA inside, as well as outside the plot. The flights were recorded on the point count data forms for each point count station (Appendix B).

In addition to the GOEA point count surveys and the UDA data, any miscellaneous observations information gathered during the 2013 PVS giant kangaroo rat and blunt- nosed leopard lizard surveys, conducted in March through September, 2013, was also used to supplement the point count/UDA data (Appendix C).

## 4.2 Utilization Distribution Assessment (UDA)

In addition to the point count surveys, a UDA for GOEA was completed during the survey season. The UDA was completed to document the GOEA spatial distribution of use on the Proposed Project Footprint. The observation data was noted on field maps (Appendix B) and then convert the data into GIS formats for analyses. The field maps were created by placing a grid of square cells, each 0.5 x 0.5 kilometer (km), which was framed by a Universal Transverse Mercator (UTM) system across a map of the PVS Project Footprint to record eagle observations in each 0.25 $km^2$ cell (Figure 7).

The Project Footprint/VFCL was divided into non-overlapping observation sectors centered on a designated Observation Point, each with a vantage point. The point count stations were utilized for the UDA Observation Points (Figure 7). These locations afforded an unobstructed viewing of the grid cells to more than one km in all directions. The UDA observation periods were conducted for two hours and were added to each point count survey period for the Project Footprint/VFCL. The UDA was not conducted on the VRCL and the SCRCL since they are outside of the Project Footprint.

During the UDA, when necessary, the observers worked together with the use of hand-held radios from separate vantage points to pinpoint the location(s) of GOEA through triangulation. This communication between observers also eliminated the duplication of GOEA sightings. The data recorded by the

observers during the UDA included GOEA activity/behavior and flight path and location. The prevalent activity/behavior of each GOEA was recorded in one-minute interval as soaring flight (circling broadly with wings outstretched); unidirectional flapping gliding; kiting-hovering; stooping or diving at prey; stooping or diving in an agonistic context with other eagles or other bird species; undulating/territorial flight; perched; or other. The flight paths and location data was recorded on the gridded field maps (Appendix B), using topographic features or distance indicators as location references.

The data was analyzed by simply counting the number of flights intersecting each cell. If the data set had been larger, a specific GOEAs distribution of use would have been estimated by using standard kernel analyses (USFWS 2013).

# 5.0 Discussion, Analysis and Results

This discussion, analysis, and results section presents a compilation of the data that was gathered during the surveys point count and UDA surveys for GOEA. As stated previously, the surveys for GOEA resources were conducted through use of point counts and UDA surveys at 12 established stations within the PVS Project Footprint; Conservation lands associated with the Project include the Valley Floor, Valadeao Ranch, and Silver Creek Ranch areas.

Survey events occurred every other week between the weeks of September 3, 2013 until January 24, 2014, for a total of 11 survey events. Each survey event was made up of 12 point counts surveys that lasted 2 hours each and 6 UDA surveys which were also 2 hours each. The total hours surveying for GOEA during each survey event was 36 hours. This gives an overall total of 396 hours of survey time within the Project area. The overall sightings of GOEA during the surveys, excluding the aerial surveys, was 94. Weather was generally conducive to GOEA surveys; temperatures ranged between 20-97˚F, and winds ranged between 0 and 19.5 miles per hour (mph), though were typically less than 8 mph, nothing but a trace of rain throughout the surveys, and visibility that ranged from 80% to 100% (Appendix D).

## 5.1 Point Count Surveys

As stated previously, six point count stations (P-01 to P-06) were located within Project Footprint and VFCL (Figure 4), and six point count stations were located within Valadeao Ranch and Silver Creek Ranch Conservation Lands (Figures 5 and 6). Three point count stations were located in the VRCL (Figure 5) and three point count stations in the SCRCL (Figure 6).

The results of the point count surveys included a total of 61 observations of GOEA. This total includes 23 individual observations of GOEA seen within the point count plot boundaries and 38 observations outside the plot boundaries (Tables 1 and 2).

**Table 1. Total GOEA by Survey Event**

| Survey Event | Total GOEA Observed (inside and out of boundaries) | Observation Location (Inside Point Count/Outside) | Juvenile GOEA (Inside Point Count/Outside) | Subadult GOEA (Inside Point Count/Outside) | Adult (Inside Point Count/Outside) | Unknown Age (Inside Point Count/Outside) |
|---|---|---|---|---|---|---|
| 1st (September 3 -5, 2013 ) | 10 | 2/8 | 0/0 | 0/0 | 2/0 | 0/8 |
| 2nd (September 17-19, 2013) | 21[1] | 9/12 | 2/0 | 1/0 | 3/2 | 2/10 |
| 3rd October 2-4, 2013 | 1 | 1/0 | 0/0 | 0/0 | 1/0 | 0/0 |
| 4th October 15-17, 2013 | 5 | 3/2 | 0/0 | 0/0 | 3/2 | 0/0 |
| 5th October 28-30, 2013 | 4 | 1/3 | 0/1 | 0/0 | 1/1 | 0/1 |
| 6th November 11-13, 2013 | 7 | 0/7 | 0/0 | 0/0 | 0/1 | 0/6 |
| 7th November 25-27, 2013 | 3 | 0/3 | 0/0 | 0/0 | 0/0 | 0/3 |
| 8th December 9-11, 2013 | 2 | 1/1 | 0/0 | 0/0 | 0/0 | 1/1 |
| 9th December 21-23, 2013 | 2 | 0/2 | 0/0 | 0/0 | 0/2 | 0/0 |
| 10th January 7-9, 2014 | 5 | 5/0 | 2/0 | 1/0 | 1/0 | 1/0 |
| 11th January 22-24, 2014 | 1 | 1/0 | 0/0 | 0/0 | 1/0 | 0/0 |

[1] - Data includes several GOEA (approx. 7 GOEA) that were feeding on a carcass of a dead cow inside the project boundary and GOEA stayed at carcass during point count and UDA.

**Table 2. GOEA by Point Count Station**

| | Project Footprint/Valley Floor CL | | | | | | Valadeao Ranch CL | | | Silver Creek Ranch CL | | | Age Class Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Age Class** | **P-01** | **P-02** | **P-03** | **P-04** | **P-05** | **P-06** | **V-01** | **V-02** | **V-03** | **S-01** | **S-02** | **S-03** | |
| Juvenile | 2/1[1] | 0/0 | 0/0 | 1/0 | 0/0 | 0/0 | 0/0 | 2/0 | 0/0 | 0/0 | 0/0 | 0/0 | 6 |
| Sub-Adult | 1/0 | 0/0 | 1/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 0/0 | 2 |
| Adult | 5/2 | 2/2 | 0/2 | 0/0 | 0/1 | 0/0 | 2/0 | 0/0 | 0/0 | 0/0 | 1/0 | 2/1 | 20 |
| Unknown | 2/10 | 0/3 | 1/0 | 0/0 | 0/7 | 0/0 | 0/0 | 0/5 | 0/2 | 0/0 | 1/1 | 0/1 | 33 |
| Total – Inside/Out | 10/13[2] | 2/5 | 2/2 | 1/0 | 0/8 | 0/0 | 2/0 | 2/5 | 0/2 | 0/0 | 2/1 | 2/2 | |
| **Total** | 23 | 7 | 4 | 1 | 8 | 0 | 2 | 7 | 2 | 0 | 3 | 4 | 61 |

[1] - Numbers of GOEA observed inside point count plot/outside point count plot
[2] - Data includes several GOEA that were feeding on a carcass of what appeared to be a dead animal inside the P-01 boundaries.

Project Footprint/Valley Floor Conservation Lands

The GOEA observations in the Project Footprint/VFCL totaled 43 GOEA, with 15 observations within the point count plot boundaries and 28 observations outside the plot boundaries for the entire survey season. These observations were also categorized by their age class (Table 2). The GOEA observation on the Project Footprint/Valley Floor Conservation Lands were made up of four juveniles, three inside the point count plot boundaries and one observation outside the plot boundaries. There were two subadult GOEA observed within the point count plot boundaries and none outside. The surveys also found 14 adult GOEA observations within the Project Footprint/Valley Floor Conservation Lands areas, with 7 adults being seen inside the plot boundaries, and 7 adult GOEA observed outside the plot boundaries. Furthermore, there were 23 GOEA observations where the age class could not be

determined and were categorized as unknown (Table 2). A majority of the unknown age class observations were due to the distance between the observer and the GOEA.

The point count station with the highest number of observations of GOEA, both inside and outside the plot boundaries, was P-01 (Figure 4) with a total of 23 GOEA observations (10 inside/13 outside) (Table 2). Note that the reasons for the high number of GOEA observations at this point count station was due to numerous GOEA observed utilizing the hills of the VRCL and the hills to the west of the VRCL for perching, foraging, etc. An additional event elevated the number of GOEA observed at this point. During the second survey event (September 17-19, 2013), 7 GOEA were observed feeding on a carcass of a dead animal (i.e. cattle) during the entire point count survey period (Table 1). The point count station with the lowest number of GOEA observations during the survey season was P-06 (Figure 4) with no GOEA observed during all of the point count surveys (Table 2).

Of the 15 GOEA observations within the Project Footprint/Valley Floor Conservation Lands observed within the point count plots, over half of the observations (8 GOEA) were seen within the month of September (Table 3). As previously stated, during the second survey event (September 17-19, 2013), 7 GOEA were observed feeding on a carcass of a dead animal during the entire point count survey period. The next highest number of observations during a month was the events in October with four GOEA (Table 3). The observation numbers for the other months included two observations in January, one GOEA observation in December, and no observations of GOEA in November within the Project Footprint/Valley Floor Conservation Lands during the point count surveys (Table 3).

**Table 3.Survey Event Results for Project Footprint/Valley Floor Conservation Lands**

| Survey Event | P-01 | P-02 | P-03 | P-04 | P-05 | P-06 | Total |
|---|---|---|---|---|---|---|---|
| 1st (September 3 -5, 2013 ) | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 2nd (September 17-19, 2013) | 7[1] | 0 | 1 | 0 | 0 | 0 | **8** |
| 3rd (October 2-4, 2013) | 1 | 0 | 0 | 0 | 0 | 0 | **1** |
| 4th (October 15-17, 2013) | 1 | 2 | 0 | 0 | 0 | 0 | **3** |
| 5th (October 28-30, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 6th (November 11-13, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 7th (November 25-27, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 8th (December 9-11, 2013) | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| 9th (December 21-23, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| 10th (January 7-9, 2014) | 1 | 0 | 0 | 1 | 0 | 0 | **2** |
| 11th (January 22-24, 2014) | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| **Total** | **10** | **2** | **2** | **1** | **0** | **0** | **15** |

[1] - Data includes several GOEA that were feeding on a carcass of a dead animal inside the plot boundary.

Valadeao Ranch Conservation Lands

The GOEA observations in the VRCL totaled 11 GOEA with 4 observations within the point count plot boundaries and 7 observations outside the plot boundaries for the entire survey season (Table 2). These observations were also categorized by their age class. The GOEA observations on the Valadeao Ranch Conservation Lands were made up of 2 juveniles, all inside the point count plot boundaries. There were no subadult GOEA observed within the point count plot boundaries or outside the plot boundaries. The surveys also found 2 adult GOEA observations within the Valadeao Ranch Conservation Lands areas with all being seen inside the plot boundaries. Furthermore, there were 7 unknown age class observations that were observed outside the plot boundaries. The unknown age class observations were due to the distance between the observer and the GOEA.

The point count station with the highest number of observations of GOEA, both inside and outside the plot boundaries was V-02 (Figure 5) with a total of 7 GOEA observations (2 inside/5 outside) (Table 2). The point count stations with the lowest number of GOEA observations during the survey season was V-01 and V-03 (Figure 5) with 2 GOEA observations each (Table 2). V-01 had 2 GOEA observations inside the plot boundaries, and V-03 had 2 observed outside the plot boundaries (Table 2).

Of the 4 GOEA observations within the VRCL observed within the point count plots, 75% of the observations (3 GOEA) were seen within the month of September (Table 4). The next highest number of observations during a month was the events in January with 1 GOEA observation. For the months of October, November, and December, no observations of GOEA were made within the VRCL during the point count surveys (Table 4).

**Table 4. Survey Event Results for Valadeao Ranch/Silver Creek Ranch Conservation Lands**

| Survey Event | V-01 | V-02 | V-03 | S-01 | S-02 | S-03 | Total |
|---|---|---|---|---|---|---|---|
| 1st (September 3 -5, 2013 ) | 2 | 0 | 0 | 0 | 0 | 0 | 2 |
| 2nd (September 17-19, 2013) | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 3rd (October 2-4, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4th (October 15-17, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5th (October 28-30, 2013) | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 6th (November 11-13, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7th (November 25-27, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8th (December 9-11, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9th (December 21-23, 2013) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10th (January 7-9, 2014) | 0 | 1 | 0 | 0 | 2 | 0 | 3 |
| 11th (January 22-24, 2014) | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| **Total** | **2** | **2** | **0** | **0** | **2** | **2** | **8** |

Silver Creek Ranch Conservation Lands

The GOEA observations in the SCRCL totaled 7 GOEA with four observations within the point count plot boundaries (Figure 6) and 3 observations outside the plot boundaries for the entire survey season. These observations were also categorized by their age class (Table 2). The GOEA observations on the SCRCL had no juvenile or subadult eagles inside or outside the point count plot boundaries. The surveys found 4 adult GOEA observations within the SCRCL areas with 3 observations inside the plot boundaries and one observation outside the plot boundaries. Furthermore, there were 3 unknown age class observations with 1 observation inside the plot boundaries and 2 observations outside the plot boundaries (Table 2). The unknown age class observations were due to the distance between the observer and the GOEA.

The point count station in the SCRCL with the highest number of observations of GOEA, both inside and outside the plot boundaries was S-03 (Figure 6) with a total of 4 GOEA observations (2 inside/2 outside) (Table 2). The point count stations with the lowest number of GOEA observations during the survey season was V-01 and V-03 (Figure 6) with 2 GOEA observations each. V-01 had 2 GOEA observations inside the plot boundaries and V-03 had 2 observed outside the plot boundaries (Table 2). The point count station with the lowest number of GOEA observations during the survey season was S-01 (Figure 2) with no GOEA observed during all of the point count surveys.

Of the 4 GOEA observations within the SCRCL observed within the point count plots, 75% of the observations (three GOEA) were seen within the month of January (Table 4). The next highest number of observations during a month was the events in October with 1 GOEA observation. For the months of September, November, and December, no observations of GOEA were made within the SCRCL during the point count surveys (Table 4).

## 5.2 Utilization Distribution Assessment (UDA)

Like the Point Count Survey events, the UDA Survey events occurred every other week between the weeks of September 3, 2013 until January 24, 2014 for a total of 11 survey events. Each survey event was made up of 6 UDA surveys from designated Observation Points (Figure 7) for 2 hours each. The total hours surveying for GOEA during the UDA study was 132 hours of survey time within the Project Footprint/VFCL.

The results of the UDA surveys included a total of 33 observations of GOEA (Table 5) which includes observations inside the Project Footprint/ VFCL (the UDA Study Area) and outside the UDA Study Area. Of those 33 observations, 16 GOEA observations were recorded within the UDA Study Area (Table 5) with 5 identified as adult GOEA, 3 as subadult GOEA, 4 as juvenile GOEA, and 4 birds were not able to be identified by age class (Table 6).

**Table 5. Total UDA Observations**

| Date of Observation | UDA Observation Point | Observation Location - In or Out of UDA Study Area | Age Class | Flight Height (feet) | Observation Minutes |
|---|---|---|---|---|---|
| 9/4/2013 | P-06 | In | SA | 150 | 5 |
| 9/17/2013[1] | P-01 | In | UK | 0[2] | 10 |
| 9/17/2013 | P-01 | In | UK | 0 | 120 |
| 9/17/2013 | P-01 | In | AD | 0 | 80 |
| 9/17/2013 | P-01 | Out | UKN | 200-300 | 16 |
| 9/17/2013 | P-01 | Out | UKN | 200-300 | 16 |
| 9/17/2013 | P-01 | Out | UKN | 200-300 | 16 |
| 9/17/2013 | P-01 | In | JUV | 0 | 52 |
| 9/17/2013 | P-01 | Out | UKN | 350 | 11 |
| 9/17/2013 | P-01 | In | UKN | 0 | 15 |
| 9/17/2013 | P-01 | In | UKN | 0 | 8 |
| 9/17/2013 | P-02 | In | JUV | NR | 6 |
| 9/18/2013 | P-05 | In | AD | 120 | 4 |
| 9/18/2013 | P-06 | Out | UKN | 100 | 13 |
| 10/3/2013 | P-03 | In | AD | 150-300 | 2 |
| 10/3/2013 | P-03 | Out | JUV | 150-300 | 2 |
| 10/3/2013 | P-03 | Out | AD | 150-300 | 2 |
| 10/3/2013 | P-05 | Out | JUV | 800 | 2 |
| 10/16/2013 | P-03 | Out | AD | 50-200 | 6 |
| 10/16/2013 | P-03 | Out | AD | 50-200 | 6 |
| 10/16/2013 | P-03 | Out | UKN | 150-200 | 3 |
| 10/16/2013 | P-03 | Out | UKN | 150-200 | 3 |
| 10/16/2013 | P-04 | In | JUV | 400 - 800 | 7 |
| 10/28/2013 | P-01 | Out | UKN | 250 | 1 |
| 10/30/2013 | P-02 | In | SA | 200 - 1,000 | 13 |
| 11/12/2013 | P-06 | In | AD | 150 | 3 |
| 11/12/2013 | P-06 | In | AD | 100 | 3 |
| 12/9/2013 | P-02 | Out | UK | 1100 | 6 |
| 12/21/2013 | P-04 | Out | JUV | NR | 19 |
| 12/21/2013 | P-04 | Out | JUV | NR | 30 |
| 12/21/2013 | P-04 | Out | AD | NR | 5 |
| 1/8/2014 | P-01 | In | SA | 0 | 120 |
| 1/22/2014 | P-02 | In | JUV | 200 | 4 |

AD – Adult, SA – Subadult, JUV – Juvenile, UKN – Unknown age, NG – Not Recorded

[1] - Data includes several GOEA that were feeding on a carcass of what appeared to be a dead animal inside the P-01 boundaries on September 17, 2013.

[2] – 0 feet flight height indicates perched on ground or rock.

**Table 6. UDA Survey Overview by Age Class/Survey Point within Study Area**

| Age Class | P-01 | P-02 | P-03 | P-04 | P-05 | P-06 | Totals by Age Class |
|---|---|---|---|---|---|---|---|
| Juvenile | 1 | 2 | 0 | 1 | 0 | 0 | 4 |
| Sub-Adult | 1 | 1 | 0 | 0 | 0 | 1 | 3 |
| Adult | 1 | 0 | 1 | 0 | 1 | 2 | 5 |
| Unknown | 4 | 0 | 0 | 0 | 0 | 0 | 4 |
| Total per Observation Station | 7[1] | 3 | 1 | 1 | 1 | 3 | |

[1] - Data includes several GOEA that were feeding on a carcass of what appeared to be a dead cow inside the P-01 boundaries.

Table 5 indicates the majority of the GOEA observations came from outside the UDA Study Area near Observation Points P-01 and P-03 (Figure 7). This is due to numerous sightings of GOEA observed utilizing the hills of the western portion of the VRCL and the hills beyond the western portion of the VRCL for perching, foraging, etc.

During the UDA surveys there were 452 observation minutes of GOEA inside the UDA Study Area and 157 observation minutes of GOEA outside the UDA Study Area for a total of 609 observation minutes for the entire study period. Note that totals for the UDA study included several GOEA that were observed feeding on a carcass of a dead animal (cattle) inside the UDA Study Area near P-01 within Grid Cell 79 (Figure 7) and remained on the carcass a majority of the UDA survey event on September 17, 2013. These observations made up 63% (285 observation minutes) of the observation time for GOEA for the UDA Study. In addition, the observation time (120 observation minutes) for a subadult eagle noted on January 8, 2014, that perched on the hillside for the entire UDA survey period near P-01, make up 90% of the observation minutes made during the entire study within the UDA Study Area.

The average observed flight height noted during the study, excluding perched GOEA, for all observations of GOEA made during the UDA surveys, was approximately 300 feet above ground level. The average flight height for the GOEA observations noted inside the UDA Study Area was similar with an average flight above ground level of approximately 270 feet (Table 5).

Lastly, due to the small size of the data set, only 16 GOEA flight observations that utilized 57 grid cells within the UDA Study Area (Figure 8), a standard kernel analyses was unable to be utilized. The data was analyzed by calculating the number of flights intersecting an individual grid cell (Figure 8). With exception of the several GOEA observed feeding on a carcass in Grid Cell 79, the cells noted to be utilized by GOEA within the Study Area indicates that the GOEA are not using the southwest and south central areas of the Project Footprint and VFCL. They did not frequent the northern portion of the Project Footprint/VFCL, as well. However, Figure 8 does show that the GOEA are utilizing the hills in the VRCL on both the eastern and western sides of the Study Area for perching, foraging, etc. This area's usage was also noted during the point count surveys.

## 6.0 Conclusion

This report provides the findings of the 2013/2014 Phase II site-specific surveys (USFWS 2013) for GOEA for the Panoche Valley Solar Project. Point Count and UDA studies were completed to provide baseline data on GOEA occurrence, frequency, and behavior to present results of spatial and temporal site use and potential risk based on time spent within the Proposed Project area, which will assist in the preparation of the BBCS and the ECP.

The results of the point count surveys indicated that 93% of the GOEA observations made within the Project Footprint and VFCL point count station boundaries were from the western point count stations, which are in close proximity to the hills located within the western portion of the VRCL (Figure 4). Of the total 15 GOEA observations made during the entire study within point count plots, approximately 47% of those observations were seen during a single survey event (September 17-19, 2013), where 7 GOEA were observed feeding on a carcass of a dead animal within the proposed Project Footprint. This indicates that unless there is an attractant (i.e. food) found within the Project Footprint and the VFCL, that GOEA usage is nominal.

With exception of the several GOEA observed feeding on a carcass in the northeast corner of the UDA Study area, the cells noted to be utilized by GOEA within the UDA Study Area indicates that the GOEA are not using the northern, southwest, and south central areas of the Project Footprint and VFCL. The UDA Study does show, as seen in the point count surveys, that the GOEA are utilizing the hills in the VRCL on both the eastern and western sides of the Study Area for perching, foraging, etc. In addition, the study indicated that flight heights noted inside the UDA Study Area averaged approximately 270 feet with exception of the GOEA noted feeding on the carcass during a September survey event. This shows that the eagles mostly are flying across or through the Panoche Valley (i.e. Project Footprint and VFCL) to other habitat to forage or perch.

## 7.0 References

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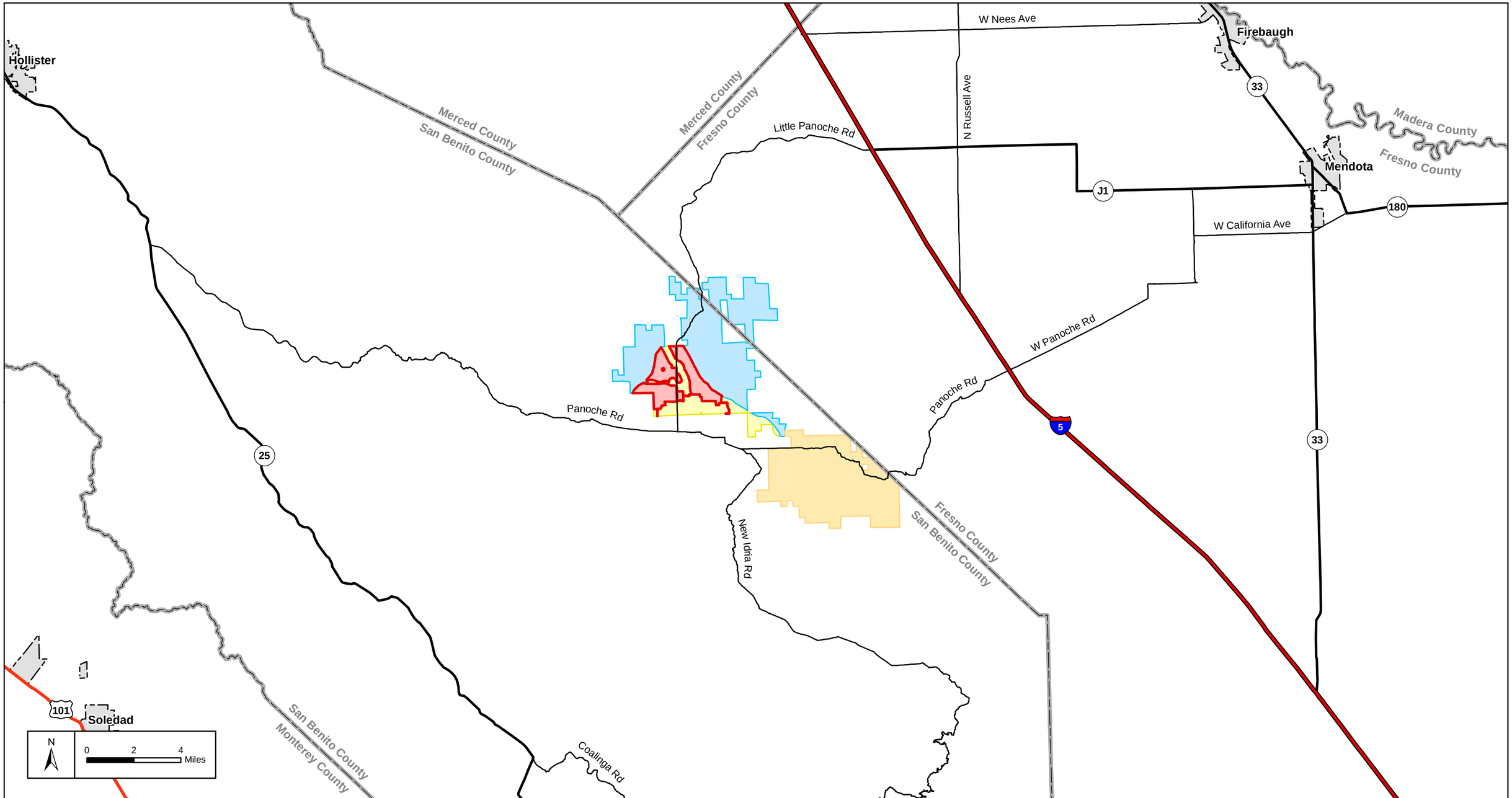
# FIGURES

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**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands
- City

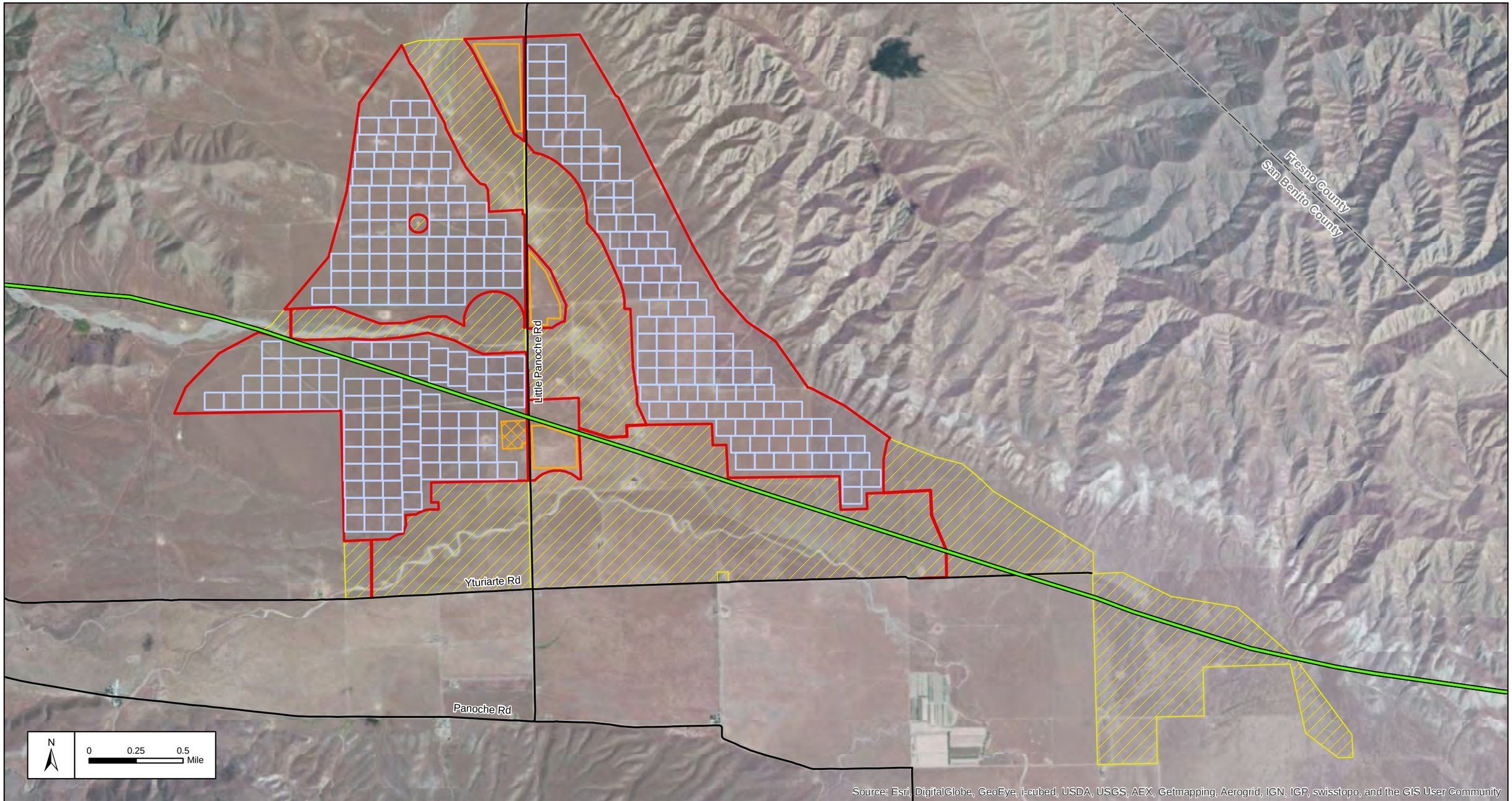
# Panoche Valley Solar Project

## Project Location

FIGURE

1

JH 2014-03-18

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**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Proposed Panel Block
- Existing Transmission Line
- Project Substation
- Laydown Yard

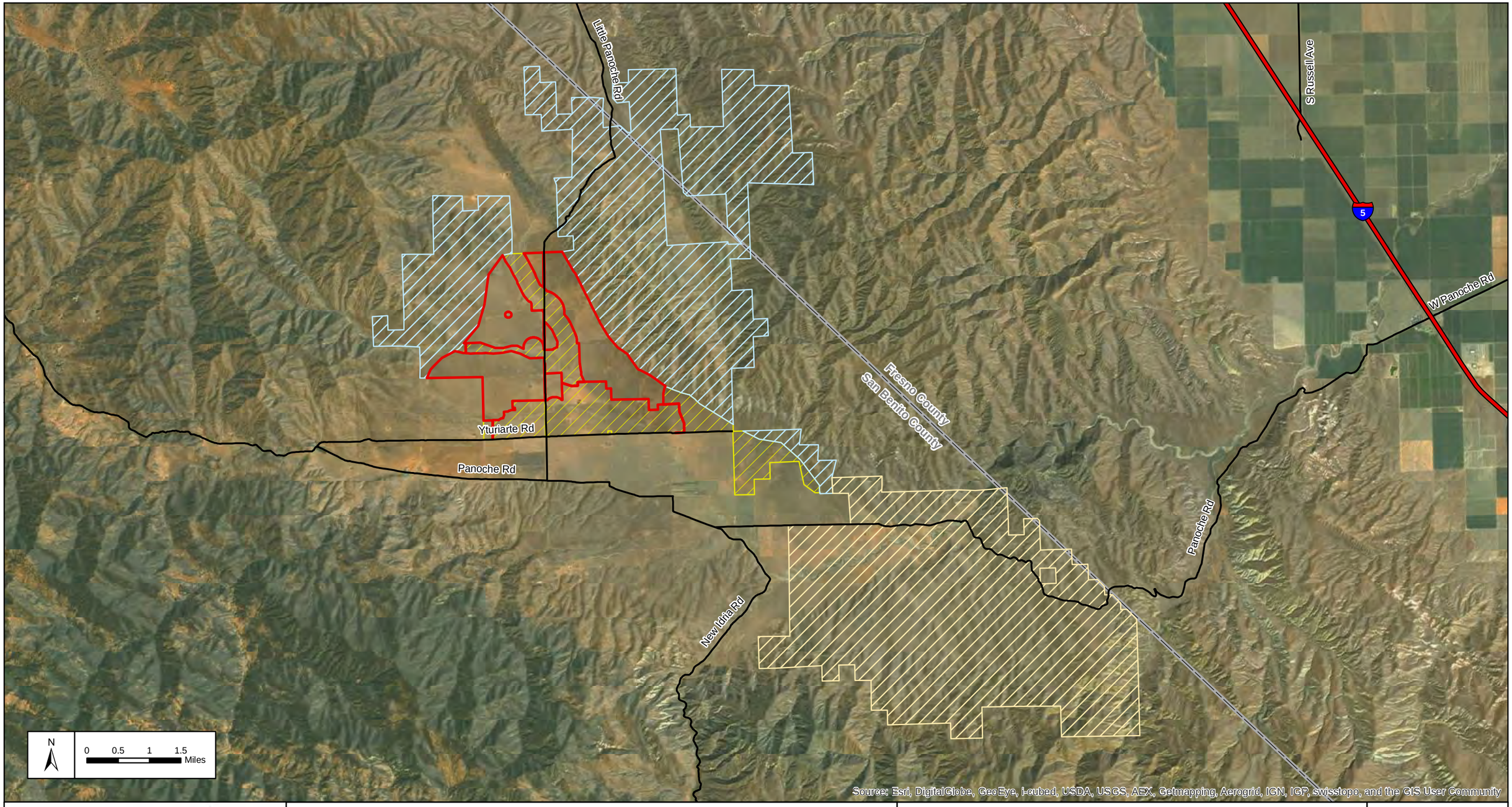
# Panoche Valley Solar Project

## Proposed Layout

FIGURE

2

JH 2014-03-17

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**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands

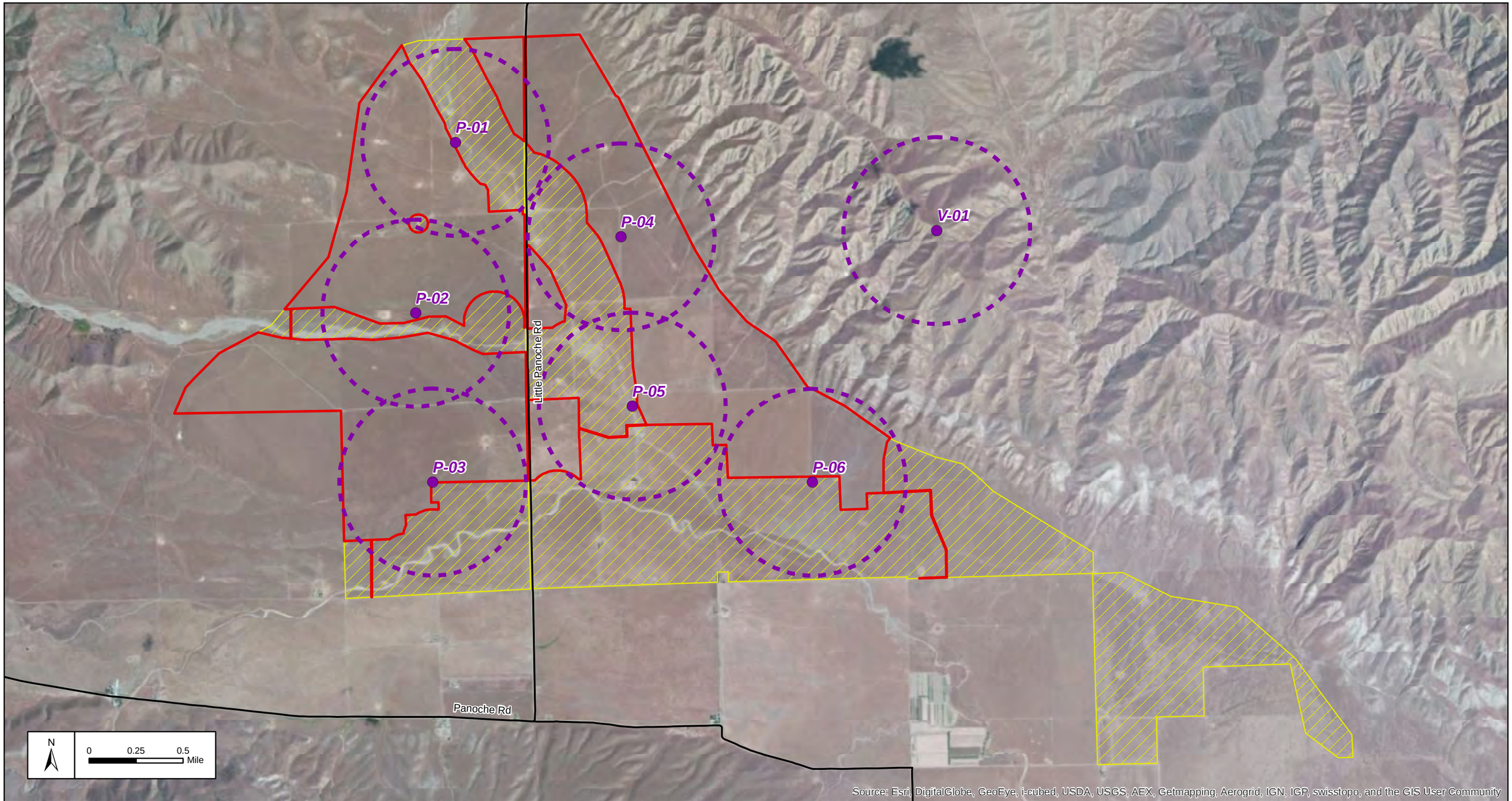
# Panoche Valley Solar Project

## Project Footprint and Conservation Lands

FIGURE

3

JH 2014-03-18

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**Legend**

- Point Count Station
- 800-meter Observation Area
- Project Footprint
- Valley Floor Conservation Lands

# Panoche Valley Solar Project

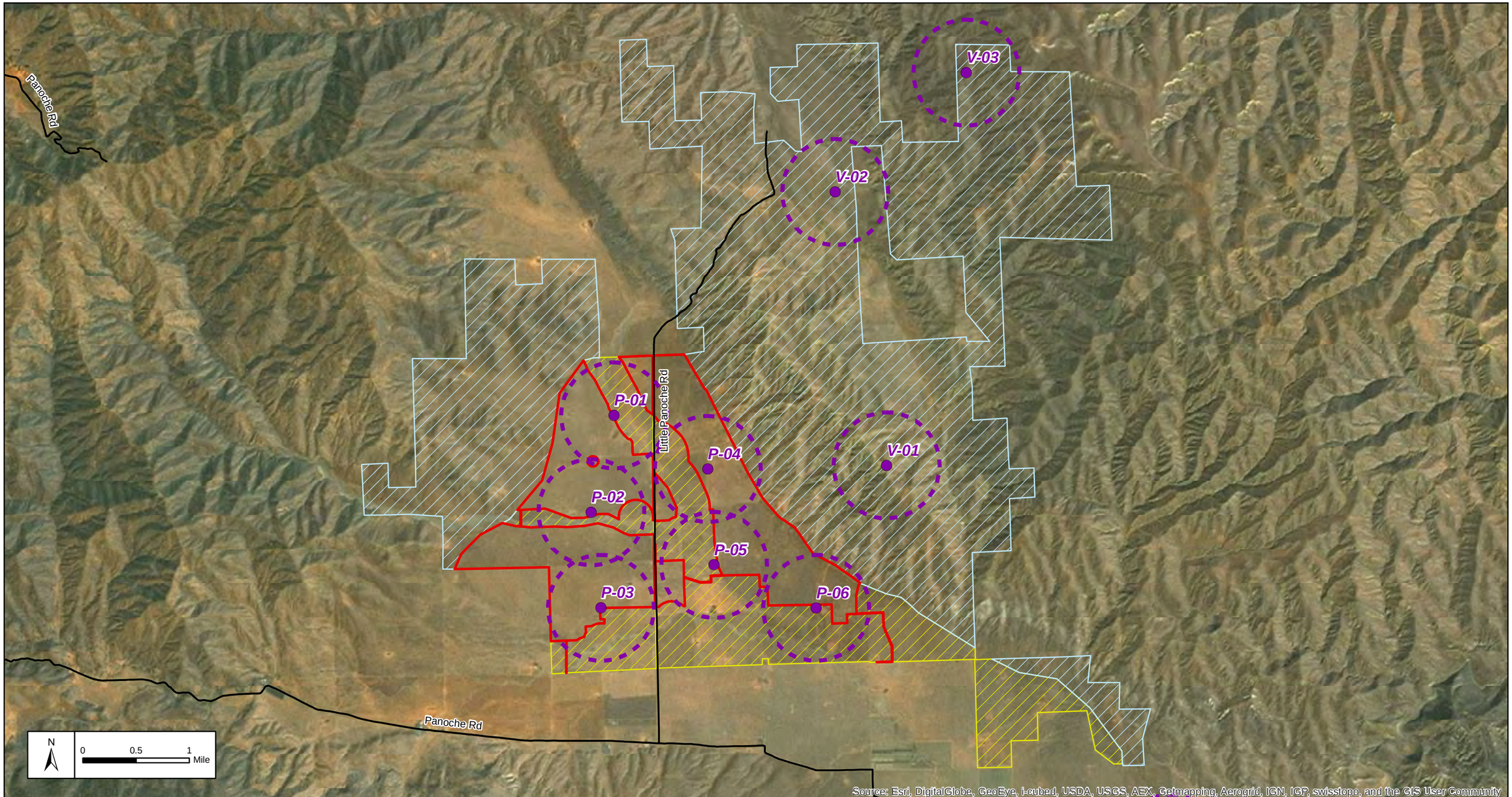
## Point Count Stations

Project Footprint and Valley Floor Conservation Lands

FIGURE

4

JH 2014-03-17

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**Legend**

- Point Count Station
- 800-meter Observation Area
- Project Footprint
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands

# Panoche Valley Solar Project

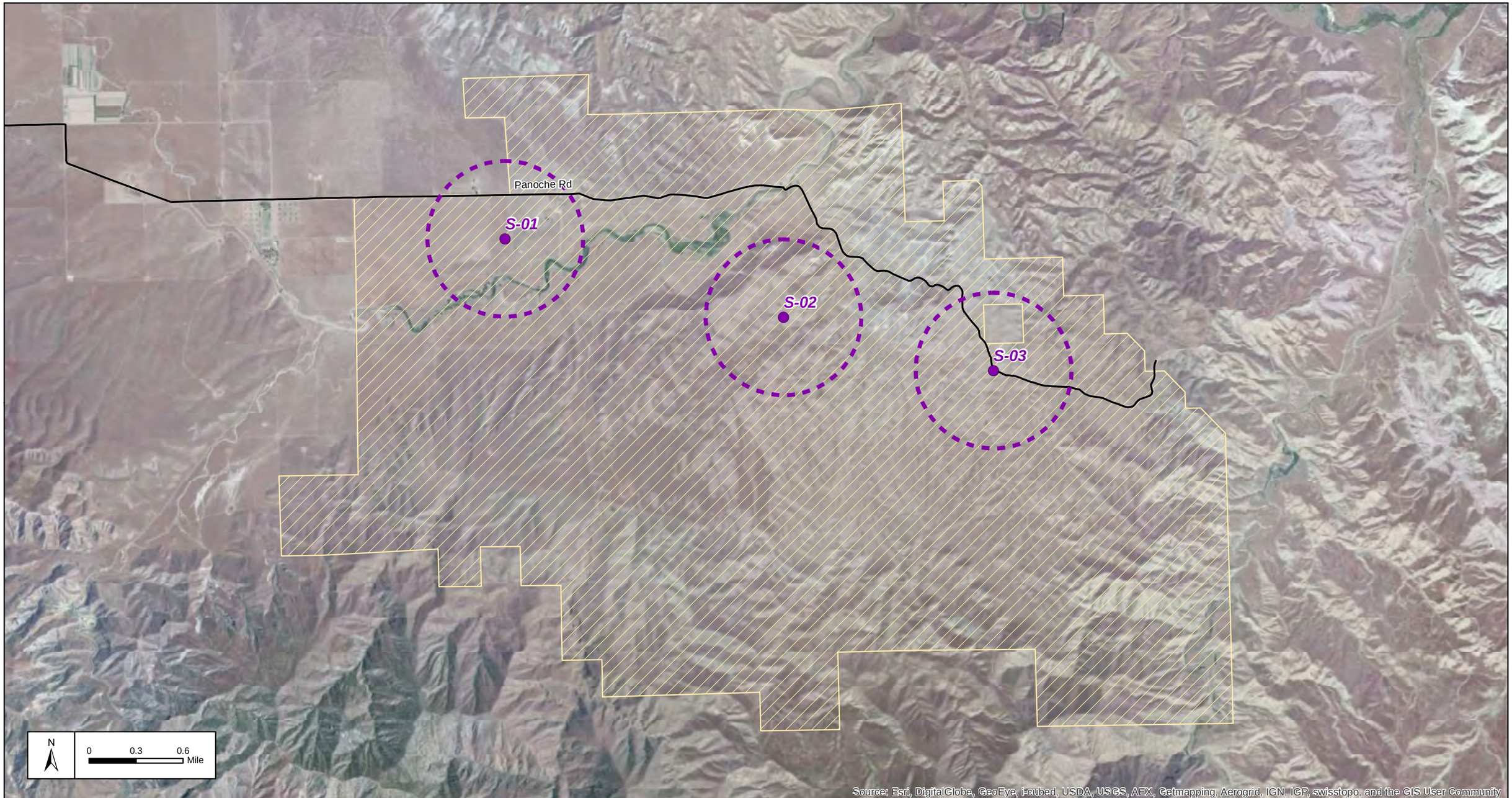
## Point Count Stations

Valadeao Ranch Conservation Lands

FIGURE

5

JH 2014-03-17

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**Legend**

- Point Count Station
- 800-meter Observation Area
- Silver Creek Ranch Conservation Lands

# Panoche Valley Solar Project

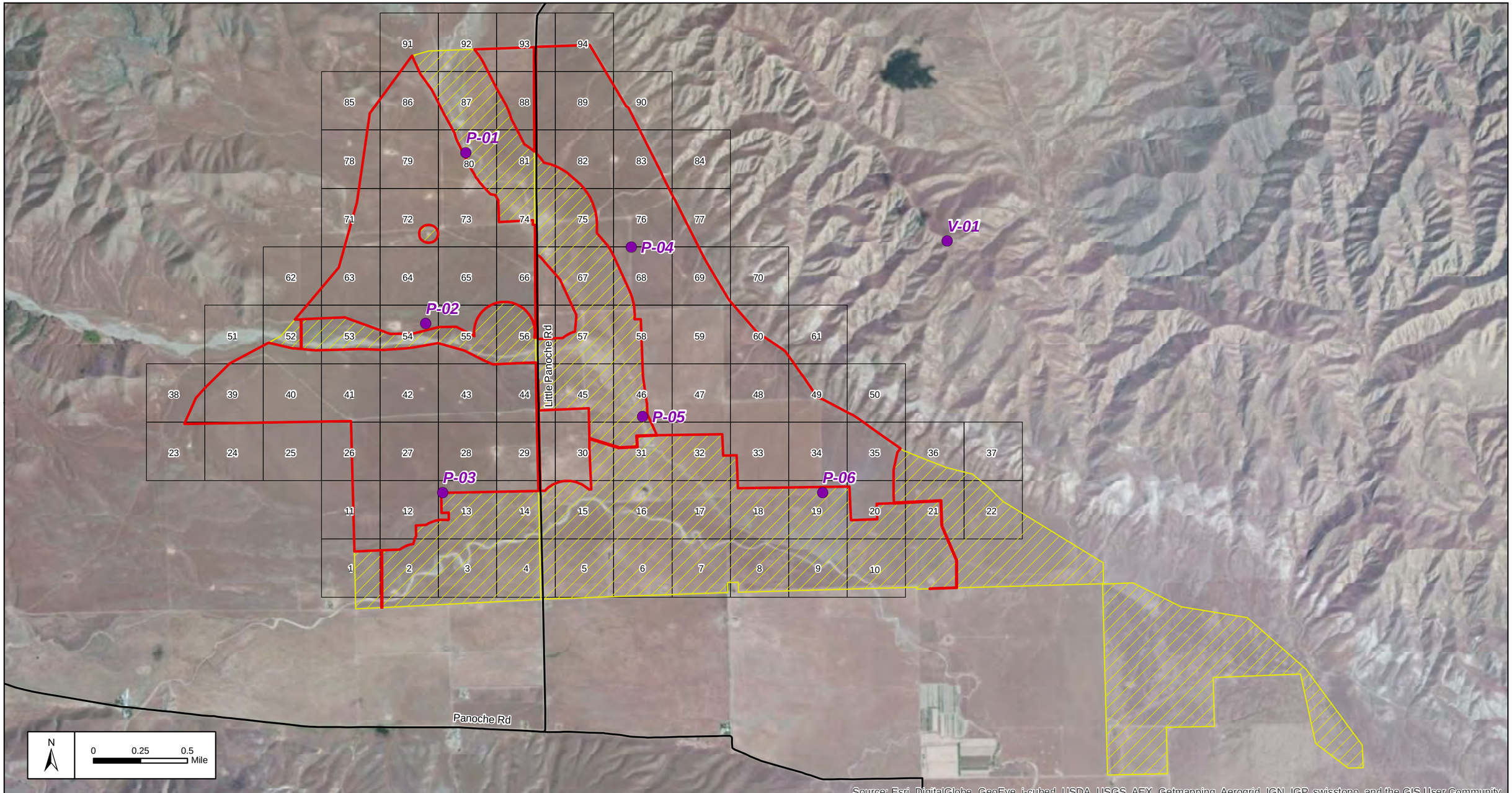
## Point Count Stations

Silver Creek Ranch Conservation Lands

FIGURE

6

JH 2014-03-17

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**Legend**

- UDA Observation Point
- Project Footprint
- Valley Floor Conservation Lands
- 0.5 x 0.5 Kilometer Grid Cell

# Panoche Valley Solar Project

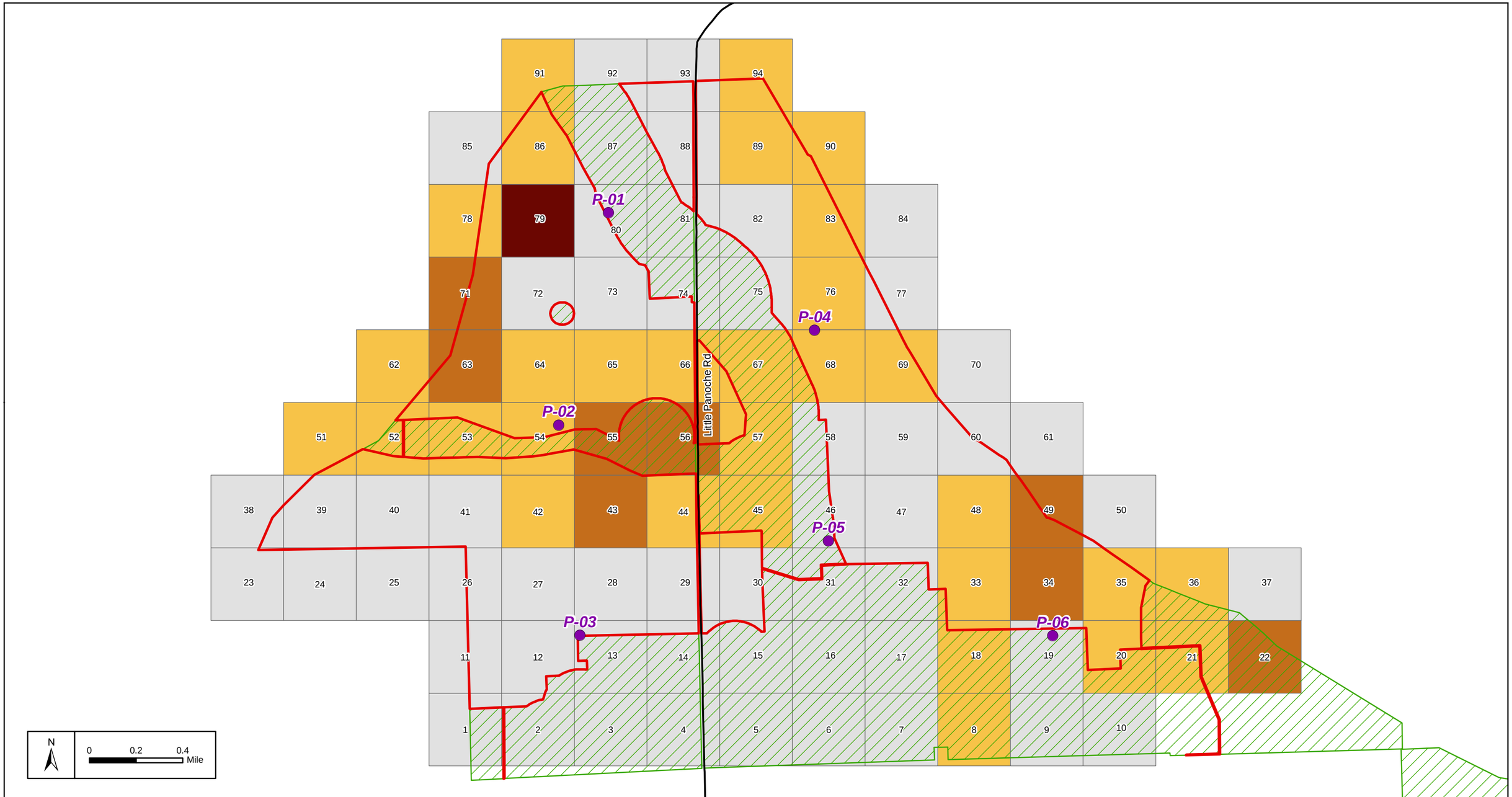
## UDA Observation Points

Project Footprint and Valley Floor Conservation Lands

FIGURE

7

JH 2014-03-17

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**Legend**

- UDA Observation Point
- Project Footprint
- Valley Floor Conservation Lands

**Number of Times a Grid Cell was Utilized by GOEA**

- 0
- 1
- 2 - 3
- 4 - 7

# Panoche Valley Solar Project

## UDA Study Results

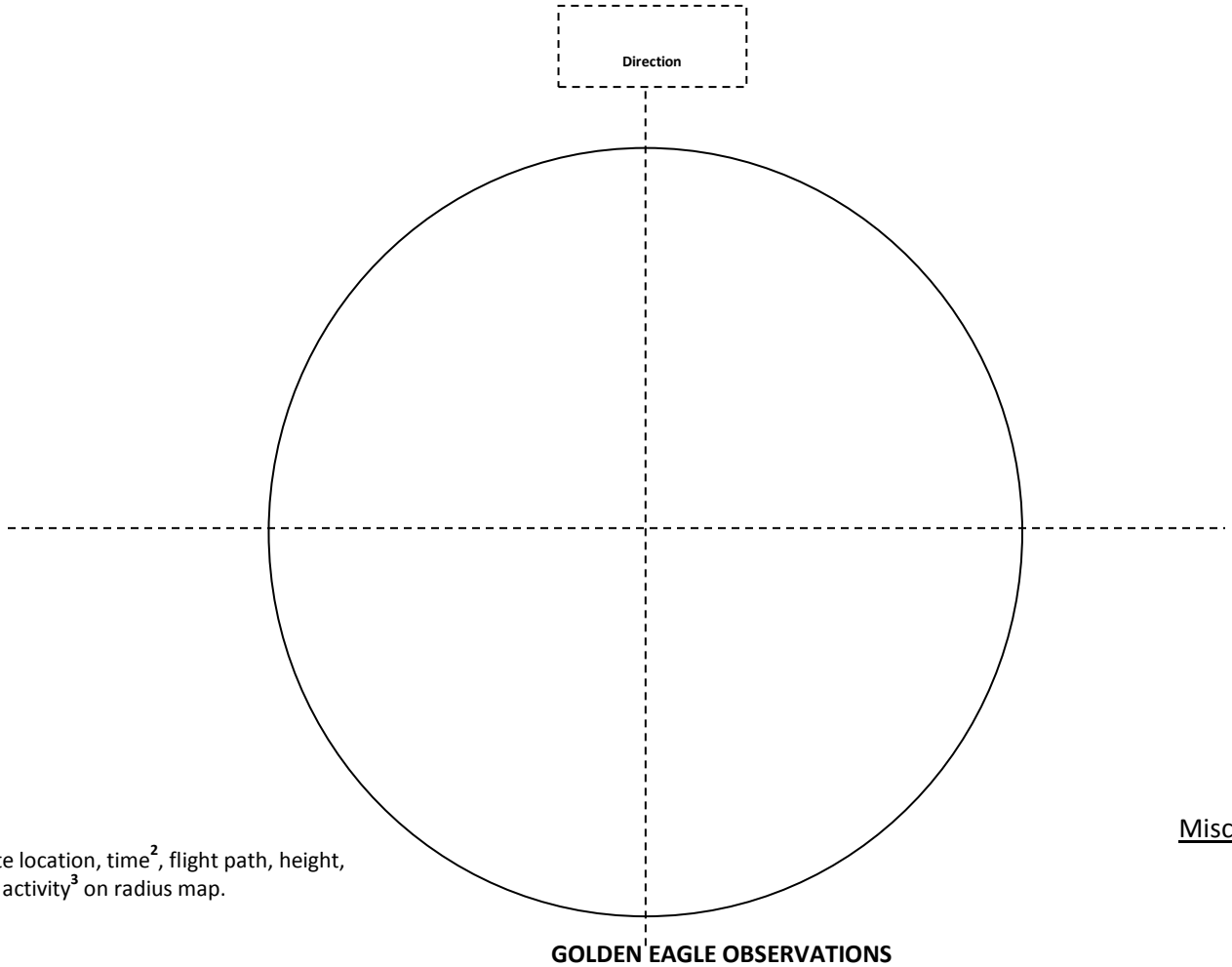
FIGURE

8

JH 2014-03-17

# APPENDIX A
# FIELD FORMS

| Panoche Valley Solar Golden Eagle 800 Meter Point Count Survey | | |
|---|---|---|
| Point Count Station Number | Start Time | Temp Start °F |
| Date (mm/dd/yy) | End Time | Temp End °F |
| Observer(s) | Precip. (amt. last 24hr) | Visibility (% clear)[1] |
| Wind (mph/direction) | Cloud Cover (% cloudy) | |




Indicate location, time[2], flight path, height, and activity[3] on radius map.

Misc. Obs

**GOLDEN EAGLE OBSERVATIONS**

| GOEA # | Age Class[4] | Obs Time Start/End | Eagle Minutes | Description of Observation/Comments |
|---|---|---|---|---|
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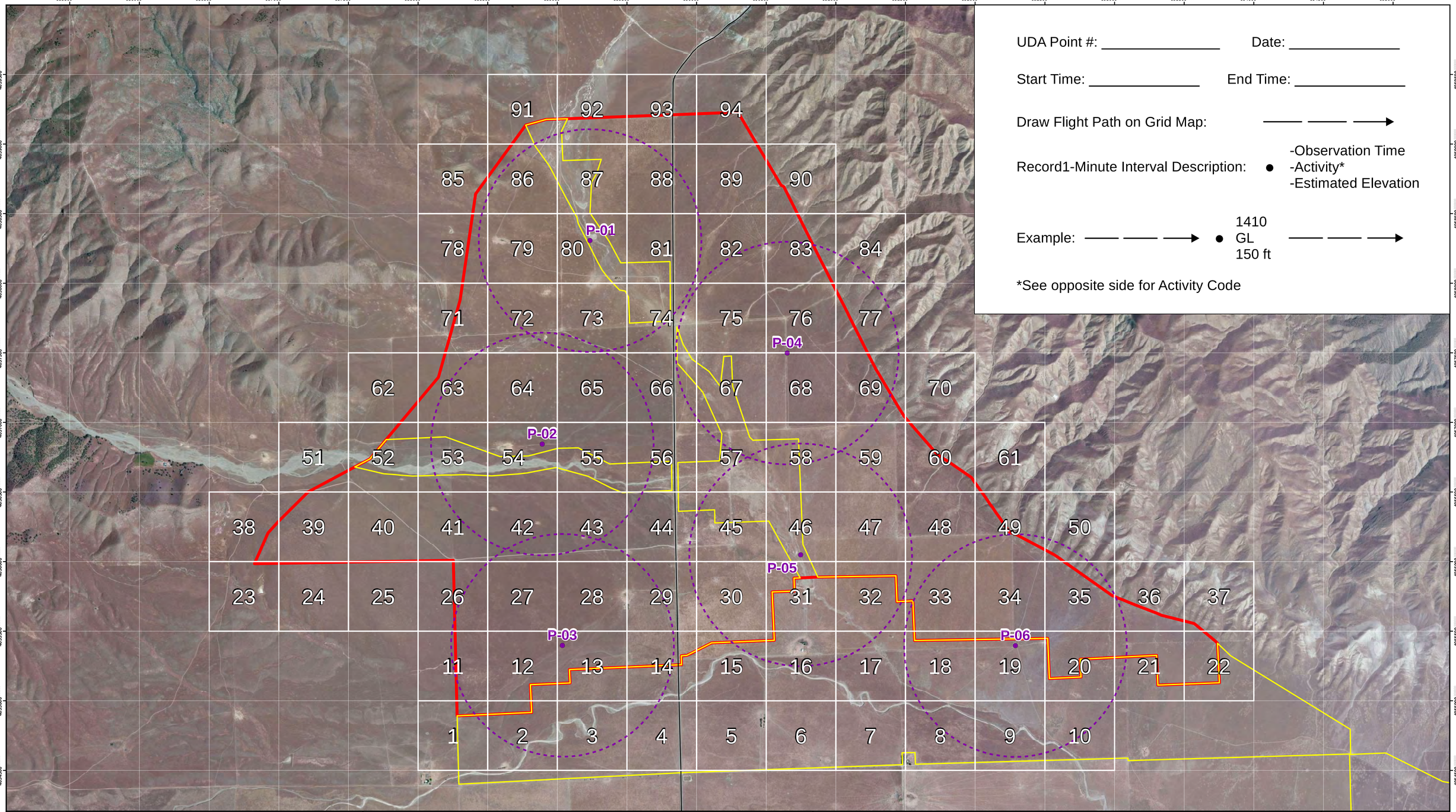
[1]Percent clear within 800 meter and 200 meter vertical
[2]Prevalent behavior noted at one minute intervals
[3]Activity - PE (Perched), SO (Linear Soaring/Gliding), CS (Circle soaring), FL (Flapping), HU (Hunting), HO (Hovering/Kiting), and OT (Other).
[4]Age Class – JUV (Juvenile), SA (Sub-adult), and AD (Adult)




UDA Point #: _____ Date: _____

Start Time: _____ End Time: _____

Draw Flight Path on Grid Map: ——— ——— ⟶

Record1-Minute Interval Description: ● -Observation Time -Activity* -Estimated Elevation

Example: ——— ——— ⟶ ● 1410 GL 150 ft ——— ——— ⟶

*See opposite side for Activity Code

Energy Renewal PARTNERS, LLC

BR
9/11/2013

**Legend**

- Approximate Project Boundary
- Valley Floor Conservation Lands
- Survey Point Location
- 800 meter Observation Area

# Duke Energy Renewables
# Panoche Valley Solar Project

## Golden Eagle Utilization Distribution Assessment (UDA) Grid Map

N

0 1,000 2,000
Feet

| Panoche Valley Solar Golden Eagle Utilization Distribution Assessment (UDA) | | | |
|---|---|---|---|
| **UDA Point Number** | **Start Time:** | **Temp Start: °F** | **Wind (mph/direction)** |
| **Date (mm/dd/yy)** | **End Time:** | **Temp End: °F** | **Observer(s)** |

**GOLDEN EAGLE OBSERVATIONS**

| GOEA # | Age Class[1] | Obs Time Start/End | Eagle Minutes | Description of Observation[2]/Comments[3] |
|---|---|---|---|---|
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Indicate location, time, flight path, estimated height, and activity[2] on grid map (opposite side).

KEY

[1]Age Class – JUV (Juvenile), SA (Sub-adult), and AD (Adult)

[2]Includes prevalent behavior/activity noted at one minute intervals. Activity description includes - PE (Perched), SO (Linear Soaring/Gliding), CS (Circle Soaring), FL (Flapping), HU (Hunting), HO (Hovering/Kiting), and OT (Other).

[3]Include grid numbers utilized from attached grid map

# APPENDIX B
# COMPLETED FIELD FORMS
# ELECTRONIC FORMAT

# APPENDIX C
# MISCELLANEOUS GOLDEN EAGLE OBSERVATIONS

## Miscellaneous Golden Eagle Observations during other Surveys

| Date | GOEA Observations |
|---|---|
| 5/13/2013 | 1 |
| 5/25/2013 | 1 |
| 5/26/2013 | 2 |
| 5/28/2013 | 1 |
| 5/29/2013 | 1 |
| 6/17/2013 | 1 |
| 6/22/2013 | 1 |
| 7/6/2013 | 1 |
| 7/8/2013 | 1 |
| 8/4/2013 | 1 |
| 8/9/2013 | 2 |
| 8/29/2013 | 1 |
| 9/5/2013 | 3 |
| 9/7/2013 | 2 |

# APPENDIX D
# WEATHER DATA

| Survey Date | Weather Conditions |
|---|---|
| September 3, 2013 | Temp 83-95° Fahrenheit (F)<br>Wind 6.5-10.4 miles per hour (mph) N<br>Cloud Cover 25%<br>Precipitation 0 inches (in)<br>Visibility 100% |
| September 4, 2013 | Temp 66-97°F<br>Wind 1.5-6.6 mph N<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| September 5, 2013 | Temp 70-96°F<br>Wind 6.1 – 7.4 mph E<br>Cloud Cover 100%<br>Precipitation 0 in.<br>Visibility 95% |
| September 17, 2013 | Temp 61-72.3°F<br>Wind 15.4 mph W<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| September 18, 2013 | Temp 64-79°F<br>Wind 7.9-13.2 mph NNW<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| September 19, 2013 | Temp 64-93.5°F<br>Wind 0.6 mph N<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| October 2, 2013 | Temp 59-70°F<br>Wind 3.2 mph SW<br>Cloud Cover 10%<br>Precipitation 0 in.<br>Visibility 100% |
| October 3, 2013 | Temp 52-66°F<br>Wind 1-12.7 mph S<br>Cloud Cover 0%<br>Precipitation 0 in. |

| Survey Date | Weather Conditions |
|---|---|
| | Visibility 100% |
| October 4, 2013 | Temp 53-68°F<br>Wind 1.4 mph E<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| October 15, 2013 | Temp 52-84°F<br>Wind 1.1 – 5.9 mph S<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| October 16, 2013 | Temp 51.5-85°F<br>Wind 0-5 mph S<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| October 17, 1913 | Temp 77-90°F<br>Wind 1.1-5 mph S<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 100% |
| October 28, 2013 | Temp 48-62°F<br>Wind 8.9-19.5 mph W<br>Cloud Cover 35%<br>Precipitation Trace<br>Visibility 100% |
| October 29, 2013 | Temp 53.4-75°F<br>Wind 3.6-6 mph NW<br>Cloud Cover 98%<br>Precipitation 0 in.<br>Visibility 90% |
| October 30, 2013 | Temp 42-67°F<br>Wind 0.9 -7 mph S<br>Cloud Cover 10%<br>Precipitation 0 in.<br>Visibility 100% |
| November 12, 2013 | Temp 58-64.4°F |

| Survey Date | Weather Conditions |
|---|---|
| | Wind 1-6 mph N<br>Cloud Cover 80%<br>Precipitation Trace<br>Visibility 100% |
| November 13, 2013 | Temp 49-74.6°F<br>Wind 2-8.1 mph N<br>Cloud Cover 5%<br>Precipitation Trace<br>Visibility 100% |
| November 14, 2013 | Temp 52-76°F<br>Wind 1 -5 mph NW<br>Cloud Cover 15%<br>Precipitation 0 in.<br>Visibility 100% |
| November 25, 2013 | Temp 32-73°F<br>Wind 0.8-3.6 mph SE<br>Cloud Cover 0%<br>Precipitation 0 in.<br>Visibility 80% |
| November 26, 2013 | Temp 46-66°F<br>Wind 1-4 E<br>Cloud Cover 90%<br>Precipitation 0 in.<br>Visibility 100% |
| November 27, 2013 | Temp 41-64°F<br>Wind 1 mph W<br>Cloud Cover 35%<br>Precipitation 0 in.<br>Visibility 100% |
| December 9, 2013 | Temp 20-50.3°F<br>Wind 1-1.7 mph SE<br>Cloud Cover 0%<br>Precipitation 0 in<br>Visibility 100% |
| December 10, 2013 | Temp 27-51.6°F<br>Wind 1-5 mph NE<br>Cloud Cover 0% |

| Survey Date | Weather Conditions |
|---|---|
| | Precipitation 0 in<br>Visibility 100% |
| December 11, 2013 | Temp 31.4-53°F<br>Wind 0.9-2.7 mph W<br>Cloud Cover 0%<br>Precipitation 0 in<br>Visibility 100% |
| December 21, 2013 | Temp 33-40°F<br>Wind 2.5- 7.5 mph W<br>Cloud Cover 0%<br>Precipitation 0 in<br>Visibility 100% |
| December 22, 2013 | Temp 30-49°F<br>Wind 0.6-8.2 mph N<br>Cloud Cover 0%<br>Precipitation 0 in<br>Visibility 100% |
| December 23, 2013 | Temp 43-60°F<br>Wind 0.6-2 mph W<br>Cloud Cover 0%<br>Precipitation 0 in<br>Visibility 100% |
| January 7, 2014 | Temp 39-69°F<br>Wind 1-5 mph E<br>Cloud Cover 75%<br>Precipitation 0 in.<br>Visibility 100% |
| January 8, 2014 | Temp 36-71°F<br>Wind 0-5 mph S<br>Cloud Cover 50%<br>Precipitation 0 in.<br>Visibility 100% |
| January 9, 2014 | Temp 41-47°F<br>Wind 0-5 mph N<br>Cloud Cover 50%<br>Precipitation 0 in.<br>Visibility 100% |

| Survey Date | Weather Conditions |
|---|---|
| January 22, 2014 | Temp 38-66°F<br>Wind 1-4 mph N<br>Cloud Cover 40%<br>Precipitation 0 in.<br>Visibility 100% |
| January 23, 2014 | Temp 47-68°F<br>Wind 3-6 mph NW<br>Cloud Cover 5%<br>Precipitation 0 in.<br>Visibility 100% |
| January 24, 2014 | Temp 48-65°F<br>Wind 0-10 mph S<br>Cloud Cover 90%<br>Precipitation 0 in.<br>Visibility 100% |

# APPENDIX E
# PHOTOGRAPHS

Photo 1. General habitat view of Valley Floor Conservation Lands (VFCL) and Project Site near P-01 looking southwest.

Photo 2. General habitat view of Project Footprint in vicinity of P-03 looking northeast toward P-04 and P-05.

Photo 3. General habitat view of Project Footprint in vicinity of P-03 looking southwest.

Photo 4. General view from Little Panoche Road toward P-05 with the Valadeao Ranch in background looking east/northeast.

Photo 5. General view of Project Footprint and VFCL looking west toward P-02 and the western Valadeao Ranch property.

Photo 6. General view of Project Footprint and VFCL looking southwest from V-01 on the eastern Valadeao Ranch property.

Photo 7. General habitat view of eastern Valadeao Ranch property looking northeast from V-01.

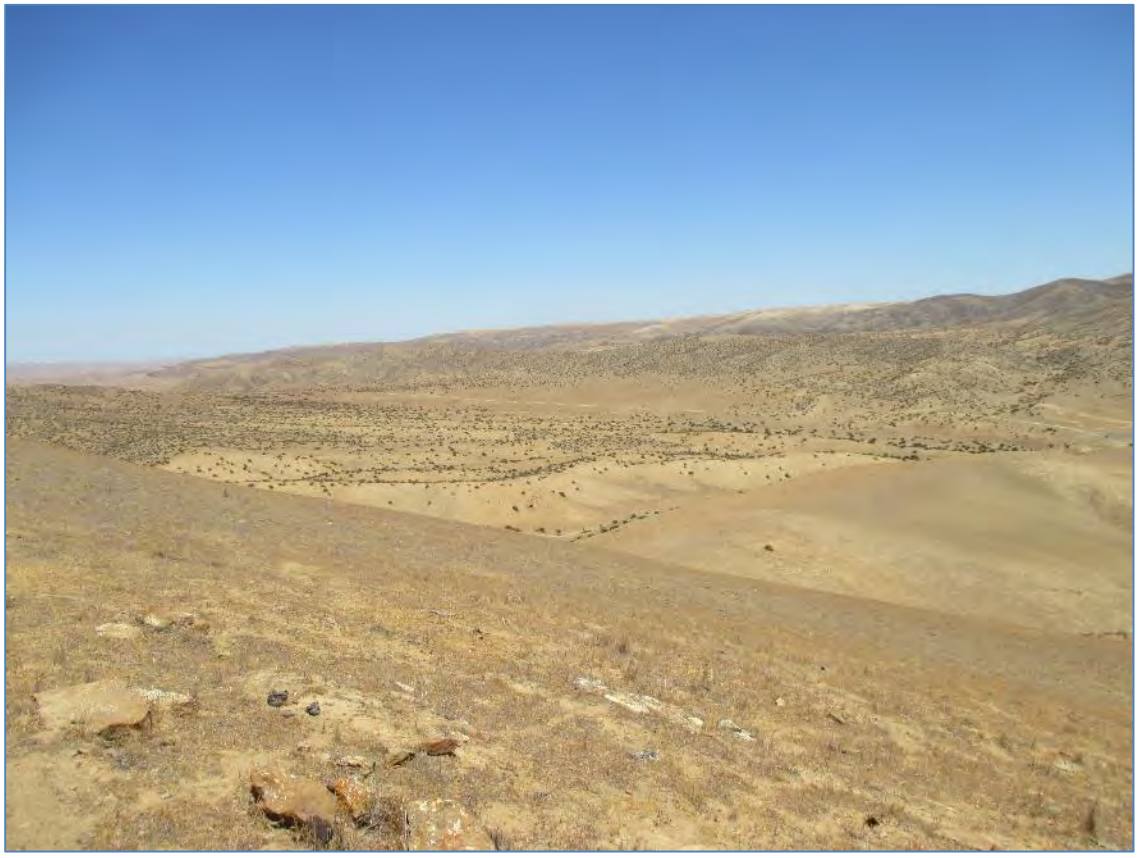

Photo 8. General habitat view of eastern Valadeao Ranch property looking north/northeast from V-01.

Photo 9. General habitat view of eastern Valadeao Ranch property looking east near V-02.

Photo 10. General habitat view of eastern Valadeao Ranch property near V-02.

Photo 11. General habitat view of the Silver Creek Ranch property looking northwest back towards S-01.

Photo 12. General habitat view of the Silver Creek Ranch property near S-02.

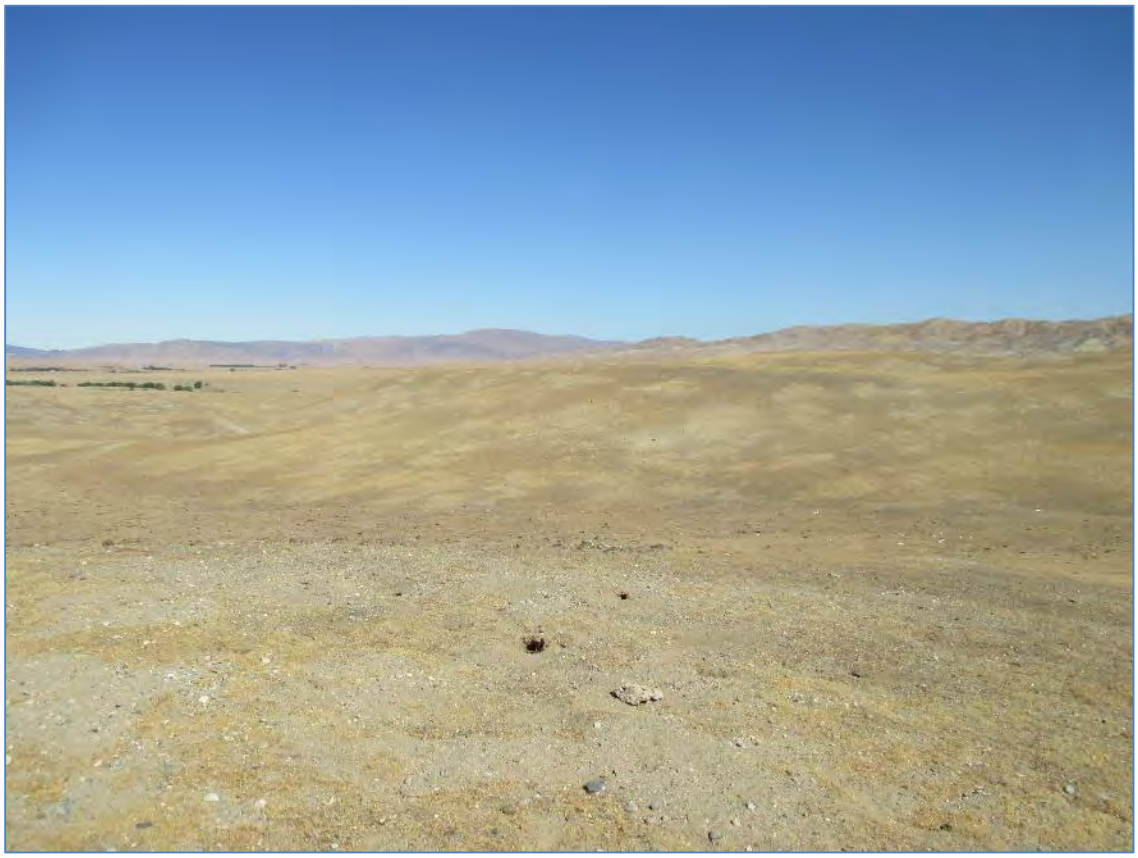

Photo 13. Additional habitat view of the Silver Creek Ranch property near S-02.

**Appendix C**

Panoche Valley Solar Facility - 2014 Final Golden Eagle Nesting Survey Report

# Panoche Valley Solar Facility

## 2014 Final Golden Eagle Nesting Survey Report

**Prepared for:**

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Huntersville, North Carolina 28078

Contact: Scott T. Fletcher

**Prepared by:**

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**May 2014**

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## ABOUT BLOOM BIOLOGICAL, INC.

For more than 35 years, Bloom Biological, Inc. (BBI) has provided biological consulting services for large and small clients. Our resume of services includes raptor and endangered species research, biological monitoring, impact assessment, permitting, conservation planning and geospatial analysis. Our innovative approach has provided solutions to complex problems for clients and projects throughout a range of industries including alternative energy, residential development and the public sector. Collectively, the management and staff of BBI hold permits or memoranda of understanding for participating in the conservation and recovery of more than a dozen endangered or threatened species, as well as a number of other special-status species, in California and the western United States. Over the years, BBI has established an impeccable relationship with the resource agencies, project proponents, and environmental organizations by skillfully balancing the needs and objectives of land planning, resource conservation, and the public interest. In addition to our work in California and the western United States, BBI biologists have worked in Alaska, Central and South America, Europe, Southern Asia, and the western Pacific. BBI is a certified Small Business Enterprise.

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C. Species Lists
D. Resumes

# 1.0 INTRODUCTION

Bloom Biological, Inc. (BBI) was retained by Duke Energy for Panoche Valley Solar, LLC (the Applicants) to conduct nesting surveys for Golden Eagle (*Aquila chrysateos*) associated with the Panoche Valley Solar Facility (Project), an approximately 399 megawatt solar photovoltaic energy generating facility proposed for construction in San Benito County, California. BBI previously conducted surveys for the proposed Project, documenting 15 potential Golden Eagle nests within ten miles of the proposed Project, 8 of which were designated as having been active in the 2010 breeding season (BBI 2010). The report authors noted however, that the survey was conducted late in the season and that a more complete survey should be conducted during the breeding season and prior to leaf-on of deciduous trees, when nests would be easier to detect. To augment the 2010 nest survey effort, the U.S. Fish and Wildlife Service (Service) recommended that the Applicants conduct "Stage 2" aerial surveys of the Project area nesting population during a January-February time frame before leaf-on. BBI conducted aerial surveys for Golden Eagle with ten miles of the proposed project in January and April 2014, resulting in the documentation of 46 Golden Eagle nests and an estimated 30 Golden Eagle territories, with nine of them active, though none were located within three miles of the limits of the proposed Project. This report presents BBI's detailed survey methods and results, identifying the location and status of all nests, and the distance from each nest to the Project.

# 2.0 NATURAL HISTORY

The Golden Eagle is found throughout most of the north Temperate Zone. In North America it ranges from arctic Canada and Alaska south through the western United States to central Mexico. Northern populations are migratory; however, most populations south of Canada are residents or short-distant migrants.

Kochert et al. (2002) provided a thorough description of the natural history of the Golden Eagle, noting that the species is found in a variety of habitats located in a wide range of latitudes throughout the Northern Hemisphere. In North America, Golden Eagles are most common in the western half of the continent near open spaces that provide habitat for foraging, and generally with cliffs present for nesting sites. While northern populations of the species are migratory, often making trips of thousands of miles to the wintering grounds; southern populations (including those in southern California) tend to be resident year-round.

While Golden Eagles are capable of killing large prey such as cranes, wild ungulates, and domestic livestock, they primarily subsist on rabbits, hares, ground squirrels, and prairie dogs (Bloom and Hawks 1982, Olendorff 1976). Golden Eagles are thought to typically reach sexual maturity, form territories and begin nesting at four years of age. Pairs are generally thought to stay within the limits of their territory, which can measure well over 20 square kilometers and may contain as many as 14 nests (Kochert et al. 2012, Bloom pers. obs.). The pair maintains and repairs one or more of these nests as part of its courtship. Over the course of a decade several of these nests will be used and will produce young, while others may only receive occasional fresh sticks. Most alternate nests are important in the successful reproduction of a pair of eagles. Kochert et al. (2002) also noted that the nesting season is prolonged, extending more than 6 months from the time the 1-3 eggs are laid until the young reach independence. A typical Golden Eagle raises an average of only 1 young per year and up to 15 young over its lifetime. Pairs commonly refrain from laying eggs in some years, particularly when prey is scarce. The number of young that Golden Eagles produce each year depends on a combination of weather and prey conditions.

# 3.0 REGULATORY STATUS

Regulatory protections for Golden Eagles include thorough surveys to determine the status of Golden Eagles for projects occurring within their range and habitat. The intent is to determine the extent of potential direct, indirect and cumulative effects projects may have on eagles, avoid and or minimize these effects, assess the potential for incidental take during project operation, and monitor eagle populations. These measures are predominantly driven by the Bald and Golden Eagle Protection Act.

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

For purposes of the guidelines, "disturb" means: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment.

## 4.0 STUDY AREA DESCRIPTION

The Study Area includes all areas inside of, and within a 10-mile (16-kilometer) radius of the Project boundary (Figure 1, Exhibit 1), and encompasses approximately 305,004 acres (123,431 hectares). The Study Area is southeast of the City of Los Banos, California, and portions lie within San Benito, Fresno, and Merced Counties.

Terrain is variable throughout the Study Area, and includes relatively flat, largely agricultural fields in the extreme east, bordered by rolling arid grasslands that occupy the central portion. Most of the western half of the Study Area lies within the Diablo Range and includes more rugged hills and mountains with rocky outcroppings and cliff faces. The predominant land-use within the Study Area is ranching. Vegetative cover includes grasslands and agriculture in the east, chaparral at low elevations in the mountains, with Gray Pine (*Pinus sabineana*) occurring at higher elevations in the mountains, and various oak species, including the deciduous Blue Oak (*Quercus douglasii*), and evergreen Valley Oak (*Quercus lobata*) and Canyon Live Oak (*Quercus chrysolepis*). Elevation within the Study Area ranges from approximately 600 feet above mean sea level (amsl) in the southeast to approximately 4,000 feet amsl in the west.

*Figure 1. Study area location*

# 5.0 METHODS

As per guidance provided by the Service, an initial round of helicopter surveys was performed over a 10-day period during the early breeding season, from January 15-24, 2014. A second round of surveys was conducted over a 7-day period from April 2-8, 2014, when active nests were expected to contain eggs or young nestlings. The first round of surveys was conducted early enough that deciduous trees such as California Sycamore (*Platanus racemosa*), Valley Oak and particularly Blue Oak, which were very abundant in parts of the study area, had not yet leafed out, making it easier to detect large nests within their canopies.

All surveys were conducted by BBI biologist Peter H. Bloom, Ph.D. (lead observer), who was accompanied by one of three assistant observers, including Scott Thomas, Karyn Sernka and Michael J. Kuehn, Ph.D. The helicopter (Bell Jet Ranger 206) was owned and operated by a pilot experienced in conducting aerial Golden Eagle nesting surveys. Survey methodology described in Section VII.b of Aerial Surveys of Pagel et al. (2010) was followed to the extent possible. The biologists conducted an aerial examination of all appropriate nesting habitat inside the pre-defined Study Area described above (Section 4.0). During aerial surveys, BBI biologists searched for large stick nests of Golden Eagles and other raptors on cliff faces, rocky outcrops, trees, transmission towers, and other suitable nesting substrates.

GPS units (one primary and one backup) were used to mark locations of nest sites. The following information was recorded for each raptor or Common Raven (*Corvus corax*) nest found during surveys:

- Name of observer(s)
- Date/Time/Weather conditions
- Species of nest owner
- Location (GPS coordinates)
- Nest status (active, inactive, or unknown)
- Nest contents (empty, eggs, nestlings)
- Nest condition
- Nest substrate
- Nest description (or other indications of breeding behavior)
- Other pertinent descriptive information

Photographs were taken of Golden Eagle nests when feasible, and are presented in Appendix A of this report. Survey dates, times, and weather conditions are summarized in Table 1.

*Table 1. Field Survey Dates, Times, and Weather Conditions*

| Date | Time | Weather | Biologists |
|---|---|---|---|
| 1/15/2014 | 1300-1545h | Start: 62°F, 0% Cloud Cover, Breeze out of the SW<br>End: 56°F, 0% Cloud Cover, Breeze out of the SW<br>No Rain, No Fog, No Snow | Peter Bloom<br>Scott Thomas |
| 1/16/2014 | 0830-1700h | Start: 45°F, 0% Cloud Cover, Calm out of the SW<br>End: 63°F, 0% Cloud Cover, Breeze out of the SW<br>No Rain, No Fog, No Snow | Peter Bloom<br>Scott Thomas |
| 1/17/2014 | 0800-1630h | Start: 38°F, 0% Cloud Cover, Calm out of the N<br>End: 58°F, 0% Cloud Cover, Light Wind out of the NW<br>No Rain, No Fog, No Snow | Peter Bloom<br>Karyn Sernka |
| 1/18/2014 | 0830-1645h | Start: 41°F, 0% Cloud Cover, Calm out of the N<br>End: 62°F, 0% Cloud Cover, Calm out of the N<br>No Rain, No Fog, No Snow | Peter Bloom<br>Karyn Sernka |
| 1/19/2014 | 0830-1645h | Start: 40°F, 0% Cloud Cover, Light Wind out of the NE<br>End: 65°F, 0% Cloud Cover, Calm out of the N<br>No Rain, No Fog, No Snow | Peter Bloom<br>Karyn Sernka |

| Date | Time | Weather | Biologists |
|---|---|---|---|
| 1/20/2014 | 0800-1630h | Start: 39°F, 0% Cloud Cover, Calm out of the N<br>End: 61°F, 0% Cloud Cover, Calm out of the N<br>No Rain, No Fog, No Snow | Peter Bloom<br>Karyn Sernka |
| 1/21/2014 | 0800-1645h | Start: 38°F, 50% Cloud Cover, Light Wind out of the NW<br>End: 60°F, 0% Cloud Cover, Light Wind out of the NE<br>No Rain, No Fog, No Snow | Peter Bloom<br>Karyn Sernka |
| 1/22/2014 | 0840-1700h | Start: 41°F, 0% Cloud Cover, Calm out of the N<br>End: 63°F, 0% Cloud Cover, Calm out of the N<br>No Rain, No Fog, No Snow | Peter Bloom<br>Michael Kuehn |
| 1/23/2014 | 0900-1700h | Start: 46°F, 0% Cloud Cover, Calm out of the N<br>End: 64°F, 0% Cloud Cover, Calm out of the N<br>No Rain, No Fog, No Snow | Peter Bloom<br>Michael Kuehn |
| 1/24/2014 | 0850-1200h | Start: 51°F, 40% Cloud Cover, Calm out of the N<br>End: 60°F, 100% Cloud Cover, Calm out of the N<br>No Rain, No Fog, No Snow | Peter Bloom<br>Michael Kuehn |
| 4/2/2014 | 1200-1800h | Start: 62°F, 50% Cloud Cover, Light Wind out of the NE<br>End: 60°F, 40% Cloud Cover, Light Wind out of the NE<br>No Rain, No Fog, No Snow | Peter Bloom<br>Michael Kuehn |
| 4/3/2014 | 0730-1715h | Start: 43°F, 0% Cloud Cover, Calm out of the N<br>End: 58°F, 0% Cloud Cover, Light Wind out of the NW<br>No Rain, No Fog, No Snow | Peter Bloom<br>Michael Kuehn |
| 4/4/2014 | 0745-1730h | Start: 50°F, 0% Cloud Cover, Calm out of the N<br>End: 58°F, 0% Cloud Cover, Breeze out of the W<br>No Rain, No Fog, No Snow | Peter Bloom<br>Michael Kuehn |
| 4/5/2014 | 0730-1730h | Start: 48°F, 0% Cloud Cover, Breeze out of the W<br>End: 67°F, 0% Cloud Cover, Light Wind out of the NW<br>No Rain, No Fog, No Snow | Peter Bloom<br>Michael Kuehn |
| 4/6/2014 | 0730-1715h | Start: 46°F, 30% Cloud Cover, Calm out of the N<br>End: 71°F, 20% Cloud Cover, Light Wind out of the N<br>No Rain, No Fog, No Snow | Peter Bloom<br>Michael Kuehn |
| 4/7/2014 | 0715-1730h | Start: 51°F, 20% Cloud Cover, Calm out of the N<br>End: 78°F, 0% Cloud Cover, Breeze out of the NW<br>No Rain, No Fog, No Snow | Peter Bloom<br>Michael Kuehn |
| 4/8/2014 | 0700-1245h | Start: 54°F, 10% Cloud Cover, Calm out of the N<br>End: 81°F, 30% Cloud Cover, Calm out of the N<br>No Rain, No Fog, No Snow | Peter Bloom<br>Michael Kuehn |

## 5.1 Nest Determination

### 5.1.1 Species Identification

Biologists determined the species that built or occupied all large stick nests discovered during surveys by observing defending or incubating adults, the size of the nest, stick size, eggs and chicks, volume and height of excrement, and anthropogenic material if present. These distinctions were based upon the experience of the principal investigator (Dr. Bloom), which includes the entry and inspection of thousands of California raptor nests of 22 raptorial species including Golden Eagle, and the four raptor species that might utilize Golden Eagle nests in this region; Red-tailed Hawk (*Buteo jamaicensis*), Peregrine Falcon (*Falco peregrinus*), Prairie Falcon (*Falco mexicanus*) and Great Horned Owl (*Bubo virginianus*).

Within the Study Area, the Red-tailed Hawk is the predominant raptor species that builds large nests constructed of sticks, which may overlap in size with Golden Eagle nests. Common Ravens are non-raptors

that also construct reasonably large stick nests in this region. Of these three species, Red-tailed Hawk and Common Raven nests are the most abundant by a large factor. Fortunately, there are often predictable cues that can be used to differentiate among the nests of these species, beyond the direct observation of adults, young or eggs in the nest.

Common Ravens tend to have the smallest nests of the three species, followed by Red-tailed Hawks and finally, Golden Eagles, which may build nests 15 feet tall and 6 feet wide.

Though Red-tailed Hawk and Common Raven nests are sometimes difficult to distinguish from one another, Common Ravens are unique in that they often bring trash to their nest sites situated near civilization, and their nests tend to be very tightly structured. However, many Common Raven nests, and particularly those in very remote locations, do not incorporate anthropogenic materials into their nests.

Golden Eagle and Red-tailed Hawk nests can also be difficult to separate from each other without ample experience. The two species often use each other's nests for reproduction, though Red-tailed Hawks more commonly usurp Golden Eagle nests than the other way around. This may be because Golden Eagles often have more alternate nests than do Red-tailed Hawks and because the larger Golden Eagle nests tend to survive longer. Newly created, first year Golden Eagle nests are typically 6-10 inches thick and as small as 4 feet wide and may overlap in size with Red-tailed Hawk nests. At the other end of the size spectrum, Golden Eagles may build large tower nests that exceed 15 feet in thickness and 4-6 feet in width.

We considered nests greater than 5 feet wide and 3 feet thick to be definitive eagle nests. The size of the sticks, both in diameter and length also provides clues as to what species carried them and added them to the nest, with eagle nests containing much larger sticks than Red-tailed Hawks would generally bring to their nests.

### 5.1.2 Nest Status

A nest was considered *active* if any of the following three conditions was met: (1) fresh (live or dead) sticks had been added during the current nesting season, (2) the nest was found to contain eggs or young (dead or alive), or (3) an adult was observed on the nest in an incubating (or brooding) posture. Nests without any of these signs were considered *inactive*. A *failed* nest was an active nest that did not successfully fledge young. The newness (fresh sticks) of nest sticks can often be determined by their color and condition if they were recently collected from live plants and trees, however bleaching by the desert sun can sometimes make new sticks appear old quickly. The placement, compaction or lack of compaction of sticks can be a more accurate determination of the newness, such as the fresh sticks seen on the top of a recently active Golden Eagle nest compared with the compacted old sticks in the inactive nest. A *successful* nest was one that fledged at least one young (typically assumed if young were greater than eight weeks old during an observation). Active nests found at the end of the nesting cycle with considerable excrement in and around the nest, surrounding boulders or alternate nests were considered to have fledged.

Determining the activity status of nests during the breeding season is often unequivocal because in some instances there will be an adult eagle incubating eggs or brooding nestlings and/or visible eggs or nestlings. However, nest status can often be inferred even if a nest is visited outside of the actual nesting period (e.g., prior to egg laying or after fledging). Under these circumstances, more emphasis is placed on the condition of the nest and presence or absence of sign. Prior to egg laying, a typical active Golden Eagle nest will be relatively level on top, will have visibly newer sticks several inches thick arranged on the top of the nest, may have fresh greenery, and may have fresh feathers. Following fledging, the biologists primarily consider the condition of the nest and the amount (or lack of) and relative age of white-wash, which in the case of Golden Eagles should occur in significant amounts forming a broad splatter pattern composed of long, large broken streaks often referred to as slices. At some locations with recently fledged multiple young, it may appear as if it snowed below the nest edge.

Although there may be no definitive determination of whether nestling(s) fledged there will be strong indicators if the nest was active and at least contained chicks of more than a few weeks old. White wash sprays and slices behind the nest are not commonly deposited by adults. Significant accumulation of fresh white wash behind, around, directly below, and approximately level with the nest are indicators that nestling(s) were present.

Other factors considered include the nearby presence or absence of adult and/or fledgling eagles, active nearby perch sites with fresh sign and active alternative nests within close proximity to the nest in question.

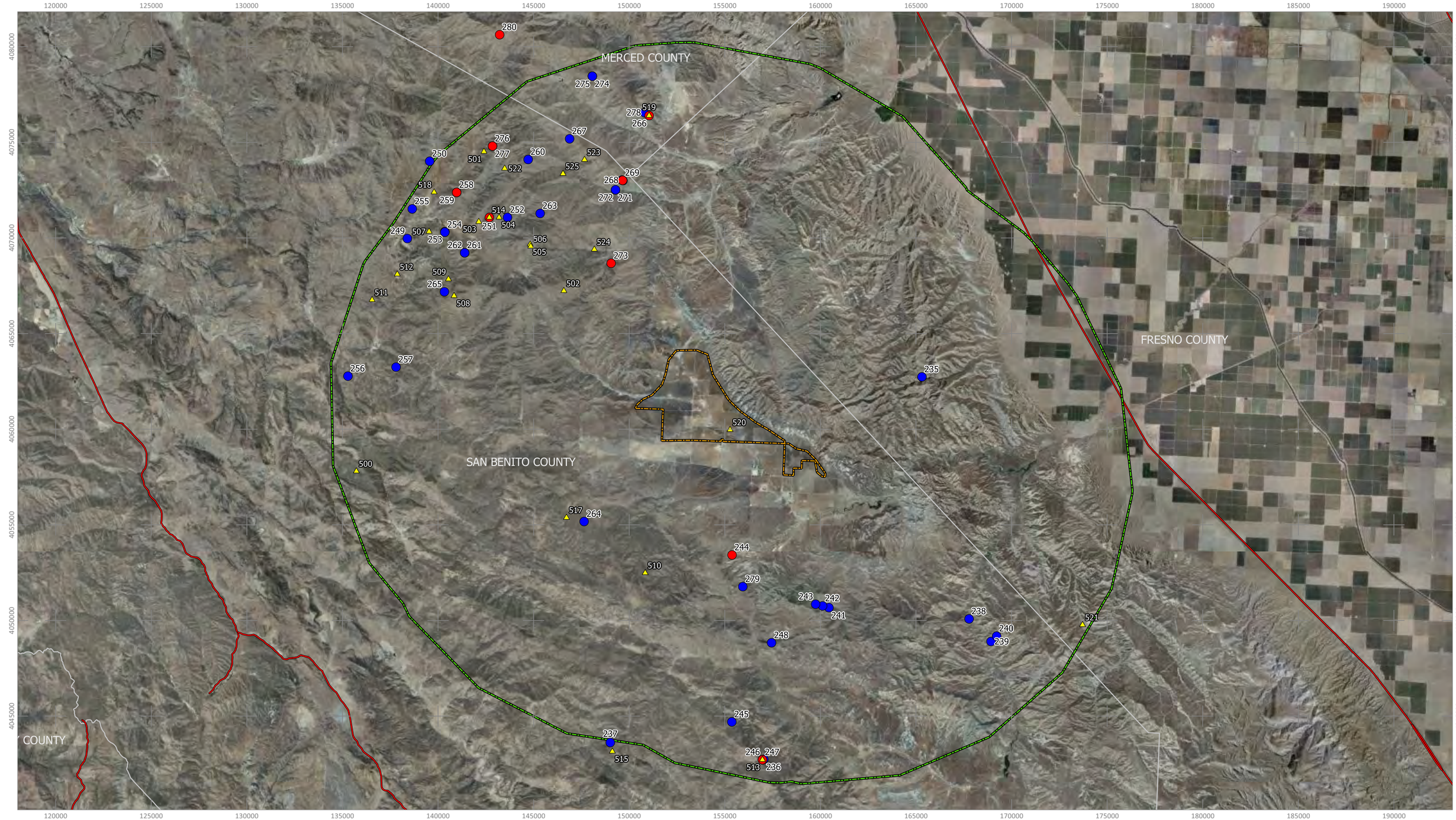
# 6.0 RESULTS & DISCUSSION

A total of 492 nests was documented by BBI within the Study Area, including 46 Golden Eagle nests. All Golden Eagle nests are listed in Table 2 below, and their locations are mapped in Exhibit 1. Photographs of all Golden Eagle nests that could safely be photographed are presented in Appendix A. All nests classified as belonging to species other than Golden Eagles are listed in Appendix B, including nests of 226 Common Ravens, 146 Red-tailed Hawks, 62 Prairie Falcons, 8 Barn Owls (*Tyto alba)*, 3 Great Horned Owls, and 1 Turkey Vulture (*Cathartes aura*).

Dr. Bloom estimates that the 46 Golden Eagle nests discovered during this survey effort comprise approximately 30 breeding territories, some of which contain one or more alternate nests. The actual number of territories could be slightly higher or lower than 30, and the exact number of territories depends, in part, on how alternate nests of a single territory are defined. In most cases, nests that were on the same cliff faces, or at least very close together could be safely designated as alternate nests within the same breeding territory. For example, nest IDs 266 and 278 were separated by less than 330 yards (300 meters) and were in the same watershed, and were attributed to the same breeding territory. In other cases, it was less clear if different nests were part of a single territory or not. Golden Eagle nesting density (and territory size) is driven primarily by habitat quality, with higher nesting density in better quality habitat. Given that habitat quality in the Study Area varies from quite high (in the northwestern quadrant, where most nests were located), to quite low, in extreme eastern portions, it would not be surprising for nests in some areas to be located as close together as 1 mile (1.6 kilometers), or even rarely 0.5 miles (0.8 kilometers), particularly in the areas of better quality habitat. Golden Eagle nests 251 and 252, in the northwestern quadrant, were separated by only 0.6 miles (1 kilometer), and this is a prime example of two nests that could comprise two breeding territories, but likely represent one.

In total, nine Golden Eagle nests were classified as active in the 2014 season, each representing a separate territory. Thus, active nesting occurred in almost one-third (9 of about 30) of the territories identified in this survey. Of these nine nests, eggs are presumed to have been laid in at least four. Adults were observed on nests in incubating posture, in April, at nest IDs 246 and 251, and two un-incubated eggs were observed in (presumed failed) nest ID 276 in April. Finally, two chicks were observed being tended to by a female Golden Eagle at nest ID 266 in early April. Of the remaining five Golden Eagle nests that were identified as active in 2014, none was known to contain eggs or nestlings as of April 8$^{th}$. Given that Golden Eagles in this region normally lay eggs on or before this date, it is very unlikely that any of these nests went on to successfully fledge young during the 2014 nesting season.

No Golden Eagle nests were identified within 3 miles (5 kilometers) of the Project (Table 2), though four nests (IDs 244, 264, 273 and 279), comprising four breeding territories were located within four miles of the Project boundary. Two of these four nests (IDs 244 and 273) were active in 2014, though neither nest was ever found to contain eggs or nestlings. The next closest active Golden Eagle nest to the Project in 2014 was nest ID 269, located 5.79 miles (9.34 kilometers) north-northwest of the Project.




County Border
Major Road
Proposed Project Boundary
Study Area

Observation Type
Active Golden Eagle Nest
Inactive Golden Eagle Nest
Golden Eagle Observation

10000 0 10000 20000 30000 40000 ft
1:184,877

UTM NAD83 Zone 11 Coordinate Grid
Map Date: 5/10/2014
Author: Michael J. Kuehn
Background Source: US Department of Agriculture

EXHIBIT 1. 2014 Golden Eagle Nesting Survey Results
Panoche Valley Solar Project | Merced, Fresno and San Benito Counties, California

BBI

Although it cannot be ruled out that some Golden Eagle nests within the Study Area could have gone undetected, the 10-day effort in late January represented a massive and comprehensive survey, during a period when deciduous trees such as Blue and Valley Oaks had not yet leafed out. This effort was followed by an 8-day effort in April, when special attention was paid to surveying areas where adult Golden Eagles had been observed, but no nests had been found; or where only inactive nests had been found and additional effort was dedicated to surveying for active nests that may have been missed.

*Table 2. Golden Eagle Nests Discovered During Surveys*

*The following table lists the identification number (ID) of all 46 Golden Eagle nests discovered during surveys conducted in January and April of 2014. Each nest ID number is accompanied by the following information: (1) substrate supporting nest (Substrate), (2) estimated nest height in feet (Est. Height [ft.], (3) nest contents (Contents), (4) quantity of nest contents (Quan.), (5) nest status (Status), (6) distance in miles from nest to the proposed Project (Project Dist. [mi.]), and (7) relevant notes (Notes).*

| ID | Substrate | Est. Height (ft.) | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 235 | Cliff | 50 | Empty | 0 | Inactive | 4.37 | |
| 236 | Cliff | 50 | Empty | 0 | Inactive | 9.24 | Fledged young in 2013 |
| 237 | Cliff | 50 | Empty | 0 | Inactive | 9.93 | |
| 238 | Cliff | 150 | Empty | 0 | Inactive | 6.56 | |
| 239 | Cliff | 85 | Empty | 0 | Inactive | 7.58 | Two nests on east face, one nest on west face |
| 240 | Cliff | 85 | Empty | 0 | Inactive | 7.59 | |
| 241 | Cliff | 75 | Empty | 0 | Inactive | 4.25 | Very old |
| 242 | Cliff | 100 | Empty | 0 | Inactive | 4.19 | Fledged young in 2013 |
| 243 | Cliff | 60 | Empty | 0 | Inactive | 4.14 | Sticks below nest |
| 244 | Cliff | 70 | Empty | 0 | Active | 3.09 | Nest freshly rebuilt in January, but unattended, empty, and looked worn and inactive in April |
| 245 | Cliff | 50 | Empty | 0 | Inactive | 8.18 | On same cliff face as two inactive Common Raven nests |
| 246 | Cliff | 50 | Unknown | N.A. | Active | 9.26 | Nest with fresh greenery on Jan. 21. adult sitting tight, presumably on eggs, on nest on Apr. 2 |
| 247 | Cliff | 50 | Empty | 0 | Inactive | 9.26 | Old nests near active Golden Eagle nest |
| 248 | Gray Pine | 50 | Empty | 0 | Inactive | 5.46 | |
| 249 | Valley Oak | 80 | Empty | 0 | Inactive | 9.20 | |
| 250 | Valley Oak | 60 | Empty | 0 | Inactive | 10.07 | Nest on mistletoe |
| 251 | Blue Oak | 55 | Unknown | N.A. | Active | 7.42 | Active and empty on Jan. 19. Adult sitting on nest in incubation posture Apr. 3. |
| 252 | Blue Oak | 65 | Empty | 0 | Inactive | 6.97 | Falling, only remnants remain in tree. Some whitewash. Not photographed |
| 253 | Blue Oak | 70 | Empty | 0 | Inactive | 8.36 | Near another nest in tree with bare branches |
| 254 | Blue Oak | 70 | Empty | 0 | Inactive | 8.35 | near another nest in tree with live (leaved) branches |

| ID | Substrate | Est. Height (ft.) | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 255 | Valley Oak | 70 | Empty | 0 | Inactive | 9.65 | |
| 256 | Gray Pine | 65 | Empty | 0 | Inactive | 9.38 | Smaller nest above main nest in same tree |
| 257 | Gray Pine | 55 | Empty | 0 | Inactive | 7.87 | |
| 258 | Blue Oak | 60 | Empty | 0 | Active | 8.76 | Adults present near nest on Jan. 19 and Apr. 3, fresh greenery in bowl. Eggs never observed. Second, inactive nest 50 meters away. |
| 259 | Blue Oak | 60 | Empty | 0 | Inactive | 8.76 | 50 meters from second, active Golden Eagle nest |
| 260 | Blue Oak | 55 | Empty | 0 | Inactive | 7.84 | |
| 261 | Blue Oak | 55 | Empty | 0 | Inactive | 7.45 | Two nests in same tree. Lower nest is smaller, older. Pair of adult Golden Eagles near |
| 262 | Blue Oak | 60 | Empty | 0 | Inactive | 7.45 | Two nests in same tree. Higher nest is larger, newer. Pair of adult Golden Eagles near |
| 263 | Blue Oak | 65 | Empty | 0 | Inactive | 6.27 | Very large nest; two adults and one 2nd-year bird nearby |
| 264 | Gray Pine | 60 | Empty | 0 | Inactive | 3.64 | |
| 265 | Blue Oak | 55 | Empty | 0 | Inactive | 7.24 | Yellow-billed Magpie nest in top of tree |
| 266 | Cliff | 100 | Nestlings | 2 | Active | 7.67 | Nest inactive on Jan. 15. An adult and 2 nestlings in nest on Apr. 4 |
| 267 | Cliff | 50 | Empty | 0 | Inactive | 7.69 | |
| 268 | Cliff | 150 | Empty | 0 | Inactive | 5.80 | |
| 269 | Cliff | 80 | Empty | 0 | Active | 5.79 | Built on this season. |
| 270 | Cliff | 50 | Empty | 0 | Inactive | 5.78 | Used recently in a previous season |
| 271 | Cliff | 60 | Empty | 0 | Inactive | 5.57 | Old nest located above Red-tailed Hawk nest |
| 272 | Cliff | 35 | Empty | 0 | Inactive | 5.57 | Very old, located below and west of another old eagle nest |
| 273 | Cliff | 50 | Empty | 0 | Active | 3.53 | Two nests next to each other on same rock face; Inactive on Jan. 20, but significantly built on by Apr. 4. No eggs ever observed. |
| 274 | Cliff | 50 | Empty | 0 | Inactive | 9.30 | On west face |
| 275 | Cliff | 60 | Empty | 0 | Inactive | 9.30 | On east face |
| 276 | Blue Oak | 40 | Eggs | 2 | Active | 8.91 | Lower of two nests in same tree. Adult near on Jan. 23, but nest inactive. On Apr. 3, contained two un-incubated eggs, though two adult eagles were nearby. Eggs still not being incubated on Apr. 4. |
| 277 | Blue Oak | 45 | Empty | 0 | Inactive | 8.91 | Upper of two nests in same tree. |
| 278 | Cliff | 70 | Empty | 0 | Inactive | 7.79 | Inactive. More than 100 yards of ribbon with colored flagging strewn across vegetation above cliff with nest |

| ID | Substrate | Est. Height (ft.) | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 279 | Cliff | 60 | Empty | 0 | Inactive | 3.85 | Good condition but no whitewash. Not active in last 5 years |
| 280 | Cliff | 55 | Empty | 0 | Active | 11.73 | Newly built nest this year. |

*Table 3. Golden Eagle and California Condor Observations Made During Surveys*

*The following table lists the identification number (ID) of all Golden Eagle and California Condor observations made during surveys conducted in January and April of 2014. Each nest ID number is accompanied by the following information: (1) common name of species observed (Species), (2) number of individuals observed (Quan.), (3) age of individuals observed (Age), (4) sex of individuals observed (Sex), and (5) relevant notes (Notes).*

| ID | Species | Quan. | Age | Sex | Notes |
|---|---|---|---|---|---|
| 500 | Golden Eagle | 1 | Adult | Unknown | |
| 501 | Golden Eagle | 1 | Adult | Unknown | |
| 502 | Golden Eagle | 2 | Adult | Pair | |
| 503 | Golden Eagle | 1 | Adult | Unknown | |
| 504 | Golden Eagle | 1 | Adult | Unknown | |
| 505 | Golden Eagle | 1 | Subadult | Unknown | 2nd year bird |
| 506 | Golden Eagle | 2 | Adult | Pair | Not aggressive toward 2nd year bird in area |
| 507 | Golden Eagle | 1 | Unknown | Unknown | Perched |
| 508 | Golden Eagle | 2 | Adult | Pair | Perched at top of ridge |
| 509 | Golden Eagle | 1 | Adult | Unknown | Perched |
| 510 | Golden Eagle | 1 | Unknown | Unknown | Soaring over peak |
| 511 | Golden Eagle | 4 | Mixed | Mixed | One group of three Golden Eagles (two adults, one subadult) and a fourth, lone adult in the distance |
| 512 | Golden Eagle | 2 | Adult | Pair | |
| 513 | Golden Eagle | 1 | Adult | Unknown | Adult on nest in incubation posture |
| 514 | Golden Eagle | 1 | Adult | Female | Adult on nest in incubation posture |
| 515 | Golden Eagle | 1 | Adult | Unknown | In flight |
| 516 | California Condor | 2 | Adult | Pair | Emerged from crevice in cliff |
| 517 | Golden Eagle | 1 | Adult | Unknown | Flying to south |
| 518 | Golden Eagle | 1 | Adult | Female | Flying over field |
| 519 | Golden Eagle | 1 | Adult | Female | Adult on nest in incubation posture |
| 520 | Golden Eagle | 1 | Adult | Unknown | Flying about 600 feet above ground |
| 521 | Golden Eagle | 1 | Adult | Unknown | In flight |
| 522 | Golden Eagle | 1 | Adult | Unknown | |
| 523 | Golden Eagle | 1 | Subadult | Unknown | |
| 524 | Golden Eagle | 1 | Adult | Unknown | Flying. One of two adults detected in territory |
| 525 | Golden Eagle | 1 | Adult | Female | Perched. One of two adults detected in territory |

# 7.0 LITERATURE CITED

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# APPENDIX A. PHOTOGRAPHS OF GOLDEN EAGLE NESTS

Nest ID 235

Nest ID 237

Nest ID 238

Nest ID 239

Nest ID 240

Nest ID 241

Nest ID 242

Nest ID 243

Nest ID 244

Nest ID 245

Nest ID 246

Nest ID 247

Nest ID 248

Nest ID 249

Nest ID 251

Nest ID 253

Nest ID 254

Nest ID 255

Nest ID 256

Nest ID 257

Nest ID 258

Nest ID 259

Nest ID 260

Nest ID 262

Nest ID 263

Nest ID 264

Nest ID 265

Nest ID 266

Nest ID 267

Nest ID 268

Nest ID 269

Nest ID 270

Nest ID 271

Nest ID 272

Nest ID 273

Nest ID 274

Nest ID 275

Nest ID 276

Nest ID 277

Nest ID 278

Nest ID 279

Nest ID 280

# APPENDIX B. NON-GOLDEN EAGLE SURVEY RESULTS

*The following table lists the identification number (ID) of all non-Golden Eagle nests discovered during surveys conducted in January and April of 2014. Each nest ID number is accompanied by the following information: (1) species of nest-owner (Species), (2) substrate supporting nest (Substrate), (3) nest contents (Contents), (4) quantity of nest contents (Quan.), (5) nest status (Status), (6) distance in miles from nest to the proposed Project (Project Dist. [mi.]), and (7) relevant notes (Notes).*

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 1 | Barn Owl | Cliff | Empty | 0 | Inactive | 8.56 | Possible Prairie Falcon eyrie |
| 2 | Barn Owl | Cliff | Empty | 0 | Inactive | 8.45 | Possible Prairie Falcon eyrie |
| 3 | Barn Owl | Cliff | Empty | 0 | Inactive | 8.27 | Possible Prairie Falcon eyrie |
| 4 | Barn Owl | Cliff | Empty | 0 | Inactive | 1.31 | |
| 5 | Barn Owl | Cliff | Empty | 0 | Inactive | 1.73 | |
| 6 | Barn Owl | Cliff | Empty | 0 | Inactive | 1.94 | |
| 7 | Barn Owl | Cliff | Empty | 0 | Inactive | 2.16 | |
| 8 | Barn Owl | Cliff | Empty | 0 | Inactive | 2.85 | |
| 9 | Common Raven | Cliff | Empty | 0 | Inactive | 7.96 | Fallen nest |
| 10 | Common Raven | Cliff | Empty | 0 | Inactive | 8.18 | |
| 11 | Common Raven | Windmill | Empty | 0 | Inactive | 5.71 | |
| 12 | Common Raven | Cliff | Empty | 0 | Inactive | 5.12 | |
| 13 | Common Raven | Cliff | Empty | 0 | Inactive | 5.06 | |
| 14 | Common Raven | Cliff | Empty | 0 | Inactive | 9.33 | |
| 15 | Common Raven | Cliff | Empty | 0 | Inactive | 7.99 | |
| 16 | Common Raven | Cliff | Empty | 0 | Inactive | 5.64 | |
| 17 | Common Raven | Cliff | Empty | 0 | Inactive | 7.28 | |
| 18 | Common Raven | Cliff | Empty | 0 | Inactive | 7.31 | |
| 19 | Common Raven | Cliff | Empty | 0 | Inactive | 8.22 | |
| 20 | Common Raven | Cliff | Empty | 0 | Inactive | 8.49 | |
| 21 | Common Raven | Cliff | Empty | 0 | Inactive | 6.05 | |
| 22 | Common Raven | Rock | Empty | 0 | Inactive | 7.04 | |
| 23 | Common Raven | Cliff | Empty | 0 | Inactive | 4.47 | |
| 24 | Common Raven | Cliff | Empty | 0 | Inactive | 4.88 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 25 | Common Raven | Cliff | Empty | 0 | Inactive | 9.57 | |
| 26 | Common Raven | Cliff | Empty | 0 | Inactive | 10.52 | |
| 27 | Common Raven | Cliff | Empty | 0 | Inactive | 10.53 | Three Common Raven nests, same cliff |
| 28 | Common Raven | Cliff | Empty | 0 | Inactive | 11.22 | |
| 29 | Common Raven | Cliff | Empty | 0 | Inactive | 10.23 | |
| 30 | Common Raven | Cliff | Empty | 0 | Inactive | 10.30 | |
| 31 | Common Raven | Cliff | Empty | 0 | Inactive | 9.50 | |
| 32 | Common Raven | Cliff | Empty | 0 | Inactive | 6.86 | |
| 33 | Common Raven | Cliff | Empty | 0 | Inactive | 5.89 | |
| 34 | Common Raven | Cliff | Empty | 0 | Inactive | 5.77 | |
| 35 | Common Raven | Cliff | Empty | 0 | Inactive | 6.35 | |
| 36 | Common Raven | Cliff | Empty | 0 | Inactive | 6.53 | |
| 37 | Common Raven | Cliff | Empty | 0 | Inactive | 6.57 | |
| 38 | Common Raven | Cliff | Empty | 0 | Inactive | 6.71 | |
| 39 | Common Raven | Cliff | Empty | 0 | Inactive | 7.37 | |
| 40 | Common Raven | Cliff | Empty | 0 | Inactive | 6.33 | |
| 41 | Common Raven | Cliff | Empty | 0 | Inactive | 4.55 | |
| 42 | Common Raven | Cliff | Empty | 0 | Inactive | 4.60 | |
| 43 | Common Raven | Cliff | Empty | 0 | Inactive | 4.10 | |
| 44 | Common Raven | Cliff | Empty | 0 | Inactive | 6.13 | |
| 45 | Common Raven | Cliff | Empty | 0 | Inactive | 5.99 | |
| 46 | Common Raven | Cliff | Empty | 0 | Inactive | 7.14 | |
| 47 | Common Raven | Cliff | Empty | 0 | Inactive | 9.49 | |
| 48 | Common Raven | Cliff | Empty | 0 | Inactive | 10.11 | |
| 49 | Common Raven | Cliff | Empty | 0 | Inactive | 10.12 | |
| 50 | Common Raven | Cliff | Empty | 0 | Inactive | 7.29 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 51 | Common Raven | Cliff | Empty | 0 | Inactive | 6.17 | |
| 52 | Common Raven | Cliff | Empty | 0 | Inactive | 4.25 | |
| 53 | Common Raven | Cliff | Empty | 0 | Inactive | 4.82 | |
| 54 | Common Raven | Cliff | Empty | 0 | Inactive | 5.88 | |
| 55 | Common Raven | Cliff | Empty | 0 | Inactive | 4.56 | |
| 56 | Common Raven | Cliff | Empty | 0 | Inactive | 4.58 | |
| 57 | Common Raven | Cliff | Empty | 0 | Inactive | 4.22 | |
| 58 | Common Raven | Cliff | Empty | 0 | Inactive | 3.72 | |
| 59 | Common Raven | Cliff | Empty | 0 | Inactive | 4.36 | |
| 60 | Common Raven | Cliff | Empty | 0 | Inactive | 1.27 | |
| 61 | Common Raven | Cliff | Empty | 0 | Inactive | 2.77 | |
| 62 | Common Raven | Cliff | Empty | 0 | Inactive | 2.30 | |
| 63 | Common Raven | Cliff | Empty | 0 | Inactive | 10.22 | |
| 64 | Common Raven | Cliff | Empty | 0 | Inactive | 2.89 | |
| 65 | Common Raven | Cliff | Empty | 0 | Inactive | 3.14 | |
| 66 | Common Raven | Cliff | Empty | 0 | Inactive | 2.78 | Near Red-tailed Hawk nest |
| 67 | Common Raven | Cliff | Empty | 0 | Inactive | 0.64 | |
| 68 | Common Raven | Cliff | Empty | 0 | Inactive | 2.98 | |
| 69 | Common Raven | Cliff | Empty | 0 | Active | 2.09 | |
| 70 | Common Raven | Cliff | Empty | 0 | Inactive | 2.43 | |
| 71 | Common Raven | Cliff | Empty | 0 | Inactive | 2.41 | |
| 72 | Common Raven | Cliff | Empty | 0 | Inactive | 3.40 | |
| 73 | Common Raven | Cliff | Empty | 0 | Active | 3.32 | |
| 74 | Common Raven | Cliff | Empty | 0 | Inactive | 3.06 | |
| 75 | Common Raven | Cliff | Empty | 0 | Inactive | 3.62 | |
| 76 | Common Raven | Cliff | Empty | 0 | Inactive | 5.07 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 77 | Common Raven | Cliff | Empty | 0 | Inactive | 5.04 | |
| 78 | Common Raven | Cliff | Empty | 0 | Inactive | 5.07 | |
| 79 | Common Raven | Cliff | Empty | 0 | Inactive | 10.04 | |
| 80 | Common Raven | Cliff | Empty | 0 | Inactive | 9.97 | |
| 81 | Common Raven | Cliff | Empty | 0 | Inactive | 9.65 | Two nests next to each other |
| 82 | Common Raven | Cliff | Empty | 0 | Inactive | 9.65 | |
| 83 | Common Raven | Cliff | Empty | 0 | Inactive | 6.37 | Two old nests nearby |
| 84 | Common Raven | Cliff | Empty | 0 | Active | 4.22 | |
| 85 | Common Raven | Cliff | Empty | 0 | Inactive | 4.99 | |
| 86 | Common Raven | Cliff | Empty | 0 | Inactive | 3.90 | |
| 87 | Common Raven | Cliff | Empty | 0 | Inactive | 3.04 | |
| 88 | Common Raven | Cliff | Empty | 0 | Inactive | 3.03 | |
| 89 | Common Raven | Cliff | Empty | 0 | Inactive | 3.16 | |
| 90 | Common Raven | Cliff | Empty | 0 | Inactive | 2.85 | |
| 91 | Common Raven | Valley Oak | Empty | 0 | Inactive | 3.24 | |
| 92 | Common Raven | Cliff | Empty | 0 | Inactive | 2.56 | |
| 93 | Common Raven | Cliff | Empty | 0 | Inactive | 2.29 | |
| 94 | Common Raven | Tower | Empty | 0 | Inactive | 0.82 | |
| 95 | Common Raven | Tower | Empty | 0 | Inactive | 0.36 | |
| 96 | Common Raven | Tower | Empty | 0 | Inactive | 0.23 | |
| 97 | Common Raven | Tower | Empty | 0 | Inactive | 0.41 | |
| 98 | Common Raven | Tower | Empty | 0 | Inactive | 0.00 | |
| 99 | Common Raven | Tower | Empty | 0 | Inactive | 0.00 | Nest in a transformer pole |
| 100 | Common Raven | Tower | Empty | 0 | Inactive | 0.00 | |
| 101 | Common Raven | Tower | Empty | 0 | Inactive | 0.00 | |
| 102 | Common Raven | Tower | Empty | 0 | Inactive | 0.21 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 103 | Common Raven | Tower | Empty | 0 | Inactive | 0.55 | |
| 104 | Common Raven | Tower | Empty | 0 | Inactive | 0.87 | |
| 105 | Common Raven | Tower | Empty | 0 | Inactive | 1.01 | |
| 106 | Common Raven | Tower | Empty | 0 | Inactive | 5.49 | |
| 107 | Common Raven | Tower | Empty | 0 | Inactive | 5.70 | Two nests on one tower |
| 108 | Common Raven | Tower | Empty | 0 | Inactive | 9.96 | |
| 109 | Common Raven | Valley Oak | Empty | 0 | Inactive | 9.11 | |
| 110 | Common Raven | Blue Oak | Empty | 0 | Inactive | 9.13 | |
| 111 | Common Raven | Digger Pine | Empty | 0 | Inactive | 7.48 | |
| 112 | Common Raven | Blue Oak | Empty | 0 | Inactive | 0.66 | |
| 113 | Common Raven | Blue Oak | Empty | 0 | Inactive | 2.87 | |
| 114 | Common Raven | Blue Oak | Empty | 0 | Inactive | 2.95 | |
| 115 | Common Raven | Cliff | Empty | 0 | Inactive | 3.77 | |
| 116 | Common Raven | Blue Oak | Empty | 0 | Inactive | 5.29 | |
| 117 | Common Raven | Cliff | Empty | 0 | Inactive | 9.23 | |
| 118 | Common Raven | Cliff | Empty | 0 | Inactive | 9.17 | |
| 119 | Common Raven | Tower | Empty | 0 | Inactive | 10.07 | |
| 120 | Common Raven | Tower | Empty | 0 | Inactive | 10.03 | |
| 121 | Common Raven | Tower | Empty | 0 | Inactive | 9.99 | Two nests in two adjacent towers |
| 122 | Common Raven | Tower | Empty | 0 | Inactive | 9.92 | |
| 123 | Common Raven | Tower | Empty | 0 | Inactive | 9.88 | Two nests in one tower |
| 124 | Common Raven | Tower | Empty | 0 | Inactive | 9.85 | |
| 125 | Common Raven | Tower | Empty | 0 | Inactive | 9.87 | |
| 126 | Common Raven | Tower | Empty | 0 | Inactive | 10.06 | |
| 127 | Common Raven | Cliff | Empty | 0 | Inactive | 4.72 | |
| 128 | Common Raven | Cliff | Empty | 0 | Inactive | 7.22 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 129 | Common Raven | Cliff | Empty | 0 | Inactive | 7.41 | |
| 130 | Common Raven | Cliff | Empty | 0 | Inactive | 7.42 | |
| 131 | Common Raven | Cliff | Empty | 0 | Inactive | 7.71 | |
| 132 | Common Raven | Digger Pine | Empty | 0 | Inactive | 8.36 | |
| 133 | Common Raven | Cliff | Empty | 0 | Inactive | 10.15 | |
| 134 | Common Raven | Digger Pine | Empty | 0 | Inactive | 9.72 | |
| 135 | Common Raven | Digger Pine | Empty | 0 | Inactive | 8.66 | |
| 136 | Common Raven | Cliff | Empty | 0 | Inactive | 5.39 | |
| 137 | Common Raven | Digger Pine | Empty | 0 | Inactive | 5.37 | |
| 138 | Common Raven | Cliff | Empty | 0 | Inactive | 4.67 | |
| 139 | Common Raven | Cliff | Empty | 0 | Inactive | 5.43 | |
| 140 | Common Raven | Cliff | Empty | 0 | Inactive | 5.59 | |
| 141 | Common Raven | Cliff | Empty | 0 | Inactive | 5.36 | Next to Prairie Falcon |
| 142 | Common Raven | Cliff | Empty | 0 | Inactive | 5.48 | |
| 143 | Common Raven | Cliff | Empty | 0 | Inactive | 4.43 | |
| 144 | Common Raven | Cliff | Empty | 0 | Inactive | 5.75 | |
| 145 | Common Raven | Tower | Empty | 0 | Inactive | 9.90 | |
| 146 | Common Raven | Tower | Empty | 0 | Inactive | 10.00 | |
| 147 | Common Raven | Tower | Empty | 0 | Inactive | 9.67 | |
| 148 | Common Raven | Tower | Empty | 0 | Inactive | 9.58 | Two nests in one tower; old |
| 149 | Common Raven | Tower | Empty | 0 | Inactive | 9.58 | Two nests in one tower; old |
| 150 | Common Raven | Tower | Empty | 0 | Inactive | 9.45 | |
| 151 | Common Raven | Tower | Empty | 0 | Inactive | 9.28 | |
| 152 | Common Raven | Tower | Empty | 0 | Inactive | 9.30 | |
| 153 | Common Raven | Tower | Empty | 0 | Inactive | 9.36 | |
| 154 | Common Raven | Tower | Empty | 0 | Inactive | 9.44 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 155 | Common Raven | Tower | Empty | 0 | Inactive | 9.49 | |
| 156 | Common Raven | Tower | Empty | 0 | Inactive | 9.56 | |
| 157 | Common Raven | Tower | Empty | 0 | Inactive | 9.62 | |
| 158 | Common Raven | Tower | Empty | 0 | Inactive | 9.67 | Two nests in one tower |
| 159 | Common Raven | Tower | Empty | 0 | Inactive | 9.67 | Two nests in one tower |
| 160 | Common Raven | Tower | Empty | 0 | Inactive | 9.23 | |
| 161 | Common Raven | Tower | Empty | 0 | Inactive | 8.70 | |
| 162 | Common Raven | Tower | Empty | 0 | Inactive | 8.54 | |
| 163 | Common Raven | Tower | Empty | 0 | Inactive | 8.41 | |
| 164 | Common Raven | Tower | Empty | 0 | Inactive | 8.26 | Two nests in one tower |
| 165 | Common Raven | Tower | Empty | 0 | Inactive | 8.26 | Two nests in one tower |
| 166 | Common Raven | Tower | Empty | 0 | Inactive | 8.18 | Three nests in one tower |
| 167 | Common Raven | Tower | Empty | 0 | Inactive | 8.18 | Three nests in one tower |
| 168 | Common Raven | Tower | Empty | 0 | Inactive | 8.18 | Three nests in one tower |
| 169 | Common Raven | Tower | Empty | 0 | Inactive | 8.12 | |
| 170 | Common Raven | Tower | Empty | 0 | Inactive | 8.06 | |
| 171 | Common Raven | Tower | Empty | 0 | Inactive | 7.85 | Two nests in one tower |
| 172 | Common Raven | Tower | Empty | 0 | Inactive | 7.85 | Two nests in one tower |
| 173 | Common Raven | Tower | Empty | 0 | Inactive | 7.66 | |
| 174 | Common Raven | Tower | Empty | 0 | Inactive | 7.66 | |
| 175 | Common Raven | Tower | Empty | 0 | Inactive | 7.70 | Two nests in one tower |
| 176 | Common Raven | Tower | Empty | 0 | Inactive | 7.70 | Two nests in one tower |
| 177 | Common Raven | Tower | Empty | 0 | Inactive | 7.93 | |
| 178 | Common Raven | Tower | Empty | 0 | Inactive | 8.04 | |
| 179 | Common Raven | Tower | Empty | 0 | Inactive | 8.38 | |
| 180 | Common Raven | Tower | Empty | 0 | Inactive | 8.51 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 181 | Common Raven | Tower | Empty | 0 | Inactive | 8.64 | |
| 182 | Common Raven | Tower | Empty | 0 | Inactive | 9.17 | |
| 183 | Common Raven | Tower | Empty | 0 | Inactive | 9.89 | |
| 184 | Common Raven | Cliff | Empty | 0 | Inactive | 6.38 | |
| 185 | Common Raven | Digger Pine | Empty | 0 | Inactive | 6.63 | Bowl is deep |
| 186 | Common Raven | Digger Pine | Empty | 0 | Inactive | 9.25 | |
| 187 | Common Raven | Cliff | Empty | 0 | Inactive | 6.91 | Pair of Common Ravens near |
| 188 | Common Raven | Cliff | Empty | 0 | Inactive | 5.97 | |
| 189 | Common Raven | Cliff | Empty | 0 | Inactive | 10.10 | |
| 190 | Common Raven | Cliff | Empty | 0 | Inactive | 10.12 | |
| 191 | Common Raven | Cliff | Empty | 0 | Inactive | 10.22 | |
| 192 | Common Raven | Cliff | Empty | 0 | Inactive | 7.29 | |
| 193 | Common Raven | Blue Oak | Empty | 0 | Inactive | 7.25 | deep bowl |
| 194 | Common Raven | Blue Oak | Empty | 0 | Inactive | 9.12 | deep bowl |
| 195 | Common Raven | Cliff | Empty | 0 | Inactive | 5.78 | |
| 196 | Common Raven | Cottonwood | Empty | 0 | Inactive | 0.00 | |
| 197 | Common Raven | Blue Oak | Empty | 0 | Inactive | 6.72 | |
| 198 | Common Raven | Cliff | Empty | 0 | Inactive | 7.88 | |
| 199 | Common Raven | Digger Pine | Empty | 0 | Inactive | 7.99 | Fledged young in 2013 |
| 200 | Common Raven | Cliff | Empty | 0 | Inactive | 7.53 | |
| 201 | Common Raven | Cliff | Unknown | N.A. | Active | 4.57 | Adult on nest in incubation posture. Near two inactive Common Raven Nests |
| 202 | Common Raven | Cliff | Empty | 0 | Inactive | 8.31 | |
| 203 | Common Raven | Cliff | Empty | 0 | Inactive | 8.32 | Active in 2013 |
| 204 | Common Raven | Cliff | Empty | 0 | Inactive | 8.18 | Two Common Raven nests above and to right of inactive Golden Eagle nest |
| 205 | Common Raven | Cliff | Empty | 0 | Inactive | 9.70 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 206 | Common Raven | Cliff | Empty | 0 | Inactive | 9.66 | |
| 207 | Common Raven | Cottonwood | Unknown | N.A. | Active | 8.80 | Adult on nest |
| 208 | Common Raven | Cliff | Empty | 0 | Inactive | 3.33 | Lower of two nests on same cliff face |
| 209 | Common Raven | Cliff | Unknown | N.A. | Active | 7.56 | Adult on nest in incubation posture |
| 210 | Common Raven | Cliff | Empty | 0 | Active | 7.60 | Nest is freshly built on |
| 211 | Common Raven | Cliff | Empty | 0 | Active | 4.81 | |
| 212 | Common Raven | Cliff | Empty | 0 | Active | 4.37 | Upper and smaller of two nests on face |
| 213 | Common Raven | Cliff | Empty | 0 | Inactive | 4.37 | Lower and larger of two nests on face |
| 214 | Common Raven | Cliff | Empty | 0 | Inactive | 9.56 | |
| 215 | Common Raven | Cliff | Empty | 0 | Inactive | 9.63 | Large nest |
| 216 | Common Raven | Digger Pine | Empty | 0 | Inactive | 9.65 | |
| 217 | Common Raven | Digger Pine | Empty | 0 | Inactive | 9.92 | Lower of two nests in same tree |
| 218 | Common Raven | Digger Pine | Empty | 0 | Inactive | 9.85 | Upper of two nests in same tree; pine cones in bowl |
| 219 | Common Raven | Cliff | Empty | 0 | Active | 5.63 | |
| 220 | Common Raven | Cliff | Empty | 0 | Inactive | 5.97 | |
| 221 | Common Raven | Cliff | Unknown | N.A. | Unknown | 4.16 | Two nests close together. Difficult to fly, so hiked in to confirm status. Lower part of canyon used heavily as firing range, possibly used by Golden Eagles in the distant past |
| 222 | Common Raven | Cliff | Empty | 0 | Inactive | 5.69 | Near active Prairie Falcon nest |
| 223 | Common Raven | Cliff | Empty | 0 | Active | 2.32 | Likely failed |
| 224 | Common Raven | Cliff | Empty | 0 | Inactive | 7.91 | Directly below another Common Raven nest on same cliff |
| 225 | Common Raven | Cliff | Empty | 0 | Inactive | 7.91 | Directly above another Common Raven nest on same cliff |
| 226 | Common Raven | Cliff | Empty | 0 | Active | 5.95 | Below an older nest. Likely failed |
| 227 | Common Raven | Cliff | Unknown | N.A. | Active | 5.78 | Above a newer nest. Adult on nest |
| 228 | Common Raven | Cliff | Empty | 0 | Active | 5.60 | Rebuilt in 2014. Likely failed |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 229 | Common Raven | Cliff | Empty | 0 | Active | 8.26 | Rebuilt in 2014. Likely failed |
| 230 | Common Raven | Valley Oak | Eggs | 1 | Unknown | 7.91 | One Common Raven egg in an old Red-tailed Hawk nest. No Common Ravens observed |
| 231 | Common Raven | Cliff | Unknown | N.A. | Active | 8.74 | Adult on nest in incubation posture |
| 232 | Common Raven | Cliff | Unknown | N.A. | Active | 10.68 | Adult on nest in incubation posture |
| 233 | Common Raven | Cliff | Unknown | N.A. | Active | 11.38 | Adult on nest in incubation posture |
| 234 | Common Raven | Cliff | Unknown | N.A. | Unknown | 3.37 | Adult near, could not see contents clearly |
| 281 | Great Horned Owl | Cliff | Empty | 0 | Inactive | 6.81 | |
| 282 | Great Horned Owl | Cliff | Empty | 0 | Inactive | 2.78 | |
| 283 | Great Horned Owl | Cliff | Empty | 0 | Inactive | 2.79 | |
| 284 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 8.98 | On top of old Common Raven nest; same cliff as Golden Eagle and Red-tailed Hawk nests |
| 285 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 7.28 | Lots of whitewash |
| 286 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 7.85 | |
| 287 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 4.40 | |
| 288 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 10.01 | |
| 289 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 10.33 | |
| 290 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 10.33 | |
| 291 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 8.57 | |
| 292 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 9.53 | |
| 293 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 9.52 | |
| 294 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 7.22 | |
| 295 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 6.58 | |
| 296 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 6.27 | On old Common Raven nest |
| 297 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 6.58 | |
| 298 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 6.59 | |
| 299 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 7.03 | |
| 300 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 6.93 | |
| 301 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 4.20 | |
| 302 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 6.31 | |
| 303 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 6.13 | |
| 304 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 9.54 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 305 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 10.14 | |
| 306 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 10.20 | |
| 307 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 10.14 | |
| 308 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 5.19 | Prairie Falcon observed near nest |
| 309 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 4.97 | |
| 310 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 4.48 | |
| 311 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 4.66 | |
| 312 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 4.38 | |
| 313 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 3.59 | |
| 314 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 2.85 | |
| 315 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 2.78 | |
| 316 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 10.22 | |
| 317 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 3.86 | |
| 318 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 4.22 | |
| 319 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 4.21 | |
| 320 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 3.79 | |
| 321 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 3.13 | Three nests within 50 feet of each other. One on top and two below |
| 322 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 2.76 | |
| 323 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 2.54 | |
| 324 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 2.75 | |
| 325 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 2.86 | |
| 326 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 2.78 | |
| 327 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 2.88 | Over old Common Raven nest |
| 328 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 3.30 | Priarie Falcon pair observed |
| 329 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 3.94 | |
| 330 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 3.09 | |
| 331 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 2.40 | |
| 332 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 7.24 | |
| 333 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 2.75 | |
| 334 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 4.95 | Another Prairie Falcon eyrie located on same rock |
| 335 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 4.95 | Another Prairie Falcon eyrie located on same rock |
| 336 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 4.68 | |
| 337 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 8.18 | |
| 338 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 8.18 | |
| 339 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 7.56 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 340 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 4.82 | |
| 341 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 5.45 | |
| 342 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 5.36 | Nest to Common Raven |
| 343 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 10.12 | |
| 344 | Prairie Falcon | Cliff | Empty | 0 | Inactive | 5.43 | |
| 345 | Prairie Falcon | Cliff | Unknown | N.A. | Active | 5.68 | Adult sitting in nest in incubation posture. Nesting in old Common Raven nest. Abundant whitewash above and in nest. |
| 346 | Red-tailed Hawk | Eucalyptus | Empty | 0 | Inactive | 8.07 | |
| 347 | Red-tailed Hawk | Eucalyptus | Empty | 0 | Inactive | 8.07 | |
| 348 | Red-tailed Hawk | Eucalyptus | Empty | 0 | Inactive | 6.43 | |
| 349 | Red-tailed Hawk | Cottonwood | Empty | 0 | Inactive | 5.07 | |
| 350 | Red-tailed Hawk | Cottonwood | Empty | 0 | Inactive | 5.33 | |
| 351 | Red-tailed Hawk | Cottonwood | Empty | 0 | Inactive | 5.41 | |
| 352 | Red-tailed Hawk | Eucalyptus | Empty | 0 | Inactive | 6.31 | |
| 353 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 7.33 | |
| 354 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 7.95 | |
| 355 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 7.38 | |
| 356 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 6.93 | |
| 357 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 4.25 | |
| 358 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 3.33 | |
| 359 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 3.45 | |
| 360 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 4.65 | |
| 361 | Red-tailed Hawk | Unknown Oak | Empty | 0 | Inactive | 8.53 | |
| 362 | Red-tailed Hawk | Unknown Oak | Empty | 0 | Inactive | 8.41 | |
| 363 | Red-tailed Hawk | Unknown Oak | Empty | 0 | Inactive | 8.20 | Two nests in same tree |
| 364 | Red-tailed Hawk | Unknown Oak | Empty | 0 | Inactive | 8.20 | Two nests in same tree |
| 365 | Red-tailed Hawk | Unknown Oak | Empty | 0 | Inactive | 8.08 | |

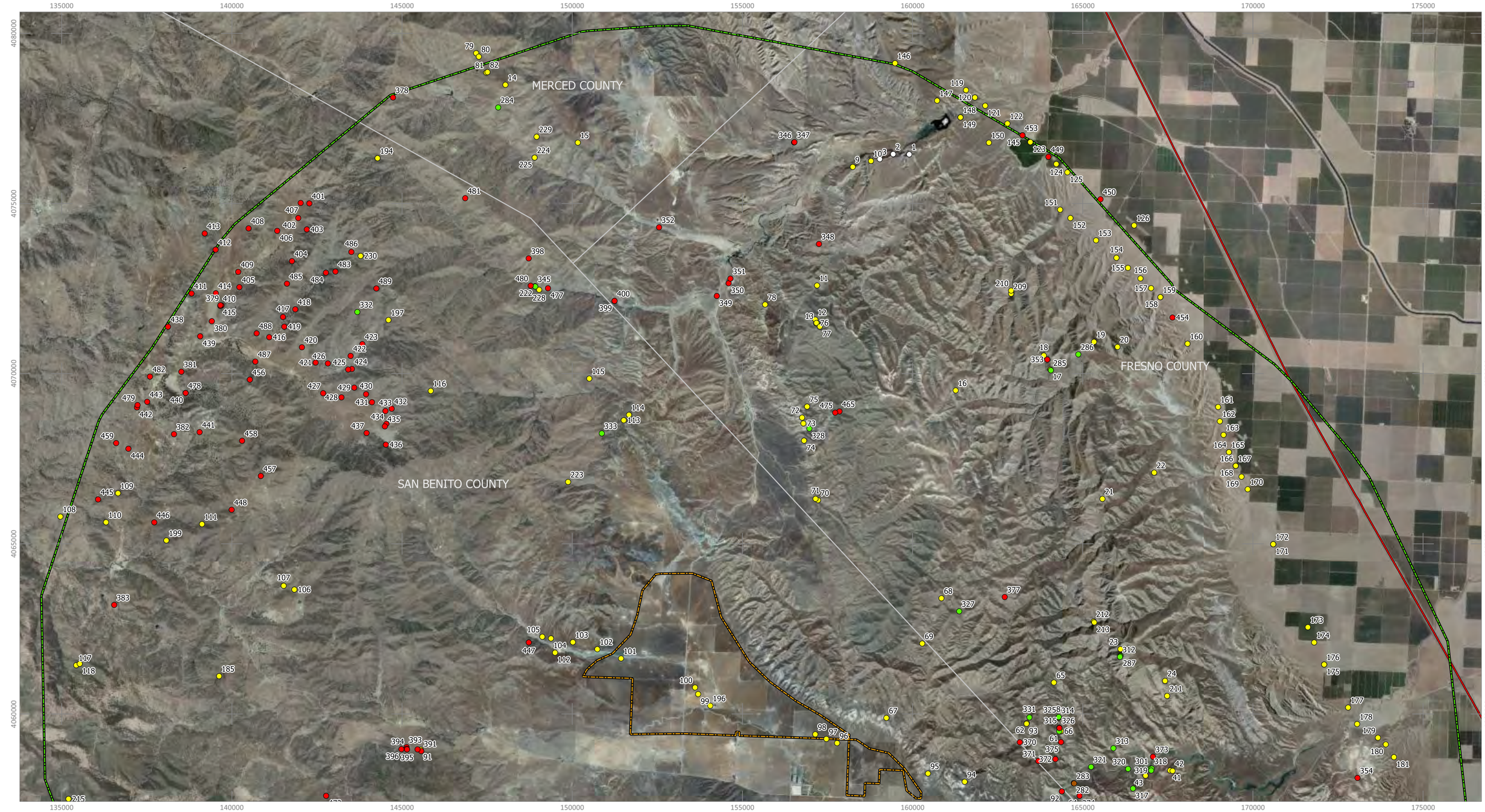
| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 366 | Red-tailed Hawk | Unknown Oak | Empty | 0 | Inactive | 8.07 | |
| 367 | Red-tailed Hawk | Unknown Oak | Empty | 0 | Inactive | 6.42 | |
| 368 | Red-tailed Hawk | Cottonwood | Empty | 0 | Inactive | 1.26 | |
| 369 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 1.85 | |
| 370 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 2.02 | |
| 371 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 2.21 | |
| 372 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 2.52 | |
| 373 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 4.27 | |
| 374 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 2.89 | |
| 375 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 2.71 | |
| 376 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 2.78 | Near Common Raven nest |
| 377 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 3.54 | |
| 378 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 9.92 | |
| 379 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.26 | |
| 380 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.25 | |
| 381 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.17 | |
| 382 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 8.66 | |
| 383 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 8.64 | |
| 384 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 7.49 | Near another Red-tailed Hawk nest in adjacent tree |
| 385 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 7.51 | Near another Red-tailed Hawk nest in adjacent tree |
| 386 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 4.91 | Same territory as nearby nest |
| 387 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 4.97 | Same territory as nearby nest |
| 388 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 4.94 | |
| 389 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 5.01 | |
| 390 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 1.75 | |
| 391 | Red-tailed Hawk | Digger Pine | Empty | 0 | Inactive | 3.24 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 392 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 3.29 | |
| 393 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 3.46 | |
| 394 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 3.47 | |
| 395 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 3.47 | Nest falling apart |
| 396 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 3.56 | |
| 397 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 2.56 | |
| 398 | Red-tailed Hawk | Cliff | Empty | 0 | Active | 6.20 | |
| 399 | Red-tailed Hawk | Cottonwood | Empty | 0 | Inactive | 5.04 | |
| 400 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 5.04 | |
| 401 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.25 | |
| 402 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.19 | |
| 403 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 8.94 | |
| 404 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 8.75 | |
| 405 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.19 | |
| 406 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.31 | |
| 407 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.36 | |
| 408 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.73 | |
| 409 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.37 | |
| 410 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.27 | |
| 411 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 9.83 | |
| 412 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 9.95 | |
| 413 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 10.29 | |
| 414 | Red-tailed Hawk | Windmill | Empty | 0 | Inactive | 9.47 | |
| 415 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.28 | |
| 416 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 8.21 | |
| 417 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 8.23 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 418 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 8.14 | |
| 419 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 8.10 | |
| 420 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 7.62 | |
| 421 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 7.26 | |
| 422 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 6.82 | |
| 423 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 6.79 | |
| 424 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 6.65 | |
| 425 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 6.70 | Two nests near each other |
| 426 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 7.07 | |
| 427 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 6.84 | |
| 428 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 6.51 | |
| 429 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 6.42 | |
| 430 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 6.17 | |
| 431 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 6.00 | |
| 432 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 5.64 | |
| 433 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 5.71 | |
| 434 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 5.56 | |
| 435 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 5.56 | |
| 436 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 5.37 | |
| 437 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 5.78 | |
| 438 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 9.86 | |
| 439 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.29 | |
| 440 | Red-tailed Hawk | Valley Oak | Empty | 0 | Active | 8.88 | |
| 441 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 8.27 | |
| 442 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.49 | |
| 443 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.38 | |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 444 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.27 | |
| 445 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 9.41 | |
| 446 | Red-tailed Hawk | Digger Pine | Empty | 0 | Inactive | 8.30 | |
| 447 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 1.17 | |
| 448 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 7.09 | |
| 449 | Red-tailed Hawk | Tower | Empty | 0 | Inactive | 9.87 | Red-tailed Hawk perched nearby |
| 450 | Red-tailed Hawk | Tower | Empty | 0 | Inactive | 9.93 | Red-tailed Hawk perched nearby |
| 451 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 4.82 | |
| 452 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 7.19 | |
| 453 | Red-tailed Hawk | Tower | Empty | 0 | Inactive | 9.90 | Red-tailed Hawk perched nearby |
| 454 | Red-tailed Hawk | Tower | Empty | 0 | Inactive | 9.47 | |
| 455 | Red-tailed Hawk | Digger Pine | Empty | 0 | Active | 8.14 | New nest bowl. Two adults near |
| 456 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 8.10 | Two adults near |
| 457 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 6.91 | Old nest |
| 458 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 7.54 | |
| 459 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 9.51 | |
| 460 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 6.74 | |
| 461 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 4.51 | |
| 462 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 4.43 | |
| 463 | Red-tailed Hawk | Cliff | Eggs | 2 | Incubating | 4.50 | Newly built nest this year. |
| 464 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 3.33 | Upper of two nests on same cliff face |
| 465 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 3.87 | |
| 466 | Red-tailed Hawk | Digger Pine | Empty | 0 | Inactive | 7.22 | Fledged young in 2013 |
| 467 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 10.19 | Old nest, only remnants or possibly never built completely |
| 468 | Red-tailed Hawk | Digger Pine | Empty | 0 | Inactive | 8.64 | Adult Red-tailed Hawk near nest acting territorial, but nest not built on |

| ID | Species | Substrate | Contents | Quan. | Status | Project Dist. (mi.) | Notes |
|---|---|---|---|---|---|---|---|
| 469 | Red-tailed Hawk | Digger Pine | Empty | 0 | Inactive | 5.68 | |
| 470 | Red-tailed Hawk | Digger Pine | Empty | 0 | Inactive | 4.34 | |
| 471 | Red-tailed Hawk | Digger Pine | Empty | 0 | Inactive | 5.11 | |
| 472 | Red-tailed Hawk | Digger Pine | Empty | 0 | Inactive | 5.16 | Old nest |
| 473 | Red-tailed Hawk | Digger Pine | Unknown | N.A. | Active | 8.25 | Adult on nest |
| 474 | Red-tailed Hawk | Digger Pine | Empty | 0 | Inactive | 9.24 | |
| 475 | Red-tailed Hawk | Cliff | Empty | 0 | Active | 3.80 | Fresh, built this year. No grasses. |
| 476 | Red-tailed Hawk | Digger Pine | Empty | 0 | Inactive | 9.55 | |
| 477 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 5.57 | Located below old Golden Eagle nest |
| 478 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 8.88 | |
| 479 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 9.50 | |
| 480 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 5.73 | |
| 481 | Red-tailed Hawk | Cliff | Empty | 0 | Inactive | 7.68 | |
| 482 | Red-tailed Hawk | Valley Oak | Eggs | 2 | Active | 9.58 | Adult observed incubating |
| 483 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 8.03 | |
| 484 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 8.14 | |
| 485 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 8.55 | |
| 486 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 8.08 | |
| 487 | Red-tailed Hawk | Valley Oak | Empty | 0 | Active | 8.19 | Freshly lined with lichens on Jan. 23. Empty and no activity on Apr. 5. |
| 488 | Red-tailed Hawk | Blue Oak | Empty | 0 | Inactive | 8.44 | Large bowl |
| 489 | Red-tailed Hawk | Valley Oak | Empty | 0 | Inactive | 7.28 | Old, remnants of a large stick nest |
| 490 | Red-tailed Hawk | Digger Pine | Empty | 0 | Inactive | 4.26 | |
| 491 | Red-tailed Hawk | Cliff | Unknown | N.A. | Active | 3.43 | Adult on nest in incubation posture |
| 492 | Turkey Vulture | Cliff | Empty | 0 | Inactive | 6.91 | |




County Border
Major Road
Proposed Project Boundary
Study Area

Nest Locations

- Barn Owl
- Common Raven
- Prairie Falcon
- Great Horned Owl
- Red-tailed Hawk
- Turkey Vulture

5000 0 5000 10000 15000 20000 ft

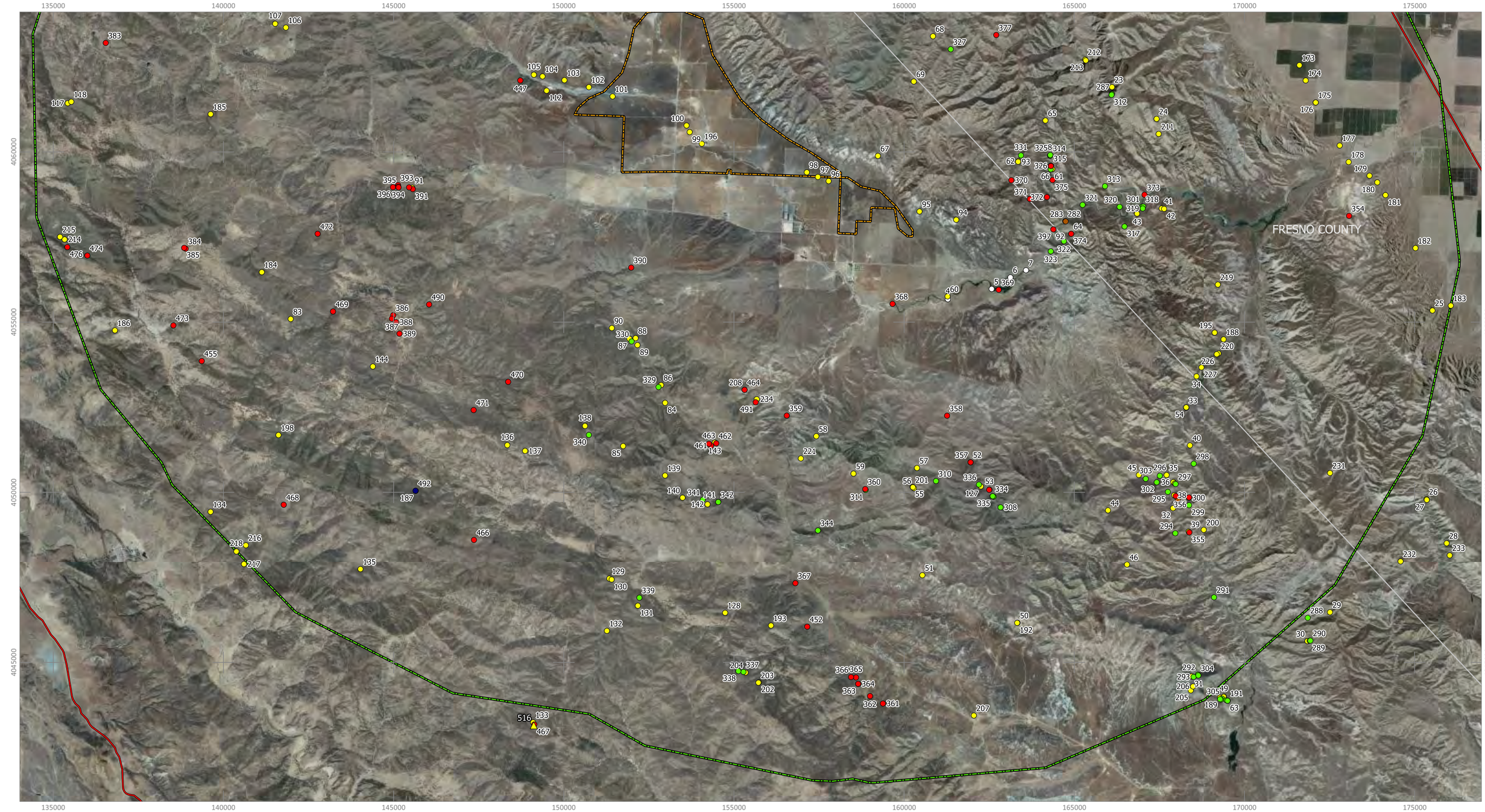
1:105,791

UTM NAD83 Zone 11 Coordinate Grid
Map Date: 5/8/2014
Author: Michael J. Kuehn
Background Source: US Department of Agriculture

# EXHIBIT 2. 2014 Nesting Survey: Non-Golden Eagle Results (Northern Study Area)

Panoche Valley Solar Project | Merced, Fresno and San Benito Counties, California

BBI




County Border
Major Road
Proposed Project Boundary
Study Area

Special Status Species Observations

California Condor

Nest Locations

Barn Owl
Common Raven
Prairie Falcon
Great Horned Owl
Red-tailed Hawk
Turkey Vulture

5000 0 5000 10000 15000 20000 ft

1:105,791

UTM NAD83 Zone 11 Coordinate Grid
Map Date: 5/8/2014
Author: Michael J. Kuehn
Background Source: US Department of Agriculture

# EXHIBIT 3. 2014 Nesting Survey: Non-Golden Eagle Results (Southern Study Area)

Panoche Valley Solar Project | Merced, Fresno and San Benito Counties, California

BBI

# APPENDIX C. SPECIES LIST

*The following list of 36 bird and 10 mammal species represents a complete compendium of vertebrate species detected during surveys by BBI biologists in January and April, 2014. Sensitive status designations are derived directly from the California Department of Fish and Wildlife's California Wildlife Habitats Relationship Database. Sensitive statuses in this database may pertain only to a subspecies or genetically distinct population of the species, and are included here only if the sensitive population has the potential to occur in the Study Area.*

## Birds

| Common Name | Scientific Name | FE | FT | CE | CT | CFP | SSC |
|---|---|---|---|---|---|---|---|
| Mallard | Anas platyrhynchos | | | | | | |
| California Quail | Callipepla californica | | | | | | |
| Chukar | Alectoris chukar | | | | | | |
| Wild Turkey | Meleagris gallopavo | | | | | | |
| Cattle Egret | Bubulcus ibis | | | | | | |
| White-faced Ibis | Plegadis chihi | | | | | | |
| Turkey Vulture | Cathartes aura | | | | | | |
| Bald Eagle | Haliaeetus leucocephalus | | | X | | X | |
| Northern Harrier | Circus cyaneus | | | | | | |
| Cooper's Hawk | Accipiter cooperii | | | | | | |
| Red-tailed Hawk | Buteo jamaicensis | | | | | | |
| Ferruginous Hawk | Buteo regalis | | | | | | |
| Golden Eagle | Aquila chrysaetos | | | | | X | |
| Killdeer | Charadrius vociferus | | | | | | |
| Rock Pigeon | Columba livia | | | | | | |
| Greater Roadrunner | Geococcyx californianus | | | | | | |
| Barn Owl | Tyto alba | | | | | | |
| Great Horned Owl | Bubo virginianus | | | | | | |
| Acorn Woodpecker | Melanerpes formicivorus | | | | | | |
| Northern Flicker | Colaptes auratus | | | | | | |
| American Kestrel | Falco sparverius | | | | | | |
| Merlin | Falco columbarius | | | | | | |
| Prairie Falcon | Falco mexicanus | | | | | | |
| Loggerhead Shrike | Lanius ludovicianus | X | | | | | |
| Western Scrub-Jay | Aphelocoma californica | | | | | | |
| Yellow-billed Magpie | Pica nuttalli | | | | | | |
| American Crow | Corvus brachyrhynchos | | | | | | |
| Common Raven | Corvus corax | | | | | | |
| Canyon Wren | Catherpes mexicanus | | | | | | |
| Western Bluebird | Sialia mexicana | | | | | | |
| California Thrasher | Toxostoma redivivum | | | | | | |
| European Starling | Sturnus vulgaris | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| California Towhee | Melozone crissalis | | | | | | |
| Western Meadowlark | Sturnella neglecta | | | | | | |
| House Finch | Haemorhous mexicanus | | | | | | |

## Mammals

| **Common Name** | **Scientific Name** | **FE** | **FT** | **CE** | **CT** | **CP** | **SSC** |
|---|---|---|---|---|---|---|---|
| Desert Cottontail | Sylvilagus audubonii | | | | | | |
| Black-tailed Jackrabbit | Lepus californicus | | | | | | X |
| California Ground Squirrel | Spermophilus beecheyi | | | | | | |
| Coyote | Canis latrans | | | | | | |
| Gray Fox | Urocyon cinereoargenteus | | | | | | |
| American Badger | Taxidea taxus | | | | | | X |
| Bobcat | Lynx rufus | | | | | | |
| Wild Pig | Sus scrofa | | | | | | |
| Elk | Cervus elaphus | | | | | | |
| Mule Deer | Odocoileus hemionus | | | | | | |

# APPENDIX D. RESUMES

# Peter H. Bloom, Ph.D. | President

## Qualifications

Peter Bloom has been a professional environmental consultant for more than 35 years, principally in California. He specializes in the environmental sciences, is an internationally recognized expert in raptor biology and conservation and is considered one of the best all-around field biologists in California with his extensive knowledge and experience with all terrestrial vertebrate groups (amphibians, reptiles, birds, and mammals) and the vascular plants. Corporate clients for whom he has prepared or contributed to the production of numerous biological assessments and environmental impact reports include The Irvine Company, Rancho Mission Viejo, Tejon Ranch, Newhall Ranch, Ahmanson Ranch, Metropolitan Water District, and Los Angeles Department of Water and Power. He has also worked extensively with the Department of Defense, U.S. Fish and Wildlife Service, National Park Service, Bureau of Land Management, U.S. Forest Service, California Department of Fish and Game, and various non-profit conservation groups providing valuable research and advice, primarily on raptor ecology and conservation. He has conducted avian and herpetological research in the western United States, Alaska, Peru, Ecuador, and India and has been responsible for a wide variety of biological, ecological, and conservation studies ranging from local biological assessments to regional conservation planning. Dr. Bloom has published more than 30 peer-reviewed scientific papers and technical reports and taught California natural history at a local junior college for more than 12 years.

## Professional Experience

As founder and President of Bloom Biological, Inc., Dr. Bloom has prepared numerous biological assessments and worked on an array of avian research projects in the western United States, Alaska, Peru, Ecuador, and India, spending over 600 hours conducting helicopter and fixed-wing nest survey work and aerial radio-tracking of eagles, California condors, hawks, and herons. He has also been responsible for conducting or supervising:

- fiber-optics and electrical powerline installation surveys and construction monitoring;
- surveys of nesting and wintering birds of prey for the California Department of Fish and Game (CDFG), BLM, U.S. Forest Service, Department of Defense, and numerous private land owners;
- transponder and radio-tagging of adult California red-legged frogs in Ventura County;
- focused surveys for California gnatcatcher, southwestern willow flycatcher, least Bell's vireo, yellow-billed cuckoo, Swainson's hawks, golden eagles, arroyo toad, California red-legged frog, desert tortoise, Pacific pond turtle (including trapping and surveying habitat), coast horned lizard, flat-tailed horned lizard, Belding's orange-throated whiptail, coastal whiptail, southern rubber boa, coastal patch-nosed snake, California glossy snake, two-striped garter snake (including trapping and surveying habitat), red-diamond rattlesnake, southern flying squirrel, and Pacific pocket mouse;
- general herpetological, small mammal, breeding and winter bird surveys in southern California;
- translocation of several hundred arroyo toads at Camp Pendleton Marine Corps Base;
- sensitive herpetological, mammal, and raptor surveys for the Transportation Corridor Agency in Orange County; and
- a raptor status and management plan for Naval Weapons Station, Seal Beach and Fallbrook Detachment.

As a research biologist at the Western Foundation of Vertebrate Zoology, served on the Science Advisory Board of the South Orange County Natural Communities Conservation Program. During his tenure there he:

- provided herpetological input into the Orange County environmental GIS and Cleveland National Forest environmental inventory.
- managed a long-term (30 yr.) raptor ecology study in California;
- managed a successful Great Blue Heron mitigation project designed to increase numbers of nesting herons through placement of artificial nest platforms;
- supervised and performed predator management activities for USFWS related to protection of California least terns, snowy plovers, and light-footed clapper rails in southwestern California from avian and other vertebrate predators (locations included Vandenberg Air Force Base, Naval Weapons Station Seal Beach, Batiquitos Lagoon, Port of Long Beach, Port of San Diego, and Tijuana Slough National Wildlife Refuge);
- supervised a two year CalTrans radio-telemetry study of nesting peregrine falcons and their relationship to California least terns in southwestern California; and
- organized and finished seven years of a MAPS passerine monitoring station.
- Together with sub-permittees, banded ~ 45,000 birds, mostly nestlings (1970 – 2013).

While serving as a research biologist and advisor in India, responsibilities included educating local biologists in the various techniques needed to capture birds, and conducting radio-telemetry research.

Served as thesis advisor to seven students at CSU Long Beach, one student at CSU Humboldt, and one student at CSU Fullerton.

As research biologist for the National Audubon Society, was responsible for writing the grant proposal and ultimately the successful award of two grants totaling $300,000 for six years of fulltime research on the ecology of southern California raptor populations. Responsibilities included project management, personnel selection, supervision of 12 volunteers, proposal and budget preparation, method design, data analysis, report writing, and publication of results. Directed the effort to capture all wild free-flying California condors for transmitter placement or captive breeding. Radio-tracked condors and conducted contaminant studies involving condors and 180 golden eagles.

As a research biologist at the University of California, Santa Cruz, was principal investigator on a three year study designed to determine the status of northern goshawk populations in California for CDFG.

Trapped and placed transmitters on great gray owls for the National Park Service , prairie falcons for CDFG, and peregrine falcons in Peru for the Bodega Bay Institute of Pollution Ecology.

As a wildlife biologist for BLM, was principal investigator of a study designed to determine the status of the Swainson's hawk in California. Surveyed all semi-arid and desert regions, reviewed literature and museum records, assessed reproduction, banded adults and young, and prepared the final report. His efforts contributed to the state-listing of Swainson's hawk as threatened.

Surveyed and reported on the ecology and distribution of raptors inhabiting the 200-square-mile Camp Pendleton Marine Corps Base.

While serving as a biological technician for BLM, conducted reptile, amphibian, small mammal, and avian surveys of 3.25 million acres of public land as part of a grazing EIS.

## Education

Ph.D., Natural Resources, College of Natural Resources, University of Idaho, Moscow
M.S., Biology, California State University, Long Beach
B.S., Zoology, California State University, Long Beach

## Awards

Graduation with Honors – Best Thesis Award School of Natural Sciences 1979
The Wildlife Society Western Section: Professional of the Year, 2005

Association of Field Ornithologists: Bergstrom Award, 1981
The Nature Conservancy: $27,000 for satellite transmitters, 2004 and 2006

## Permits & Certifications

Federal endangered species recovery permit (TE-787376) for red-legged frog (including placement of transmitters and transponders), arroyo toad, California gnatcatcher (including banding), least Bell's vireo (including banding), southwestern willow flycatcher (including banding), California least tern, snowy plover, peregrine falcon (banding), bald eagle (banding), and Swainson's hawk (banding).

California scientific collecting permit and memorandum of understanding for all raptors, including state-threatened Swainson's hawk, reptiles, amphibians, small mammals, and many additional species of birds, including state-threatened western yellow-billed cuckoo, California least tern, snowy plover, peregrine falcon, and bald eagle
Federal Master Banding Permit No. 20431
- Federal Bird Marking and Salvage Permit
- Predator Management Permit
- Migratory Bird Relocation Permit (burrowing owl and other species)

Brown-headed cowbird trapping authorization

Desert Tortoise Council-approved for conducting desert tortoise monitoring surveys

## Selected Publications

Home range and habitat use of Cooper's Hawks in urban and natural areas. C.A. Lepczyk and P.S. Warren (eds). Studies in Avian Biology No. 45. www.ucpress.edu/go/sab. 2012. (with Chiang, S.N., P.H. Bloom, A.M.Bartuszevige and S. E. Thomas)

Impact of the lead ammunition ban on reducing lead exposure in golden eagles and turkey vultures in California. PloS One. 18 pgs. 2011. (with Kelly, T.R., S. Torres, Y. Hernandez, R. Poppenga, W.M. Boyce, and C.K. Johnson)

Vagrant western Red-shouldered Hawks: Origins, natal dispersal patterns and survival. The Condor. 113:538-546. 2011. (with J.M. Scott, J.M. Papp, J.W. Kidd, S. Thomas)

Capture techniques. Pgs. 193 – 219. In Bird and Bildstein (eds). Raptor research and management techniques. Hancock House, Blaine, WA. 2007. (with W.S. Clark and J.W. Kidd)

Status of Burrowing Owls in southwestern California. In Proceedings of the California burrowing owl symposium, November 2003. Bird populations monographs No. 1. Institute for Bird Populations and Albion Environmental, Inc. 2007. (with Kidd, J.W., P.H. Bloom, C.W. Barrows and C.T. Collins)

Turkey vulture marking history: the switch from leg bands to patagial tags. *North American Bird Bander* 30:59-64. 2005. (with C. S. Houston)

Basic II and basic III plumages of rough-legged hawks. *Journal of Field Ornithology* 76:83-89. 2005. (with William Clark)

Molt and sequence of plumages of golden eagles, and a technique for in-hand ageing. *North American Bird Bander* 26:97-116. 2001. (with William Clark)

The status of Harlan's hawk in southern California. *Western Birds* 31:200-202. 2000. (with Charles Collins)

Post-migration weight gain of Swainson's hawks in Argentina. *Wilson Bulletin* 111:428-432. 1999. (with M. I. Goldstein, J. H. Sarasola, and T. E. Lacher)

Characteristics of red-tailed hawk nest sites in oak woodlands of central California. Proceedings of a Symposium on Oak Woodlands: Ecology, Management, and Urban Interface Issues. Pgs. 365-372. 1998. (with W. D. Tietje, and J. K. Vreeland)

The urban buteo: red-shouldered hawks in southern California. Pgs 31-39 in: Raptors in Human Landscapes, Adaptations to Built and Cultivated Environments. 1996. D. M. Bird, D. E. Varland,, and J. J. Negro, eds. Academic Press. (with M. D. McCrary)

Reproductive performance, age structure, and natal dispersal of Swainson's hawks in the Butte Valley, California. Journal of Raptor Research 29:187-192. 1995. 1995. (with B. Woodbridge and K. K. Finley)

The biology and current status of the long-eared owl in coastal southern California. Bulletin of the Southern California Academy of Sciences 93:1-12. 1994.

Red-shouldered hawk home range and habitat use in southern California. Journal of Wildlife Management 57:258-265. 1993. (with M. D. McCrary and M. J. Gibson)

The dho-gaza with great horned owl lure: an analysis of its effectiveness in capturing raptors. Journal of Raptor Research 26:167-178. 1992. (with J. L. Henckel, E. H. Henckel, J. K. Schmutz, B. Woodbridge, J. R. Bryan, R. L. Anderson, P. J. Detrich, T. L. Maechtle, J. O. McKinley, M. D. McCrary, K. Titus, and P. F. Schempf [Bloom senior author])

Lead hazards within the range of the California condor. The Condor 92:931-937. 1990. (with O. H. Pattee, J. M. Scott, and M. R. Smith)

Investigations of the decline of Swainson's hawk populations in California. Journal of Raptor Research 23:63-71. 1990. (with R. W. Risebrough, R. W. Schlorff, and E. E. Littrell)

Importance of riparian systems to nesting Swainson's hawks in the Central Valley of California. Pgs. 612-618 in Warner, R.E. and K.M. Hendrix eds., California Riparian Systems, Ecology, Conservation, and Productive Management. University of California Press. 1984. (with R. D. Schlorff)

# Michael Kuehn, Ph.D. | Senior Biologist & Statistical Analyst

## Qualifications

Dr. Kuehn is an avian ecologist with experience conducting field research throughout the Americas from Ecuador to Alaska. He also has a solid working knowledge of the other terrestrial vertebrate groups (amphibians, reptiles, and mammals), and has taught courses about their ecology and identification at UC-Santa Barbara. He is familiar with the fauna and flora of coastal California and the Mojave/Sonoran Desert regions. He has studied nesting birds for 15 years, principally in California, Nevada, Arizona, Montana, Idaho and Alaska, but also in Ecuador. Dr. Kuehn has been responsible for a wide variety of biological, ecological, and conservation studies ranging from local biological assessments to studies aimed at understanding specific stressors on regional avian communities. He has designed and conducted numerous avian field studies, and supervised field crews during the implementation of these studies in addition to performing statistical analysis and interpretation of data for report preparation.

## Professional Experience

As a biologist at Bloom Biological, Dr. Kuehn has worked for three years in a variety of capacities to help design and conduct ecological assessments and prepare permitting documents, including the following:

Development of statistically valid pre-construction and post-construction avian survey protocols that meet federal and state permit requirements for alternative energy projects.

Managed multiple environmental assessments at alternative energy projects, involving survey design and site selection, training biologists to follow specific survey methods and protocols, scheduling and data management, as well as GIS management, data synthesis, statistical analysis and report preparation.

Contributed to the drafting of multiple Eagle Conservation Plans for wind energy projects seeking to apply for USFWS programmatic incidental eagle take permits.

Experienced with the application of field survey data to generate eagle fatality estimates for wind energy projects using the USFWS-developed Bayesian fatality prediction model using R Statistical software.

Conducted field surveys for a variety of passerine birds, owls, and other raptors.

Trained in raptor trapping (including Golden Eagles) and radio telemetry tracking of tagged birds.

Worked as an avian specialist, conducting nest searching and monitoring for the Sunrise Powerlink Project in San Diego and Imperial counties in California.

Assisted in creating burrows and conducting surveys for Burrowing Owls.

Dr. Kuehn also has the following experience:

As a research assistant at the Western Foundation of Vertebrate Zoology, conducted surveys for Loggerhead Shrikes on Santa Cruz Island and for all bird species along the Santa Clara River (Ventura County).

As a research associate at the University of California, Santa Barbara, designed and directed a two-year study investigating the effects of a tamarisk biocontrol agent on avian communities using riparian habitat in southern Nevada.

Served on a Technical Advisory Committee for a Walton Family Foundation funded initiative to restore habitat for Southwestern Willow Flycatchers in the Colorado Basin in the wake of Tamarisk biocontrol beetle introduction during 2011 and 2012.

Conducted independent research on reproductive strategies of birds breeding at high latitudes in central Alaska.

As a graduate student at UC Santa Barbara, conducted seven years of field research in Alaska, Idaho and Montana to investigate the behavioral defenses of hosts against Brown-headed Cowbird parasitism.

Participated for four years in a long-term ecological investigation of landscape effects on nesting success of riparian birds in Western Montana

Participated in a study of nesting birds in the cloud-forests of central and southern Ecuador.

## Education

Ph.D., University of California, Department of Ecology, Evolution and Marine Biology, Santa Barbara

B.S., Fisheries and Wildlife Management, Lake Superior State University, Sault Ste. Marie, Michigan

## Awards

Worster Award for Graduate/Undergraduate Collaborative Research, Department Ecology, Evolution and Marine Biology, University of California, Santa Barbara ($6000). 2007

Frank M. Chapman Memorial Grant, American Museum of Natural History ($2500). 2007
Student Research Award, Animal Behavior Society ($1000). 2007

Exploration Fund Award, Explorer's Club ($1200). 2007

Paul A. Stewart Research Award, Wilson Ornithological Society ($500). 2007

Ralph Schreiber Ornithology Research Award, Los Angeles Audubon Society ($2500). 2006

Student Research Award, American Ornithologist's Union ($1800). 2003

## Permits & Certifications

USFWS Sci. Collector's Permit (MB085567-0)

USGS Bird Banding Subpermitee (22905-F )

## Selected Publications

Kuehn, M. J., B. D. Peer, and S. I. Rothstein. (*Submitted Dec. 25, 2013*). Expression of Nest Defense Behaviors by a Brood Parasite Host is Experience-Dependent and Retained in the Absence of Parasitism. Evolution.

Kuehn, M. J., B. D. Peer, and S. I. Rothstein. 2014. Variation in host response to brood parasitism reflects evolutionary differences and not phenotypic plasticity. Anim. Behav. 88:21-28.

Peer, B. D., M. J. Kuehn, S. I. Rothstein and R. C. Fleischer. 2011. Persistence of host defence behavior in the absence of avian brood parasitism. Biology Letters. 7(5): 670-673.

Peer, B. D., C. E. McIntosh, M. J. Kuehn, S. I. Rothstein and R.C. Fleischer. 2011. Complex biogeographic history of lanius spp. shrikes and its implications for the evolution of defenses against avian brood parasitism. Condor. 113(2): 385-394.

Bateman, H.L., T.L. Dudley, D.W. Bean, S.M. Ostoja, K.R. Hultine, and M.J.Kuehn. 2010. A river system to watch: documenting the effects of saltcedar (Tamarix spp.) biocontrol in the Virgin River Valley. Ecological Restoration. 28:405-410.

Rivers, J. W., and M. J. Kuehn. Predation of eared grebe by great blue heron. 2007. Wilson Journal of Ornithology. 118(1): 112-113.

Peer, B. D., S. I. Rothstein, M. J. Kuehn and R. C. Fleischer. 2005. Host defenses against cowbird Molothrus spp. parasitism: implications for cowbird management. Pp. 84-97 in C. P. Ortega, J. F. Chace and B. D. Peer eds., Management of cowbirds and their hosts: balancing science, ethics and mandates. Ornithological Monographs. No. 57.

Tewksbury, J. J., T. E. Martin, S. J. Hejl, M. J. Kuehn and W. J. Jenkins. 2002. Parental care of a cowbird host: caught between the costs of egg-removal and nest predation. Proc. R. Soc. Lond. B. 269: 423-429.

Dobbs, R.C., P.R. Martin, and M. J. Kuehn. 2001. On the nest, eggs, nestlings, and parental care in the Scaled Antpitta (Grallaria guatimalensis). Ornithologia Neotropical 2:225-233

**Appendix D**

Resume of Eagle Conservation Plan Preparer

# James A. McRacken

Senior Scientist

Mr. McRacken has over 26 years of experience in wildlife studies including avian, mammal, and reptile and amphibian surveys, jurisdictional streams and wetlands delineations, as well as federal, state, and local permitting activities. During his career, he has conducted wildlife surveys, including rare, threatened, and endangered (RTE) plant and wildlife species, wetland evaluations, habitat and substrate assessments, and various National Environmental Policy Act (NEPA) related assessments for multiple branches of the federal government. He has also conducted wetland compensation design and monitoring to support development and hydropower and transportation projects.

In the area of protected species and wildlife studies, he has conducted and managed protected species assessments on projects throughout the eastern U.S. In addition, he has conducted U.S. Fish and Wildlife Service formal and informal consultations for protected species and provided client representation during the Endangered Species Act permitting. Mr. McRacken's major studies include wildlife habitat studies associated with avian studies – including waterfowl, raptor, breeding, and migratory bird surveys, as well as bat acoustic and trapping studies.

Mr. McRacken's wetland experience includes assessing, surveying, and managing wetland projects at over 270 sites throughout the eastern and southeastern United States. He has permitted impacts to jurisdictional waters of the U.S., including wetlands, impacts under the Nationwide Permit, and Individual Permit programs throughout the southeastern U.S. Mr. McRacken has provided client representation in court as an expert witness and at regulatory meetings for wetland permitting issues.

Selected project experience is summarized below.

**Panoche Valley Solar Facility Project (247 MW) - Ongoing**

California, Duke Energy Renewables, LLC

Served as a Senior Scientist by conducting biological surveys such as protected species surveys for golden eagle, burrowing owls, San Joaquin kit fox, giant kangaroo rat, blunt-nosed leopard lizard, San Joaquin antelope squirrel, and various other terrestrial animal on the project footprint and conservation lands. Also responsible for the preparation of the Clean Water Act Section 404 Individual Permit and the Section 404(b)(1) Alternative Analysis for submittal to the USACE, and the preparation of the Biological Assessment report for submittal to the USFWS as part of the Section 7 Endangered Species Act consultation. Additional support included preparation of the California Department of Fish and Wildlife Endangered Species Act Incidental Take Permit Application (2081) for state protected species as well as the Lake or Streambed Alteration Agreement permit application, Weed Control Plan, Avian Conservation

**Education**

B.S. Biology/Naturalist,
Appalachian State University, 1989

**Specialized Training and Certifications**

Anabat Acoustic Monitoring Techniques - Bat Sense/Bats R Us

Bat Acoustic Monitoring Training - Bat Conservation International

Bat Conservation and Management Training – BCI

Bat Study Techniques - Indiana Bat - Bat Conservation and Management, Inc.

Basic Wetlands Training Program - The National Wetland Science Training Cooperative

Federal Highway Administration NEPA Training Program - FHWA and GDOT

Endangered Species Act Section 7 Consultation Training - Duncan & Duncan WEST

USACE Nationwide Permit Training - The Wetland Training Institute

Stream Restoration Trainings – NC State University

Florida Department of Environmental Protection Jurisdictional Wetland Identification Training

Florida Department of Environmental Protection Controlled Prescribed Burning Interagency Training – Florida Division of Forestry

Strategy, Eagle Conservation Plan, and the Wetland Mitigation and Monitoring Plan for the Project.

**Avian Survey of the Los Vientos III, IV, V and Rio Bravo Wind Farms - Ongoing**
Texas, Duke Energy Renewables, LLC

Served as Senior Scientist responsible for the Breeding, Migratory and Wintering Bird Study for the proposed wind farm in south Texas. The purpose of the avian study was to characterize the existing breeding, migratory, and wintering avian communities of the project area and to estimate the temporal and spatial use of the project area by birds, especially raptors, and also to create risk indices for bird assemblages (large and small birds).

**Avian/Eagle Surveys of the Frontier City Wind Farm - Ongoing**
Oklahoma, Amshore, LLC

Served as Senior Scientist responsible for the Breeding, Migratory and Wintering Bird Study for the proposed wind farm in northern Oklahoma. The purpose of the avian study was to characterize the existing breeding, migratory, and wintering avian communities of the project area and to estimate the temporal and spatial use of the project area by birds, especially raptors, and also to create risk indices for bird assemblages (large and small birds).

**Bat Acoustic Surveys Associated With W.S. Lee Nuclear Station and Make-Up Pond C**
Cherokee County, South Carolina, Duke Energy Carolinas, LLC

Served as Project Manager and Senior Scientist responsible for the acoustic bat surveys on the proposed nuclear station and the adjacent Make-Up Pond C parcel. The purpose of this study was to characterize the existing bat communities of the Project areas and assess the potential project-related impacts on the federally protected Northern Long-eared Bat (*Myotis septentrionalis*). The study focused on representative and high-value roosting and foraging habitat areas located within Project areas.

**Bat Acoustic Surveys Associated With the Oconee and Catawba Nuclear Stations and the W. S. Lee Combined Cycle Power Plant**
Oconee, York, and Anderson Counties, South Carolina, Duke Energy Carolinas, LLC

Served as Project Manager and Senior Scientist responsible for the acoustic bat surveys on the Oconee and Catawba Nuclear Stations and the W. S. Lee Combined Cycle Power Plant. The purpose of this study was to assess the potential project-related impacts on the federally protected Northern Long-eared Bat (*Myotis septentrionalis*) within areas of the power plants where development was planned.

The study focused on representative and high-value roosting and foraging habitat areas located within Project areas.

**Keowee-Toxaway Hydroelectric Relicensing Project (FERC No. 2503), Avian Study**
Oconee, South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager responsible for the development of the comprehensive study plan and the field studies that characterize the avian resources within the Federal Energy Regulatory Commission (FERC) Project Boundary. Study objectives were to survey and evaluate existing breeding, resident, and migratory avian populations; survey and identify the presence of any avian state or federal rare, threatened or endangered species; assess any effects of current and any proposed Project-related hydropower operations on the breeding and migratory species and communities; and provide information to assist in developing any potential mitigation measures. Results of the avian study will be filed as part of Exhibit E in the overall FERC hydroelectric relicensing application.

**Toledo Bend Relicensing Project, Red-cockaded Woodpecker Foraging Habitat Assessment**
Texas and Louisiana, Sabine River Authority

Served as Task Manager responsible for the assessment of potential foraging habitat within the 0.5 mile foraging buffer around the red-cockaded woodpecker (*Picoides borealis*) nesting cluster found adjacent to the Toledo Bend Reservoir. Results of the study will be used in the FERC hydroelectric relicensing process.

**Toledo Bend Relicensing Project, Terrestrial Special-Status and Species Assessment Studies**
Texas and Louisiana, Sabine River Authority

Served as Task Manager responsible for surveys, planning, coordinating, and managing the Terrestrial Special-Status and Species Assessment studies for inclusion into the Integrated Licensing Process (ILP) application to FERC. These studies focused on federally and state protected species such as the Louisiana pine snake (*Pituophis ruthveni*) and the red-cockaded woodpecker that could be found adjacent to the Toledo Bend Reservoir. Results of the studies will be filed as part of Exhibit E in the overall FERC hydroelectric relicensing application.

**Avian Survey of the William States Lee III Nuclear Station**
Cherokee County, South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager and Senior Scientist responsible for the Breeding and Migratory Bird Study. The purpose of the avian study was to characterize the existing breeding and migratory avian communities of the approximately 2,068 acres project

area and assess the potential project-related impacts on the breeding and migratory species and communities. The study focused on representative and high-value habitat areas located within the project area. The study also provided information that assisted in development of potential mitigation measures and any occurrences of state or federally protected avian species.

**Avian Survey of the Railroad Corridor between Gaffney and the William States Lee III Nuclear Station**

Cherokee County, South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager and Senior Scientist responsible for the Breeding and Migratory Bird Study. The purpose of the avian study was to characterize the existing breeding and migratory avian communities of the project area and assess the potential project-related impacts on the breeding and migratory species and communities. The study focused on representative and high-value habitat areas located within approximately 6.8 miles (10.9 km) within a 100-foot (30.5 m)-wide corridor that would connect to the existing railroad line in Gaffney, South Carolina, to the proposed William States Lee III Nuclear Station. In addition, a survey to determine the presence/absence of breeding raptors (hawks, owls, and eagles) along the proposed railway was performed. The study also provided information that assisted in development of potential mitigation measures and any occurrences of state or federally protected avian species.

**Breeding and Migratory Avian Species Associated With London Creek**

Cherokee County, South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager and Senior Scientist responsible for the Breeding and Migratory Bird Study. The purpose of this study was to characterize the existing breeding and migratory avian communities of the Project area and assess the potential project-related impacts on the breeding and migratory species and communities. The study focused on representative and high-value habitat areas located within Project area. The study also provided information that assisted in development of potential mitigation measures and any occurrences of state or federally protected avian species.

**Sutton Hydroelectric Project**

Braxton County, West Virginia, Brookfield Renewable Power Corporation

Served as Task Manager responsible for planning, conducting, and managing the terrestrial surveys for the project. Surveys included avian, bat mist netting and acoustic inventories, small and large mammal trapping and sampling, and reptile and amphibian assessments. Results of the studies were to be filed as part of Exhibit E in the overall FERC hydroelectric licensing application.

## James A. McRacken

Senior Scientist

**Catawba-Wateree Relicensing Project, Breeding and Migratory Bird Study**

North and South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager responsible for the Breeding and Migratory Bird Study. The work included the characterization of the existing breeding, resident, and migratory bird communities of the relicensing project area; assessing any effects of current and any proposed relicensing project-related hydropower operations on the breeding and migratory species and communities; and providing information to assist in developing any potential protection, mitigation, and enhancement (PM&E) measures.

**Tillery and Blewett Falls Lake Relicensing Project, Avian Assessment**

Anson and Richmond Counties, North Carolina, Progress Energy

Served as Project Scientist assisting in conducting the avian survey on existing impoundments to anticipate various relicensing scenarios. Work included field reconnaissance for transect locations and performing surveys of existing bird communities, which would be utilized to provide information to assist in developing any potential PM&E measures.

**John Scott Highway Indiana Bat Roost Survey**

Steubenville, Ohio, Ohio Department of Transportation

Served as a Senior Scientist responsible for conducting a survey at the John Scott Connector Safety Project in Steubenville, Ohio, for potential maternity roost and day roost trees for the Indiana Bat (*Myotis sodalis*). This survey was for an emergency Ohio Department of Transportation Project, which involved surveying of the proposed spoil laydown and access road for the Project.

**Linville Dam Embankment Seismic Stabilization Improvements (ESSI) Project**

North Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as wetland delineation and protected species surveys, stream surveys, stream and wetland mitigation, cultural resources oversight with Historic American Engineering Record (HAER) assessment. Responsible for the CWA Section 404 Individual Permit for submittal to the USACE and North Carolina Department of Environment and Natural Resources (NCDENR). Prepared Biological Assessment report for the Section 7 Endangered Species Act formal consultation regarding the dwarf-flowered heartleaf (*Hexastylis naniflora*). In addition, performed the erosion and control permitting as well as regulatory consultation.

## James A. McRacken

Senior Scientist

**Catawba Dam ESSI Project**

North Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as wetland delineation and protected species surveys, stream surveys, stream and wetland mitigation, cultural resources oversight with abandoned cemetery relocation, county watershed and shoreline protection permits, and sediment and erosion control permitting and regulatory inspections. Responsible for the Section 404 CWA Individual Permit for submittal to the USACE and several North Carolina agencies. Prepared Biological Assessment report for USFWS Section 7 Endangered Species Act informal consultation.

**Paddy Creek ESSI Project**

North Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as wetland delineation and protected species surveys, stream surveys, county watershed and shoreline protection permits, and nursery stock inventory evaluations. Also responsible for the CWA Section 404 Individual Permit for submittal to the USACE and several North Carolina agencies and Biological Assessment report preparation (Section 7 Endangered Species Act) USFWS formal consultation. In addition, performed the erosion and control permitting and compliance inspections as well as regulatory consultation.

**Catawba-Wateree Relicensing Project, Schweinitz's Sunflower Monitoring Study**

North Carolina, Duke Energy Carolinas, LLC

Served as Task Manager and Senior Scientist responsible for the yearly monitoring surveys and reports to document population size and health of the Schweinitz's sunflower (*Helianthus schweinitzii*), which is a federally endangered species. This monitoring is in association with Duke Energy's Catawba-Wateree Comprehensive Relicensing Agreement to prepare and institute a species protection plans for the sunflower, which was documented within the FERC Project Boundary.

**Lake Keowee/Little River Bypassed Reach Beaver Pond Leveler Installation**

Oconee County, South Carolina, Duke Energy Carolinas, LLC

Served as the Project Manager and Senior Scientist responsible for conducting biological surveys such as wetland delineation and protected species surveys for the installation of a pond leveling device for American beaver impacts to ensure dam safety. Also responsible for the Clean Water Act (CWA) Section 404 Nationwide Permit application for submittal to the U.S. Army Corps of Engineers (USACE) with Project concurrence letters to the U.S. Fish and Wildlife Service (USFWS) and South Carolina State Historic Preservation Office (SHPO).

## James A. McRacken

Senior Scientist

**Make-up Pond B Spillway Channel Repair on the William States Lee III Nuclear Station**

Cherokee County, South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager and Senior Scientist responsible for conducting biological surveys including wetland delineation, protected species surveys, and submittal of the Nationwide Permit application for impacts due to the necessary channel repair. The purpose of the project was to stabilize approximately 798 linear feet of the jurisdictional channel with engineered gabion mats to limit future erosion, protect against the planned flood event, and to ensure the adjacent meteorological tower is protected from slope subsidence.

**Paddy Creek Spillway Improvement Project (FERC No. 2232)**

Burke County, North Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as wetland delineation, protected species surveys, and management of cultural resources evaluations. Also responsible for the submittal of the Shoreline Protection Act permit submittal to Burke County Planning and Development Department.

**Caesars Head Mountain Transmission Line Environmental Review Project**

Greenville County, South Carolina, and Henderson County, North Carolina, Duke Energy Carolinas, LLC

Conducted field surveys along the existing 22-mile transmission line. Duties included delineating and mapping wetlands and streams, managing field staff, and managing project financials. Work also involved the senior review and signoff of all submitted materials to client.

**Bridgewater Powerhouse Penstock Tie-In Temporary Fish Relocation and Water Quality and Quantity Monitoring**

North Carolina, Duke Energy Carolinas, LLC

Served as Project Manager and Senior Scientist responsible for conducting a field effort to relocate stranded fish following penstock closure of the existing Bridgewater Powerhouse penstock. Duties involved project management, deployment of temperature loggers throughout a one-mile reach of the Linville River immediately downstream of the Linville Dam, oversight of Hydrolab (dissolved oxygen, etc.) measurements at each temperature monitoring location, and field collection of the fish utilizing backpack electrofishing and seining. Duties also included obtaining a Scientific Fish Collecting License/Permit through the North Carolina Wildlife Resource Council (NCWRC) prior to the field effort.

## James A. McRacken

Senior Scientist

**Cedar Cliff Hydroelectric Station Proposed Minimum Flow Powerhouse Permitting, East Fork Tuckasegee River Hydroelectric Project (FERC No. 2698)**

Jackson County, North Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as jurisdictional waters delineation and protected species surveys. Submitted and received a request for a finding of "no permit necessary" for the construction of the new Cedar Cliff Hydroelectric Station Proposed Minimum Flow Powerhouse. This work and request included an on-site field assessment to document the extent of the jurisdictional ordinary high water mark (OHWM) within the proposed construction area and submittal of the findings to the USACE.

**Lee Steam Station Combined Cycle Combustion Turbine Natural Resource Survey Project**

Anderson County, South Carolina, Duke Energy Carolinas, LLC

Performed field surveys for wetlands and protected species and provided senior report review on all information concerning the 325-acre site.

**Dan River Combined Cycle Combustion Turbine Environmental Survey Project**

Rockingham County, North Carolina, Duke Energy Carolinas, LLC

Consulted and provided senior-level review of all information concerning stream and wetland and natural resources on the 250-acre site. Provided permitting support between clients and agencies. Obtained all NEPA-related permits for project to proceed.

**Hawks Nest Hydroelectric Project**

West Virginia, Brookfield Renewable Power Corporation

Served as Terrestrial Lead responsible for the preparation of the wildlife and botanical resources, wetlands, riparian and littoral habitat, and terrestrial rare, threatened, and endangered species sections of the pre-application document.

**Keowee-Toxaway Hydroelectric Relicensing Project (FERC No. 2503), Bat Acoustic Study**

Oconee, South Carolina, Duke Energy Carolinas, LLC

Served as Task Manager responsible for the Bat Acoustic Study. The work included the characterization of the bat species that utilize the relicensing project area; assessment of any effects of current and any proposed relicensing project-related hydropower operations on the bat populations; and providing information to assist in developing any potential protection, mitigation, and enhancement (PM&E) measures.

## James A. McRacken

Senior Scientist

**Buck Steam Station Combined Cycle Combustion Turbine Environmental Survey Project**

Rowan County, North Carolina, Duke Energy Carolinas, LLC

Consulted and provided senior-level review of all information concerning stream and wetland and natural resources on the 80-acre site. Consulted with client to re-position station footprint to minimize stream and wetland impacts. Provided permitting support between clients and agencies. Obtained all NEPA-related permits for project to proceed.

**Opekiska and Hildebrand Hydroelectric Project**

Monongalia County, West Virginia, Brookfield Renewable Power Corporation

Served as Terrestrial Lead responsible for the preparation of the wildlife and botanical resources, wetlands, riparian and littoral habitat, and terrestrial rare, threatened, and endangered species sections of the pre-application document.

**Island Point Substation Project, Wetlands Delineation**

Iredell County, North Carolina, Duke Energy Carolinas, LLC

Delineated 12 acres of proposed substation property for potentially jurisdictional waters of the U.S., including wetlands. Work also involved the senior review and signoff of all submitted materials to client and agencies.

**Hydroelectric Relicensing Project, Relicensing Application Field Studies and Application Development**

City of Spearfish, South Dakota

Served as Task Manager responsible for the Botanical and Wildlife Resources study for the relicensing application of the hydroelectric project on Spearfish Creek. Assisted other HDR scientists with the wildlife and protected species studies. In addition, assisted with the instream flow study.

**Gaston Shoals Hydroelectric Station Dam Stabilization and Probable Maximum Flood (PMF) Remediation Project**

South Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as wetland delineation, protected species surveys, and cultural resources evaluations. Responsible for the CWA Nationwide Permit for submittal to the USACE and South Carolina Department of Health and Environmental Control (SCDHEC).

## James A. McRacken

Senior Scientist

**Claytor Lake Hydroelectric Relicensing Project**

Virginia, Appalachian Power Company/American Electric Power

Served as Terrestrial Lead responsible for the preparation of the wildlife and botanical resources, wetlands, riparian and littoral habitat study plans for the Pre-Application Document.

**Myers-Pinch Gut 100kV Transmission Corridor and Substation Project**

North Carolina, Duke Energy Carolinas, LLC

Served as a Senior Scientist responsible for conducting biological surveys such as wetland delineation and protected species surveys. Responsible for the CWA Nationwide Permit for submittal to the USACE and South Carolina Department of Health and Environmental Control. Prepared the Biological Assessment report (Section 7 Endangered Species Act) for the USFWS informal consultation regarding the dwarf-flowered heartleaf.

**Beaverdam Creek Sanitary Sewer Project**

Anderson County, South Carolina, Anderson County Utilities

Served as Senior Project Scientist responsible for performing wetland delineation and federal and state protected species surveys within the Project's corridor. Responsible for the appropriate state and federal permits and certifications from the USACE and the SCDHEC. In addition, developed alternative analyses, wetland mitigative actions, or monitoring requirements due to the impacts to waters of the U.S. including wetlands. In addition, provided expert witness services.

**Low Level Radiation Disposal Facility Siting Project, Biological Assessment and Permitting**

Richmond, Chatham, and Wake Counties, North Carolina, Chem-Nuclear

Served as Project Scientist and Task Manager. Conducted and assisted in several wildlife population studies for an Environmental Impact Statement needed for the proposed location of a low-level radioactive waste facility. The studies involved were small mammal trapping with capture-recapture of small rodents, flora plot surveys, large mammal spotlighting, scent station monitoring, transect study of the avian community, and reptile and amphibian study.

## James A. McRacken

Senior Scientist

**Yamaha Facility Siting Project, Environmental Assessment**

Alabama, Yamaha Motor Corporation, USA

Served as Project Scientist responsible for conducting biological surveys such as wetland delineation and endangered species assessment for Anthony's Riversnail (*Athearnia anthonyi*), and Section 404 permitting and site monitoring activities associated with the proposed engine testing facility.

**Phase III Natural Gas Pipeline Expansion Project**

Florida Gas Transmission Company, Central and East Coast Florida

Served as Spread Environmental Inspector/Advisor responsible for the supervision of the construction of an entire spread of the Florida Gas Transmission Company Phase III natural gas pipeline expansion project. The tasks included advising and instructing the construction contractor on state and federal environmental permit compliance issues; supervising the construction through environmentally sensitive natural features, such as wetlands and Outstanding Florida Waters; coordinating all construction and environmental activities with the appropriate federal, state, and local regulatory agencies; monitoring all hydrological and turbidity problems in construction areas that crossed either wetland or open water habitats; analyzing the hydrological and turbidity data for permit compliance; and interpreting the data to ensure total compliance or corrective measures.

**L&C Development Project, Environmental Studies**

South Carolina, L&C Development Corporation

Served as Project Manager and Senior Scientist responsible for conducting wetland and protected species surveys, ASTM Phase I environmental site assessments, and coordinating geotechnical and archaeology studies for potential commercial development sites.

**Sony Property, Environmental Assessment and Permitting**

Blythewood, South Carolina, Sony Corporation of America

Served as Senior Project Scientist responsible for performing the wetland delineation, assisting in the regulatory verification, and conducting a federal and state protected species survey on the subject property. Responsible for obtaining the appropriate permits and certifications from the USACE and SCDHEC. Performed wetland mitigation planning, implementation, and monitoring. In addition, represented Sony during a wetland-related dispute with a site development contractor, and fulfilled all mitigation requirements and coordinated with a local land trust conservancy group to arrange deeding of the remaining wetlands and associated upland buffers.

## James A. McRacken

Senior Scientist

**Marine Mammal Studies and Surveys**

Northeast Florida, Florida Department of Environmental Protection and University of Miami

Served as Biologist assisting in the research of pelagic and intracoastal Bottle-nosed Dolphin (*Tursiops truncatus*) populations in the waters of northeast Florida. This study consisted of dorsal fin photography for individual identification and data gathering to show migrant populations, movements, group interactions, and habitat usage. In addition, logged over 40 hours flying aerial surveys for manatees along the St. John's River for research on movements, habitat usage, and population studies. Additionally, flew surveys to locate the presence of the Northern Right Whale off the coast of North Florida. Mr. McRacken also created a manatee scar sketch catalogue for the northeastern field office of the Florida Department of Environmental Protection Florida Marine Research Institute and tracked tagged manatees using telemetry in northeastern Florida and southeastern Georgia.

# Panoche Valley Solar
# Giant Kangaroo Rat Relocation and Translocation Plan

Panoche Valley Solar Project
San Benito County, California

December 1, 2015

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# DEFINITIONS

| | |
|---|---|
| Biological Monitor | Observers that work on-site to perform biological surveys or provide oversight of ground disturbing activities as needed and receive instruction from and reports to the Designated Biologist(s). |
| Conservation Lands | Three large parcels of land to offset potential impacts as part of a conservation package consisting of the permanent preservation and management of those parcels (Valley Floor Conservation Lands, Valadeao Ranch Conservation Lands, and Silver Creek Ranch Conservation Lands). |
| Designated Biologist | Biologist knowledgeable and experienced in the biology and natural history of the special-status species on the Project and shall be responsible for monitoring construction activities to help minimize and fully mitigate or avoid the incidental take of individual species and to minimize disturbance of special-status species' habitat. This biologist may appoint biological monitors to perform biological surveys or provide oversight of ground disturbing activities as needed in their place. |
| Project Footprint | The portion of the project that includes the solar arrays and associated roads and equipment, totaling 2,492 acres. |
| PVS | Panoche Valley Solar Facility; name of the proposed project. |
| Study Area | Project Footprint and Conservation Lands are collectively referred to for this relocation and translocation plan. |

# ACRONYMS

| | |
|---|---|
| BNLL | Blunt-nosed Leopard Lizard |
| CDFW | California Department of Fish and Wildlife |
| CESA | California Endangered Species Act |
| DNA | Deoxyribonucleic Acid |
| ESA | Endangered Species Act |
| ˚F | Fahrenheit |
| FEIR | Final Environmental Impact Report |
| GPS | Global Positioning System |
| GKR | Giant Kangaroo Rat |
| m | meters |
| MW | megawatt |
| PV | photovoltaic |
| PVC | Polyvinyl chloride |
| SCRCL | Silver Creek Ranch Conservation Lands |
| SJKF | San Joaquin Kit Fox |
| USFWS | U.S. Fish and Wildlife Service |
| VFCL | Valley Floor Conservation Lands |
| VRCL | Valadeao Ranch Conservation Lands |

# 1.0 Introduction

Panoche Valley Solar, LLC proposes to construct and operate a solar photovoltaic (PV) energy generating facility located in San Benito County, California that will generate approximately 247-megawatts (MW) (Figure 1). This project is called the Panoche Valley Solar Facility (PVS) Project (Proposed Project). The Proposed Project will include some unavoidable impacts on giant kangaroo rats (*Dipodomys ingens*; GKR) located within the boundaries of the Proposed Project Footprint. This relocation and translocation plan has been developed to minimize the unavoidable impacts due to the construction of the Proposed Project on recommendations from the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW).

The proposed solar site construction footprint (Project Footprint) contains approximately 2,153 acres of presently grazed (cattle and sheep) land in the Panoche Valley of eastern San Benito County, California (Figure 2). The Proposed Project would also include approximately 25,618 acres of quality Conservation Lands that are primarily contiguous with the approximately 2,153-acre Project Footprint (Figure 3). These high quality lands are the Valley Floor Conservation Lands (VFCL), Valadeao Ranch Conservation Lands (VRCL), and Silver Creek Ranch Conservation Lands (SCRCL). The Project Footprint and Conservation Lands are collectively referred to for this relocation and translocation plan as the “Study Area”.

# 2.0 Species Description

The GKR is currently listed as endangered by the federal Endangered Species Act (ESA) and endangered by the California Endangered Species Act (CESA [Fish and Game Code §§ 2050 et seq]). The GKR was proposed for listing on August 13, 1985 (50 FR 32585 32587) and finalized on January 5, 1987 (52 FR 283 288). No critical habitat has been established for the GKR. The species does not have its own recovery plan, but is included in the Recovery Plan of Upland Species of San Joaquin Valley, California (USFWS 1998).

## 2.1 Historical Distribution of GKR

Historically, the GKR was known to occur over vast stretches of the western San Joaquin Valley, Carrizo Plain, and Cuyama Valley with scattered colonies located on steeper slopes and ridge tops in the Ciervo, Kettleman, Tumey, Panoche Hills, and Panoche Valley in California (Grinnell 1932, Shaw 1934, Hawbecker 1944, USFWS 1998). The Panoche Region located in western Fresno and eastern San Benito Counties is currently identified as one of the six major geographical units for remaining GKR populations. The other five remaining major geographical units are: 1) Kettlemen Hills in Kings County; 2) San Juan Creek Valley in San Luis Obispo County; 3) western Kern County in the area of the Lokern, Elk Hills, and other uplands; 4) Carrizo Plain Natural Area in eastern San Luis Obispo County; and 5) Cuyama Valley in Santa Barbara and San Luis Obispo Counties (USFWS 1998, USFWS 2005).

## 2.2 Characteristics of GKR

The GKR, compared to other kangaroo rat species found in the Study Area, is very large, brownish in color, with a light brown tail tip. An adult male GKR can weigh up to 157 grams, nearly double the weight of other coexisting kangaroo rats (Grinnell 1932), and can have a total length of approximately 31.1 centimeters (cm). In comparison, the San Joaquin kangaroo rat (*Dipodomys nitratoides*) has four toes on the hind feet while GKR has five toes which are longer than 4.7 cm (Best 1993).

The GKR is primarily a seed-eater, but will occasionally consume green plants and insects. Foraging takes place year round in all types of weather from around sunset to near sunrise, with most activity taking place within two hours of sunset. GKR cut ripening heads of grasses and forbs and places them in small surface pits or pit caches located near the GKR's burrow system. These pits have full sun exposure, ensuring the seeds become fully dried/cured. After the seeds have sufficiently dried, they are moved into underground storage for consumption at a later date. The purpose of this curing process is believed to prevent mold growth after the seeds are moved below ground (Shaw 1934). Largeleaf filaree (*Erodium* spp.) and shining peppergrass (*Lepidium nitidum*) are two important seed producing plants utilized by GKR. Peppergrass species ripen earlier in the year and may be one of the more important seed sources for GKR (Williams et al. 1993). The ability to transport large quantities of seeds in cheek pouches, coupled with the highly developed seed curing and caching behaviors, probably allows GKR to endure prolonged droughts of one or two years, without major regional population effects (Williams et al. 1993).

GKR live in burrow systems referred to as precincts, which are the most intensely used portion of their home range. Precincts consist of one to five separate burrow openings within one to eight meters (m) of one another. A typical precinct has three burrows that are independent of one another and not

interconnected, and as Grinnell (1932) and Shaw (1934) purport, precincts are occupied by a single animal. Precincts of individuals are arranged in colonies with other precincts, and colonies are generally separated by several hundred meters (Williams and Kilburn 1991). These GKR precincts are easily spotted in spring due to the denser, lush vegetation compared to the intervening areas. Plants on a precinct are the first to turn green after autumn rains and the last to ripen and turn brown in the spring (Grinnell 1932, USFWS 1998). When sufficient annual vegetation is present, population density of GKR can be estimated by counting precincts within a colony. Using this method of estimating density, Grinnell (1932) found that colonies contained between 18 and 69 precincts, with a mean of 52 GKR individuals per hectare.

Female GKR have displayed an adaptable reproductive pattern that reflects surrounding population densities and food availability. During times of high population density, females have a short reproductive season. In times of low population densities, females may continue to breed well into the summer (December to September; USFWS 1998). This ability to extend the breeding season can potentially lead to population irruptions during favorable climatic conditions. For example, populations in the northern reaches of the GKR range went from an estimated 2,000 individuals between 1980 and 1985, to an estimated 37,125 individuals between 1992 and 1993, following the end of a prolonged drought (Williams et al. 1995). During the post-drought January – May breeding season, approximately 44% of counted litters contained two young; however, one female had a litter of three and the remaining 39% had a litter of one (USFWS 1998).

Young GKR begin to disperse at approximately 11 to 12 weeks after birth, but may remain in their natal precinct after the 12th week during times of high population densities. The young tend to remain in the precinct until there is an opportunity to disperse or they are driven off by the mother or a sibling. At this point, they typically disperse into existing burrows of other adults that have died or dispersed. When abundant, GKR out-compete other rodents within the colony area, becoming the only rodent species present (Grinnell 1932).

When abundant, GKR are a major prey item for numerous predators, including: great horned owl (*Bubo virginianus*), western burrowing owl (*Athene cunicularia hypugaea*), short-eared owl (*Asio flammeus*), coyote (*Canis latrans*), San Joaquin kit fox (*Vulpes macrotis mutica)*, and American badger (*Taxidea taxus*). Snakes that might prey on GKR include: coachwhip (*Coluber flagellum*), gopher snake (*Pituophis catenifer*), king snake (*Lampropeltis* spp.), and western rattlesnake (*Crotalus oreganus oreganus*). GKR are apparently more aggressive than other co-occurring rodents and tend to be the dominant small mammal where they are present (Grinnell 1932).

Presently, the GKR population in the northern portion of the species' range is divided into three main population sections: Tumey Hills, Ciervo Hills, and Monocline Ridge. Each main population is divided into several sub-populations. The population within the Project Footprint, VFCL, VRCL, and SCRCL are all within the same subpopulation of the Tumey Hills portion of the northern population (Loew et al. 2005, USFWS 1998). Connectivity and genetic flow between these sub-populations are key to maintaining genetic diversity in GKR throughout the northern populations. Loew et al. (2005) used microsatellite DNA loci to analyze the amount of gene flow taking place between the northern sub-populations using samples from the various Tumey Hills, Ciervo Hills, Monocline Ridge, and Panoche Valley colonies. Results of these

analyses suggest current or relatively recent connectivity between sub-populations in the northern population section (Loew et al. 2005). Results propose that colonies in the Tumey Hills and Monocline Ridge sub-populations had recent connectivity, most likely via a corridor along Panoche Creek after its confluence with Silver Creek. Results also suggest that colonies in the Ciervo Ridge and Tumey Hills populations had been connected with the Panoche Valley population via long distance migrants or the use of smaller stepping-stone populations (Loew et al. 2005). Panoche Valley appears to be at the northwestern extent of the GKR sub-populations (USFWS 1998).

## 2.3 Site Survey Background - GKR

Reconnaissance surveys conducted in April 2009 found evidence of GKR precincts and scat throughout the Study Area. Multiple focused biological surveys performed in the Study Area between 2009 and 2012 (total of over 20,000 survey hours) documented the presence of GKR in multiple locations. These surveys included: protocol-level rare plant surveys, abridged 2009 protocol-level blunt-nosed leopard lizard (*Gambelia sila*; BNLL) surveys, distance sampling, occupancy sampling, and surveys specific to GKR for the purpose of documenting precinct locations.

Based on feedback and concerns expressed by the CDFW and the USFWS about the previous studies, a 100 % coverage survey of the Study Area (Figure 4) for GKR was conducted, and a systematic stratified sampling effort was completed on the Conservation Lands in February and March 2013. The survey methodology that was implemented was approved by CDFW.

Field surveyors with experience in GKR surveys used a grid sampling system whereby 30m x 30m grid squares were evaluated for the presence of GKR sign. Grid squares were arranged along north-south running parallel transects. Surveyors visually inspected each grid square for evidence of GKR precincts. Burrow precincts were considered occupied based on presence of scat, tracks, tail-drags, pit caches, fresh excavations, and cropped vegetation around a series of suitably sized horizontal and vertical burrow openings.

Precincts that did not appear to be occupied were also identified and mapped as inactive. Precincts were considered unoccupied when characteristic horizontal and vertical burrow openings and the surrounding area were devoid of other diagnostic sign (e.g. fresh scat, tracks, fresh digging, and cropped vegetation). Evidence of other congeneric species was also noted and recorded as “other kangaroo rat species”.

Within the Project Footprint, the survey grid accounted for 100% coverage, plus a 500 foot buffer (in areas where landowner access was granted). The VFCL are interlaced within the Project Footprint. For this reason, the VFCL was surveyed using the same grid system as the Project Footprint and was subject to 100% coverage. The data were post-stratified following collection in the field, and the results were treated separately.

The SCRCL and VRCL were surveyed using the same methodology described above, but with wider transects. No buffers were surveyed for the Conservation Lands since surveyors did not have landowner access outside these areas. Transects were systematically distributed across the Project Footprint and included areas previously identified as high and low suitability habitats in past studies. The SCRCL and

VRCL surveys were designed to cover approximately 20-30 % of the Conservation Lands; therefore, transect spacing was approximately 148 meters (485 feet).

# 3.0 GKR Occurrence Results

Based on feedback and concerns expressed by CDFW and USFWS, a 100% coverage survey of the Project Footprint for GKR was conducted, and a systematic stratified sampling effort was completed on the Conservation Lands in February and March 2013. Follow-up surveys on the Project Footprint were conducted from July 13 to July 15, 2013, to verify and/or update the status of inactive sites. The survey methodology that was implemented was approved by CDFW and was provided to USFWS prior to the start of the survey.

Field surveys used a grid sampling system whereby 30m x 30m grid squares were evaluated for the presence of GKR signs. Grid squares were arranged along north-south running parallel transects. Surveyors visually inspected each grid square for evidence of GKR precincts. Burrow precincts were considered occupied based on presence of scat, tracks, tail-drags, pit caches, fresh excavations, and cropped vegetation around a series of suitably sized horizontal and vertical burrow openings.

Precincts that did not appear to be occupied were also identified and mapped as inactive. Precincts were considered unoccupied when characteristic horizontal and vertical burrow openings and the surrounding area are devoid of all signs (fresh scat, tracks, fresh digging, and cropped vegetation). Evidence of other congeneric species was also noted and recorded as “other kangaroo rat”.

A total of 46,845 survey grid cells were evaluated (Figures 4-7) for GKR presence; 7,270 grid cells were not evaluated due to lack of landowner access, terrain that was too steep to be safely accessed, presence of bulls or other reasons precluding surveyors from entering the grid cell, or data equipment error. These areas are combined within the cells that are highlighted as “No Data”. Results are presented according to the various project/conservation land components in the sections below.

## 3.1 GKR Results within Project Area

Of the 12,398 total survey grid cells located within the Project Footprint and the 500-foot buffer study area, approximately 11,666 survey grid cells were able to be evaluated (10,355 within the project area boundaries and 1,311 within the 500-foot buffer). A total of 177 of these grid cells were observed to have GKR evidence at the time of the survey (approximately 2% of evaluated cells). A total of 130 cells within the Project Footprint have GKR evidence (1.2% of evaluated cells in the project footprint), while 47 cells within the 500-foot buffer were considered to be active (4% of evaluated cells in 500 foot buffer). It should be noted that cells along the boundary of the Project Footprint and 500 foot buffer may have been counted twice to account for cells that were split between the two areas. The remaining 732 grid cells were not evaluated primarily due to lack of landowner access. These areas are combined within the cells that are noted as “No Data”. Table 1 describes the results of the GKR survey within the Project Footprint.

**Table 1 GKR survey results within the Project Footprint**

| | GKR Grid Cell Status | | | | | |
|---|---|---|---|---|---|---|
| | **Active** | **Inactive** | **No GKR** | **Relict GKR** | **No Data** | **TOTAL** |
| Project Footprint | 130 | 39 | 10,185 | 1 | 71 | 10,426 |
| 500-foot Buffer | 47 | 57 | 1,207 | 0 | 661 | 1,972 |
| **TOTAL** | **177** | **96** | **11,392** | **1** | **732** | **12,398** |

*No data areas in the project footprint were located along fence line locations along the 500-foot buffer and Valley Floor Conservation Lands. None are wholly within the project area. The entire Project Footprint area was surveyed during the GKR survey.

## 3.2 GKR Results within VFCL

For the purpose of this Relocation (Translocation) Plan the GKR evidence found in the Onsite Conservation Lands will be included in the VFCL. Therefore, of the 13,973 total survey grid cells located within the VFCL study area, approximately 12,725 survey grid cells were evaluated. A total of 1,010 of these grid cells were observed to have GKR evidence at the time of the survey (8.0% of the cells evaluated). The 1,248 grid cells were not evaluated primarily due to lack of landowner access based on grazing operations or other restrictions. **Table 2** describes the results of the GKR survey on the VFCL.

**Table 2 GKR survey results within the VFCL**

| | GKR Grid Cell Status | | | | | |
|---|---|---|---|---|---|---|
| | **Active** | **Inactive** | **No GKR** | **Relict GKR** | **No Data** | **TOTAL** |
| VFCL | 1010 | 805 | 10,909 | 1 | 1,248 | 13,973 |

VFCL = Valley Floor Conservation Lands which also includes the Onsite Conservation Lands for this Plan only.

## 3.3 GKR Results within SCRCL

Of the 10,309 total survey grid cells located within the SCRCL study area, approximately 8,211 survey grid cells were evaluated. A total of 1,883 of these grid cells were observed to have GKR evidence at the time of the survey (23.0% of the cells evaluated). The 2,098 grid cells were not evaluated due to lack of landowner access, terrain that was too steep to be safely accessed, or other reasons precluding surveyors from entering the grid cell. **Table 3** describes the results of the GKR survey on the SCRCL within the study area.

**Table 3 GKR survey results within the SCRCL**

| | GKR Grid Cell Status | | | | | |
|---|---|---|---|---|---|---|
| | **Active** | **Inactive** | **No GKR** | **Relict GKR** | **No Data** | **TOTAL** |
| SCRCL | 1,883 | 1,414 | 4,914 | 0 | 2,098 | 10,309 |

SCRCL=Silver Creek Ranch Conservation Lands.

## 3.4 GKR Results within VRCL

Of the 10,165 total survey grid cells located within the VRCL, approximately 6,973 survey grid cells were evaluated. A total of 58 of these grid cells were observed to have GKR evidence at the time of the survey (1.0% of the cells evaluated). The 3,192 grid cells were not evaluated due to lack of landowner access, terrain that was too steep to be safely accessed, presence of bulls, or other reasons precluding surveyors from entering the grid cell. **Table 4** presents the results of the GKR survey.

**Table 4 GKR survey results within the VRCL**

| | GKR Grid Cell Status | | | | | |
|---|---|---|---|---|---|---|
| | **Active** | **Inactive** | **No GKR** | **Relict GKR** | **No Data** | **TOTAL** |
| VRCL | 58 | 48 | 6,866 | 1 | 3,192 | 10,165 |

VRCL = Valadeao Ranch Conservation Lands

## 4.0 Discussion of Results

GKR evidence generally matched the results of past studies in the region with the highest densities occurring on SCRCL followed by the VFCL, Project Footprint, and VRCL. The low density of GKR evidence observed on the VRCL in many areas was likely due to the generally steeper topography. In the Little Panoche Valley area, near the northern extent of the VRCL, habitats appeared to be suitable for GKR occupancy, yet there were very few observations of GKR sign. Potential candidate relocation (receiver) sites could include areas where past GKR occupancy was observed, but that were not active during surveys or that represent suitable habitat in all other respects. Pockets of occupied habitat are present, indicating general suitability (Figure 8).

Evidence of GKR occupancy within the Project Footprint was relatively low, with most of the areas exhibiting evidence matching the Williams (1992) core area polygons that are excluded from the Project Footprint and are part of the VFCL.

The results of the 100% survey were used to generate estimates of the total number of GKR potentially supported in the Project Footprint. It was conservatively assumed that all 130 active cells were located in high quality GKR habitat, even though habitat quality in the Project Footprint appears to be compromised over much of the occupied area due to past land use practices. An attempt was made to field verify the density of GKR per active cell; however, based on field conditions (heavy grazing), it was not possible to identify individually clipped precincts within the grid cells. Without performing a systematic grid trapping study, it is assumed that each active cell within the Project Footprint is occupied with at least one individual GKR. This resulting assumed minimum density is within the range provided by Williams, and above the density is predicted by the Habitat Suitability Model for the Project.

Using this density estimate for GKR within the Project Footprint, a minimum of 130 GKR are expected to occur within the Project Footprint currently. Typically GKR populations can fluctuate significantly from year to year and within years, potentially leading to a population increase across the Project Footprint outside of the cells identified as active during the survey. A population increase would likely result in occupancy of at least the currently inactive GKR cells found within the Project Footprint. Therefore, a minimum reasonably expected estimate of the population potentially supported within the Project Footprint is 169 individual GKR.

To account for possible increases in density from one year to the next, a potentially higher density should be assumed. Project Footprint densities of GKR are not available in literature. The only colony evaluated in Williams (1992) from the Valley Floor was not trapped, and no density estimate specifically for that GKR colony was calculated. In the Panoche region, other density estimates are available for Silver Creek Ranch, the vicinity of Valadeao Ranch, and on the east side of the Panoche Region in the vicinity of Panoche Creek alluvial fan. Of these, the Project Footprint is most likely more similar to Valadeao Ranch than Silver Creek Ranch or Panoche Creek, given the very high quality habitat conditions present on the latter two. Therefore, using the maximum measured density for the Valadeao Ranch area (7.90 GKR/acre), up to 343 GKR may be present within the Project Footprint. The CDFW estimated between 505 and 998 GKR within the Project Footprint while the U.S. Fish and Wildlife Service estimated the number of individuals expected

in Project Footprint to be 521 GKR utilizing the Project Footprint prior to the development of the Onsite Conservation Lands.

GKR are a species that has periodic population irruptions, resulting in large increases in numbers of individuals and potentially large areas of adjacent habitat becoming occupied over very short time periods. Although these population increases may follow years of favorable precipitation, a direct causative link has not been determined. When these events occur, existing populations can increase greatly. While this type of population increase is an observed phenomenon, predicting the resulting population on a particular area (e.g. Project Footprint) is problematic and not the typical condition.

## 5.0 GKR Relocation and Translocation

The following GKR conservation measures are pertinent to this plan and are consistent with those required in the Final Environmental Impact report (FEIR) (San Benito County 2010) and Supplemental Environmental Impact Report (SEIR) (San Benito County 2014) for the Project:

- All activities that will result in permanent or temporary ground disturbances shall be preceded by a pre-construction survey for GKR by the Designated Biologist (or their representative) in the area of work no more than 30 days prior to commencement of ground disturbing activities. The Designated Biologist(s) will be a County and CDFW approved individual that specializes in GKR. If GKR sign is observed within the area of work, the area of work will be saturated with traps to capture GKR and relocate them off-site. If the Designated Biologist deems exclusion fencing necessary, it will be buried deep enough in the ground to deter GKR from digging under and high enough to deter them from jumping over. Exclusion fencing may be designed to exclude multiple species. Special care will be taken in exclusion fence design if cattle or sheep are adjacent to the site and to ensure that the fencing does not enclose or trap the fully protected BNLL. Construction will not commence in the area of exclusion fencing until that area has been completely trapped, and no more GKR are expected to use the area as determined by the Designated Biologist. These areas may be fenced and trapped in smaller sections within the larger Project Area. At the end of trapping, no GKR should remain within a proposed construction area.
- Appropriate buffers will be established with highly visible markers. All active GKR burrows shall be identified by flagging and avoided by a buffer with a radius of at least 15.24m (50 feet).

Relocation procedures to implement these measures are described in Section 5.1. All individuals detected will be relocated to suitable nearby habitat as described below. This GKR Relocation Plan will implement methodology consistent with other successful kangaroo rat relocations (Bender et al. 2010; Germano 2001, 2010; Germano and Saslaw 2007; Germano et al. 2009; Tennant et.al. 2013), the project CDFW Incidental Take Permit, and includes guidance with local knowledge of the GKR. The relocation methodology includes trapping to remove GKR from the Project Footprint that will be impacted by construction activities and hand or mechanical excavation (as appropriate) of burrows/precincts. The GKR will be relocated to suitable areas adjacent to the project footprint including unoccupied areas within the VFCL, and potentially in the VRCL and SCRCL as detailed in the translocation plan. Specific relocation receiver site criteria are detailed herein.

The ultimate goal and objective of relocating GKR is to preserve and minimize harm, injury, or death of individual GKR during project build-out and to possibly recolonize nearby locations where GKR are no longer colonized or within suitable habitat near occupied colonies. The conservation strategy is built largely on the conservation principle that 90% of the source population of GKR as defined in the USFWS Recovery Plan (1998) is preserved in perpetuity.

Recolonization of suitable habitat that is not occupied by GKR will create opportunities to grow the population beyond its current levels and occupancy. The relocated individuals and/or populations will be

monitored for five years to determine success of the relocation and inform future relocation efforts through post-project reporting.

Conducting successful relocations requires careful consideration for each animal's well-being during capture, transport, release, and successive monitoring. Risk to the animal should be minimized, and acclimation and survival at the release site will be maximized by implementing accepted practices. At a minimum, the following procedures will be implemented:

## 5.1 Relocation and Translocation Procedures

Relocation and Translocation Procedures will be implemented subsequent to preconstruction surveys and will be based on survey results and any incidental observations during Project Site preparation.

I. Project Site Preparation

A. PVS or their contractor will mark work area limits with stakes and flagging.

B. All potential GKR burrows within the Project Footprint and a 50-foot buffer will be documented (size, location and aspect), mapped, and staked and/or flagged.

C. Prior to any excavation, trenching, or digging associated with this Relocation Plan, the party or parties responsible for such activities will contact the project safety personnel to ensure all safety requirements are followed (e.g. location of underground utilities).

D. A Biological Monitor, under the direct supervision of a Designated Biologist and that has been trained, will be present for the installation of buried wildlife exclusion fencing along the marked work area boundary intended to exclude GKR from the Project Footprint. Fence installation will be overseen by the Designated Biologist who does not need to be present during all installation activities, but should inspect fence locations prior to trenching. At the discretion of the Designated Biologist, temporary exclusion fencing that is not buried may be used to enclose areas targeted for trapping that are in the direct path of construction phase exclusion fence installation (e.g., from trenching).

E. Exclusion fencing will consist of smooth material (such as aluminum flashing or polyvinyl chloride [PVC] jacket material) or of a design that prevents wildlife from climbing. Construction-phase exclusion fence will be buried at least 24 inches deep with at least 36 inches above ground level. The buried wildlife exclusion fence will avoid all remaining covered species burrow entrances by a buffer of at least 50 feet.

F. If determined to be necessary to minimize impacts to GKR outside of the project perimeter, wildlife exclusion fencing will be installed along the project boundary adjacent to GKR precincts (either existing active or newly relocated) and for a distance extending for approximately 500 feet from the nearest active precinct (additional exclusion fencing may be required beyond GKR fencing to exclude other covered species).

G. If burrows potentially occupied by GKR or other listed species cannot be avoided by at least 50 feet, the following measures to remove GKR from such burrows prior to installation of wildlife exclusion fencing requiring trenching will be implemented.
    1. For GKR burrows/precincts, trapping following GKR trapping methods (below in Section II) will be conducted prior to exclusion fence installation requiring trenching. Such burrows will be excavated following excavation procedures detailed below.
    2. For other covered species, avoidance and minimization measures specific to that species will be implemented prior to fence installation requiring trenching.

H. All cross-country routes shall avoid GKR precincts to the maximum extent practicable. Where GKR precincts cannot be avoided by vehicles, temporary 1-inch plywood sheets (minimum size of 4 by 8 feet) or stronger material will be placed over the burrow to prevent burrow collapse. Seed caches or haystacks shall be avoided by vehicles or the Designated Biologist may temporarily relocate food (only during daytime, returning at night) or cover the seeds with plywood to allow temporary access. If other measures are proposed, CDFW must be contacted.

I. Release locations (receiver sites) will be identified subsequent to preconstruction surveys and prior to trapping and removal activities subject to the following criteria:
    1. Captured GKR will be relocated (translocated) in neighbor groups. A GKR will be considered within a "neighbor group" if they are within 100 feet (approximately 30m) of the nearest neighbor. Neighbor groups will consist of at least 30 animals.
    2. If fewer than 30 animals are translocated (isolated groups), release sites shall be located on the periphery of neighbor groups.
    3. Release locations must be able to accommodate all GKR potentially captured that are within each neighbor group.
    4. Release locations will be chosen based on the following, in order:
        a. The nearest high quality habitat in the VFCL that is unoccupied or has abandoned GKR precincts such that the relocated group will be at least 100 feet (approximately 30m) from the nearest suspected active precinct.
        b. Receiver sites will have been historically farmed and reverted to grassland.
        c. Receiver sites will be devoid of existing sign of GKR but will be demonstrated to have suitable substrate, landscape position (not susceptible to flooding), and vegetation to support GKR.
        d. If there are no candidate release locations on the VFCL within one mile of the capture location, unoccupied high quality habitat in former agricultural land within SCRCL will be utilized first, then lands within VRCL will be used as relocation sites.

e. Subject to approval by CDFW and USFWS, captured GKR may be used to further recovery efforts for this species at locations in the greater Panoche-Ciervo Core GKR area (USFWS 1998, Loew 2005). If individual GKR are relocated outside of PVS Conservation Lands, monitoring of relocation success would be the responsibility of the wildlife agencies.

II. GKR Detection and Removal

The following methods are intended to result in as close to 100% depletion rates as possible, with the goal of avoiding mortality of GKR.

A. The Designated Biologist, Biological Monitor under the direction of the Designated Biologist, or a supervised trapping crew will conduct six consecutive nights of trapping with live traps (e.g. Sherman live traps or similar live traps) to capture GKR at precincts/burrows identified during preconstruction surveys using 20% more traps then the number of identified precincts in the enclosed trapping area.

B. Data to be collected on all GKR captured will include: (1) the locations (Global Positioning System [GPS] coordinates and maps) and the time of capture and/or observation, as well as release; (2) sex; (3) approximate age (adult/juvenile); (4) weight; (5) general condition and health, noting all visible conditions including gait and behavior, diarrhea, emaciation, salivation, hair loss, ectoparasites, and injuries; and (6) ambient temperature when handled and released. Any non-listed small mammals that are captured will be documented and released outside of the Project Footprint boundary.

C. If a lactating female GKR is captured (potentially December – April), the following procedure will be followed: No precincts containing a pregnant or lactating female will be excavated. A 250 foot buffer between precincts containing lactating females and/or dependent young and all ground- or vegetation-disturbing activities will be observed until lactating has ceased.

    1. The precinct may be monitored by a remote camera to observe activity.
    2. Because the occupied precinct would be enclosed with fencing that would potentially inhibit or preclude foraging, a sufficient amount of seed to sustain a nursing female must be placed at the precinct opening.
    3. If the Designated Biologist can determine with certainty which precinct the lactating female is occupying, adjacent precincts may be excavated only if impacts to the precinct(s) occupied by the lactating female(s) are avoided.

D. In addition, from January 1 through August 31 to reduce the amount of time a lactating/nursing female may be in a trap, all traps set from January 1 through August 31 for the capture and relocation of GKR must be set no more than 1 hour prior to sunset and closed no more than 1 hour after sunrise. All traps set during this period when females may be lactating/nursing must also be checked for occupancy every 2 hours between sunset and sunrise and any captured lactating/nursing GKR released immediately at their trap location.

E. If the National Weather Service predicts a 40% or greater chance of rain, all traps for GKR will be closed.
F. If temperatures exceed 105 degrees Fahrenheit, all traps will be closed.
G. If the air temperature is predicted to drop below 50 degrees Fahrenheit, synthetic batting or other appropriate insulating material must be placed in each trap. The material will be changed (replaced) each time a capture is made in a given trap.
H. Project minimization and avoidance measures will be implemented during all GKR trapping and relocation activities.
I. Where temporary, low-impact activities would occur and GKR burrow systems can be left in place while ensuring the activities would not directly take GKR, any haystacks, seed caches, or other food stockpiled by GKR on the ground surface shall be left undisturbed in the greatest extent practicable. If avoidance of the food caches is not possible, the Designated Biologist shall implement measures to keep the food caches intact, including temporary relocation of the food (only in the daytime; seeds must be returned to the original location at night), cover the seeds with plywood to allow temporary vehicle or foot-traffic access, or implement other measures developed in consultation with CDFW.
J. Captured GKR will be released into pre-identified release locations (receiver sites) identified in Section I.H.3 above, following the procedure in Section IV, below. If new evidence of GKR (individuals/burrows) is found in an active construction area, construction will be halted within a 100-foot avoidance area or greater if deemed necessary. Procedures A through H (above) will then be implemented.

III. Burrow excavation

Upon completion of six consecutive nights of live trapping, the following will be implemented:

A. Small mammal burrows suitable for GKR that are present within the trapping grid will be excavated using hand tools, if possible. If soil conditions or burrow depths make manual excavation impractical or unsafe, hand-held power tools may be used to assist in direct excavation of burrows. At no time will the hand-held power tool be used without a protective barrier (such as PVC tube, or similar) to prevent injury/mortality to small mammals that may attempt to escape burrows during excavation procedures. With the Designated Biologist and/or Biological Monitor present, additional mechanized equipment (e.g., backhoe) may be used to expand, slope, and/or terrace excavations for safety; however, this type of equipment will not be used for direct burrow excavation.
B. If any GKR are detected during burrow excavation, they will be captured (either through additional trapping or by hand), and release procedures (see below in Section IV) shall be followed.
C. No GKR burrow excavation will occur within any BNLL buffer avoidance area.

D. The Designated Biologist will document all GKR rat burrows/precincts abandoned or destroyed (through excavation) and provide a written report to the County of San Benito, prior to final County inspection that allows operation of each project phase.

IV. GKR Release

A. Subject to the direction of a Designated Biologist or Biological Monitor, captured GKR will be released into the designated release location (receiver site).

B. Receiver sites with both high quality habitat and the presence of abandoned precincts (refugia) in the vicinity will be given higher priority than sites with no abandoned burrows (Tennant et.al. 2013). GKR will not be relocated to burrows that are occupied by other kangaroo rat species.

C. The high quality habitat for the relocation sites will typically lack dense, non-native grass cover, or will be managed to reduce dense, non-native grass cover that occurs during years when herbaceous growth is high.

D. If necessary due to weather, time, or site preparation at receiver sites, captured GKR will be held in captivity by a properly permitted small mammal trapping specialist. Captive GKR would be subject to holding for no more than 30 days.

E. GKR in captivity would be held in separate plastic, glass, or other rigid non-toxic container measuring at least five gallons in size in an on-site climate controlled room (between 60°F and 85°F). Individual GKR will be provided with non-tinted, unbleached paper towels and enough suitable substrate (soil, sand, or similar) to cover the bottom of the container. Each GKR will be provided with approximately one cup of bird seed mix (e.g., mixture of approximately 75% proso white millet and 25% oats groats) initially that will be maintained until release.

F. Individuals will be released into artificial burrows constructed within the designated receiver site location using the map created under Section I.B as a base map and actual arrangement of individuals captured during trapping. Spatial arrangement of released individuals will account for territoriality, appropriate neighbor spacing, and arrangement.

G. No GKR will be relocated within 50 feet of small mammal burrows that may be occupied by BNLL in BNLL buffer avoidance areas in the VFCL. GKR relocation in the VRCL and SCRCL will be located at least 50 feet from small mammal burrows that may be occupied by BNLL at all relocation sites, unless protocol BNLL surveys have been conducted with no detections of BNLL.

H. Artificial burrows will consist of an approximately three inch diameter burrow constructed with a soil auger. The augured hole will be at least three feet in length and extend at least two feet in depth.

I. Each artificial burrow relocation site in which a GKR is released will be provisioned with four cups of seed (e.g., mixture of approximately 75% proso white millet and 25% oats groats) upon release. The approximate precinct of each individual will be provisioned with four cups of seed once per week continuing until green-up of

vegetation or until provisioning is deemed to be unnecessary by the Designated Biologist.

J. Haystacks, seed caches, and seed stores found with live-trapped GKR or in excavated burrows will be relocated with the associated GKR, within the release cages and/or artificial burrows.

K. Each receiver site will be protected using covers (Figure 8) anchored to the ground. This predator exclusion fencing will be maintained for 30 days after the relocation in order to enable the animals to acclimate to their new location. Anchoring will be adequate to hold covers in place, depending on conditions (wind, cattle, etc.).

L. With the artificial burrows, unless evidence indicates that temporary covers anchored to the ground are not providing adequate protection, covers will be set on the ground surface (not buried). Dimensions will be at least 6 feet x 6 feet and will cover release burrows at a sufficient height to allow free movement of individuals within the shelter. Covers will be constructed of ½-inch by ½-inch mesh metal hardware cloth, or similar. The frame will be constructed of wood stakes, metal posts, or a combination. Seams will be held in place by plastic ties or similar. By installing at the surface of the ground, GKR will be allowed and expected to dig out of the shelters.

M. Candidate receiver sites will preferentially be selected on Panoche Valley Solar Conservation Lands within the Panoche Valley Floor and immediately adjacent lands.

N. Receiver sites will be pre-selected on loam or sandy loam soils, preferentially on slopes of less than 10% but in no case greater than 20%, on in locations that would not be susceptible to flooding.

O. Receiver sites will be selected that have evidence of historic farming, but which have reverted to annual grassland provided that the sites meet all other criteria.

P. Receiver sites for each GKR group capture will be selected at the nearest location within Conservation Lands that meets the previous three criteria and the following conditions:

1. GKR should be located far enough away that individual GKR will be discouraged from moving back to the capture location;
2. release sites should be located close enough such that environmental conditions (e.g., soils, aspect, rainfall, etc.) are not substantially different from the capture location (e.g., GKR captured on the eastern extreme of the Project Footprint should not be moved to Conservation Lands west of the Project Footprint);
3. GKR could be released into other locations on the Conservation Lands upon approval of USFWS and CDFW, up to 5 miles away if it can be determined that smaller subpopulations would not be compromised by introducing additional genetic diversity.

V. Long Term Monitoring

A. Released individuals will be permanently marked with passive integrated transponder (PIT) tags to document survivorship. A Designated Biologist will monitor release

locations and sufficient occupied control areas by conducting trapping approximately 30 to 60 days following release and an annual trapping program for five years after the release date. A minimum of 3 trapping sessions shall occur at each location in April and August in each of the first five years. The trapping program will include Control sites that are trapped in the same manner within the Panoche Valley.

B. Performance monitoring will measure abundance, apparent survival, reproduction by translocated individuals, and recruitment. Abundance and extent of GKR surface sign shall also be measured. Additional details of the monitoring/trapping program are part of the Habitat Mitigation and Monitoring Plan.

C. Data to be collected on all GKR recaptured will include: (1) the locations (GPS coordinates and maps) and the time of capture and/or observation, as well as release; (2) sex; (3) approximate age (adult/juvenile); (4) weight; (5) general condition and health, noting all visible conditions including gait and behavior, diarrhea, emaciation, salivation, hair loss, ectoparasites, and injuries; and (6) ambient temperature when handled and released.

D. The monitoring of apparent survival, abundance, reproduction by translocated individuals, and recruitment of the translocated individuals will be assessed for inclusion in annual reports. Abundance and extent of GKR surface sign associated with the receiver sites will also be measured. The results of the annual monitoring will be reported in a standalone report submitted to CDFW and USFWS as part of the performance monitoring.

E. The details of the monitoring program is part of the Habitat Mitigation and Monitoring Plan as stated in Section V.A.

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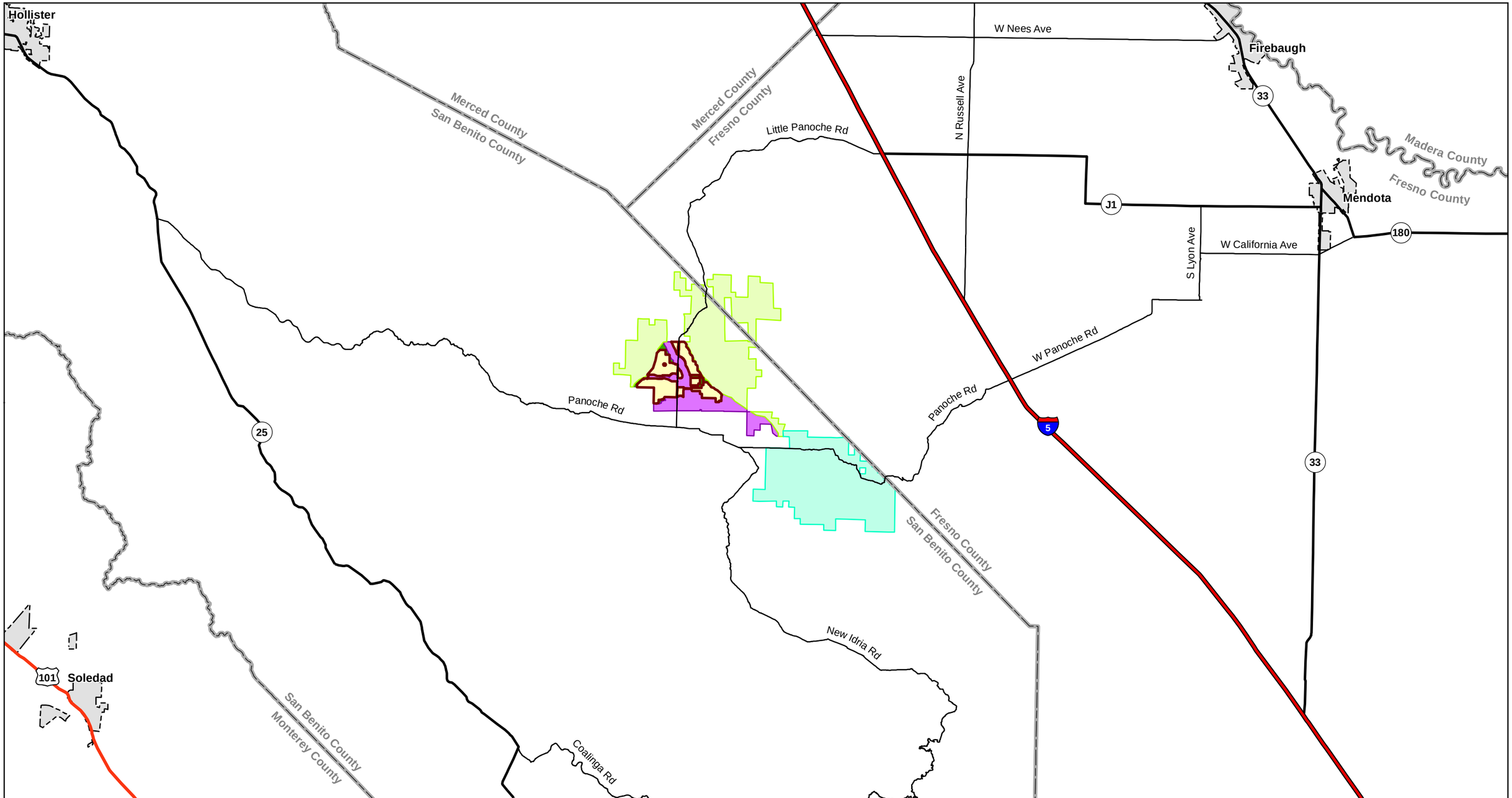
# FIGURES

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**Legend**

- Project Footprint
- On-site Conservation Lands
- Silver Creek Ranch Conservation Lands
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands
- City

# Panoche Valley Solar Project

## Project Location

Project Location: San Benito County, California

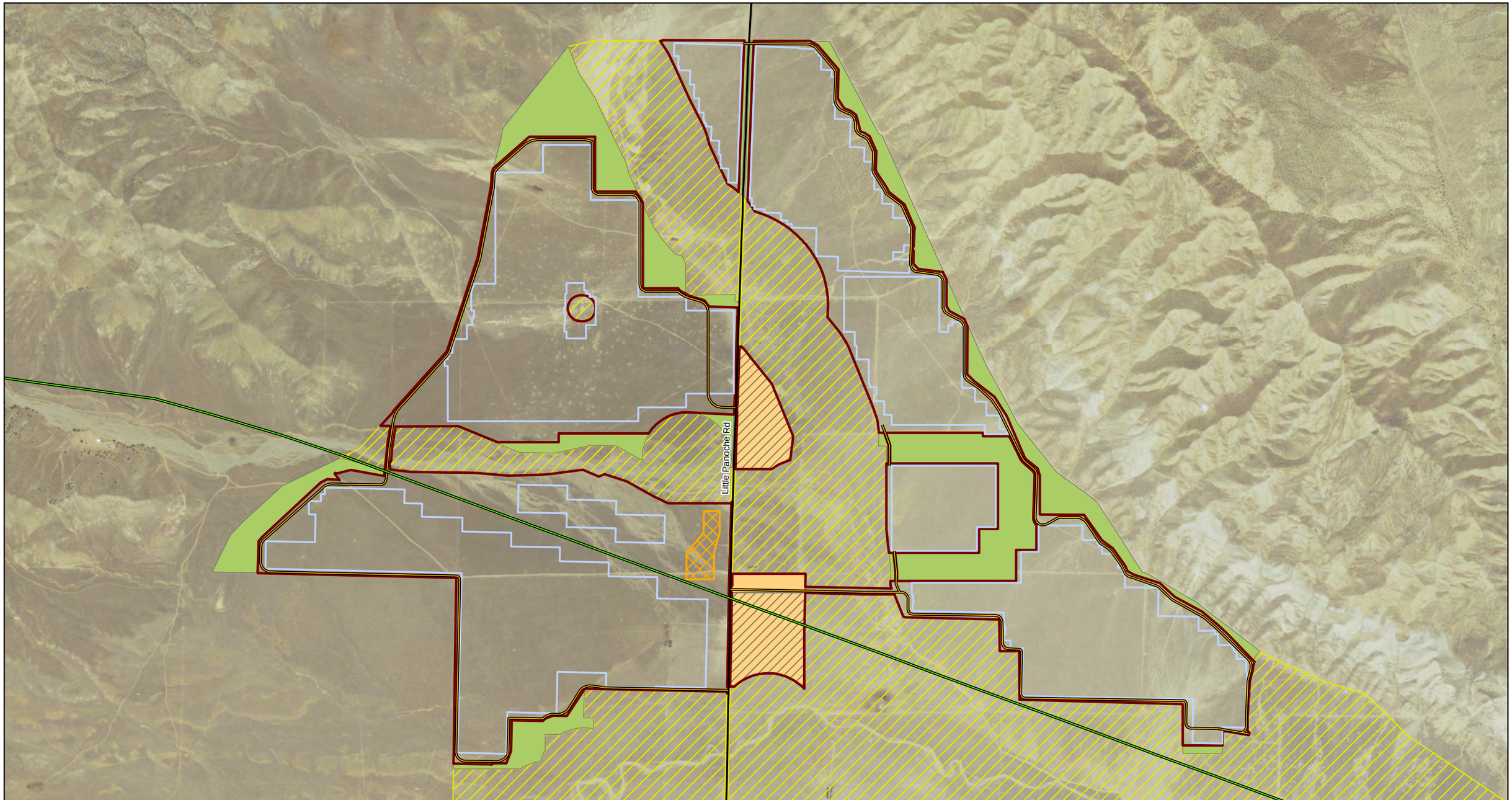
N

0 2 4 Miles

**FIGURE 1**

Prepared by: J. Hobbs

Date: 2015-12-01

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**Legend**

- Project Footprint
- On-site Conservation Lands
- Valley Floor Conservation Lands
- Proposed Panel Block
- Existing Transmission Line
- Perimeter Road
- Substation, Switchyard, O&M Building
- Temporary Laydown Yard
- Temporary Laydown Yard *(converted to on-site conservation land after construction)*

# Panoche Valley Solar Project

## Proposed Layout

Project Location: San Benito County, California

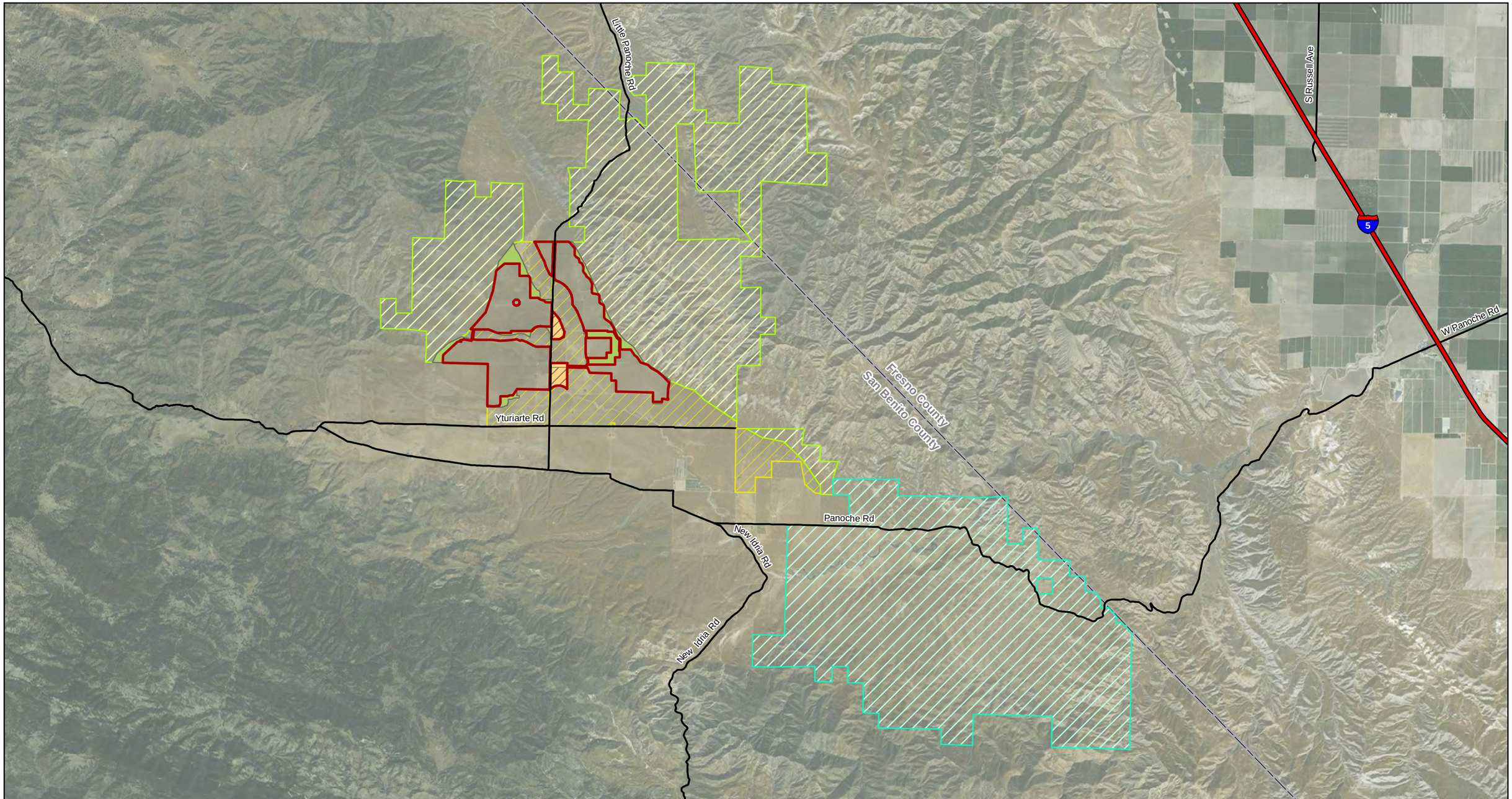
N

0 900 1,800 Feet

**FIGURE 2**

Prepared by: J. Hobbs

Date: 2015-12-01

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**Legend**

- Project Footprint
- On-site Conservation Lands
- Temporary Laydown Yard
- Temporary Laydown Yard *(To be converted to on-site conservation lands after construction)*
- Silver Creek Ranch Conservation Lands
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands

# Panoche Valley Solar Project

## Project Footprint and Conservation Lands

Project Location: San Benito County, California

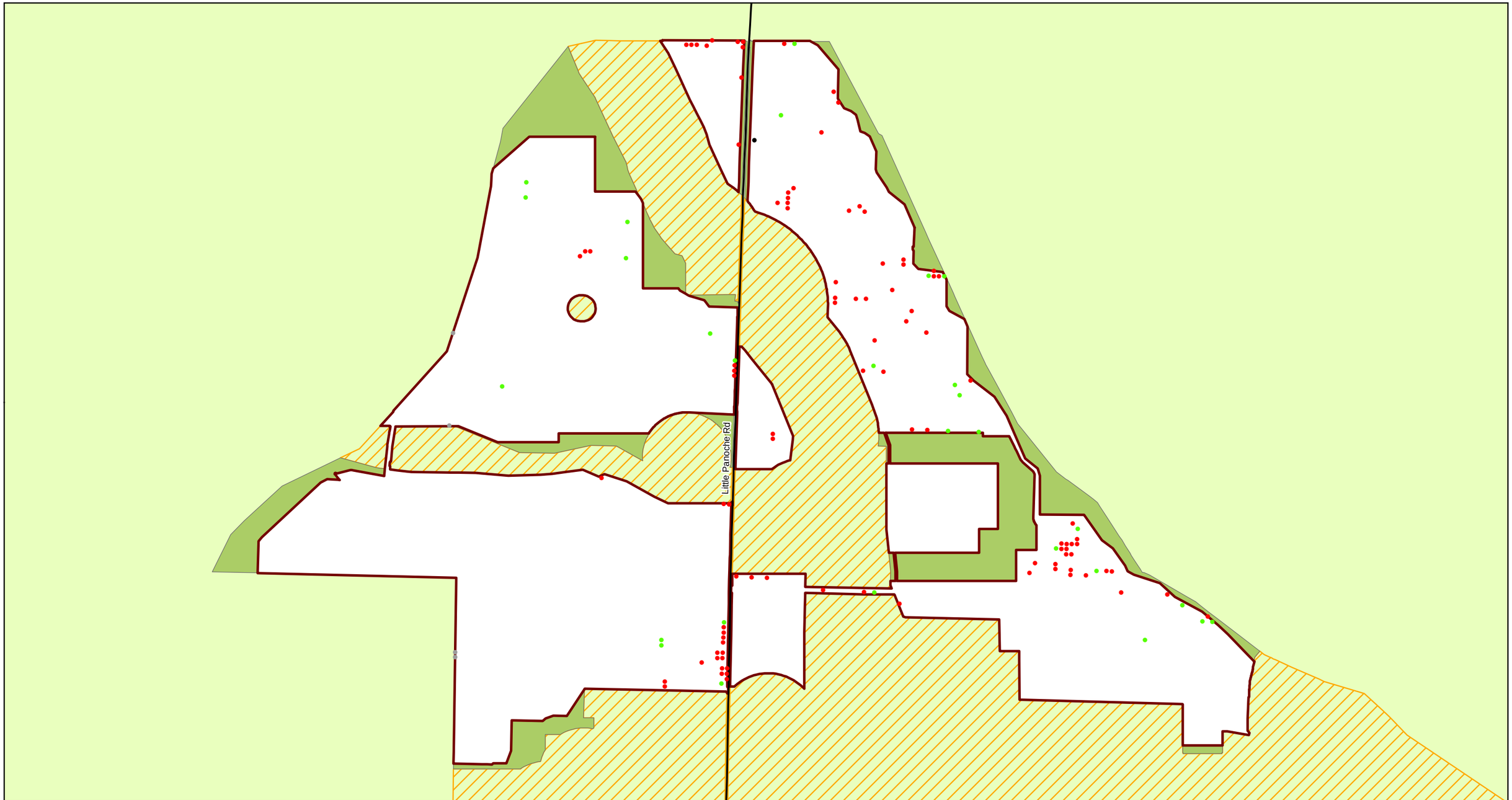
N

0 0.5 1 1.5 Miles

**FIGURE 3**

Prepared by: J. Hobbs

Date: 2015-12-01

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**Legend**

- Project Footprint
- On-site Conservation Lands
- Valley Floor Conservation Lands
- GKR Evidence, Active
- GKR Evidence, Inactive
- Relict GKR Sign Present
- No Data

# Panoche Valley Solar Project

## 2013 Giant Kangaroo Rat Observations

Project Footprint

Project Location: San Benito County, California

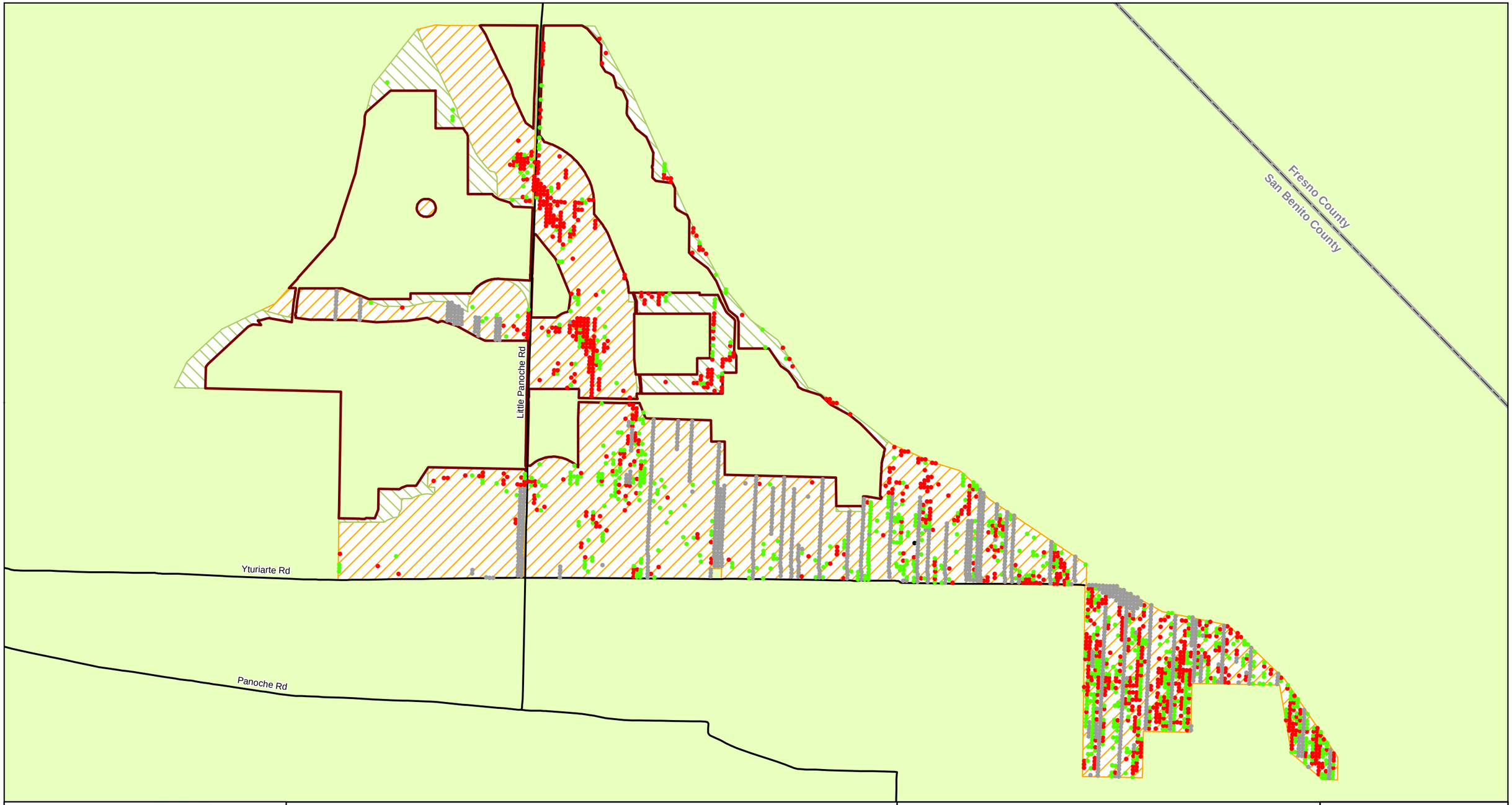
N

0 900 1,800 Feet

**FIGURE 4**

Prepared by: J. Hobbs

Date: 2015-12-01

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**Legend**

- Project Footprint
- Valley Floor Conservation Lands
- Valley Floor Conservation Lands
- GKR Evidence, Active
- GKR Evidence, Inactive
- Relict GKR Sign Present
- No Data

# Panoche Valley Solar Project

## 2013 Giant Kangaroo Rat Observations

On-site Conservation Lands and Valley Floor Conservation Lands

Project Location: San Benito County, California

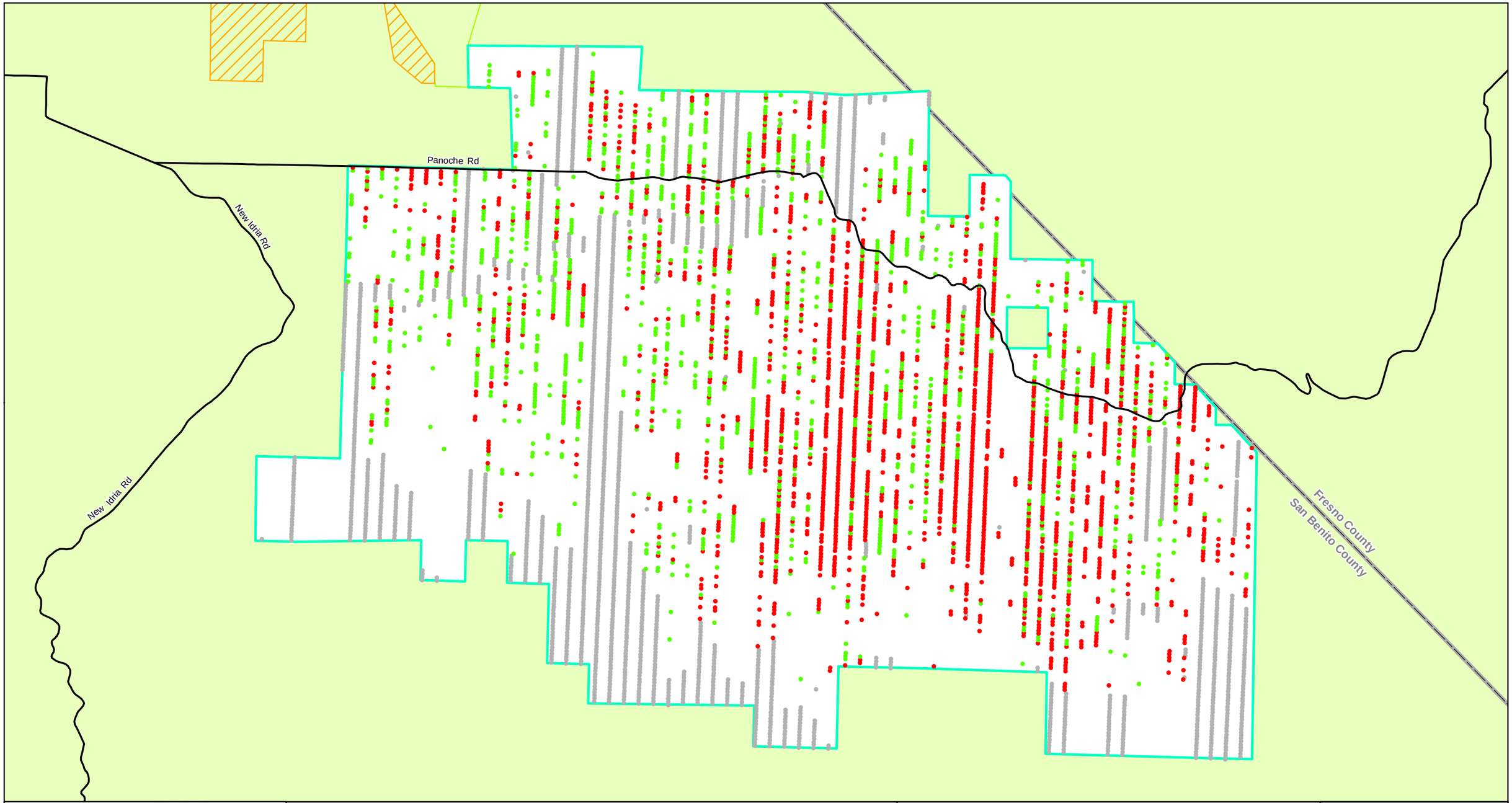
N

0 0.25 0.5 Mile

**FIGURE 5**

Prepared by: J. Hobbs

Date: 2015-12-01

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**Legend**

- Silver Creek Ranch Conservation Lands
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands
- GKR Evidence, Active
- GKR Evidence, Inactive
- No Data

# Panoche Valley Solar Project

## 2013 Giant Kangaroo Rat Observations

Silver Creek Ranch Conservation Lands

Project Location: San Benito County, California

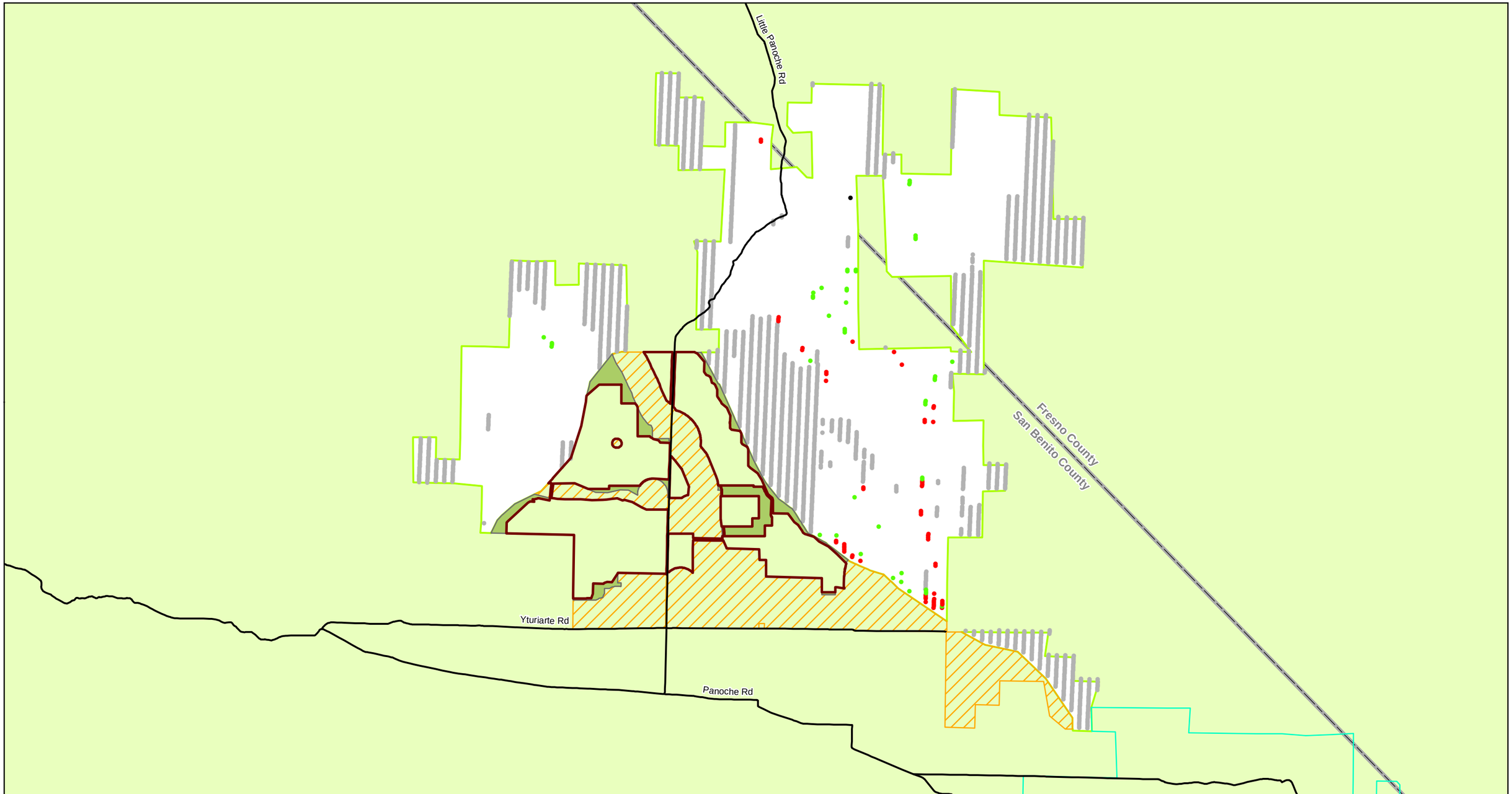
N

0 1,500 3,000 Feet

**FIGURE 6**

Prepared by: J. Hobbs

Date: 2015-12-01

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**Legend**

- Project Footprint
- On-site Conservation Lands
- Silver Creek Ranch Conservation Lands
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands
- GKR Evidence, Active
- GKR Evidence, Inactive
- Relict GKR Sign Present
- No Data

# Panoche Valley Solar Project

## 2013 Giant Kangaroo Rat Observations

Valadeao Ranch Conservation Lands

Project Location: San Benito County, California

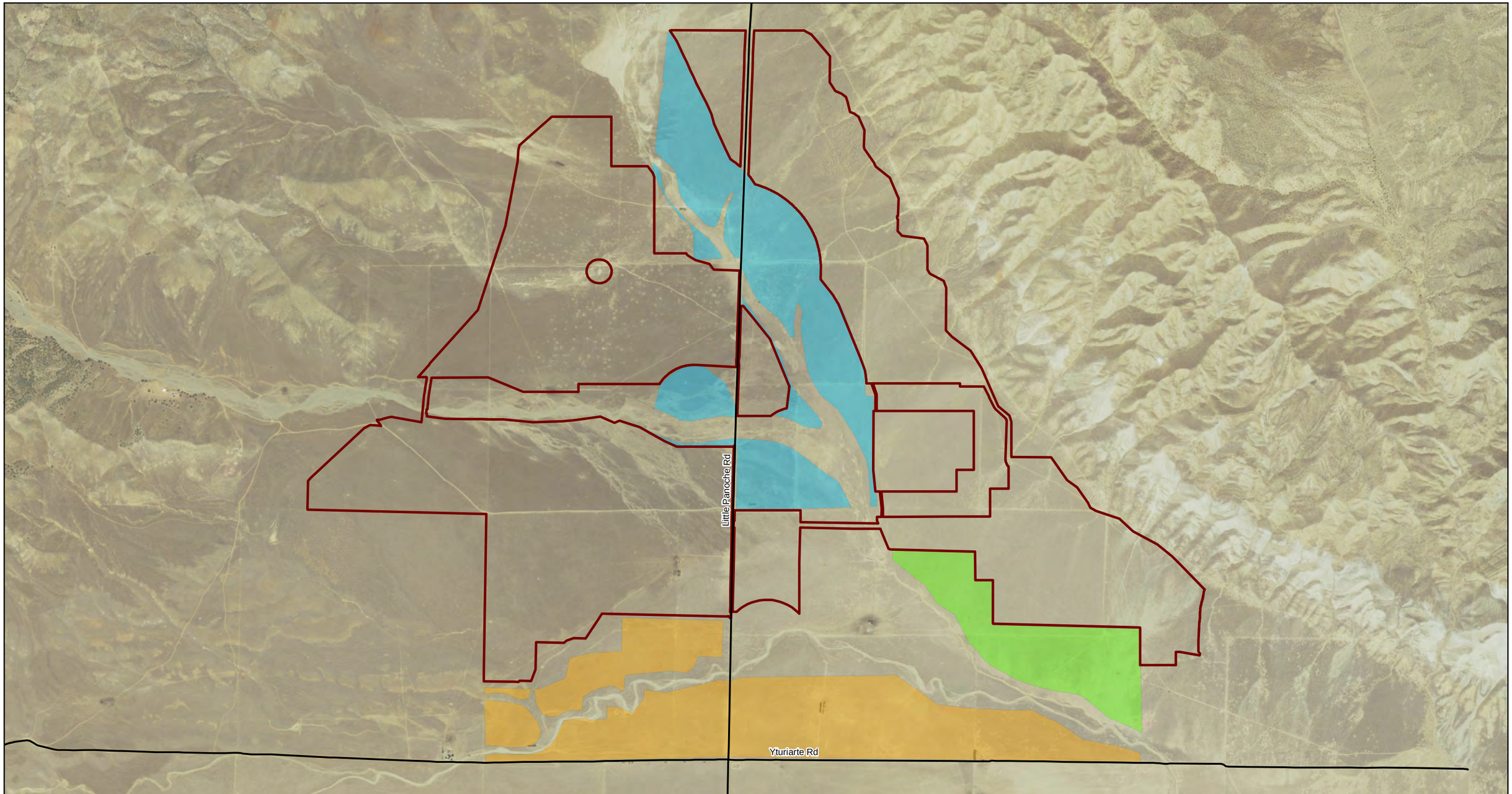
N

0 0.5 1 Mile

**FIGURE 7**

Prepared by: J. Hobbs

Date: 2015-12-01

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**Legend**

- Project Footprint
- GKR Relocation Area 1
- GKR Relocation Area 2
- GKR Relocation Area 3

# Panoche Valley Solar Project

## Proposed Footprint and GKR Relocation/Translocation Sites

Project Location: San Benito County, California

N

0 1,000 2,000 Feet

**FIGURE 8**

Prepared by: J. Hobbs

Date: 2015-12-01

**Figure 9: GKR Relocation Cover Photos**

# GROUNDWATER MONITORING AND REPORTING PLAN
# PANOCHE VALLEY SOLAR PROJECT
# PAICINES, SAN BENITO COUNTY, CALIFORNIA
# KLEINFELDER PROJECT NO. 20154702.001A

**MARCH 24, 2015**

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**GROUNDWATER MONITORING AND REPORTING PLAN**
**PANOCHE VALLEY SOLAR PROJECT**
**PAICINES, SAN BENITO COUNTY, CALIFORNIA 95043**

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A Hydrographs 2004 - 2014




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**GROUNWATER MONITORING AND REPORTING PLAN**
**PANOCHE VALLEY SOLAR PROJECT**
**PAICINES, SAN BENITO, CALIFORNIA 95043**

# 1 INTRODUCTION

On behalf of AMEC Kamtech, Inc., a division of Amec Foster Wheeler (AMEC / Client), and at the request of the County of San Benito, California, Kleinfelder, Inc. (Kleinfelder) has prepared this *Draft Groundwater Monitoring and Reporting Plan* (Plan) for the Panoche Valley Solar Project (Site), located in the unincorporated community of Paicines, California (see Figure 1). The Site consists primarily of vacant land located in the Panoche Valley drainage basin, within the County of San Benito (see Figures 1 and 2). Kleinfelder understands that this work is being performed to satisfy permit requirements for the development of a solar photovoltaic power generation facility on the Site.

This Plan provides proposed procedures and methods for groundwater monitoring and reporting that will be used to establish pre- and post-construction groundwater conditions and conditions during construction for the Site. The Plan is subject to change depending on the results of a proposed aquifer pumping test and or observed groundwater data. This Plan was prepared in accordance with Kleinfelder's authorized scope of services described in its *Proposal for Groundwater Monitoring and Reporting, Panoche Valley Solar Project, Paicines, San Benito County, CA, d*ated January 14, 2015.


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# 2 SITE BACKGROUND INFORMATION

## 2.1 SITE LOCATION AND DESCRIPTION

The Site is located within the northwest trending Panoche Valley drainage basin in the unincorporated community of Paicines, San Benito County, California (See Figures 1 and 2). The Valley is bounded to the northwest by the easternmost Diablo Range and to the northeast and southeast by Upper Cretaceous marine sedimentary rocks of the Great Valley sequence (Geologica, 2010). The Site is primarily comprised of vacant land that is being developed with a photovoltaic solar power generation facility. Based on client-provided information, approximately 26,677 acres of land have been purchased by Panoche Valley Solar of which approximately 2,492 acres will encompass the power generation facility.

A more comprehensive description of Site hydrogeology and geology is included in a 2010 hydrogeologic study (Geologica, 2010). The most recent groundwater data for the Site is included in a 2014 Technical Memorandum (Geologica, 2014). Based on review of the provided groundwater information, depth to groundwater is expected to range between 40 to 75 feet bgs and flow generally to the southeast. Available historical groundwater levels for 43 wells from 2004 through 2014 have been plotted and are included in Appendix A. These data indicate that groundwater levels have not consistently decreased or increased in basin wells, but exhibit either trend (or no trend) at different wells.

## 2.2 PREVIOUS SITE ASSESSMENTS

A Site hydrogeologic study was performed to evaluate the geologic and hydrogeological setting of the Site, its underlying aquifers, historical and existing groundwater levels, and the viability of existing groundwater wells within the project area (Geologica, 2010). The study described the Panoche Valley drainage basin as filled with coarse-grained sediments and interlayered fine-grained sediments deposited in streams and on terraces draining the rising Diablo Range mountains to the west. As a result deposits within the basin can be laterally discontinuous and variable. This study identified approximately 46 groundwater wells within the valley, for which a review of available data suggested that most of the wells produced water from one or more gravelly zones within 80 to 400 feet of valley fill and that these zones could vary between wells that were less than 100 feet apart (Geologica, 2010). A review of the available well location and


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construction data was used to create the groundwater well information table included in this Plan (see Table 1).

Since the 1970s through the early 2000s, water levels within the project area historically rose from approximately 100 feet below ground surface (bgs) to approximately 30 to 60 feet bgs due to a decrease in pumping for local agricultural irrigation since the early 1970s (Geologica, 2010). Development of the proposed solar power facility, which estimated a groundwater extraction rate of 25.5 acre-feet per year (AFY) during construction and 3.74 AFY during operation, is not expected to significantly impact the estimated annual groundwater recharge rate of 2,700 AFY in the valley (Geologica, 2010).

An assessment of potential hydrogeologic issues associated with the proposed groundwater extraction needs for the proposed Panoche Valley Solar Project evaluated the impact of water demands for the project during construction and operation and potential impacts to the aquifer and provided recommendations for additional investigation of the aquifer (Geologica, 2014). A maximum extraction rate of approximately 800,000 gallons per day (gpd) is projected to occur during the anticipated 18-month construction phase of the project (Geologica, 2014).

Based on a review of water level measurements collected on May 16, 2014, and Department of Water Resources (DWR) water level measurements available for a number of wells in the Panoche Valley, groundwater elevations in the Valley have decreased since the 2010 hydrogeologic study, presumably due to the drought conditions experienced in California over the last few years (Geologica, 2014). Based on numerical modeling, it was estimated that a maximum drawdown of 3 feet bgs near the edge of the southern project boundary would occur, with 1 to 2 feet of drawdown off-Site and 0.5 foot of drawdown or less close to the model boundaries (Geologica, 2014). Drawdown effects are expected to be transient and are expected to dissipate following the end of construction, in approximately the same amount of time as the construction phase. As a result, construction and long-term operation water use is not likely to significantly impair the existing water supply in the valley Geologica, 2014).


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# 3 PROPOSED SCOPE OF WORK

This Plan has been prepared, at the request of the County of San Benito, to meet the following objectives:

- Document the location of project-related wells and well construction details (diameter, total depth, screen interval, and available construction details).
- Install a water meter, equipped with a flow totalizer, on each extraction well used for project purposes and monitor flow on a daily basis to document extraction volumes. Currently, wells #4 and #20 (Figure 2) are proposed to be used for project pumping.
- Document gradient and directional flow of groundwater in the project area
- Provide a detailed methodology for monitoring groundwater levels in the valley, based on readings collected on at least a monthly basis.
- Establish groundwater level trends that can be quantitatively compared against observed and calculated trends near the project groundwater extraction wells and near existing private wells that could be potentially impacted by the project groundwater extraction activities
- Monitor a minimum of three new or existing on- or off-Site down-gradient wells, near the southern end of the project boundary. Existing wells that have active pumping will be used for monitoring only if extraction records are provided, so drawdown from extraction can be distinguished from project effects.
- Submit monthly reports summarizing groundwater extraction volumes and water level monitoring data collected on a minimum monthly basis. The report shall include, at a minimum,
    - Daily water usage, monthly range of usage, and a 30-day (monthly) average water usage, reported in gpd;
    - Total water used on a monthly and annual basis in acre-feet, including a summary of all water level data; and
    - Trend analysis, to identify projected groundwater level drawdown in potentially impacted off-site wells.
- In the event that monthly trend analysis indicates a water level decline of 5 feet or more from the baseline water level trend at nearby private wells (and accounting for extraction from actively used private wells and data from other nearby monitoring wells, if


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available), project use of the extraction well(s) shall be discontinued or extraction rates shall be reduced to allow for water levels to recover.

To meet the goals of the monitoring and reporting program, we propose the following scope:

- Systematically select the groundwater wells to be included in the groundwater monitoring and reporting program, based on their proximity to the extraction wells and/or identified "sensitive receptors," basin boundaries, and areas of interest. Wells 0, 3, 4, 5, 10, 12, 16, 17, 19, 20, 22, 24, 42, 43, 44, and 45 have initially been selected for the groundwater monitoring and reporting program (Figure 2). Accessible wells will be evaluated and measured for depth and screen interval, if possible, prior to finalizing the monitoring well list.
- Although location and elevation data appear to be available, if any inaccuracies become apparent during project preparation, optionally contract a surveyor to survey the location and top-of-casing reference point for each of the selected groundwater monitoring wells.
- Commence groundwater monitoring program two weeks prior to the start of construction activities.
- Install water meters for rate and flow totalizer on project extraction wells.
- Measure groundwater levels in the selected wells with a manual water level meter as follows (to be modified, if necessary, based on actual measurements):
    - Once a week for two weeks prior to commencing groundwater extraction;
    - Once a day through the end of the first two weeks of groundwater extraction;
    - Once a week for the following 4 weeks; and
    - Once a month for the remainder of the program.
- Optionally, install electronic pressure sensor transducers to monitor water levels in the selected wells. This will permit more frequent monitoring, especially during project startup, with data downloaded according to the above schedule.
- Once a day, record the extraction well(s) flow meter and totalizer readings.
- Adjust the data collection frequency and observation and extraction wells, if necessary, based on planned future aquifer test results.
- Tabulate collected water data, perform trend analysis, plot groundwater elevations and contour the potentiometric surface on a Site map to establish groundwater gradient, and create a monthly groundwater report for submittal to the County of San Benito.
    - Contouring frequency will be monthly for the first three months, including pre-pumping conditions, then at a less frequent interval based on basin conditions.


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Construction water storage ponds are proposed adjacent to wells #4 / #19 and #44. Although the ponds are expected to be lined, groundwater elevations in these wells will also be evaluated for potential leakage.

## 3.1 PRE-FIELD ACTIVITIES

A Site-Specific Health and Safety Plan (HASP) will be prepared prior to implementing field activities to address the health and safety of Kleinfelder's workers and provide contingency plans for emergencies that may arise. The HASP will provide guidelines for personal protection equipment and safety procedures to be used by Kleinfelder's staff during field operations. Kleinfelder will review and comply with AMEC's project-specific Incident Prevention Plan.

## 3.2 GROUNDWATER MONITORING PROCEDURES

<u>Well Head Inspection and Cleanup</u>

1. Inspect well pad for damage and note condition in field log.
2. Depending on surface completion of the various wells to be monitored, the access point will be opened and the well inspected for damage and presence of debris or fluid. Note condition in field log.
3. Remove debris and fluids from well vault (or other access-point structures) if there is a risk of material entering the well during measurement.

<u>Manual Well Measurements and Flow Totalizer Readings</u>

1. Groundwater depth shall be recorded to the nearest 0.01 foot. Depths will be measured from a surveyed, permanent reference mark on the top of the well casing.
2. Using a manual water level meter (or optional transducer), measure depth to water and record the measurement.
3. Replace and lock well, if appropriate.
4. Record flow meter and totalizer readings directly from the meters.

## 3.3 REPORTING

Following completion of the monthly groundwater monitoring period, Kleinfelder will tabulate the collected groundwater data; create a groundwater contour map, using monthly average groundwater elevations to establish groundwater flow direction and gradient; evaluate draw-down using trend analysis graphs, and prepare a Monthly Groundwater Monitoring Report


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providing a summary of current and historical groundwater data collected from the start of the groundwater monitoring program. Contouring and trend analysis will be performed using all of the selected groundwater monitoring program wells, assuming that they are screened within the same aquifer. The report will also describe any changes or "data gaps" that occur during the reported monthly monitoring period. At a minimum, the report will contain the following:

- Monthly groundwater summary sheet(s)
- Monthly narrative summary
- Groundwater monitoring well construction details and location information
- Groundwater monitoring schedule
- Site plan(s) showing approximate groundwater well locations, and monthly average groundwater elevation contours, flow direction and gradient; contouring will be performed according to the schedule described above
- Monthly and historical groundwater elevation tables, including recorded flow meter and totalizer readings
- Trend graphs of extraction volumes and groundwater elevations
- Conclusions and recommendations for additional assessment activities if warranted based on the results of the monthly trend analyses and/or planned future aquifer test results.

Existing data for 43 basin wells for the period 2004 through 2014, as presented in Appendix A, will be incorporated into the trend analysis. This data set provides a robust long-term base against which to compare project pumping effects. The reports will be prepared under the supervision of a Professional Geologist and/or Civil Engineer licensed to practice in the State of California.


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# 4 SCHEDULE

We anticipate commencing monitoring two weeks prior to the construction activity start date. We estimate that the data collected two weeks prior to the construction activities will give us sufficient information to establish pre-construction baseline water level data. Groundwater monitoring frequency will decrease, as detailed in the table below, as sufficient groundwater elevation data is gathered and evaluated to establish reliable groundwater elevation trends throughout the pre-, during, and post-construction phases of the project. Planned future aquifer test results may also warrant additional changes to the planned monitoring frequency and/or the selected groundwater monitoring wells. The following preliminary schedule outlines the anticipated sequence, frequency, and duration of the groundwater monitoring program tasks:

| Task/Work Element | | Frequency | Duration |
|---|---|---|---|
| Notice to Proceed | | Once | N/A |
| Well Survey (optional) | | Once | 3 days |
| Installation of Transducers (optional) | | | TBD |
| Groundwater Monitoring Data Collection | Pre-construction | Weekly | 2 weeks |
| | Construction | Daily | 2 weeks |
| | Construction | Weekly | 1 month |
| | Construction | Monthly | TBD |
| Download Transducer Data (optional) | Construction | Daily<br>Weekly<br>Monthly | Weeks 1 - 2<br>Weeks 3 - 4<br>Months 2 - 18 |
| Record Flow Meter and Totalizer Readings | Construction | Daily | 18 months |
| Report Preparation | Construction | Once/Month | End of each month |

* A report will be submitted approximately one week following the end of each month and two weeks following the end of the months for which groundwater elevation contouring is performed.


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# 5 LIMITATIONS

The preparation of this Plan was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

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The work performed was based on project information provided by the Client. If the Client does not retain Kleinfelder to review any plans and specifications, including any revisions or modifications to the plans and specifications, Kleinfelder assumes no responsibility for the suitability of our recommendations. In addition, if there are any changes in the field to the plans and specifications, the Client must obtain written approval from Kleinfelder's engineer that such changes do not affect our recommendations. Failure to do so will vitiate Kleinfelder's recommendations

Regulations and professional standards applicable to Kleinfelder's services are continually evolving. Techniques are, by necessity, often new and relatively untried. Different professionals may reasonably adopt different approaches to similar problems. Therefore, no warranty or guarantee, expressed or implied, is included in Kleinfelder's scope of service.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. It should be recognized that definition and evaluation of geologic and environmental conditions comprise a difficult and inexact science. Judgments leading to


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conclusions and recommendations are generally made with incomplete knowledge of the subsurface conditions present due to the limitations of data from field studies. Although risk can never be eliminated, more-detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service that provide adequate information for their purposes at acceptable levels of risk. More extensive studies, including subsurface studies or field tests, should be performed to reduce uncertainties. The Client's acceptance of this Plan will indicate that the Client has reviewed the document and determined that it does not need or want a greater level of service than provided.


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# 6 REFERENCES

Geologica, 2010, Panoche Valley Hydrogeologic Study, SolarGen Panoche Valley Solar Farm, Panoche Valley, California, June 1.

Geologica, 2014, Technical Memorandum, Panoche Valley Solar Project, Groundwater Extraction Impact Evaluation, Panoche Valley, California. December 15.


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# FIGURES


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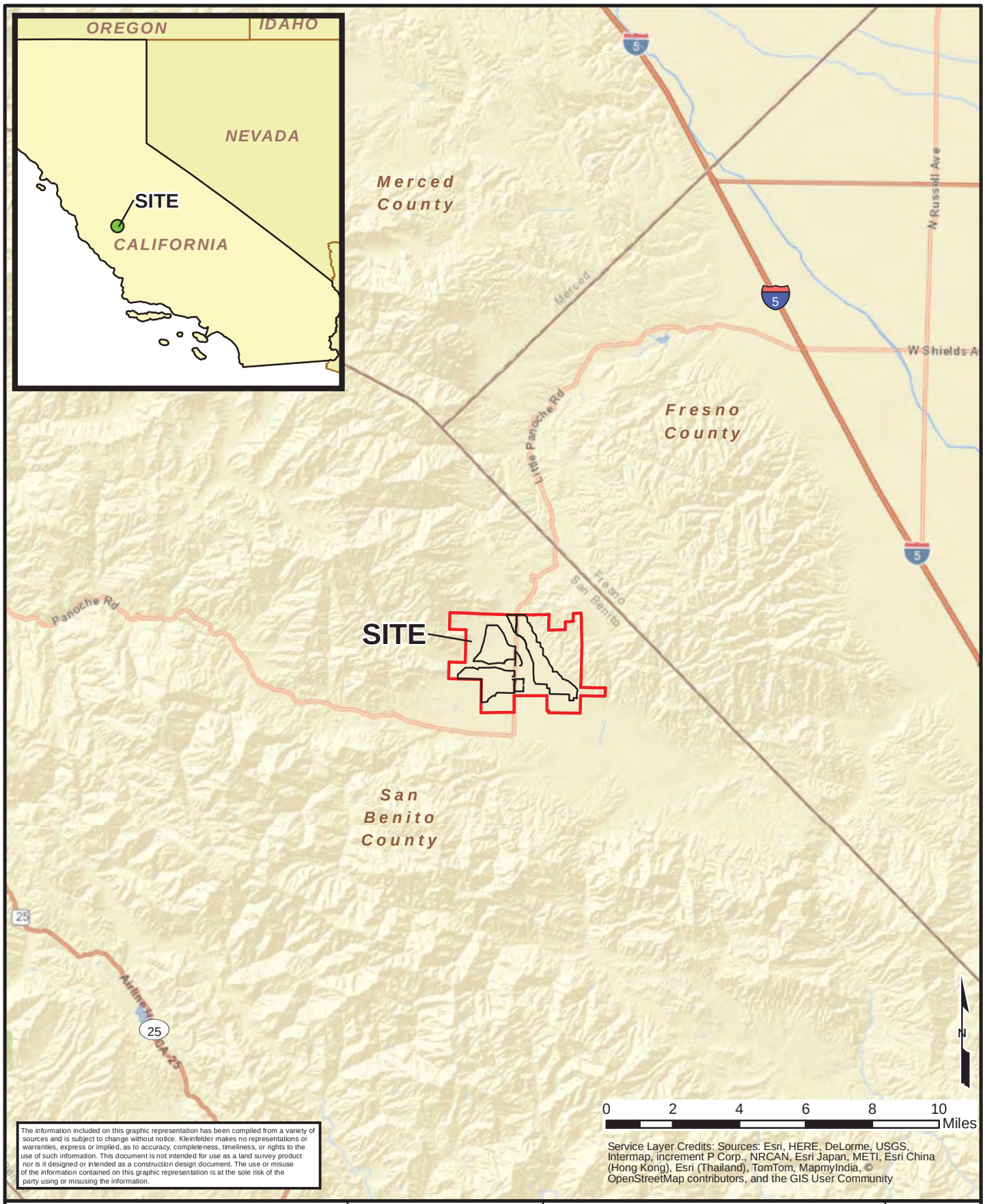


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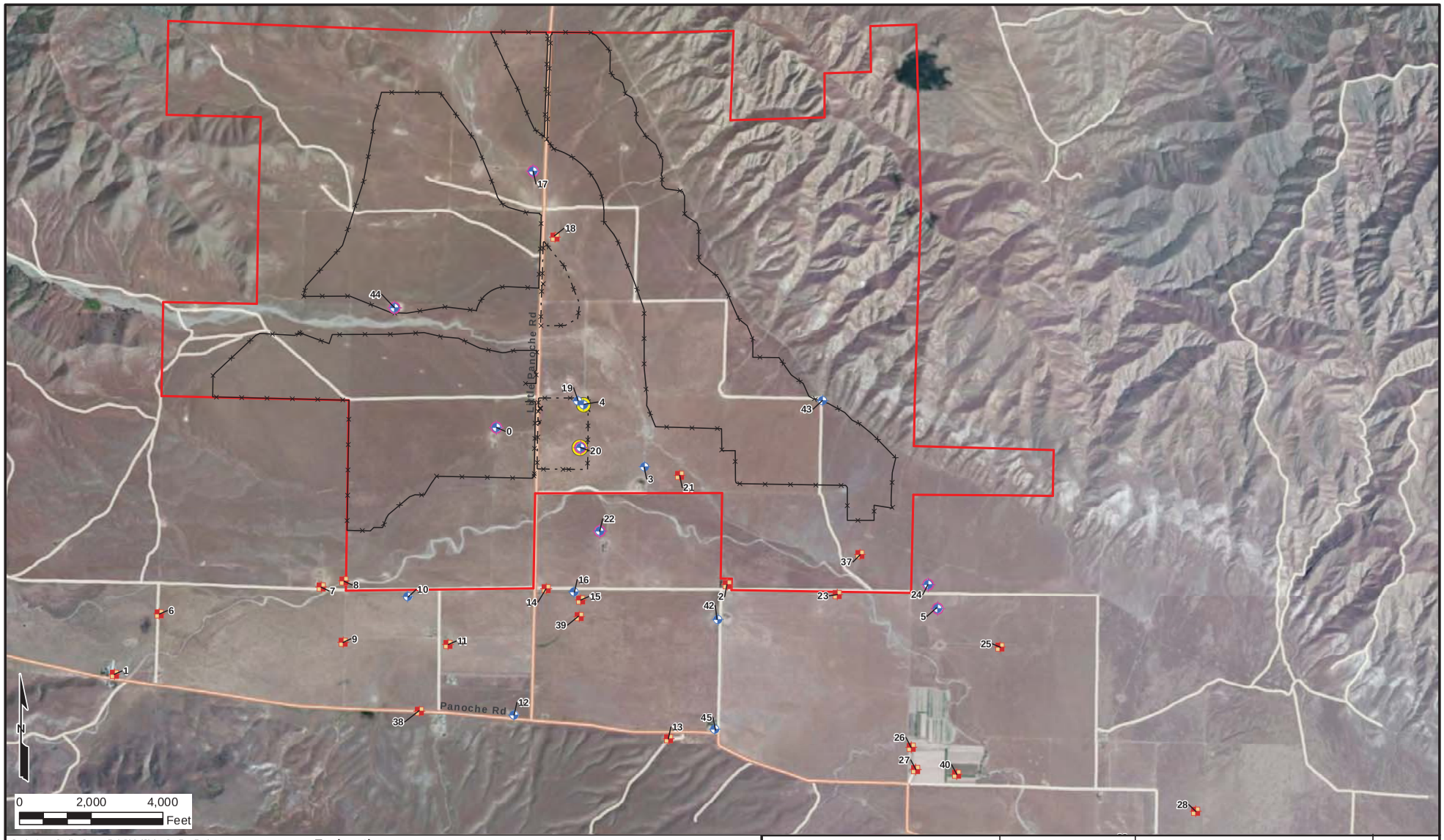
**Site Location Map**

GROUNDWATER MONITORING AND REPORTING PLAN
PANOCHE VALLEY SOLAR PROJECT
PAICINES, SAN BENITO COUNTY, CALIFORNIA 95053

FIGURE
1

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**Explanation**

- Groundwater Monitoring Program Well
- Known Operational Well
- Wells Proposed for Project Water Supply
- Well
- Property Boundary
- Perimeter Fence
- Temporary Fence

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**Site Plan with Well Locations**

GROUNDWATER MONITORING AND REPORTING PLAN
PANOCHE VALLEY SOLAR PROJECT
PAICINES, SAN BENITO COUNTY, CALIFORNIA 95053

FIGURE
2

# TABLES


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# Table 1
## Well Information
Panoche Valley Solar Project
Paicines, San Benito County, California

| Geologica Well Number | State DWR Well ID Number | Latitude | Longitude | Easting (feet) | Northing (feet) | Ground Surface Elevation (ft AMSL) | Total Well Depth (ft bgs) | Screen Interval (ft bgs) | Casing Diameter (inches) | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 15S10E16A001M | 36.629200000 | -120.880400000 | 6009941.77 | 2117572.99 | 1323 | n/a | 58-300 | n/a | Observation Well |
| 1 | 15S10E19H001M | 36.609700000 | -120.916300000 | 5999268.16 | 2110683.55 | 1420 | n/a | n/a | n/a | |
| 2 | 15S10E14N001M | 36.617500000 | -120.858200000 | 6016372.21 | 2113187.57 | 1275 | n/a | n/a | n/a | |
| 3 | 15S10E15G001M | 36.626400000 | -120.866300000 | 6014058.50 | 2116473.13 | 1282 | n/a | n/a | 12 | |
| 4 | 15S10E10P002M | 36.631900000 | -120.871000000 | 6012718.60 | 2118501.89 | 1300 | 422 | 182-422 | 14 | Extraction Well |
| 5 | 15S10E13N001M | 36.615977000 | -120.838097195 | 6022260.10 | 2112519.70 | 1300 | n/a | n/a | n/a | |
| 6 | 15S10E20D001M | 36.614400000 | -120.912100000 | 6000534.68 | 2112369.70 | 1395 | n/a | n/a | n/a | |
| 7 | 15S10E17R001M | 36.616700000 | -120.896800000 | 6005040.62 | 2113117.82 | 1358 | n/a | n/a | n/a | |
| 8 | 15S10E17R002M | 36.617200000 | -120.894600000 | 6005689.73 | 2113287.07 | 1352 | n/a | n/a | n/a | |
| 9 | 15S10E20H001M | 36.612500000 | -120.894600000 | 6005655.98 | 2111576.35 | 1350 | n/a | n/a | n/a | |
| 10 | 15S10E21C001M | 36.616100000 | -120.888500000 | 6007471.69 | 2112851.43 | 1338 | n/a | n/a | n/a | |
| 11 | 15S10E21G001M | 36.612500000 | -120.884600000 | 6008590.32 | 2111518.61 | 1340 | n/a | n/a | n/a | |
| 12 | 15S10E21.1001M | 36.607200000 | -120.878200000 | 6010430.56 | 2109552.70 | 1325 | n/a | n/a | n/a | |
| 13 | 15S10E22Q001M | 36.605600000 | -120.863500000 | 6014733.04 | 2108886.28 | 1273 | n/a | n/a | n/a | |
| 14 | 15S10E22D003M | 36.616900000 | -120.875400000 | 6011321.19 | 2113067.29 | 1300 | n/a | n/a | n/a | |
| 15 | 15S10E22D004M | 36.616100000 | -120.872100000 | 6012283.79 | 2112757.21 | 1300 | n/a | n/a | n/a | |
| 16 | 15S10E22D002M | 36.616700000 | -120.872700000 | 6012112.00 | 2112979.03 | 1300 | n/a | n/a | n/a | |
| 17 | 15S10E04R001M | 36.648900000 | -120.877400000 | 6010962.07 | 2124726.29 | 1330 | n/a | n/a | 24 | |
| 18 | 15S10E03N001M | 36.646400000 | -120.875700000 | 6011442.90 | 2123806.58 | 1320 | n/a | n/a | 12 | |
| 19 | 15S10E10P001M | 36.632200000 | -120.871600000 | 6012544.72 | 2118614.51 | 1300 | 168 | 90-168 | 12 | Observation Well |
| 20 | 15S10E15F001M | 36.627800000 | -120.872400000 | 6012278.80 | 2117017.55 | 1304 | 380 | 90-120/280-360 | 16 | Observation Well |
| 21 | 15S10E15G002M | 36.625800000 | -120.862900000 | 6015051.76 | 2116235.37 | 1282 | 262 | n/a | 16 | |
| 22 | 15S10E15L001M | 36.621400000 | -120.870400000 | 6012820.18 | 2114676.61 | 1293 | n/a | n/a | n/a | |
| 23 | 15S10E23B001M | 36.616900000 | -120.847700000 | 6019448.88 | 2112909.73 | 1246 | n/a | n/a | n/a | |
| 24 | 15S10E13N001M | 36.617800000 | -120.839100000 | 6021978.56 | 2113188.88 | n/a | n/a | n/a | n/a | |
| 25 | 15S10E24F001M | 36.613100000 | -120.832100000 | 6023999.84 | 2111438.87 | 1245 | n/a | n/a | n/a | |
| 26 | 15S10E24N002M | 36.605300000 | -120.840400000 | 6021509.92 | 2108646.35 | 1240 | n/a | n/a | n/a | |
| 27 | 15S10E24N003M | 36.603600000 | -120.839900000 | 6021644.80 | 2108024.76 | 1240 | n/a | n/a | n/a | |
| 28 | 15S11E30C001M | 36.600800000 | -120.813200000 | 6029461.23 | 2106856.55 | 1210 | n/a | n/a | n/a | |
| 29 | 15S11E30E002M | 36.597800000 | -120.819300000 | 6027650.30 | 2105798.45 | 1191 | n/a | n/a | n/a | |
| 30 | 15S11E30M001M | 36.595000000 | -120.819900000 | 6027454.89 | 2104782.62 | 1184 | n/a | n/a | n/a | |
| 31 | 15S11E30F001M | 36.597200000 | -120.811600000 | 6029906.08 | 2105537.33 | 1190 | n/a | n/a | n/a | |
| 32 | 15S11E30K001M | 36.593100000 | -120.805700000 | 6031609.65 | 2104012.36 | 1177 | n/a | n/a | n/a | |
| 33 | 15S11E30R001M | 36.590600000 | -120.798800000 | 6033617.83 | 2103064.38 | 1160 | n/a | n/a | n/a | |
| 34 | 15S11E29E001M | 36.596100000 | -120.795400000 | 6034653.24 | 2105047.64 | 1180 | n/a | n/a | n/a | |
| 35 | 15S11E29.1001M | 36.594700000 | -120.784900000 | 6037725.53 | 2104480.61 | 1140 | n/a | n/a | n/a | |
| 36 | 15S11E32A001M | 36.587800000 | -120.782900000 | 6038265.92 | 2101958.17 | 1111 | n/a | n/a | n/a | |
| 37 | 15S10E14Q001M | 36.620000000 | -120.845600000 | 6020086.75 | 2114026.24 | n/a | n/a | n/a | 8 | |
| 38 | 15S10E21L001M | 36.607341000 | -120.887226218 | 6007782.79 | 2109655.96 | 1394 | n/a | n/a | n/a | |
| 39 | 15S10E22D001M | 36.614843000 | -120.872218355 | 6012240.14 | 2112300.36 | 1300 | n/a | n/a | n/a | |
| 40 | 15S10E24N001M | 36.603300000 | -120.836000000 | 6022787.24 | 2107893.66 | 1225 | n/a | n/a | n/a | |
| 41 | 15S10E25J001M | 36.592500000 | -120.833500000 | 6023445.87 | 2103948.58 | n/a | n/a | n/a | n/a | |
| 42 | 15S10E22J001M | 36.614796000 | -120.859037763 | 6016107.34 | 2112208.11 | n/a | n/a | n/a | n/a | |
| 43 | 15S10E14A001M | 36.631757000 | -120.849465472 | 6019035.01 | 2118327.46 | n/a | n/a | n/a | n/a | |
| 44 | DOODLEBUG | 36.637261000 | -120.891620846 | 6006707.70 | 2120571.72 | 1381 | n/a | n/a | n/a | Observation Well |
| 45 | PANOCHE SCHOOL | 36.606405000 | -120.859057392 | 6016042.45 | 2109154.02 | 1286 | n/a | n/a | n/a | |
| 46 | 15S10E25J002M | 36.593100000 | -120.833800000 | 6023361.98 | 2104168.66 | n/a | n/a | n/a | n/a | |
| 47 | 15S11E30E003M | 36.597200000 | -120.819300000 | 6027646.16 | 2105580.05 | n/a | n/a | n/a | n/a | |
| 48 | 15S11E30M002M | 36.595000000 | -120.816600000 | 6028423.45 | 2104764.28 | n/a | n/a | n/a | n/a | |
| 49 | 15S11E28R001M | 36.588100000 | -120.766800000 | 6042993.82 | 2101980.02 | n/a | n/a | n/a | n/a | |
| 50 | 15S09E24C001M | 36.616100000 | -120.950700000 | 5989221.09 | 2113216.27 | n/a | n/a | n/a | n/a | |

**Notes:**
Well location and construction information compiled from available information provded in the Geologica 2010 and 2014 reports
Northing and easting coordinates based on State Plane Zone IV coordinate grid, per the Site's American Land Title Association (ALTA) su
n/a = information not available


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# APPENDIX A
# HYDROGRAPHS


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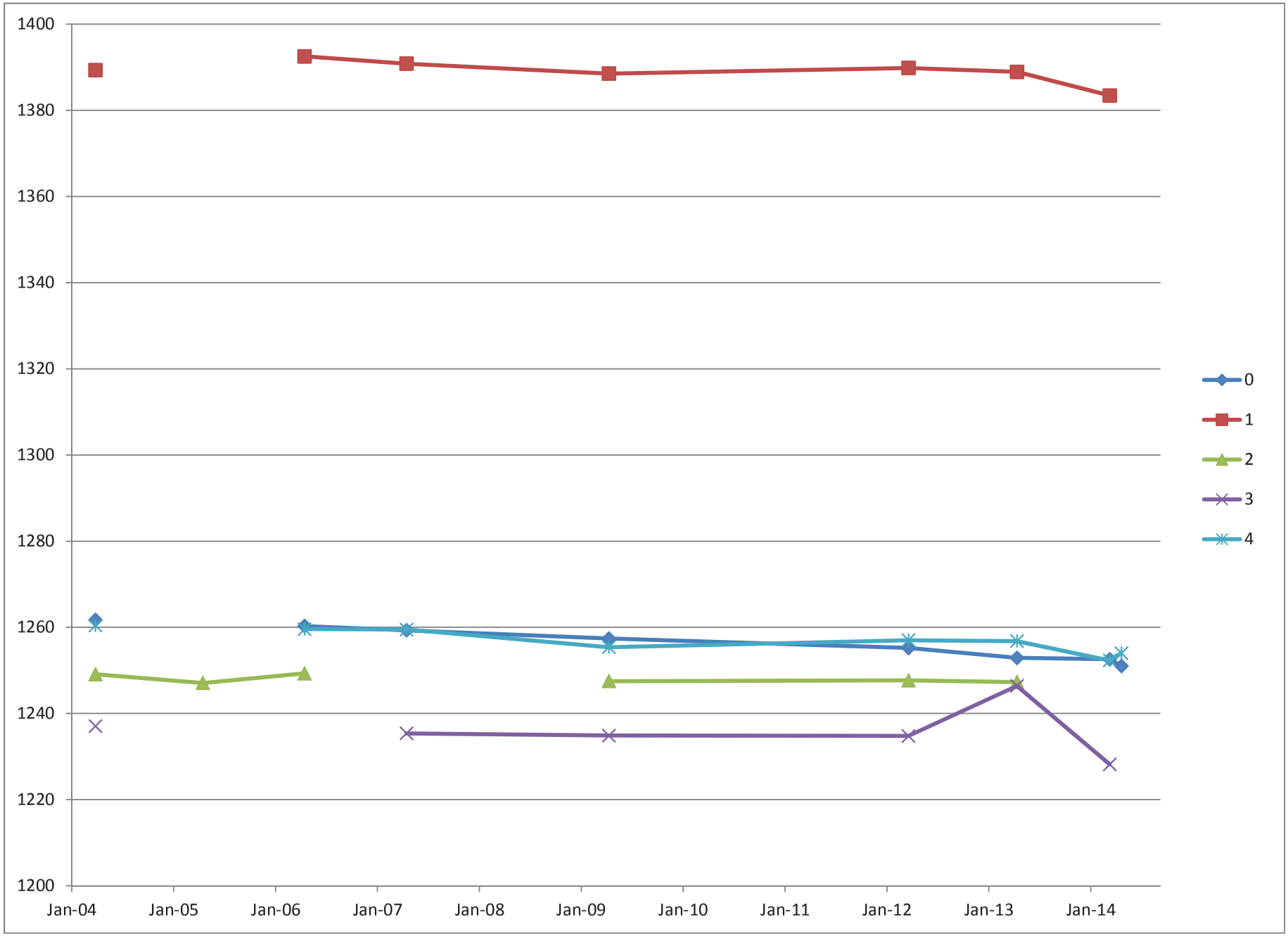
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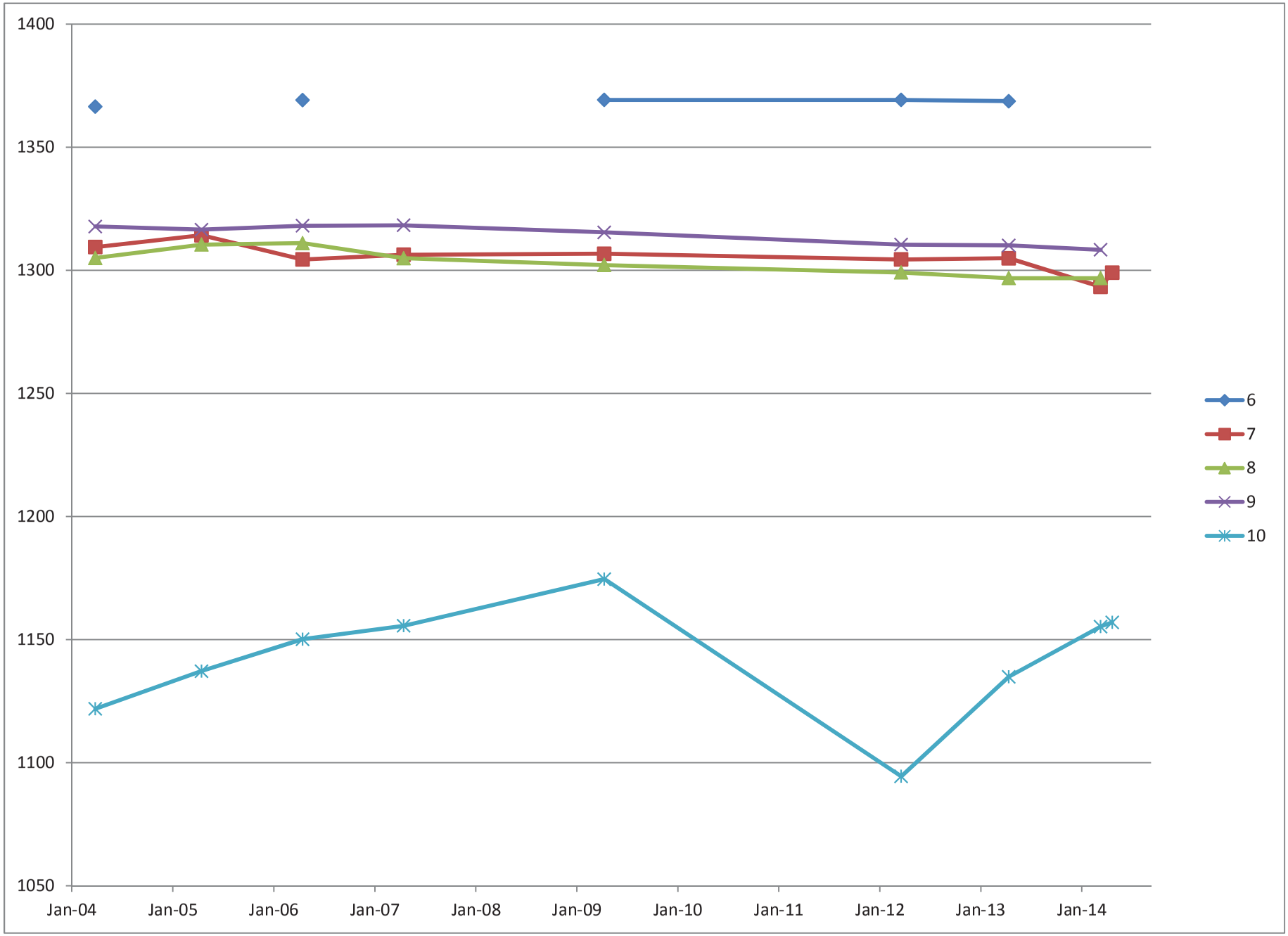
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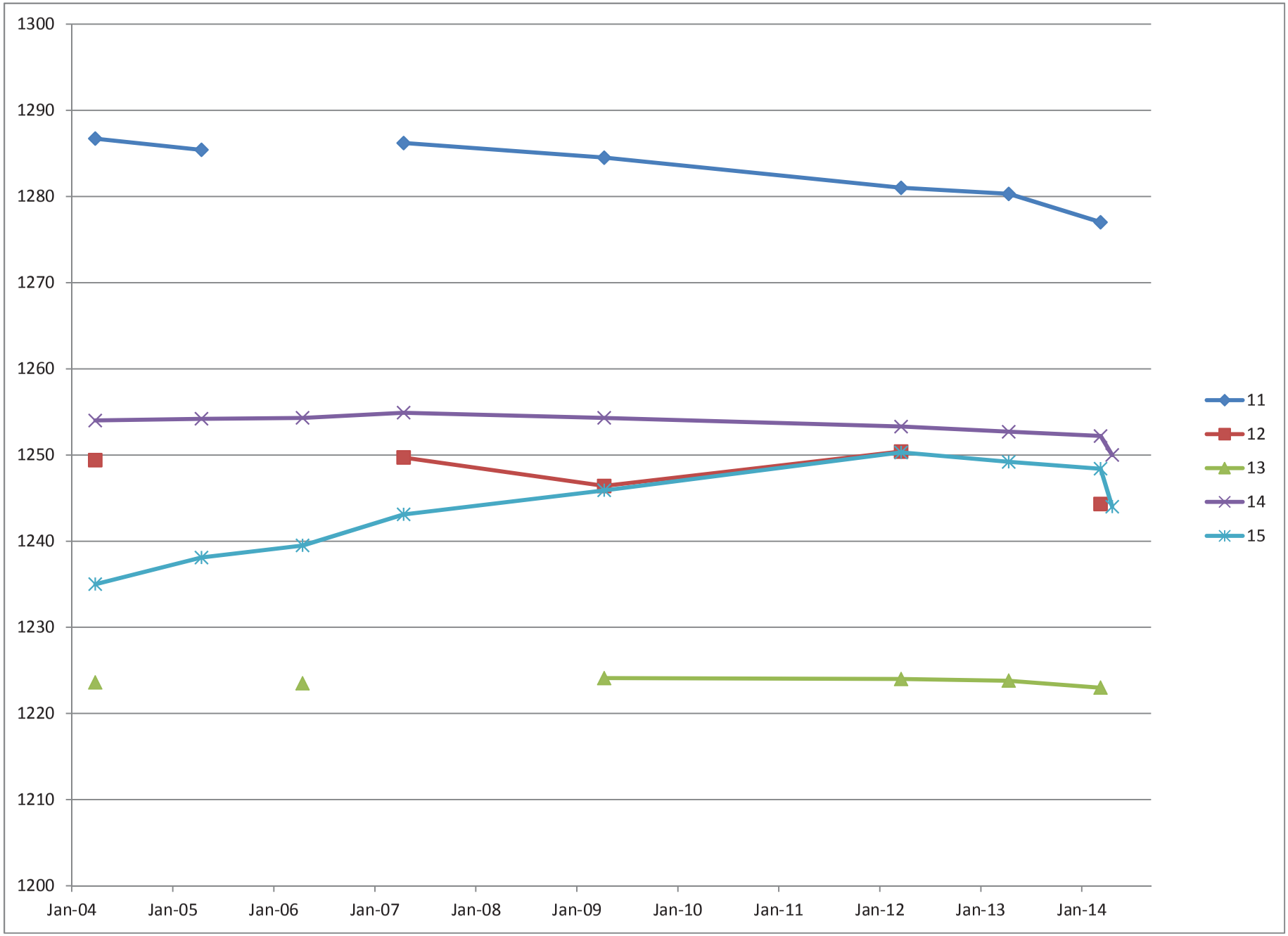
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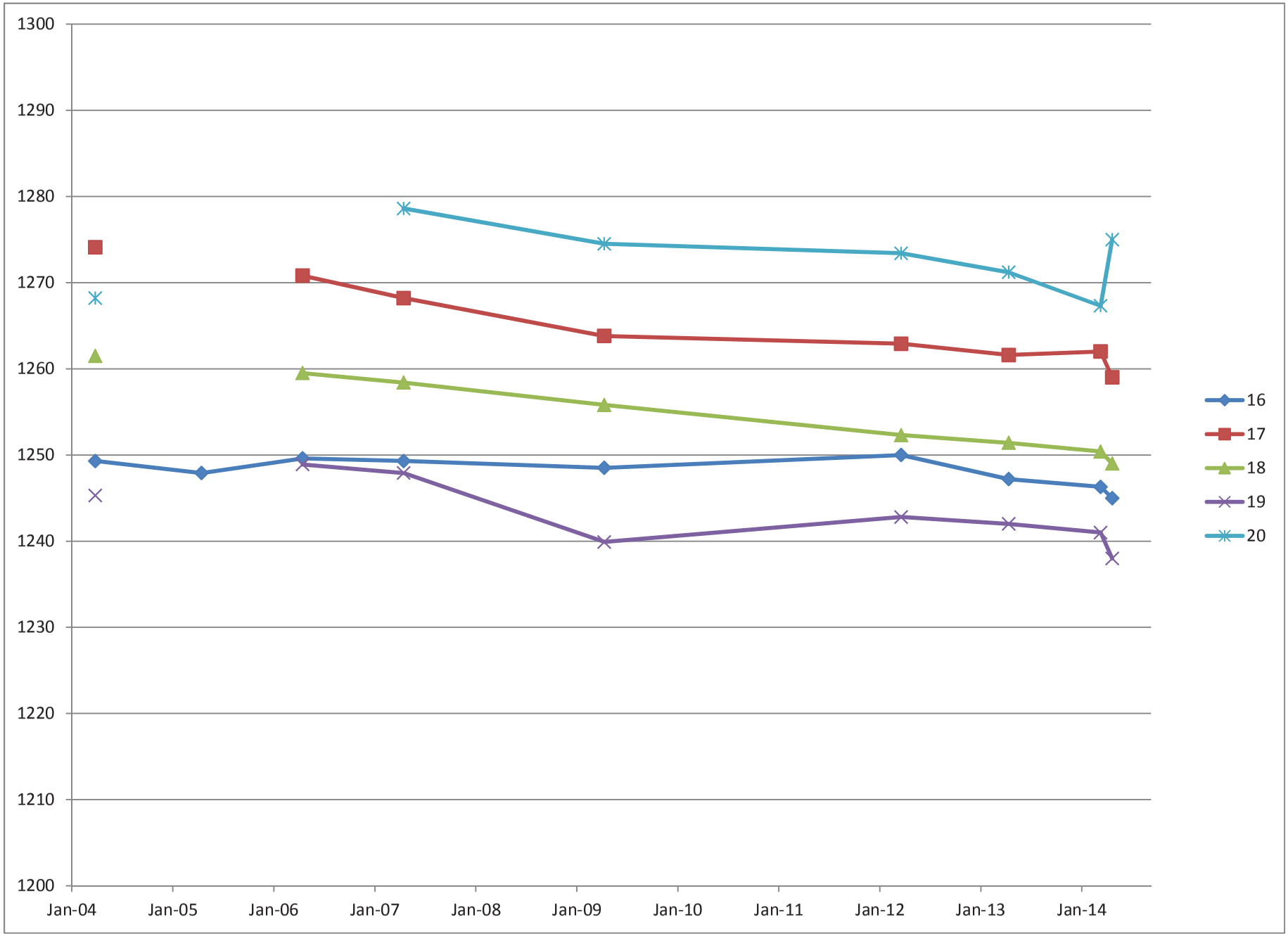
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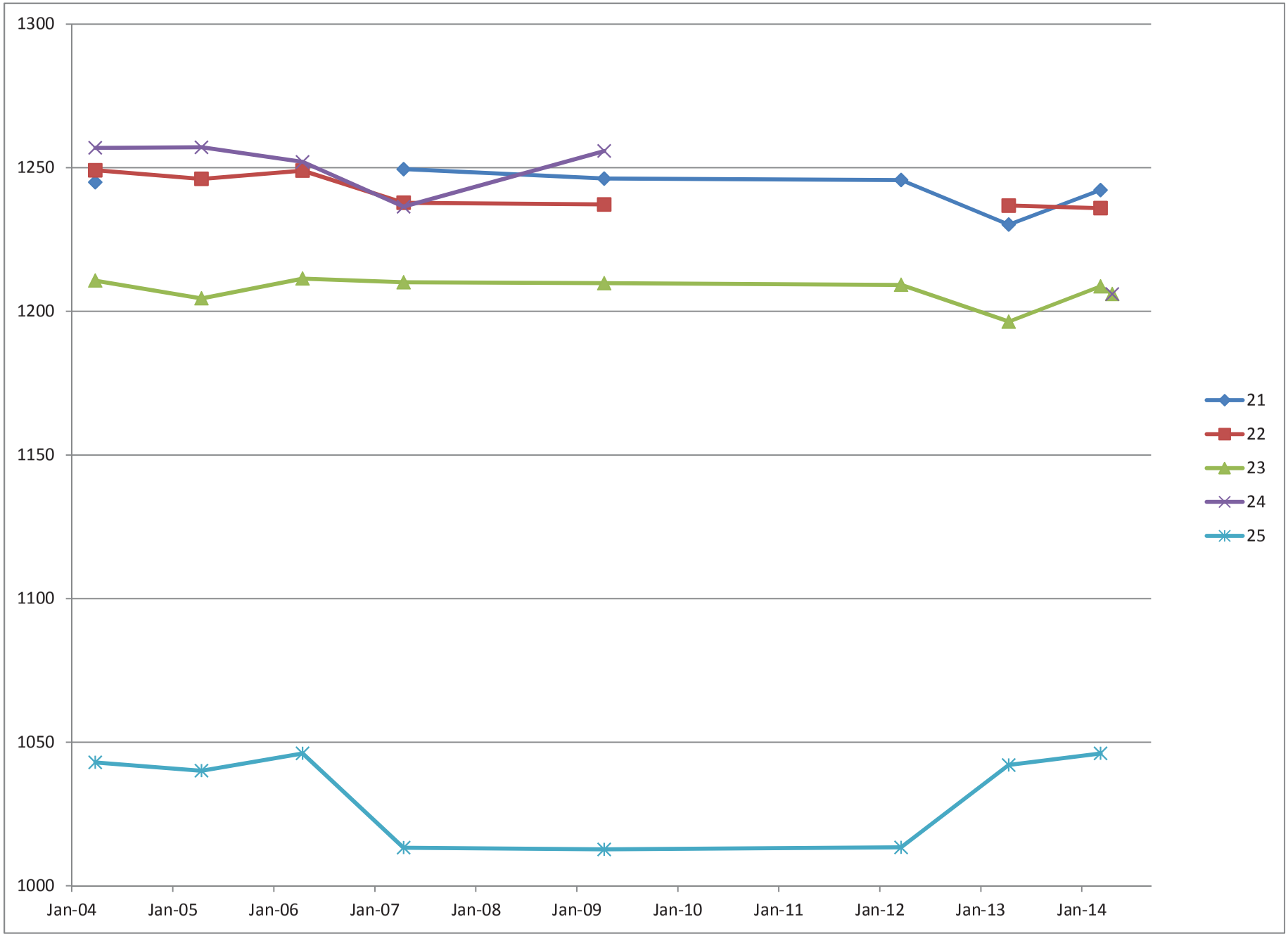
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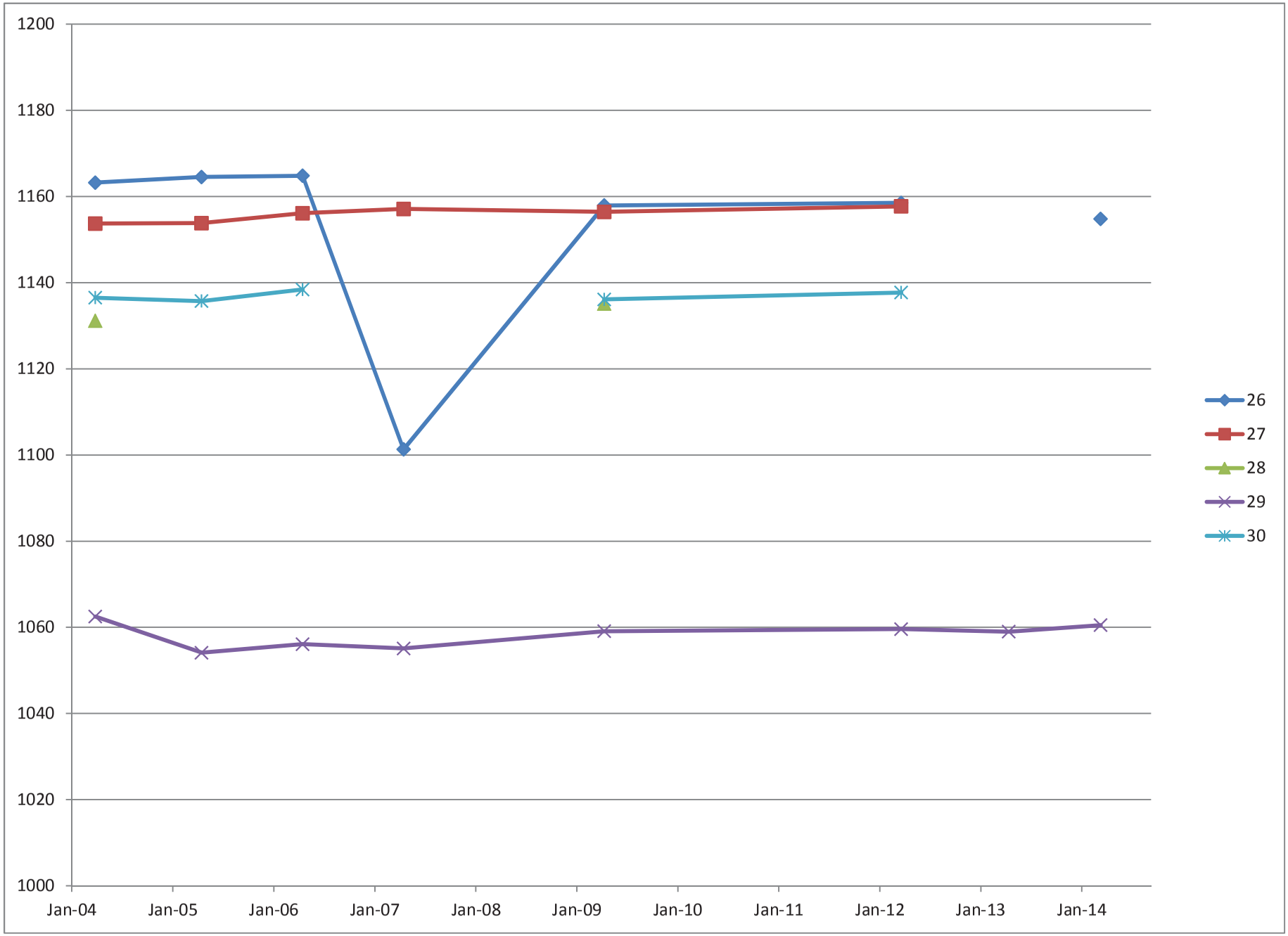
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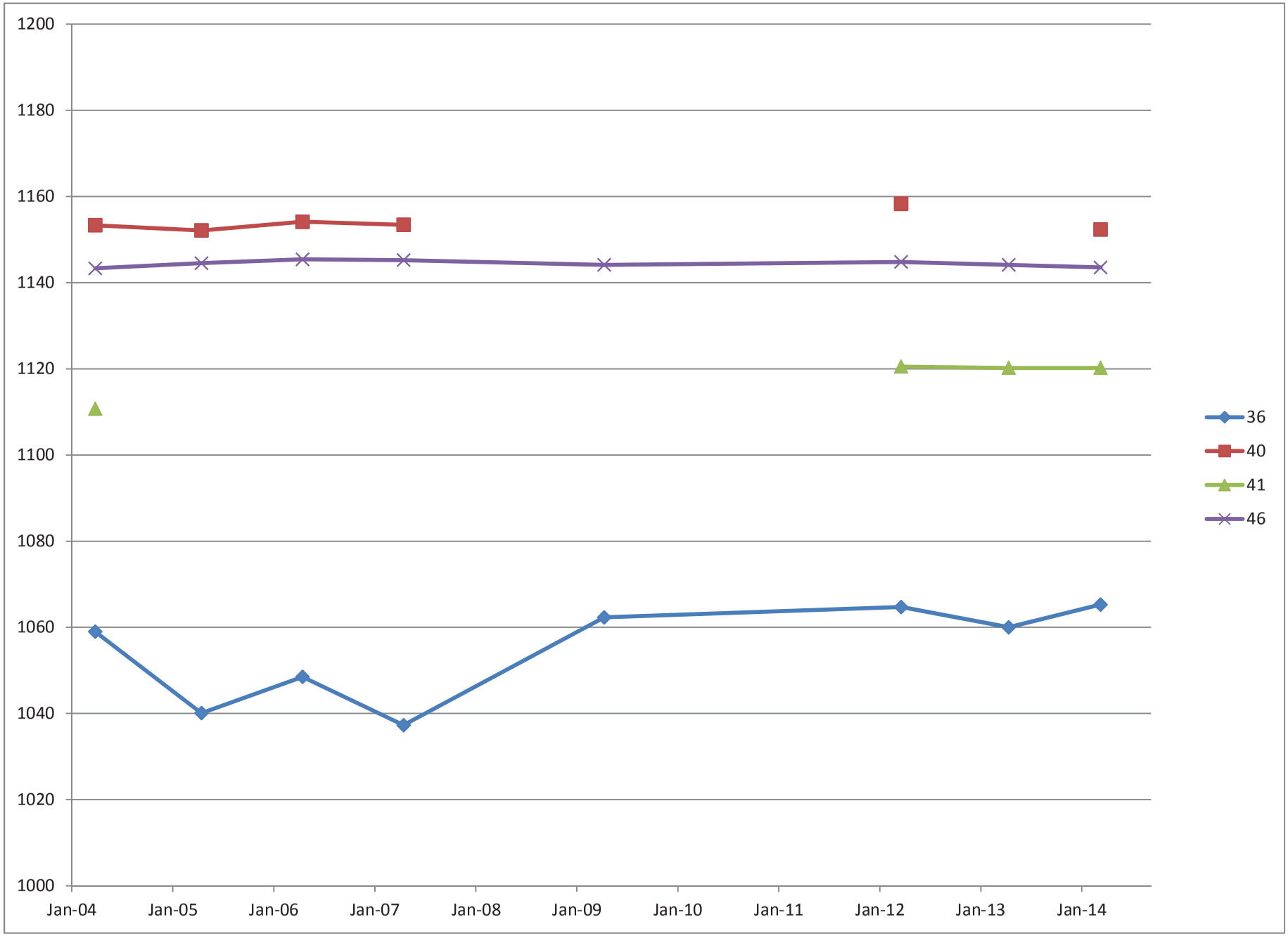
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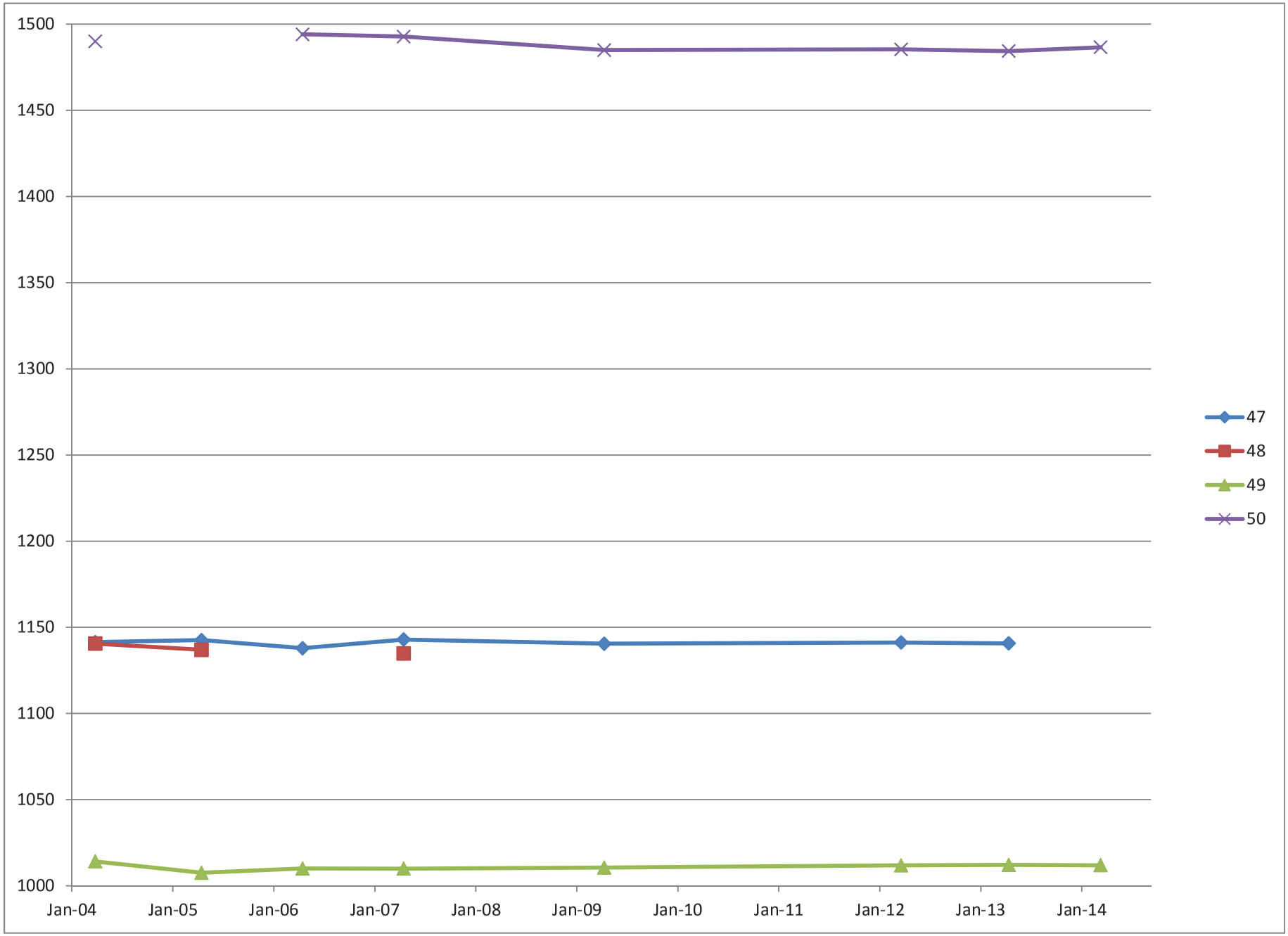
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