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PANOCHE VALLEY SOLAR, LLC

Panoche Valley Solar Farm

California Tiger Salamander Mitigation Pond Proposal

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127165

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California Tiger Salamander Mitigation Pond Proposal

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ACRONYMS AND ABBREVIATIONS

AC	alternating current
BLM	Bureau of Land Management
cm	centimeters
CNDDB	California Natural Diversity Database
Control Plan	Noxious Weed and Invasive Plant Control Plan
CTS	California tiger salamander
DC	Direct Current
ºF	degrees Fahrenheit
FEIR	Final Environmental Impact Report
kV	kilovolt
LOA	Live Oak Associates
MW	megawatts
NRCS	National Resource Conservation Service
O&M	operations and maintenance
PG&E	Pacific Gas & Electric
POWER	POWER Engineers, Inc.
Proposed Project	Panoche Valley Solar Farm Proposed Project
PV	photovoltaic
USFWS	United States Fish and Wildlife Service

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1.0 PROJECT DESCRIPTION

Panoche Valley Solar, LLC proposes to construct and operate the Panoche Valley Solar Farm (Proposed Project), a 399 megawatt (MW) solar photovoltaic energy generating facility. Because the Proposed Project will be placed adjacent to occupied California tiger salamander (CTS; *Ambystoma californiense*) breeding ponds, and will impact other potential, unoccupied breeding ponds, Panoche Valley Solar, LLC will construct new additional breeding ponds located outside of the footprint of the Proposed Project. This document presents three potential locations for new breeding ponds located on conservation lands associated with the Proposed Project. Two potential locations occur on the Valadeao Ranch Conservation Lands in close proximity to a known CTS breeding pond. One potential location occurs on Silver Creek Ranch Conservation Lands in close proximity to other existing potential CTS breeding ponds.

The Proposed Project site comprises approximately 4,885 acres in the Panoche Valley of eastern San Benito County, CA. The Proposed Project will be constructed in five phases with the first phase being 20 MW, and each subsequent phase consisting of approximately 100 MW each. The Proposed Project would be located on heavily grazed rangeland and would generally include development of the following components on 2,203 of the 4,885 acres (approximately 50% of site):

- Installation of approximately three to four million photovoltaic (PV) panels
- PV module steel support structures
- Electrical inverters and transformers
- An electrical substation with switchyard
- Buried electrical collection conduit
- An operations and maintenance (O&M) building
- A septic system and leach field
- Wastewater treatment facility/demineralization pond
- On-site access roads
- Security fencing
- Transmission support towers and line(s) to interconnect with a Pacific Gas & Electric (PG&E) transmission line that passes through the Project site

The Proposed Project would be installed over an area of approximately 4,885 acres (7.6 square miles). However, the proposed design confines the solar arrays, substation (including the O&M building and transmission interconnection towers), and on-site access roads to a footprint of approximately 2,203 acres. The remaining approximately 2,682 acres within the Project boundary would be left undisturbed. Interstitial space between rows of panels, access roads, and O&M facilities would incorporate approximately 610 acres. Undisturbed areas would include on-site drainages and riparian buffer zones totaling 389 acres, as well as approximately 1,683 acres of open space in the southern portion of the Project Area. These undisturbed areas would remain as open space, and would be managed as on-site conservation areas to maintain and enhance habitat conditions for listed species. On-site conservation areas would incorporate approximately 2,072 acres.

Project construction would occur in five phases over a total of approximately five years, at one year per phase. Approximately 18 percent of the site would be temporarily disturbed at any one time during construction and would be restored in accordance with a revegetation plan. Revegetation will be conducted on areas temporarily disturbed during construction to restore vegetative cover to similar pre-construction condition or, if requested, to meet other reasonable landowner requests, once site

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work is completed. Disturbed areas will be reclaimed by appropriate contouring, where appropriate, and replanting with an approved seed mix. All seed mixtures will be certified "weed free." Noxious weeds will be controlled through implementation of the Noxious Weed and Invasive Plant Control Plan (Control Plan). Within the Control Plan, herbicides will be used in accordance with the Bureau of Land Management (BLM) Approved Adjuvant and will follow federal and state regulations.

In general, each PV panel will be approximately two by four feet; however as technology changes during the life of the Project, larger panels may be used. All panels will be oriented toward the south and southwest, and angled upward at a degree that would maximize solar resource efficiency. Panel faces will be non-reflective and black or blue in color. The normal operating temperature of the PV panel face would be 10-15 degrees Fahrenheit (°F) above ambient temperature, and a typical summer day at 82°F would result in panel face temperatures of approximately 100°F. Panels will result in shading of the area below, providing a cooling effect beneath each structure. The PV solar panels will be mounted on direct-driven steel support structures that are between four and 25 feet in height. The steel support structures will be constructed of corrosion-resistant and galvanized steel. Concrete foundations will not be required for PV panel mounts.

The direct electrical current (DC) generated by the panels will be converted to alternating current (AC) by individual inverters, stepped up by transformers, and transmitted to a new substation via 34.5 kilovolt (kV) (AC) medium-voltage collection lines. The medium voltage collection lines will begin at the inverter transformers and will be located in trenches until the output from between 10 and 15 power blocks is terminated in the collection breaker of the substation. The electrical substation will convert power from 34.5 to 230 kV. The substation will be located directly adjacent to the existing PG&E transmission line.

The main access road, which will be a 24-foot-wide gravel road with a gate, will enter the site from the east or west from Little Panoche Road. The interior access roads will be 12-foot-wide gravel roads. Main site access roads will be graded and compacted using existing soil with a cover of gravel. Maintenance roads will be graded and compacted using existing soil with no gravel. Access roads will cross the onsite washes during construction and operation of the Proposed Project to provide adequate ingress and egress to and from the Project site for vehicles in the event of an emergency.

A six-foot-high smooth-top chain link fence will be placed around the blocks of panels. Fencing around the blocks of panels will be 5.5 feet of chain link with a 24 inch gap from ground surface to fence bottom to allow for wildlife movement.

Panel assembly will occur on-site. Panel components, such as the PV panels and racks, will be transported to laydown areas, where steel rack assemblies will be constructed at each block, and PV panels will be lowered onto the racks with final fastening being performed at the block. All items will be transported by container truck. A pre-fabricated racking system will arrive on site at a rate of approximately 10 to 20 MW per month to be assembled and grounded at the site. Pre-assembled PV panels will arrive on site and be placed in a staging area inside shipping containers. Panels will be put in place manually and secured to the rack per vendor specifications. The rack will be populated with panels, wired in series, and connected to a DC combiner box, which will deliver DC power to the local inverters.

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1.1 Proposed Mitigation

The following identifies mitigation measures described in the Proposed Project Biological Assessment (10/26/2010) and associated Addendum (9/16/2011), and the Final Environmental Impact Report (FEIR; 9/30/2010) which the Proposed Project will utilize with the specific aim of reducing impacts to CTS:

- Project components were designed to avoid impacts to known CTS breeding ponds.
- All activities that will result in permanent or temporary ground disturbance shall be preceded by a preconstruction survey conducted by a qualified biologist. If CTS are observed during burrow excavation or during construction activities, all work will be suspended within the immediate area until such time a designated biologist with appropriate federal and state permits to handle CTS moves the individual.
- Suitable rodent burrows occurring within 0.4 mile of the four breeding ponds where CTS could reasonably be expected to aestivate, will be excavated if Project construction is to occur within 25 feet of a suitable burrow.
- CTS found during preconstruction surveys will be relocated to suitable small mammal burrows on areas of the Project site which will remain undisturbed.
- As required by the FEIR, breeding habitats and suitable upland habitat disturbed within 2,100 feet of a known or potential breeding pond will be mitigated at a 3:1 acreage ratio; suitable upland habitat located between 2,100 feet and 2,640 feet (0.5 mile) of a breeding pond will be mitigated at a 2:1 acreage ratio; and suitable upland habitat located between 2,640 feet and 6,636 feet (1.2 miles) of a breeding pond will be mitigated at a 1:1 acreage ratio. Temporary impacts will be mitigated at a 0.5:1 acreage ratio. Preserved habitat shall be the same quality or better quality than the habitat disturbed.
- Additional suitable breeding ponds within suitable aestivation habitat will be created on off-site conservation lands to mitigate the loss of potential breeding ponds on the Project Area.

One component of proposed mitigation which will have a positive effect on most species found in the vicinity of the Project Area is the permanent preservation, enhancement and management of approximately 21,000 acres of land directly adjacent to the Project Area. These 21,000 acres of off-site conservation lands are broken up into two areas. To the north, northeast and west of the Project Area is approximately 10,000 acres formerly known as the Valadeao Ranch. The Valadeao Ranch is a combination of rough, rugged hills and a portion of the Little Panoche Valley. The Little Panoche Valley is a lightly sloping valley with native grasses, and provides occupied habitat for San Joaquin kit fox, giant kangaroo rat, American badger, golden eagle, mountain plover, and burrowing owl.

To the southeast of the Project Area is approximately 11,000 acres formerly known as Silver Creek Ranch. Silver Creek Ranch is less sloped and rugged than the Valadeao Ranch, and is predominantly situated within the Panoche Valley. Full surveys have yet to be performed on Silver Creek Ranch, but previously documented surveys indicate it provides suitable habitat for blunt-nosed leopard lizard, golden eagle, mountain plover, burrowing owl, San Joaquin antelope squirrel, giant kangaroo rat, San Joaquin kit fox, and American badger. The key value of Silver Creek Ranch as conservation lands is that it is within the same valley and largely the same habitat type as the Project Area. The Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998) specifically identified the natural lands in association with Silver Creek Ranch as areas of priority for habitat protection to conserve occupied habitat for Panoche Valley populations of blunt-nosed leopard lizard and giant kangaroo rat (USFWS 1998: pp 95 and 122).

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Monitoring of conservation lands will permit an adaptive management program, such as modification of grazing regime to favor species on site. These off-site lands will be managed by a third party such as the BLM or California Rangeland Trust.

In addition to the off-site conservation lands, the Proposed Project will incorporate approximately 2,000 acres of on-site conservation lands, referred to as Valley Floor Conservation Lands. These lands include the southern portion of the Project Area and the major washes purposely avoided by the Project design. The southern portion of the Project Area which will be included in the on-site conservation lands, incorporates all of the blunt-nosed leopard lizard sightings to date on the Project Area; the majority of high-suitability giant kangaroo rat habitat; a large majority of the San Joaquin kit fox sightings; and evidence found by scat-sniffing dogs.

When Valley Floor, Valadeao Ranch, and Silver Creek Ranch Conservation Lands are combined, the Proposed Project would permanently conserve over 23,000 acres of potential habitat for botanical and wildlife species. These lands would go toward meeting mitigation ratio criteria for special status species which would be impacted by the Proposed Project.

On June 28, 2012, a site visit to the Proposed Project site, Valadeao Ranch Conservation Lands, and Silver Creek Ranch Conservation Lands was completed to identify potential locations to create CTS breeding ponds to comply with the final mitigation bullet point listed above. Attendees at this site visit included biologists from POWER Engineers, Inc. (POWER) and Live Oak Associates (LOA), and one hydrologist from WH Pacific to identify potential locations in the field. The site visit on the Valadeao Ranch Conservation Lands focused on the lower slopes and flatter landscape surrounding the known CTS breeding pond to the west of the Proposed Project. By placing a potential breeding pond within close proximity to the known breeding pond, the Proposed Project would create a breeding pond complex to better serve the species. The site visit to the Silver Creek Ranch Conservation Lands focused on the lower slopes and flatter landscape to the north of Panoche Creek. Results of this site visit are described in Section 3.0 below.

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2.0 EXISTING CONDITIONS

2.1 CTS Species Ecology

The CTS originally inhabited most of central California, and remains in remnant populations throughout much of its original range. California Natural Diversity Database (CNDDB) records for CTS show its distribution encompasses portions on Alameda, Amador, Calaveras, Contra Costa, Fresno, Kern, Kings, Madera, Mariposa, Merced, Monterey, Sacramento, San Benito, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Tulare, Tuolumne, and Yolo Counties (NatureServe 2009). About 80% of all extant occurrences are in Alameda, Contra Costa, Madera, Merced, Monterey, San Benito, and Santa Clara counties, with 30% of all occurrences in Alameda County (NatureServe 2009). The use of vernal pools and other temporary bodies of water for breeding limits the CTS to areas of low elevation and low topographic relief throughout their range (Stokes et al. 2008). Ephemeral vernal pools which refill with water on a yearly basis, are 40 to 80 centimeters (cm) in depth, and have a surface area of 0.2 hectare (0.5 acre) or more are optimal for breeding CTS, although small, shallower pools will also house breeding CTS (Stokes et al. 2008). Depth of the breeding pool was highly correlated with breeding CTS. Stokes et al. (2008) found no CTS larvae in pools with an average depth of less than 22 cm. Deep pools with permanent water may not be optimal for breeding populations of CTS because they often house predatory fish, crayfish, or bullfrogs that prey upon larval CTS. This creates a narrow window of pool depth where the pool will not completely dry out before CTS have metamorphosed, but also will not contain water year round and house predators. Metamorphosed CTS move out of the vernal pools and into upland habitats. Small mammal burrows are important features of upland habitat. Adult CTS occupy small mammal burrows in grassland, savanna, or open woodland habitats (Trenham and Shaffer 2005).

Activity patterns of adult CTS are not well understood. Adult CTS live their entire lives in the burrows of small mammals such as the California ground squirrel. Adults begin moving toward breeding pools when the first fall rains begin to inundate pools. Breeding adults will continue moving to pools through the winter and spring. Adults can generally be found at breeding pools from October through May, although breeding is highly dependent on the amount of precipitation (Trenham et al. 2001; Trenham and Shaffer 2005). Adult CTS leave the breeding pools in late spring and return to upland habitats. Trenham and Shaffer (2005) used pitfall traps at various intervals away from a pool to determine the extent of upland use. They found that the numbers of adult CTS declined as distance from the pool increased out to 620 meters. Subadults also moved up to 600 meters away from the pools, but most were concentrated between 200 and 600 meters from the pool. This has led managers to suggest preserving upland habitats with suitable small mammal burrows out to 600 meters from breeding pools (Trenham and Shaffer 2005).

CTS may take upward of four to five years to reach sexual maturity (Trenham et al. 2000). Although individuals can live upward of ten years, less than 50% of individuals breed more than once (Trenham et al. 2000). Rainfall can significantly alter adult breeding pool attendance, and production of metamorphs tends to be a boom-or-bust scenario. Typically, greater numbers of breeding adults return to pools during years with greater rainfall (Trenham et al. 2000, 2001; Cook et al. 2006; Stokes et al. 2008). Males are often the first to arrive at breeding pools and remain in the pool longer than females (Trenham et al. 2000). Larvae remain in the pools approximately four months and emigrate from the pools as they dry. Metamorph emigration typically occurs throughout May and is directly related to the pool drying date (Trenham et al. 2000).

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Often amphibian populations are used as an example for the metapopulation/source-sink models. The CTS populations at different breeding pools often act in a metapopulation fashion (Trenham et al. 2001). Mark – recapture studies found that while most breeding adults return to their natal pool, 22% dispersed to different ponds (Trenham et al. 2001). It should be noted that Trenham and Shaffer (2005) did not capture any CTS, adult or subadult, more than 620 meters from the pool. Thus, pools more than 1,240 meters from one another may limit dispersal. Breeding CTS have been known to use artificially created pools, and the creation of pools in a stepping-stone fashion has been suggested to aid dispersal between populations (Stokes et al. 2008).

2.2 Surveys Completed

In the winter of 2009 – 2010 biologists from LOA completed Protocol Vernal Pool Branchiopod Surveys in support of the Proposed Project. These vernal pool branchiopod surveys identified larval CTS while surveying other species. Protocol CTS Larval Surveys, performed in March, April and May of 2010, also noted larval CTS. Results of these two surveys identified larval CTS in two ponds. Both ponds were located off the Proposed Project. One pond is in Township 15S, Range 10E, Section 4 just outside the boundary of the Project site. This pond will be referred to as Pond 12 and is further described in Section 2.2.3 below. The second pond is located off-site in Township 15S, Range 10E, Section 17. Additionally, the CNDDB contains historical records of CTS breeding ponds located in the Las Aguillas Creek drainage within the Proposed Project. These historical breeding ponds occur on the Valley Floor Conservation Lands and will not be impacted by the Proposed Project.

It is unknown at this time to what extent the Silver Creek Ranch conservation lands support CTS. Full protocol surveys have not yet taken place on Silver Creek Ranch; however LOA herpetological experts expect several ephemeral ponds on site to be utilized by breeding CTS.

2.2.1 Pond 12

Pond 12 is a man-made pond which contains water behind a push-up dam for the purpose of providing water to cattle on the Valadeao Ranch conservation lands (Figure 1). Area calculations performed using aerial imagery determined that the maximum surface area of water capable of being retained behind the push-up dam is approximately 0.2 acre. During surveys performed for CTS larvae in Pond 12 during the winter and spring of 2010, the maximum surface area of the water was approximately 0.1 acre. Maximum depth recorded during these same surveys was 57 cm (22 inches).

The watershed area for the Pond 12 is approximately 0.63 square mile. The contributing watershed feeds to an incised channel which dissipates when it reaches the low gradient valley floor. After reaching the valley floor, the flow becomes sheet or shallow concentrated flow before reaching Pond 12. Pond 12 was constructed by excavating out the pond and using the cut material to build a berm on the downslope side. The berm is of unknown height, but is assumed to be approximately four feet.

Pond 12 survey data from LOA's CTS surveys in late 2009/early 2010 were analyzed with actual monthly precipitation data from the same period (Appendix A). WH Pacific created a water budget model for potential mitigation ponds using the aforementioned data along with mean monthly evaporation rates, and adjusted the assumed infiltration rate and assumed fraction of rainfall that will reach the pond as runoff to find the best match of the model to known data. The results of this analysis showed that the pond was both filling and emptying much slower than expected, indicating slower infiltration in the pond and a small fraction of rainfall reclaimed as runoff. The infiltration rate, which coupled with mean evaporation rate, created slower than expected emptying of the pond –

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approximately 2.5% of the published Natural Resource Conservation Service (NRCS) rate for the soil in the area. The assumed fraction of rainfall that is collected as runoff was approximately 0.2%. The reason for this is likely due to two reasons. The first is that the runoff originates of the hills in a concentrated flow in an incised channel. When it hits the valley floor, the flow goes to sheet flow for approximately 1,000 feet where it can be lost to infiltration and evapo-transpiration before reaching the pond. The second potential reason for the low fraction of rainfall collected is caused by the potential direction of the sheet flow. From examination of vegetation patterns on aerial imagery, it appears as though half of the sheet flow may bypass the pond.

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3.0 PROPOSED MITIGATION PONDS

The following goals were placed on potential mitigation pond locations during the water budget analysis:

- Mitigation ponds will be ephemeral, filling in late fall, winter, and spring, and drying out by early June. Critical months of inundation are March – May.
- Mitigation ponds will be approximately three feet deep.
- Mitigation ponds ideal footprint will be equal to that of Pond 12.
- Mitigation ponds are desired to be inundated five out of every ten years, with a minimum of three out of every ten years.

The following sources of data were used to develop water budget parameters for potential mitigation pond locations:

- Pan evaporation rates were obtained for the Little Panoche Detention Dam, 1963 – 1975, from *NOAA Technical Report NWS 34, Mean Monthly, Seasonal, and Annual Pan Evaporation for the United States*.
- Rainfall data was obtained for the Panoche 2W Weather Station from the Western Regional Climate Center website, December of 1949 through April 2012.
- Soil hydrological ratings and infiltration rates were obtained from the NRCS Web Soil Survey website.
- Observations of existing pond depth and surface area obtained from LOA's 2010 CTS survey data.

The water budget analysis utilized to determine the depth, surface area, and inundation period of potential mitigation ponds was based over a year-long timeframe with one month increments using median precipitation values for each month. NRCS Soil Survey data was obtained to determine average exfiltration rates of the various soil types in the areas of pond construction. These soil types showed extremely quick draining soils which would present difficulties in keeping a mitigation pond saturated for the appropriate duration. The Pond 12 depth/surface area ratio was used to make an estimate of infiltration. The pool demonstrated infiltration rates approximately 2.5% of the published NRCS soil data. This is a common scenario in ephemeral ponds where fine silts and clays washed in over time reduces the infiltration rate.

The runoff coefficient described in Panoche Valley Hydrological Study, SolarGen Panoche Valley Solar Farm, Panoche Valley, California prepared by Geologica in mid-2010 was 0.55. This means that approximately 55% of rainfall in the Panoche Valley can be expected to runoff. A HydroCAD analysis performed by WH Pacific showed that this is a reasonable assumption during a large, 100-year type of rainfall event; however, approximately 25% can be expected as runoff during smaller 1-year rainfall events and 15% for six month events. The data for Pond 12 demonstrated a very low runoff capture rate, capturing an estimated 0.2% of the total precipitation for the watershed. Runoff in the Pond 12 watershed progresses from an incised channel at higher, steeper elevations, to a shallow, spread-out sheet flow where much of the water is lost prior to entering the pool. For the purposes of this analysis, it was assumed that 5% of the monthly rainfall can be retained if the mitigation pond is placed near the outlet of an incised channel, and 0.2% when the pond is located far from the incised channel.

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Six potential mitigation pond locations were marked during the June 28 site visit. After a preliminary water budget analysis, three potential pond locations were carried forward for a more detailed analysis described below. Sections 3.1 through 3.3 below describe the potential breeding pond locations: two on Valadeao Ranch, one on Silver Creek Ranch. These potential ponds are Valadeao Pond Site 3, Valadeao Pond Site 4, and Silver Creek Pond Site 1. As per the mitigation measures described in the Biological Assessment and associated Addendum, and the FEIR, the Proposed Project proposes to construct one mitigation pond on the Valadeao Ranch in close proximity to Pond 12, and one mitigation pond on the Silver Creek Ranch at a later date depending on the results of future CTS surveys on that property. The mitigation ponds may require the construction of shallow diversion canals perpendicular to the slope to capture sheet flow and direct it to the ponds to ensure that the ponds will remain inundated for a sufficient length of time. Exfiltration rates are the ruling factor in sizing the ponds, as these are many times higher than the evaporation rates during winter and spring. To reduce the amount of exfiltration, the rate of the in-situ native soil could be reduced by amending the native soil with a less permeable material such as bentonite or clay.

3.1 Valadeao Ranch Pond Site 3

Valadeao Ranch Pond Site 3 is located at approximately 2,300 feet (720 meters) west-northwest of Pond 12 at Easting 0687567, Northing 4058555 (UTM Zone 10; Figure 1). Valadeao Ranch Pond Site 3 is located near where an incised channel ends and the runoff converts to sheet flow. Based on this location, the pond would expect to collect a higher percentage of the monthly rainfall as runoff. For purposes of the analysis, it was assumed that the pond would capture 5% of the runoff. Valadeao Ranch Pond Site 3 has a drainage area of approximately 0.44 square mile. This area is 70% of the area of Pond 12; therefore, a pond surface area that is 70% of the existing pond surface area, or 0.14 acre would initially be anticipated. However, since we anticipate a higher rainfall as runoff capture ratio for this location, we ran the water budget model using the same size of pond as Pond 12. The water budget analysis shows Valadeao Ranch Pond Site 3 will fill to 0.14 acre, and a bypass spillway would be required to pass water over the dam. Appendix A provides the water budget analysis performed for Valadeao Ranch Pond Site 3.

From examination of aerial imagery, it appears that nearly all the sheet flow coming from the contributing area for Valadeao Ranch Pond Site 3 bypasses the existing breeding pond established in Pond 12, and therefore installation of a mitigation pond at this location would not detrimentally affect Pond 12. Additionally, the model shows that Valadeao Ranch Pond Site 3 will have excess water, assuming the 5% capture rate is correct, and provisions can be made to focus spillway discharge water toward the existing pond.

The NRCS mapping indicates that Valadeao Ranch Pond Site 3 is located in Yolo Gravelly Loam, and has a hydraulic conductivity rating of 12.0 micrometers per second, or 1.7 inches per hour. For purposes of the modeling, 2.5% of the NRCS rate was utilized, which is 0.0425 inch per hour. This was based on the infiltration rate demonstrated by Pond 12.

3.2 Valadeao Ranch Pond Site 4

Valadeao Ranch Pond Site 4 is located approximately 2,000 feet (630 meters) south-southwest of Pond 12 at Easting 0687975, Northing 4057754 (UTM Zone 10; Figure 1). Valadeao Ranch Pond Site 4 is located approximately 1,000 feet down slope of where an incised channel transitions to sheet flow. Therefore, the water budget analysis used the same capture rate as Pond 12 (0.2%). Because the

drainage area of Valadeao Ranch Pond Site 4 is approximately half that of Pond 12, it was assumed that the drainage would support a pond of approximately 0.1 acre. The water budget analysis found that the drainage would support a pond of approximately 0.1 acre, with a maximum depth of just over one foot occurring in February. Appendix A provides the water budget analysis performed for Valadeao Ranch Pond Site 4.

A potential design component of Valadeao Ranch Pond Site 4 could include extending the incised channel to the pond location in order to retain water potentially lost as sheet flow, while still capturing sheet flow from surrounding hills which does not accumulate in an incised channel. Another potential design component of Valadeao Ranch Pond Site 4 could include creating diversion dams perpendicular to the direction of sheet flow to better direct flow to the pond location.

Currently, a stock watering trough which is filled by gravity fed piped spring water is located near Valadeao Ranch Pond Site 4. This piped spring water could potentially be used to augment natural runoff collected in the pond during the winter and spring. The piped water could be diverted back to the water trough to ensure that the mitigation pond would dry out in late spring or early summer.

The NRCS mapping indicates that Valadeao Ranch Pond Site 4 is located in Yolo Gravelly Loam, and has a hydraulic conductivity rating of 12.0 micrometers per second, or 1.7 inches per hour. For purposes of the modeling, 2.5% of the NRCS rate was utilized, which is 0.0425 inch per hour. This was based on the infiltration rate demonstrated by Pond 12.

3.3 Silver Creek Pond Site 1

Silver Creek Pond Site 1 is located at the bottom of an incised drainage at Easting 0698859, Northing 4050925 (UTM Zone 10; Figure 2). Based on the June 28, 2012 site visit, Silver Creek Pond Site 1 was identified as a favorable location for a CTS mitigation pond due to the character of the incoming drainage. The drainage basin for Silver Creek Pond Site 1 encompasses approximately 0.2 square mile. Based on the June 28, 2012 site visit, the channel is fully vegetated and is not as deeply incised as those on the Valadeao Ranch. Silver Creek Pond Site 1 is located near the outlet of the vegetated channel; however, due to the unknowns of the watershed characteristics, a conservative rainfall as runoff capture rate of 0.5% was used in the water budget analysis. This runoff capture rate is just over twice the value of Pond 12. The use of a 0.5% runoff capture rate is based on the fact that there will be very little flow which will bypass the pond, and is conservative considering that the pond will be located closer to a concentrating channel.

The water budget for Silver Creek Pond Site 1 was initially modeled using a footprint of 0.06 acre, or 32% of existing Pond 12. The water budget analysis for a pond of 0.06 acre at Silver Creek Pond Site 1 showed that the pond would go dry in June and have maximum depth of approximately two feet in February. Appendix A provides the water budget analysis performed for Silver Creek Pond Site 1.

The NRCS mapping indicates that Silver Creek Ranch Pond Site 1 is located in Panoche Sandy Loam, and has a hydraulic conductivity rating of 12.3109 micrometers per second, or 1.74 inches per hour. For purposes of the modeling, 2.5% of the NRCS rate was utilized, which is 0.0425 inch per hour. This was based on the infiltration rate demonstrated by Pond 12.

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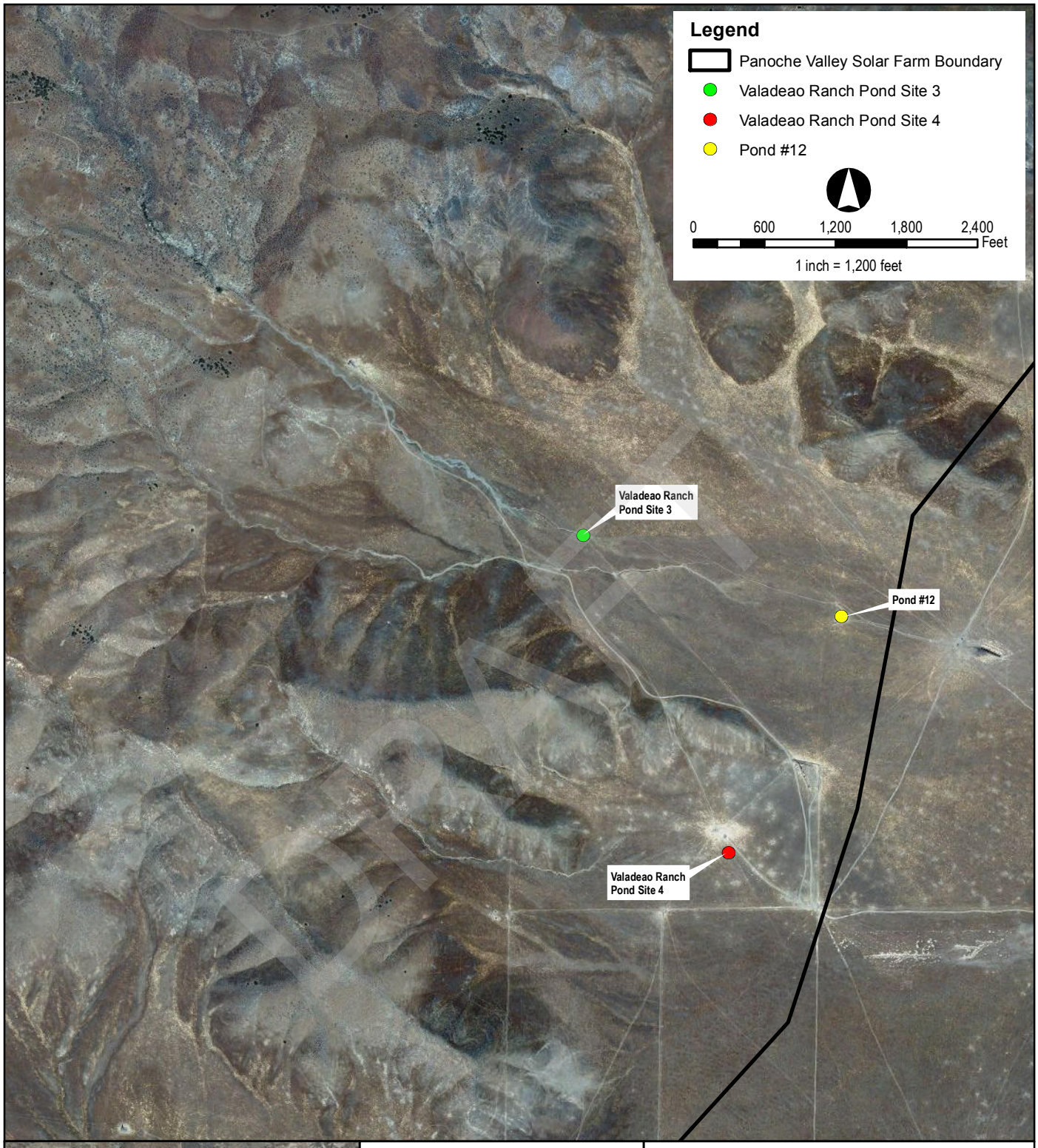

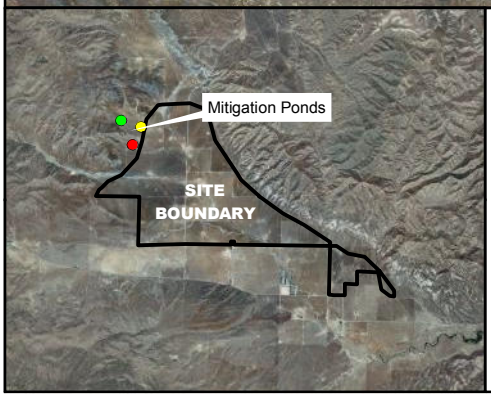

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Figure 1
Valadeao Ranch Mitigation Ponds

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Date: 7/26/2012 Path: H:\125845\DD\GIS\Apps_Lax\Figure_01_Valadeao_Ranch_Mitigation_Ponds.mxd

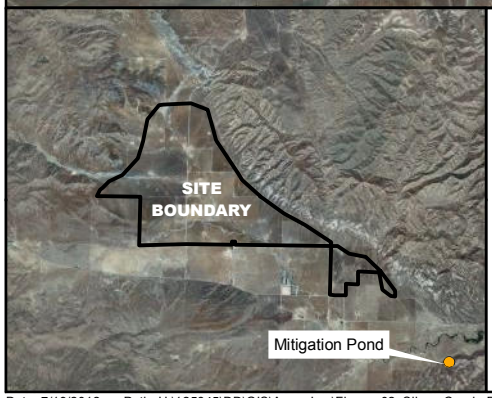

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Figure 2
Silver Creek Pond Site 1

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4.0 CONCLUSIONS

The Proposed Project proposes to construct one mitigation pond on the Valadeao Ranch in close proximity to Pond 12, and one mitigation pond on the Silver Creek Ranch at a later date depending on the results of future CTS surveys on that property. This is consistent with mitigation measures described in the Biological Assessment and associated Addendum, and the FEIR prepared on behalf of the Proposed Project. By creating a new potential CTS breeding pond in close proximity to the existing breeding pond at Pond 12, the Proposed Project will create a breeding pond complex which may support increased genetic diversity and will provide multiple breeding pond options (Trenham et al. 2001; Trenham and Shaffer 2005). Which Valadeao Ranch pond location would best conserve CTS populations in and around the Proposed Project will be determined through consultation with the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

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5.0 LITERATURE CITED

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APPENDIX A MITIGATION POND AND POND 12 WATER BUDGET ANALYSIS

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	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Mean Monthly Precipitation[1], in	2.00	1.93	1.50	0.67	0.30	0.06	0.02	0.03	0.25	0.50	1.01	1.58	9.85
Median Monthly Precipitation[2], in	1.65	1.59	1.06	0.53	0.14	0.00	0.00	0.00	0.01	0.29	0.75	1.20	9.00
Average Monthly Pan Evaporation[3], in	1.77	2.87	5.79	8.62	13.66	15.83	17.09	15.65	11.65	7.09	2.95	1.81	104.78

[1]Data for Panoche 2W Weather Station (046675) from 1949-2012, Western Regional Climate Center

[1]Data for Panoche 2W Weather Station (046675) from 1949-2012, Western Regional Climate Center, Median value calculated by WHPacific

[2]Data for Little Panoche Detention Dam, 1963-1975, from NOAA Technical Report NWS 34, Mean Monthly, Seasonal, and Annual Pan Evaporation for the United States

Projected Monthly Water Budgets

Valadeo Ranch

Pond #12 (existing)

Watershed Area= 0.63 mi^2

= 403.2 acres

Assumed fraction of rainfall that will reach pond[4]= 0.00273

Pond soil NRCS unit symbol= YvB

NRCS saturated infiltration rate= 1.7 in/hr

Projected pond infiltration rate= 0.0425 in/hr

Full Surface Area= 0.2 acres = 0.081 Ha

Full Depth Estimate= 3.92 ft

Full Vol Estimate= 0.392 ac-ft

Area x coeff= 0.051

Volume x^2 coeff= 0.0255

[4]Runoff going to existing pond travels as overland sheet flow approximately 1000LF prior to reaching the pond and it is assume it loses quite a bit of volume in order to match the model with observed results.

Month	Runoff Volume (ac-ft)	Pan Evaporation Volume (ac-ft)	Exfiltration Volume (ac-ft)	Cumulative stored volume (ac-ft)	Estimated Stage (ft)	Estimated Surface Area at Stage (ac)	Volume at stage	Solver
September	0.001	0.000	0.001	0.000	0.01	0.000	0.0000	0.0000
October	0.027	0.005	0.021	0.001	0.16	0.008	0.0006	0.0000
November	0.069	0.006	0.059	0.005	0.45	0.023	0.0052	0.0000
December	0.110	0.006	0.097	0.013	0.72	0.037	0.0132	0.0000
January	0.151	0.007	0.132	0.025	0.98	0.050	0.0247	0.0000
February	0.146	0.013	0.129	0.029	1.06	0.054	0.0288	0.0000
March	0.097	0.018	0.096	0.013	0.71	0.036	0.0129	0.0000
April	0.049	0.013	0.046	0.003	0.35	0.018	0.0031	0.0000
May	0.012	0.005	0.011	0.000	0.08	0.004	0.0002	0.0000
June	0.000	0.000	0.001	0.000	0.01	0.000	0.0000	0.0000
July	0.000	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000
August	0.000	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000

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Valadeo Site 3

Watershed Area=	0.44	mi^2
=	281.6	acres
Assumed fraction of rainfall that will reach pond[5]=	0.05	
Pond soil NRCS unit symbol=	YvB	
NRCS saturated infiltration rate=	1.7	in/hr
Projected pond infiltration rate=	0.0425	in/hr

Full Surface Area=	0.2	acres =	0.081	Ha
Full Depth Estimate=	3.92	ft	Full Vol Estimate=	0.392 ac-ft
Area x coeff=	0.051			
Volume x^2 coeff=	0.0255			

[5]Runoff coefficient described in Panoche Valley Hydrological Study, SolarGen Panoche Valley Solar Farm, Panoche Valley, California by Geologica, June 1, 2010 IS 0.55. HydroCAD anaylsis performed by WHPacific shows approximately 15% can be expected during smaller 6-month frequency storms. Note that the pond is located proximally to the end of the incised channel. To be conservative a value of 0.05 is used.

Month	Runoff Volume (ac-ft)	Pan Evaporation Volume (ac-ft)	Exfiltration Volume (ac-ft)	Cumulative stored volume (ac-ft)	Estimated Stage (ft)	Estimated Surface Area at Stage (ac)	Volume at stage	Solver
September	0.012	0.003	0.008	0.000	0.06	0.003	0.0001	0.0000
October	0.340	0.050	0.221	0.069	1.65	0.084	0.0692	0.0000
November	0.880	0.049	0.509	0.391	3.91	0.200	0.3908	0.0000
December	1.408	0.030	0.527	0.392	3.92	0.200	0.3918	0.0000
January	1.936	0.029	0.527	0.392	3.92	0.200	0.3918	0.0000
February	1.866	0.048	0.476	0.392	3.92	0.200	0.3918	0.0000
March	1.244	0.096	0.527	0.392	3.92	0.200	0.3918	0.0000
April	0.622	0.140	0.499	0.375	3.83	0.196	0.3746	0.0000
May	0.158	0.125	0.290	0.118	2.15	0.110	0.1183	0.0000
June	0.000	0.038	0.073	0.008	0.56	0.029	0.0080	0.0000
July	0.000	0.003	0.005	0.000	0.04	0.002	0.0000	0.0000
August	0.000	0.000	0.001	0.000	0.00	0.000	0.0000	0.0000

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Valadeo Site 4

Watershed Area=	0.3	mi^2					
=	192	acres					
Assumed fraction of rainfall that will reach pond[6]=	0.00273		Full Surface Area=	0.1	acres =	0.040	Ha
Pond soil NRCS unit symbol=	YvB		Full Depth Estimate=	4.00	ft	Full Vol Estimate=	0.200 ac-ft
Projected pond infiltration rate=	1.7	in/hr	Area x coeff=	0.025			
Projected pond infiltration rate=	0.0425	in/hr	Volume x^2 coeff=	0.0125			

[6]Pond site is approximately 1000LF from incised channel, similar to existing. Used same proportionality as existing.

Month	Runoff Volume (ac-ft)	Pan Evaporation Volume (ac-ft)	Exfiltration Volume (ac-ft)	Cumulative stored volume (ac-ft)	Estimated Stage (ft)	Estimated Surface Area at Stage (ac)	Volume at stage	Solver
September	0.000	0.000	0.000	0.000	0.01	0.000	0.0000	0.0000
October	0.013	0.002	0.010	0.000	0.15	0.004	0.0003	0.0000
November	0.033	0.003	0.028	0.002	0.44	0.011	0.0024	0.0000
December	0.052	0.003	0.046	0.006	0.70	0.017	0.0061	0.0000
January	0.072	0.004	0.063	0.011	0.96	0.024	0.0115	0.0000
February	0.069	0.006	0.061	0.013	1.03	0.026	0.0133	0.0000
March	0.046	0.008	0.045	0.006	0.69	0.017	0.0059	0.0000
April	0.023	0.006	0.022	0.001	0.34	0.008	0.0014	0.0000
May	0.006	0.002	0.005	0.000	0.08	0.002	0.0001	0.0000
June	0.000	0.0002	0.0003	0.000	0.01	0.000	0.0000	0.0000
July	0.000	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000
August	0.000	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000

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Silver Creek Ranch

Silver Creek Pond1

Watershed Area=	0.2	mi^2
=	128	acres
Assumed fraction of rainfall that will reach pond[4]=	0.005	
Pond soil NRCS unit symbol=	PkA	
Projected pond infiltration rate=	1.74	in/hr
Projected pond infiltration rate=	0.0435	in/hr

[4]Due to unknown specifics of the watershed, a conservative value that is roughly double that of the existing Valadeo Ranch pond was used.

Full Surface Area=	0.06	acres =	0.024	Ha
Full Depth Estimate=	4.00	ft	Full Vol Estimate=	0.120 ac-ft
Area x coeff=	0.015			
Volume x^2 coeff=	0.0075			

Month	Runoff Volume (ac-ft)	Pan Evaporation Volume (ac-ft)	Exfiltration Volume (ac-ft)	Cumulative stored volume (ac-ft)	Estimated Stage (ft)	Estimated Surface Area at Stage (ac)	Volume at stage	Solver
September	0.001	0.000	0.000	0.000	0.01	0.000	0.0000	0.0000
October	0.015	0.003	0.012	0.001	0.30	0.004	0.0007	0.0000
November	0.040	0.003	0.032	0.005	0.83	0.012	0.0052	0.0000
December	0.064	0.003	0.053	0.013	1.32	0.020	0.0130	0.0000
January	0.088	0.004	0.073	0.024	1.80	0.027	0.0243	0.0000
February	0.085	0.007	0.072	0.029	1.98	0.030	0.0295	0.0000
March	0.057	0.011	0.059	0.016	1.47	0.022	0.0161	0.0000
April	0.028	0.009	0.031	0.005	0.79	0.012	0.0047	0.0000
May	0.007	0.003	0.008	0.000	0.20	0.003	0.0003	0.0000
June	0.000	0.0002	0.0004	0.000	0.01	0.000	0.0000	0.0000
July	0.000	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000
August	0.000	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000

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