Genesis Solar, LLC
700 Universe Boulevard, Juno Beach, Florida 33408

DOCKET	
09-AFC-8	
DATE	DEC 15 2009
RECD.	DEC 15 2009

December 15, 2009

Ms. Melissa Jones
Executive Director
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512

Dear Ms. Jones,

Pursuant to the provisions of Title 20, California Code of Regulation, Genesis Solar LLC, a Delaware limited liability company, hereby submits the ***Genesis Solar Energy Project Application for Certification Data Request Responses to Set 1A .*** The Genesis Solar Energy Project is a 250 megawatt solar electric generating facility to be located between the community of Desert Center and the city of Blythe in eastern Riverside County, California.

These 227 responses were compiled in response to the Energy Commission's Genesis Solar Energy Project (09-AFC-8) Data Requests, Set 1A, dated November 13, 2009 and posted November 16, 2009. This document provides the additional information necessary to fulfill the Application for Certification data requests for the following technical areas:

- Air Quality
- Alternatives
- Biological Resources
- Geology and Paleontology
- Land Use
- Public Health
- Soil and Water Resources
- Waste Management
- Worker Safety and Fire Protection

If you have any questions, please contact Meg Russell at (561) 304-5609 or me at (561) 691-2889.

Sincerely,
Genesis Solar, LLC

Scott Busa
Director

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION FOR THE *GENESIS SOLAR ENERGY PROJECT*

Docket No. 09-AFC-8

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(Est. 11/30/09)

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<u>DECLARATION OF SERVICE</u>

I, ___________, declare that on _______, 2009, I served and filed copies of the attached __________, dated _______, 2009. The original document, filed with the Docket Unit, is accompanied by a copy of the most recent Proof of Service list, located on the web page for this project at:
[http://www.energy.ca.gov/sitingcases/genesis_solar].

The documents have been sent to both the other parties in this proceeding (as shown on the Proof of Service list) and to the Commission's Docket Unit, in the following manner:

(***Check all that Apply***)

<u>FOR SERVICE TO ALL OTHER PARTIES</u>:

_____ sent electronically to all email addresses on the Proof of Service list;

_____ by personal delivery or by depositing in the United States mail at ___________, with first-class postage thereon fully prepaid and addressed as provided on the Proof of Service list above to those addresses **NOT** marked "email preferred."

AND

<u>FOR FILING WITH THE ENERGY COMMISSION</u>:

_____ sending an original paper copy and one electronic copy, mailed and emailed respectively, to the address below (***preferred method***);

OR

_____ depositing in the mail an original and 12 paper copies, as follows:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. <u>09-AFC-8</u>
1516 Ninth Street, MS-4
Sacramento, CA 95814-5512
docket@energy.state.ca.us

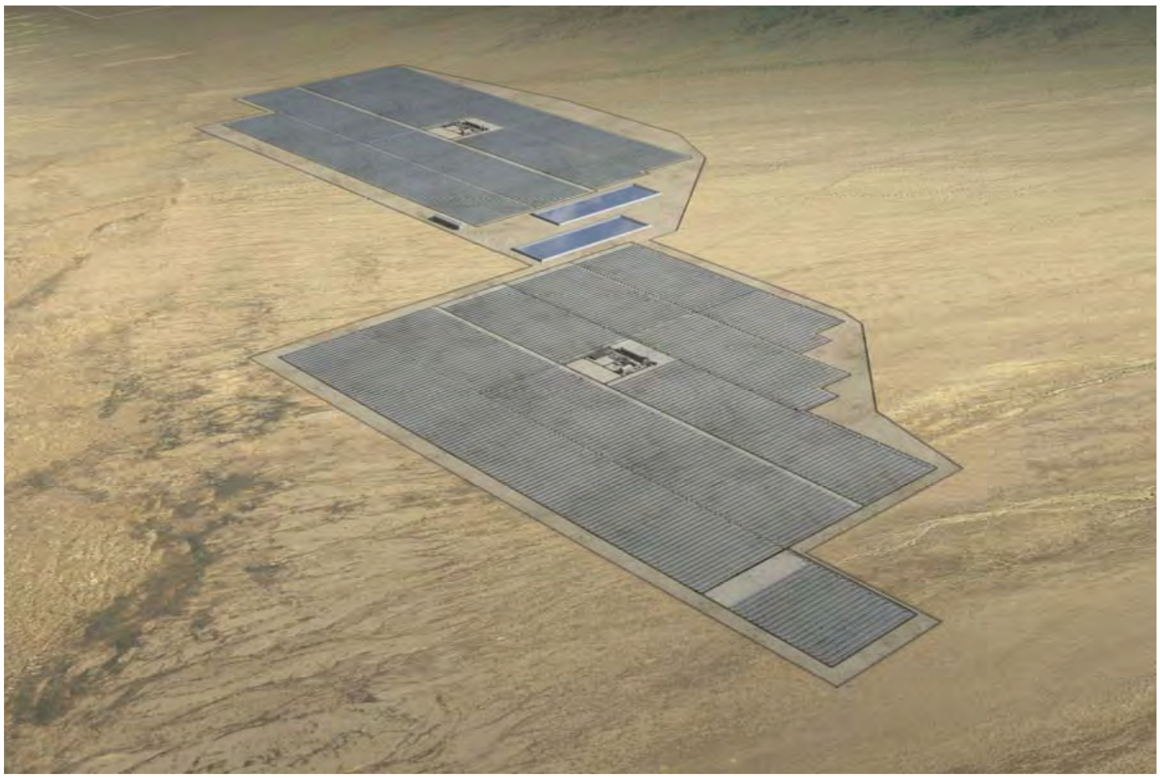
I declare under penalty of perjury that the foregoing is true and correct.

____

Genesis Solar Energy Project

DATA REQUESTS SET 1A (# 1-227)

(09-AFC-8)



Submitted to:

California Energy Commission

Submitted by:

Genesis Solar, LLC

December 14, 2009

Prepared by:

TETRA TECH EC, INC. | **WorleyParsons**

Air Quality

NOTE: There are numerous support files and tables referred to in these responses. These files are supplied in PDF format on the separately submitted CD.

Item 1:

Information Required:

Please describe the types of activities that emit combustion and fugitive dust emissions on the site currently and the quantities of those emissions that occur from those activities.

Response:

As stated in the Application for Certification (AFC) in the Air Quality Section, the proposed site is presently vacant with no emitting activities or sources of emissions other than naturally occurring emissions, i.e., wind-blown dust.

Item 2:

Information Required:

Please describe whether those activities will be permanently discontinued when the project is completed and estimate the reductions from the current onsite baseline emissions.

Response:

Since there are presently no emitting activities or sources on the site there will be no such activities to permanently discontinue. Naturally occurring emissions, such as wind-blown dust will continue to occur for those portions of the site with non-stabilized surfaces (see response #5 below).

Item 3:

Information Required:

Please review and correct the emission calculations to provide corrected worst case daily, annual and total construction period criteria pollutant and GHG emissions.

Response:

Revised construction emissions calculations and assumptions are attached per Tables K.1-7, K.5-5, K.5-6, and K.5-7.

Item 4:

Information Required:

Please defend the MRI level 2 fugitive dust emissions calculation approach and provide information that clearly shows that this emission estimation method does not significantly underestimate or overestimate emissions in comparison with a more detailed activity by activity based fugitive dust emission calculation approach.

Response:

(1) We are not aware of any guidance provided by the South Coast AQMD that indicates that the MRI Study is not appropriate for use. The SCAQMD CEQA

Handbook is undergoing revisions, but to date we have not seen any proposed or revised text which changes the existing handbook sections, methods, or procedures regarding fugitive dust emissions estimations from construction projects (see comments below on obsolete sections). Notwithstanding the foregoing, although the SCAQMD may no longer use the method or approach, this does not mean that it is invalid or barred from use by others in producing construction emissions estimates. The proposed project is in Riverside County (Mohave Desert AQMD), so the application of the method is not subject to any policy decisions made within and for the SCAQMD. We do note that all of the Fugitive Emissions Mitigations tables currently available from the SCAQMD rely upon the WRAP Fugitive Dust Handbook dated 9-7-06 (which we believe is the most recent version of this document), and that the WRAP Handbook (Chapter 3-Construction and Demolition) specifically relies upon the MRI study procedures and conclusions used in our analysis, i.e., (1) Improvement of Specific Emissions Factors-BACM #1, MRI, 3/96, (2) Estimating Particulate Matter Emissions from Construction Operations, USEPA, MRI, 9/99, and (3) MRI Report of 2005 which updates the PM2.5/PM10 ratios developed for WRAP. Additionally, we note that the current version of Urbemis (Ver 9.2.4), as well as earlier versions also rely solely upon the MRI BACM (3/96) report for calculating fugitive dust emissions. Urbemis is used, not only statewide in California, but in other states as well, and in numerous CEQA guidelines published by both planning and air quality jurisdictions within California, Urbemis is either required or strongly recommended for computing/estimating project construction fugitive dust emissions and other construction related emissions estimates.

Furthermore, we note the following:

a. A search of the SCAQMD website shows a total of 12 guidance documents available, none of which address any new guidance on fugitive dust emissions calculations.

b. The SCAQMD prepared the CEQA Air Quality Handbook in April 1993, and made minor revisions in November 1993. Copies of this handbook can be obtained by contacting AQMD's Subscription Services. The SCAQMD states:

   "While the Handbook is under revision, it is recommended that the lead agency follow the calculation methodologies in Chapter 9 and the Appendix to Chapter 9 in the Handbook. Other methodologies can be used as long as documentation is provided regarding the source and applicability to the project."

   Obsolete sections of the current Handbook are as follows:

"Lead agencies should also be aware that the on-road mobile source emission factors in Table A9-5-J1 through A9-5-L are obsolete. The most current on-road mobile source emission factors can be found at the California Air Resources Board (CARB) website.

The SCAQMD also recommends that the lead agency avoid using the screening tables in the Handbook's Chapter 6 for the following reasons:

1. The tables were derived using an obsolete version of CARB's mobile source emission factors inventory (EMFAC7E) instead of the currently approved version (EMFAC2007), and,
2. The trip generation characteristics of the land uses identified in the Chapter 6 screening tables were based on the fifth edition of the ITE Trip Generation Manual. The most current version of this manual is the sixth edition."

   No mention is made of the fugitive dust estimation methods in the handbook as being obsolete.

c. CEC staff indicates above that the MRI BACM method is no longer supported by SCAQMD, but yet the exact language from the SCAQMD website (see below, obtained on 11-18-09) clearly recommends the use of Urbemis, which is based upon the MRI BACM methodology, as noted in our earlier comments.

"The screening tables should no longer be used under any circumstances because they are based on obsolete mobile source emission factors and trip generation data. The reader should use the methodologies in the Appendix to Chapter 9 of the CEQA Air Quality Handbook or use a land use model, such as Urbemis. Other air quality analysis methodologies not in the CEQA Air Quality Handbook are acceptable as long as they are well documented, including source(s), assumptions, equations used, calculations, etc."

Therefore the method approach used by the Applicant to estimate fugitive dust emissions from construction activities is considered to be both sound and widely accepted.

(2) The MRI Level 2 analysis procedure was used to "estimate" fugitive particulate emissions from general construction activities. Per the WRAP Handbook, general construction activities include land clearing, drilling, blasting, ground excavation, cut and fill operations, as well as demolition and debris removal, site preparation (earth moving) activities, and other general construction activities. The Level 2 procedure expands upon the Level 1 analysis by further refining the emissions factor for general construction activities and adding an emissions factor and calculation procedure for cut and fill operations. These are exactly the types of construction activities proposed at the Genesis Solar Project site. The emissions factors presented in the WRAP Handbook (Table 3-2) for the Level 2 analysis procedure are: 0.011tons PM10/acre-month for general construction (for each

month of construction activity), and 0.059 tons PM10/1000 yd3 for cut and fill operations (onsite). Per the original BACM (MRI, 1996), the 0.011 tons/acre-month factor was based on an activity level of 168 hours per month. We note that the MRI report indicates that the South Coast AQMD uses a general Level 1 construction factor (worst-case) of 0.42 tons/acre-month, which is based upon detailed information developed in that air basin, and that CARB states this factor should be reduced to 0.11 tons PM10/acre-month for other areas of the state where the detailed data is not available. Per WRAP, the PM2.5/PM10 ratio for fugitive construction dust is 0.1, which results in the Level 2 factor of 0.011 tons PM10/acre-month. Therefore, the MRI Level 2 factors were used in the fugitive dust emissions estimates. The 0.011 ton PM10/acre-month value was linearly scaled up to a value of 0.0144 tons/PM10/acre-month to more accurately represent an emissions factor for the proposed project work period.

(3) Neither the project proponent or anyone else to our knowledge, is able to conclusively show that any chosen method for the computation of fugitive dust emissions from construction activities significantly under or over-estimates such emissions. The method chosen is both technically justified and approved for use via a number of references as noted above.

Item 5:

Information Required:

Please identify the increase or decrease in non-stabilized disturbed land within the project site during operation and estimate the corresponding increase in wind erosion fugitive dust emissions at the site.

Response:

The existing site is vacant desert land and is therefore subject to non-anthropogenic wind-blown dust generation. The proposed facility will result in a majority of the site being graded and compacted, with portions of the site surface being paved or graveled, or stabilized through the use of soil stabilizer treatments. This will essentially decrease the surface area available to wind-blown dust generation. The existing undeveloped site is approximately 1800 acres. Subsequent to construction, approximately 60 acres will be paved or graveled (power blocks, access roads, transmission substation, evaporation ponds, etc). Approximately 30 acres of roadways in the solar fields will be stabilized via compaction and soil treatments. In addition, the mirror access ways will be compacted and treated with soil stabilizers. This will result in a significant decrease in acres of non-stabilized land, which will result in an overall decrease in anthropogenic wind-blown dust fugitive emissions.

Item 6:

Information Required:

Please provide data to obtain an estimate of the actual surface silt content at the site, which can be from the geotechnical report not submitted as part of the AFC.

Response:

The construction estimates presented in the AFC, which relied upon soil silt content, were made without the benefit of the site geotechnical report. These estimates have been revised to reflect the geotechnical report data.

- Data presented in the geotechnical report indicates a site wide soil silt value of 16%. This value has been used where applicable in revising the fugitive dust emissions for construction and operations (See revised Tables K.1-7, K.5-5, K.5-6, and K.5-7).

Item 7:

Information Required:

Please identify if the applicant is willing to stipulate to graveling the onsite unpaved roads during construction before they are sealed to reduce the silt loading, or provide surface soils sieve data that shows that the 5.3 percent silt content assumption is representative of the site.

Response:

Soil silt content data has been revised per the site geotechnical report (see response #6). We are unable to make the connection between staff's comment to stipulate to graveling construction roads "before they are sealed", to how this relates to on-site unpaved road use during the construction phase. The use of, and emissions from, any unpaved roads onsite during construction is covered in the site fugitive dust emissions estimate as discussed in response #4.

Item 8:

Information Required:

Please update the construction fugitive dust emissions calculations as appropriate based on the site specific surface silt content estimate.

Response:

Construction emissions have been revised. See Tables K.5-5, K.5-6, and K.5-7.

Item 9:

Information Required:

Please revise the operations fugitive dust emission calculations based on the site specific surface silt content estimate and to reflect the Energy Commission staff recommended operations mitigation measure of stabilizing the onsite unpaved roads using durable non-toxic soil binders.

Response:

See response #6. Table K.1-7 has been revised to reflect the soil silt content per the site-specific geotechnical report. Use of watering, speed control, and soil stabilizers is assumed for the solar field access roads and mirror access pathways.

Item 10:

Information Required:

Please provide the electronic versions of the emission spreadsheets with the embedded calculations.

Response:

The data spreadsheets are supplied in PDF format on a CD. The calculations within each spreadsheet can be easily followed and are readily confirmable.

Item 11:

Information Required:

Please identify the units for the values provided in the “Monthly Number” columns in Table C.5-6, page 2. Please note that using the apparent meaning of the column, staff cannot match the total horsepower hours calculated for each equipment type.

Response:

The “monthly number” is simply the number of category specific units anticipated to be on site each day of each month for the period noted. The total hp-hrs for any category is simply the result of multiplying the number of units, by the hours per day/per unit, by the days on site per month, by the unit hp. A cell reference (referring to the days per month of construction) in the calculation has been corrected and the correct “hp-hr” values are now displayed in the revised tables (K.5-5, K.5-6, and K.5-7).

Item 12:

Information Required:

Please provide the original equipment estimates provided by the applicant to the applicant’s air quality consultant.

Response:

The original and recently updated equipment list and usage estimates provided by the Applicant to the consultant staff are delineated in revised Tables K.5-6 and K.5-7 (attached).

Item 13:

Information Required:

Please re-evaluate the off-road equipment schedule to provide a corrected worst-case, not average case, daily onsite emissions estimate.

Response:

The Applicant has provided revised construction equipment data (see revised Tables K.5-5, K.5-6, and K.5-7 attached for the revised data and resultant emissions estimates). Table K.5-5 (Construction Equipment Exhaust Emissions) indicates the estimated average daily and estimated maximum daily exhaust emissions values. The construction emissions summary table in response #19 provides the Applicant's best estimate of worst case daily emissions for the various phases of construction.

Item 14:

Information Required:

Please describe how the trip distance assumptions for construction were determined for each vehicle type/use. Please note that staff believes the trip lengths for the delivery vehicles and construction employee vehicles/buses to be underestimated as it seems unlikely that Blythe would be the origination point for major equipment items (SCAs, structural steel, etc.). It seems unlikely that Blythe has the population base to staff the hundreds of construction employees necessary to complete construction on this remote project site.

Response:

Table K.5-6 (original and updated versions) clearly indicates the types of vehicles, numbers of vehicles, and estimated mileages for vehicles proposed for construction support activities. Vehicle mileages are based on either: (1) a one-way trip length of 30 miles from the Blythe urban area (which includes the Blythe rail yard site), or (2) the Applicant's best estimate of mileage rates per vehicle category and anticipated use during construction. For equipment mileages based on one way distances from Blythe to the site, the following assumptions apply:

- The delivery and site support vehicles will not be owned by the project Applicant, nor will they be dedicated to the construction project.
- The project Applicant has no control over the use of these vehicles in back-haul mode.
- The 30-mile one-way distance is conservative, since a majority of the Blythe urban area, as well as the Blythe rail yard, are less than 30 miles from the project site.

Additional General Comment: The Applicant is satisfied that the Blythe regional area can supply all the required construction materials, and that there is a sufficient labor force in the area to accommodate facility construction. See the Socioeconomic Section 5.8 of the AFC for further discussion of labor issues, etc.

Item 15:

Information Required:

For each of the construction materials delivery/waste removal truck trip types, please provide the following information:

a. The types and quantities of construction materials delivered to the site and wastes hauled from the site,
b. The types of delivery trucks that will be used to deliver these materials,
c. The number of delivery trucks on a daily basis for each of these materials, and

d. The number of miles traveled roundtrip daily for each vehicle for each of these materials.

Response:

a. The types and quantities of construction materials delivered to the site and wastes hauled from the site,

Response:

The Applicant is uncertain as to how this request affects the construction phase or resultant emissions. Nonetheless, materials commonly delivered during construction would be generally as follows: (1) concrete for foundations, structure erection, and solar field supports, (2) building materials for structure construction, power block and solar field system components, (3) road paving or gravelling materials, etc. Any wastes hauled from the site during construction activities are discussed in detail in the Hazardous Materials and/or Waste Management sections of the AFC.

b. The types of delivery trucks that will be used to deliver these materials,

Response:

Tables K.5-5 and K.5-6 (original and updated versions) clearly indicate the types of vehicles to be used to support construction, including site deliveries.

c. The number of delivery trucks on a daily basis for each of these materials, and,

Response:

Table K.5-6 (original and updated versions) clearly delineates the estimated numbers of vehicles on site for any given month/day during the construction period for deliveries, etc. Mileages are also delineated on this table. Mileages are not broken out by material as such a breakout has no bearing on miles traveled or emissions.

d. The number of miles traveled roundtrip daily for each vehicle for each of these materials.

Response:

See response to data request #14. In addition, the project Applicant does not believe that they are responsible for tabulating mileage and estimating emissions for support or delivery vehicles in the entirety of Riverside County (MDAQMD portion). The Applicant will purchase construction materials and supplies from the Blythe urban/regional area. How those supplies arrive at the businesses from which they are purchased is not the responsibility of, or controlled by, the Applicant. Nor do the emissions from transport of wholesale or retail supplies to the various local or regional suppliers have anything to do with the project emissions.

Item 16:

Information Required:

Please indicate if construction employee busing will be proposed, and if so include the personal vehicle trip mileage, necessary for construction employees to get to the assumed “park and ride” locations in the construction emission estimate.

Response:

Busing is not proposed at this time.

Item 17:

Information Required:

Please estimate:

a. on-site whole roundtrip travel including unpaved road travel and corresponding emissions for all on-road construction vehicles, including heavy duty delivery trucks, light service and delivery trucks, personal vehicles and buses, etc. necessary to complete the construction activities throughout the project site. I

b. if the unpaved road travel increases the overall on-road vehicle travel lengths then also please estimate the additional on-site tailpipe emissions from these vehicles.

Response:

The emissions from on-site road use during construction is included in the overall site fugitive dust and equipment exhaust calculations presented in Table K.5-5 for the various phases of project construction, i.e., rough grading and site preparation, finish grading, power block erection, and solar field erection (See response to data request #4). Emissions from delivery vehicles, light duty support vehicles, and worker vehicles are also included in Table K.5-5.

Item 18:

Information Required:

Based on any revisions in the calculations of vehicle types, number of vehicles and vehicle miles traveled for the above data requests, please provide the revised criteria pollutant and GHG emissions associated with these vehicle emissions.

Response:

Criteria pollutant and GHG emissions estimates for all phases of construction have been revised and are presented in Table K.5-5.

Item 19:

Information Required:

Please provide rationale why the locations for the volume and area source emission inputs do not change from short-term to annual modeling, or please provide annual construction modeling that matches the extent of annual construction activities.

Response:

The table which follows (Table 1) presents the revised construction impact modeling results which matches the extent of the annual construction activities along with the revised emission estimates.

Table 1. Revised Modeled Maximum Construction Impacts

Pollutant	Averaging Time	Maximum Construction Impacts (μg/m^3)	Background (μg/m^3)	Total Impact (μg/m^3)	State Standard (μg/m^3)	Federal Standard (μg/m^3)
NO_2[a]	1-hour	84.1	149	233.1	339	-
	Annual	0.34	38	38.3	57	100
SO_2	1-hour	0.09	47.2	47.3	655	-
	3-hour	0.06	31.2	31.3	-	1300
	24-hour	0.02	13.1	13.1	105	365
	Annual	<0.001	2.7	2.7	-	80
CO	1-hour	41.6	2530	2572	23,000	40,000
	8-hour	10.8	1789	1800	10,000	10,000
PM_{10}	24-hour	45.0	88	133	50	150
	Annual[b]	0.47	31.0	31.5	20	-
$PM_{2.5}$	24-hour	9.5	28.0	37.5	-	35
	Annual[b]	0.11	10.4	10.5	12	15.0

Notes:
[a]ARM applied for annual average, using national default 0.75 ratio.
[b]Annual Arithmetic Mean.

The following table (Table 2) presents a revised summary of construction related emissions per the above data responses. The enclosed CD contains copies of all of the modeling input, output, and support files.

Table 2. Construction Related Emissions Summary

Parameter	Units	NOx	CO	VOC	SOx	PM10	PM2.5	CO2e
On Site Fugitive Dust-Main Site	Lbs/day	-	-	-	-	203.4	42.7	n/a
	Tons/Period	-	-	-	-	28.1	5.9	-
Off Site Fugitive Dust-Gas Line	Lbs/day	-	-	-	-	1.2	0.2	n/a
	Tons/Period	-	-	-	-	0.1	0.01	-
Off Site Fugitive Dust-Access Road	Lbs/day	-	-	-	-	1.0	0.2	n/a
	Tons/Period	-	-	-	-	0.031	0.006	-
Off Site Fugitive Dust-T-Line	Lbs/day	-	-	-	-	1.2	0.2	n/a
	Tons/Period	-	-	-	-	0.1	0.01	-
On Site Equipment Exhaust-Main Site	Lbs/day	269.5	133.2	43.0	0.29	15.34	15.2	n/a
	Tons/Period	109.7	54.2	17.5	0.12	6.24	6.19	26158
Off Site Equipment Exhaust-Gas Line	Lbs/day	105.7	60.9	17.9	0.12	6.48	6.42	n/a
	Tons/Period	5.8	3.3	1.0	0.007	0.36	0.35	1678
Off Site Equipment Exhaust-Access Road	Lbs/day	76.6	38.2	11.3	0.08	5.16	5.11	n/a
	Tons/Period	2.5	1.3	0.4	0.003	0.17	0.17	613
Off Site Equipment Exhaust-T-Line	Lbs/day	68.8	36.1	10.9	0.08	4.05	4.02	n/a
	Tons/Period	4.5	2.4	0.7	0.005	0.27	0.27	1287
Other Off Site Construction Emissions	Averages							
Paved Road Dust	Lbs/day	-	-	-	-	21.9	3.7	n/a
	Tons/Period	-	-	-	-	8.19	1.38	-
Track-out Dust	Lbs/day	-	-	-	-	7.82	1.32	n/a
	Tons/Period	-	-	-	-	2.92	0.5	-
Unpaved Road Dust	Lbs/day	-	-	-	-	197.06	19.61	n/a
	Tons/Period	-	-	-	-	6.5	0.65	-
Delivery/Hauling Exhaust	Lbs/day	34.0	24.8	3.61	0.056	1.55	1.54	n/a
	Tons/Period	13.8	10.1	1.47	0.023	0.63	0.62	2248
Worker Travel-Exhaust	Lbs/day	25.5	254.9	21.2	0.23	2.07	2.06	n/a
	Tons/Period	10.4	103.7	8.6	0.1	0.8	0.8	20959

Notes:

1. Daily maximum emissions for equipment exhaust can be found on Table K.5-5. Daily average emissions are presented here as they represent site activity and emissions levels over the course of the project.
2. CO2e emissions are calculated and totaled on Table K.5-5.

Based upon the Applicant’s best estimate, the maximum daily onsite emissions will occur as follows:

1. Fugitive dust emissions will be the greatest during months 1-6 when the main site is being graded, leveled, and cut and fill activities are occurring.
2. Exhaust emissions will most likely peak during the site preparation phase, but may show another peak during the main facility erection phase as well.

Table 3. Estimated Maximum Daily Onsite Emissions (lbs/day)

Month	Category	NOx	CO	VOC	SOx	PM10	PM2.5
1-6	Fugitive Dust	-	-	-	-	203.4	42.7
1-6 or 7-37	Exhaust	445.8	220.3	71.2	0.5	25.4	25.1

Item 20:

Information Required:

Please describe the assumptions used to determine the number of operating maintenance vehicles, maintenance schedule and their daily paved and unpaved vehicle miles traveled.

Response:

Table K.1-7 and the Support table which accompanies it clearly delineates the numbers, types, use areas, mileages, and fuels to be used in the on-site operations vehicles. These data were supplied by the Applicant based upon their judgment and knowledge of anticipated site operations. These tables have been slightly revised and are included as attachments to this response.

Item 21:

Information Required:

Please describe in detail the specific design of the diesel-fueled SCA cleaning trucks that will be used to clean the SCAs. Describe whether water will be towed behind the vehicle or whether the trucks will carry the water and the cleaning apparatus equipment will be attached to the water tanks on the vehicles.

Response:

The Applicant is uncertain as to why the design of the SCA cleaning vehicles has any bearing on project impacts. The trucks (used for normal washes) are presently anticipated to be diesel powered, 2-3 axles depending upon the wash-water tank capacity. The tractors with water wagons (used for mechanical washes) are anticipated to be small diesel tractors as noted on Table K.1-7 and the support table. The support table for Table K.1-7 presents the use rate, mileages, fuel type, etc., for these trucks and tractors. Table K.1-7 presents the estimated emissions for these, and all other anticipated on-site operations vehicles.

Item 22:

Information Required:

Please describe the SCA washing requirements including:

a. How the SCAs are washed, both for normal and mechanical washes;
b. Time of day for washing;
c. How long it takes each SCA row, or other specified length of SCA, to be washed;
d. The amount of SCAs that can be washed per hour or shift for each mirror washing tanker truck crew;
e. The size of each wash crew; and
f. The assumed frequency for SCA washing and the basis for this frequency.

Response:

a. How the SCAs are washed, both for normal and mechanical washes;

Response:

At present, the Applicant believes the trucks used for the SCA cleaning (normal wash) activities will be integrated vehicles, i.e., the truck frame will incorporate the water storage tank and cleaning assemblies, etc. A typical wash truck configuration is presented in the picture below. For normal washes, the opposing mirror set is rotated to a facing position, allowing the wash truck to wash two rows of mirrors at once.

For mechanical washes, a small tractor pulling a water wagon and wash equipment will be used. Mechanical washes concentrate on specific areas of mirrors which required additional cleaning above and beyond a normal wash cycle.

b. Time of day for washing;

Response:

SCA washing will occur during non-power production hours. It is presently anticipated that washing will occur during the night-time hours (most likely between the hours of 8:00 pm and 6:00 am).

c. How long it takes each SCA row, or other specified length of SCA, to be washed;

Response:

The Applicant estimates that the SCA wash trucks/tractors will proceed through the dual mirror row wash configuration (see picture above) at a rate of approximately 2 mph (which may vary). This wash rate (truck or tractor speed) will result in approximately 16 lineal miles of mirrors being washed in a typical 8-10 hour period depending on travel speed.

d. The amount of SCAs that can be washed per hour or shift for each mirror washing tanker truck crew;

Response:

See response above.

e. The size of each wash crew; and

Response:

A wash crew will consist of 1 to 2 persons per SCA wash vehicle, with multiple vehicles operating as needed.

f. The assumed frequency for SCA washing and the basis for this frequency.

Response:

Determining the wash frequency will be a site by site process, and will involve the collection of data on SCA reflectivity, decrease in reflectivity due to materials deposited on the SCA surfaces, restoration of reflectivity due to cleaning, wind patterns and wind speeds in the area, seasonal weather patterns, etc. It is estimated that the mechanical wash effort will begin in May, one month prior to the peak generation period and continue through the month following it. This will bring the general mirror cleanliness up as much as possible prior to the peak months, and washing during the following month will increase the reflectivity values as the plant enters the winter period. Normal wash truck activity will continue throughout the course of the year depending upon operator availability. Once the site becomes operational, the Applicant will be better prepared to define and implement the SCA cleaning cycle. Notwithstanding the above, the Applicant has estimated that the worst case wash cycle would be approximately every 2 weeks during the peak power production season.

Item 23:

Information Required:

Please revise the emissions calculations for the onsite dedicated vehicle exhaust emissions assuming only new model year vehicles are used.

Response:

The Applicant wishes to point out that the maintenance vehicles will meet all applicable on and off-road emissions standards as imposed by CARB and EPA, therefore the vehicles emissions are not “unmitigated”. The total emissions from onsite (on-road and off-road) vehicles used to support operations and maintenance are conservatively estimated to be as follows (based on a vehicle population mix for years 1970-2014):

- Less than 0.8 tpy of NOx
- Less than 0.65 tpy of CO
- Less than 0.12 tpy of VOC
- Less than 0.03 tpy of $PM_{10/2.5}$
- Less than 0.0011 tpy of SOx
- Less than 122 tpy of CO2e

The Applicant concludes that these emissions levels generated by operational and maintenance support vehicles are insignificant, and in the context of a 250 MW generation facility when compared to the operational emissions of a similar sized thermal power plant, results in a significant decrease in operational emissions (on a total operational facility basis).

Notwithstanding the above, revised Table K.1-7 reflects the use of only new model year vehicles for onsite use. The new model year was assumed to be 2013-2014. New model year factors were not applied to the onsite offroad equipment such as the crane, forklift, and welding truck as the annual VMT from these vehicles is approximately 3% of the total annual VMT.

Item 24:

Information Required:

Please identify if the applicant would be willing to stipulate to a condition of certification that would require a review of available alternative low-emission vehicle technologies. This condition would include electric and hydrogen fueled vehicles, and use of those technologies to replace the proposed diesel and gasoline fueled vehicles used for operations maintenance if lower emission alternative technology vehicles are both available and not cost prohibitive.

Response:

The Applicant has no objection to a condition of certification that would require a “review of available alternative low-emission vehicle technologies, including electric and hydrogen fueled vehicles". Presently the Applicant believes there are no such vehicles which could be used to replace a majority of the proposed onsite on and off-road vehicles.

Item 25:

Information Required:

Please estimate the whole roundtrip travel including any onsite unpaved road travel and corresponding criteria pollutant and GHG emissions for all offsite operational vehicle trips, including heavy duty delivery and waste haul trucks, light service and delivery trucks, and employee personal vehicles.

Response:

Table K.1-7 and the Support table which accompanies it, provides detailed estimates of onsite vehicle use, annual mileage rates, and a breakdown of onsite travel on paved versus unpaved roads.

Per the Traffic and Transportation section of the AFC (Section 5.11), the Applicant estimates that the offsite facility vehicle travel during the operations phase will be derived from delivery vehicles, with an average of 44 deliveries per month, or 1.47 deliveries per day. These deliveries and hauls will be made by vehicles and service providers not under the control of the facility. Therefore, the Applicant cannot estimate the mileages solely applicable to our site. It is estimated and assumed that deliveries to the site will be part of a normal or day specific delivery route that is controlled by the service provider, and as such the Applicant has no way of breaking out any mileage values that would be specifically allocated to the project site. In addition, we note that these emissions are not included in an applicability analysis for imposition of NSR or PSD, nor are they included in the stationary source emissions tabulation for purposes of determining offset requirements per the MDAQMD rules, etc. The emissions from operations deliveries are presented in Table K.5-5 (Truck Delivery and Site Support page, see response #26).

Item 26:

Information Required:

Please provide rationale for the round trip distances selected for each trip type.

Response:

Round trip distances and emissions for this category of vehicle (response #25) use are based on the following assumptions:

- Forty-four deliveries per average operations month
- Roundtrip distance of 20 miles assuming use of the plant access road for all delivery ingress and egress. The Applicant, as stated above, cannot estimate any further mileage distances due to the following: (1) the Applicant does not own or control the delivery vehicle, (2) the Applicant does not control the daily delivery vehicle route either before or after it leaves the facility, (3) the Applicant has no control over the vehicle back-haul schedule, and (4) the delivery vehicles will not

be owned by or dedicated to the site. Therefore, the 20-mile trip distance is the most reasonable and defendable value at the present time.

- Annual mileage from these deliveries will be 10,560 VMT. Fifty percent or 5280 VMT will be allocated to gasoline vehicles, and 50% or 5280 VMT will be allocated to diesel vehicles. The emissions from operations deliveries are presented in Table K.5-5 (Truck Delivery and Site Support page).
- Employee commute emissions and assumptions are provided on the Support table to Table K.1-7. Employee commute related emissions are as follows:

Table 4. Employee Commute Emissions Summary

Pollutant	Lbs/day	Tons/yr
NOx	1.82	0.33
CO	18.15	3.31
VOC	1.51	0.28
SOx	0.02	0.003
PM10	0.15	0.027
PM2.5	0.15	0.027
CO2e	1492.3	272.3

Item 27:

Information Required:

Please provide a revised operations modeling analysis, which includes all on-site operations emission sources including the facility operations maintenance emissions and fugitive dust emissions. When providing this response, please account for any revisions to the onsite operation emissions determined through the response to the other air quality data requests.

Response:

Revised modeling was performed to include all on-site operations emission sources including the facility operations maintenance emissions and fugitive dust emissions as well as any revisions to the onsite operation emissions determined through the response to the other air quality data requests. The revised modeling input and output files, as well as the impact summary are provided on the enclosed CD.

The table which follows (Table 5) presents a summary of the updated operational related emissions as revised per the data responses herein. The emissions totals include the following operations phase equipment or systems: (1) HTF system boilers, (2) HTF system VOC, (3) cooling towers, (4) stationary IC engines, (5) onsite mobile equipment, and (6) onsite fugitive dust due to operations.

Table 5. Summary of Facility Operational Emissions for the Project

Pollutant	lbs/hr	lbs/day	tons/year
Onsite Stationary Equipment			
NO_x	15.22	23.8	1.03
CO	1.51	16.2	0.322
VOCs	4.17	43.47	7.5
SO_x	0.03	0.234	0.0052
PM_{10}	2.71	39.71	3.86
$PM_{2.5}$	2.71	39.71	3.86
CO2e	-	-	3621
Onsite Mobile Equipment			
NO_x	-	1.99	0.363
CO	-	1.35	0.246
VOCs	-	0.3	0.055
SO_x	-	0.011	0.002
PM_{10}	-	0.142	0.026
$PM_{2.5}$	-	0.142	0.026
CO2e	-	1127.7	205.81
Onsite Fugitive Dust			
PM_{10}	-	156.3	28.5
$PM_{2.5}$	-	33.1	6.0

The engines will not run in the same hour or on the same day. Lbs/hr and lbs/day are based upon the maximum single engine emissions.

Onsite mobile equipment exhaust emissions are not subject to NSR or PSD rule applicability inclusion, nor are they subject to the MDAQMD NSR rule offset provisions.

Onsite fugitive dust emissions generated by onsite mobile equipment are not subject to NSR or PSD rule applicability inclusion, nor are they subject to the MDAQMD NSR rule offset provisions.

Offsite mobile emissions such as employee commute and delivery emissions are not included.

The table which follows (Table 6) presents the revised operations impact modeling results based upon the responses herein.

Table 6. Revised Air Quality Impact Summary for Normal Operating Conditions

Pollutant	Avg. Period	Maximum Concentration ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total ($\mu g/m^3$)	Class II Significance Level ($\mu g/m^3$)	SIL ($\mu g/m^3$)	Ambient Air Quality CAAQS/NAAQS	
							($\mu g/m^3$)	($\mu g/m^3$)
NO_2	1-hr	189.9	149	338.9	-	19	339	-
	Annual	0.064	38.0	38.06	1	1	57	100
PM_{10}	24-hr	15.9	88	103.9	5	5	50	150
	Annual	4.3	31.0	35.3	1	1	20	-
$PM_{2.5}$	24- hr	3.4	28	31.4	5	5	-	35
	Annual	0.9	10.4	11.3	1	1	12	15.0
CO	1- hr	12.3	2530	2542	2000	2000	23,000	40,000
	8- hr	2.5	1789	1789	500	500	10,000	10,000
SO_2	1- hr	0.184	47.2	47.4	-	-	655	-
	3- hr	0.102	31.2	31.3	25	25		1,300
	24- hr	0.008	13.1	13.11	5	5	105	365
	Annual	0.0003	2.7	2.7	1	1	-	80

As with the previous modeling analyses, total impacts are less than ambient air quality standards (AAQS) except when background concentrations already exceed the AAQS (California PM10 standards). Except for PM10, all facility-only impacts are less than the Class II Significance Levels. PM10 impacts exceed the Class II Significance Levels only because of the inclusion of onsite mobile equipment and fugitive dust emissions, which are not normally subject to NSR modeling analysis for multisource modeling applicability. Without onsite mobile equipment and fugitive dust emissions, maximum PM10 impacts are 0.35 and 0.03 ug/m^3 for comparison to the 24-hour and annual Class II Significance Levels, respectively (the original PM10 modeling analyses without the onsite mobile equipment and fugitive dust emissions were already submitted to the MDAQMD). The enclosed CD contains copies of all of the modeling input, output, and support files.

Item 28:

Information Required:

Please provide a description of all activities that will take place on the portion of the project site located within SCAQMD jurisdiction.

Response:

There are no plans for any construction or operational activities on the western portion of the requested Bureau of Land Management (BLM) right-of-way (ROW) which is shown on Figure 3.2-2 in the AFC (Project Description) which lies within the South Coast AQMD. At this time, this portion of the requested ROW will remain as a part of the BLM land/ROW filing until such time that all plans are confirmed for the location of the ROW and linear corridor. Once it is confirmed that the project is permitted and approved as described in the AFC, Genesis Solar, LLC will consider reducing the ROW size to the actual area needed for the immediate project.

Item 29:

Information Required:

Provide a list of SCAQMD rules and regulations that may apply to the project due to the activities proposed within SCAQMD jurisdiction.

Response:

Not applicable, see response to Item 28.

Item 30:

Information Required:

Please clarify if any equipment during construction or operation would require SCAQMD permits.

Response:

Not applicable, see response to Item 28.

Item 31:

Information Required:

Please confirm that:

a. 1,000 hours of operation is sufficient for both startup support and HTF freeze protection.

b. Alternatively, note whether the actual operation will be more than 1,000 hours, such as operating more hours at reduced loads so the total boiler use would be equivalent to 1,000 hours at full load.

c. Confirm that emissions will be limited to the equivalent emissions for 1,000 hours at full load.

Response:

As stated in the Air Section text as well as the Air Quality Appendix K.1, the HTF auxiliary heaters (boilers) will operate up to 14 hrs/day, and 1000 hrs/year. The emissions as calculated reflect this proposed operations scenario, i.e., full load at 30 mmbtu/hr each.

Boiler emissions remain unchanged as follows: (2 boiler totals)

Table 7. Boiler Emissions

Pollutant	Lbs/hr	Lbs/day	Tons/yr
NOx	0.661	9.25	0.165
CO	1.13	15.8	0.282
VOC	0.176	2.46	0.044
SOx	0.016	0.224	0.004
PM10	0.299	4.19	0.0749
PM2.5	0.299	4.19	0.0749
CO2e	-	-	3520

Item 32:

Information Required:

Please identify whether the Applicant is willing to stipulate to the incorporation of a carbon adsorption, or other VOC control system, to control VOC emissions from the HTF expansion system venting by at least 98 percent.

Response:

The Applicant has chosen to use a carbon adsorption system for the final control of VOCs from the HTF ullage system per the BACT discussion below. The system is anticipated to result in 99% control of VOCs. Nitrogen blanketing will also be used on the various HTF storage tanks per the original facility design. A brief discussion of BACT options considered by the Applicant follows.

BACT Options:

Carbon Adsorption: Carbon adsorption is where a gas stream passes through a bed of activated carbon. Vapor phase activated carbon is a proven technology and very successfully used for the removal of volatile organic compounds such as hydrocarbons, toxic gases, etc. Activated carbon adsorption vapor recovery units utilize the carbon's ability to preferentially adsorb certain molecules from gaseous mixtures. Activated carbon, with its highly porous structure and vast surface area, adsorbs hydrocarbons from the vapors generating source. The hydrocarbon molecules are adsorbed onto the carbon surface and are retained there until the regeneration step. Adsorption of the hydrocarbon molecules proceeds until the available surface area of the carbon is filled or saturated with the hydrocarbon molecules. The exhausted carbon bed is sent offsite for regeneration. Capture control efficiency is as high as 95 to 99% depending upon the number of carbon beds used.

Solvent Vapor Adsorption: Solvent vapor adsorption is an application where the VOC containing gas is bubbled through an organic solvent which "accepts" the VOC in the gas stream. HTF saturated vent stream from the HTF storage tank could be percolated through a drum or container containing high boiling mineral oil (solvent). HTF's solubility in mineral oil is very high. Once the oil becomes saturated it is disposed of as a hazardous waste, or the VOCs are then released from the solvent by heat and a partial vacuum. Subsequently, they can then be condensed at a much higher temperature than the refrigerated method in the absence of large amounts of inerts. The control efficiency is as high as 98%. This control option has been rejected in favor of carbon adsorption as it is difficult to predict the saturation conditions precisely and disposal logistics.

Refrigerated or Water Cooled Condenser: Refrigerated vapor condensation employs condensation at very low temperatures. Due to the high cost of refrigeration, this option is usually reserved for expensive solvents whose recovery can justify the high operating costs.

Thermal/Catalytic Oxidizers: These are essentially incinerators that thermally or catalytically convert pollutant-laden emissions into carbon dioxide and water vapor. The oxidation process typically achieves better than 99% destruction/removal efficiency levels for VOCs, hazardous air pollutants (HAPS) and odors. Thermal oxidation is a high temperature combustion process operating at approx 1400ºF to 1800ºF. Catalytic incinerators can save on fuel costs by destroying VOC on a catalyst's surface at 800 ^{0}F. With similar capital costs, the extra expense is usually in the catalysts. Thermal/catalytic oxidizers are generally the most expensive technology and require parasitic load and additional fuel consumption which generate VOCs and NO_x emissions.

Thermal/catalytic oxidizers are good for high concentrations of VOC levels and continuous loads. Since the HTF venting is not a continuous process, thermal/catalytic oxidizers were rejected as a viable and cost-effective control option.

BACT Option Chosen:

Based on the above BACT option analysis the project will design, install, and operate a carbon adsorption system where the residual uncondensed HTF, benzene and phenol along with nitrogen will pass through carbon towers. Activated carbon will capture the uncondensed HTF and low boilers like benzene and phenol which are products of HTF degradation. Exhausted carbon will be regenerated off site.

Data prepared by the project engineer using the Aspen Plus Model (Version 2006.5) indicates the degradation products from the ullage system off-gas will be as follows:

- Benzene will comprise ~89.9% (wt) of total VOC emissions.
- Phenol will comprise ~9.8% (wt) of total VOC emissions.
- Other VOCs will comprise ~0.3% (wt) of total VOC emissions.

For the breakdown of HAPs in the solar field components, the MSDS sheet states that the decomposition products of benzene and phenol occur in “trace amounts”. For purposes of calculating the HAPs emissions from the component fugitives in the solar field, a value of 5% by wt of total VOCs of each compound was used as an upper limit representative of a “trace amount” (see Response #141 under Public Health).

Emissions Summary

Therefore, the HTF tanking and venting system will result in VOC emissions on the order of approximately 0.17 lbs/hr, 1.48 lbs/day, 540 lbs/year, or 0.27 tpy for a single power block. VOC emissions for two power blocks would be approximately 0.34 lbs/hr, 2.95 lbs/day, 1080 lbs/yr, or 0.54 tpy.

Waste hauling (total load-out emissions for the 250 MW facility) will be approximately 0.0013 lbs/hr, 0.0013 lbs/day, 0.0157 lbs/yr, or 7.84E-6 tpy. These emissions are based on the following data and assumptions:

a. 12 facility load-outs per year (1 per month) maximum.
b. 2 hours per load-out (1 hour at each power block). The actual load-out pumping or transfer time will be less than an hour, but an hour was used as the basic emissions period.
c. VOC emissions loss rate is ~0.0013 lbs/hr (based upon the haul truck evacuated vapor space volume and the VOC concentration in the vapor per facility load-out).
d. HTF VOC fugitive emissions from valves, flanges, pumps, seals, etc., will be 3.35 lbs/hr, 37.76 lbs/day, 13781.6 lbs/year, or 6.89 tpy, based on the data and assumptions in the attached VOC Component Emissions spreadsheet.

Table 7. Summary of the Revised Estimated HTF System VOC Emissions

HTF Component	Lbs/hr	Lbs/Day	Lbs/Yr	TPY
Tanks/Venting	0.34	2.95	1080	0.54
Fugitives	3.35	37.76	13781.6	6.89
Waste Load Out	0.0013	0.0013	0.0157	7.84E-6
Total VOC	***3.69***	***40.71***	***14,862***	***7.43***

Item 33:

Information Required:

Please estimate the HTF fugitive VOC emissions, including providing a piping component count.

Response:

See response #32 above. The 250 MW facility-wide component count is as follows:

- 5000 valves – light liquid service
- 20 pumps (double mechanical seals or equivalent) – light liquid service
- 20 PRVs – gas service
- 6000 flanges/connectors – all services

Item 34:

Information Required:

Please provide an estimate of the SF_6 onsite inventory and leakage emissions both in operation and construction phases to complete the GHG emission estimates.

Response:

The Applicant estimates there will be no SF_6 storage on site during construction. Based upon a review of the operational phase electrical system by the Applicant's engineer, the system is anticipated to have a total of two (2) breakers. The switchyard breaker will have an SF_6 capacity of 135 lbs, and the generator breaker will have a capacity of 145.5 lbs of SF_6. Per NEMA (National Electrical Manufacturers Association) SF_6 management guidelines, the leak rate will not exceed 5% over a 50 year lifetime, or a leak rate of 0.1% per year. One manufacturer (Mitsubishi) indicates there will be no leakage for the first 20 years of the life of the breaker. Breaker lifetimes vary widely, i.e., Siemens states the design lifetime of their units is 20 years, while Mitsubishi states an 80-year design life.

Total storage capacity of the system will be 280.5 lbs. Assuming a loss rate of 0.1% per year results in a total estimated SF_6 emissions rate of 0.281 lbs per year. The equivalent CO2e emissions rate will be 6715.9 lbs/year, or 3.36 tons/yr.

References: California Climate Action Registry General Reporting Protocol, January 2009, Version 3.1.(IPCC 2nd and 3rd Assessment Report GWP value for SF_6 is 23,900.)

SF_6 Leak Rates from High Voltage Circuit Breakers-U.S. EPA Investigates Potential Greenhouse Gas Emissions Source, J. Blackman, et.al., USEPA, 2005.

Item 35:

Information Required:

Please confirm that:

a. there will be no gasoline storage at the site and that vehicles will have to drive to the nearest gasoline station, which is about 20 miles round trip from the site, to refuel.

b. Alternatively, provide information for any proposed onsite gasoline storage including throughput information and permitting requirements.

Response:

The Applicant is considering the installation and use of an onsite gasoline tank and an onsite diesel fuel tank. Presently, the size and throughput of the tanks is not known, and the anticipated configuration (above or below ground) is also not known. The anticipated tank size is 1000 to 2000 gallons capacity each, with Phase I vapor recovery installed on the gasoline tank. As soon as these data are finalized, the Applicant will provide the data and the emissions calculations to the CEC staff and the MDAQMD staff. If a gasoline tank is proposed, the appropriate permit application forms will be filed with the MDAQMD.

Item 36:

Information Required:

Please indicate if the additional gasoline vehicle mileage required for refueling is considered in the total vehicle miles estimates and emissions estimates, or please correct the estimates accordingly.

Response:

The onsite operational support vehicle mileages include the necessary re-fueling VMT (assuming that no onsite gasoline or diesel fuel storage occurs). Based on the Applicant's response to item #35, onsite fuel storage may occur. In order to remain conservative with respect to emissions estimates, the onsite vehicle VMT will not change if onsite fuel storage is implemented.

Item 37:

Information Required:

Please provide a cumulative air quality impacts analysis or information from the MDAQMD and SCAQMD that indicates that there are no other proposed projects within six miles of the proposed project site which have received construction permits but are not yet operational, or are in the permitting process.

Response:

The MDAQMD stated in correspondence (email) that "A review of the District permit system (PTBS) shows no non-operating Authorities to Construct and permit applications within 6 miles of the proposed Genesis Solar Project" (per Richard Wales, PE., 11-10-2009, MDAQMD, 760-245-1661, ext 1803).

A public records request was submitted to the SCAQMD on 11-10-09 asking for confirmation “that there are no other proposed projects within six miles of the proposed project site which have received construction permits but are not yet operational, or are in the permitting process”. The SCAQMD written response (email) dated 11-18-09, as well as a verbal confirmation made on 11-19-09 (Ms. Lisa A. Ramos, SCAQMD) indicates that no projects which meet the above noted criteria can be found in the SCAQMD permit tracking system for the noted radius area.

Based upon the responses above, a review of aerial photos of the site and surrounding region, as well as visual reconnaissance of the surrounding area, no source construction activities were noted that would indicate any new source construction in either the MDAQMD or the SCAQMD portions of the 6 mile radius area. The Applicant concludes that a cumulative analysis is not warranted at this time. The enclosed CD contains copies of these public records requests and responses.

Item 38:

Information Required:

Please provide copies of any official submittals and correspondence to or from the local air district(s) within 5 days of their submittal to or their receipt from the local air district(s).

Response:

The Applicant will supply CEC staff via the normal docketing process, any submittals of official correspondence to and from the MDAQMD within 5 days of submittal or receipt.

Alternatives

<u>Item 39:</u>

Information Required:

In order to facilitate preparation of the SA/DEIS and allow further comparison of the project site with alternative sites, please provide the precise locations of the three alternative sites (Township/Range/Section and/or parcel numbers) and GIS data if available.

Response:

Please see Figure ALT-DR39, at the end of this section showing the location of the three alternative sites as well as the Genesis site and the McCoy site. The GIS files have been provided to the CEC under separate cover.

The following is the Township, Range and Section number for the center of each alternative site:

- Black Hill = Section 3, T5S R22E
- Mule Mountain = Section 12, T7S R20E
- McCoy = Section 28, T5S R21E
- Desert Center = Section 13, T4S R16E
- Genesis = Section 5, T6S R19E

<u>Item 40:</u>

Information Required:

Please identify the size (total acreage) and dimensions of each alternative site.

Response:

The acreage for each site is as follows:

- Black Hill = 8,721.4
- Mule Mountain = 6,954.1
- McCoy = 7,753.1
- Desert Center = 5,746.4
- Western Genesis = 1,467.6, Eastern Genesis = 3,014.2 Total = 4,481.8

<u>Item 41:</u>

Information Required:

Please indicate whether the ROW applications to the BLM for Desert Center 1, Mule Mountain, and Black Hill alternatives have been withdrawn by the Applicant, and if not, please indicate the status of the applications.

Response:

The Applicant has withdrawn the ROW applications for Desert Center 1, Mule Mountain and Black Hills. The Applicant has retained the ROW application for the McCoy site.

Since 2007, the size of the Genesis (also referred to as Ford Dry Lake) ROW request with BLM has been reduced twice to the current size of 4,460 acres. The original ROW request was over 19,000 acres. The current acreage represents the remaining land that Genesis Solar, LLC and BLM found to be the least environmentally sensitive, particularly regarding cultural resources and biological resources.

<u>Item 42:</u>

Information Required:

Please fill in Table 1 on the last page of this Data Request to compare the McCoy, Desert Center 1, Mule Mountain, and Black Hill alternative sites with the proposed project using the criteria developed by the environmental community.

Response:

See Table below

Table 1. Alternatives Data Request

Environmental Criteria	Proposed Project Site	Desert Center 1	McCoy	Mule Mountain	Black Hill
Is site mechanically disturbed?	Yes, portions are as indicated by aerial imagery.	Yes, portions are as indicated by aerial imagery.	Yes, portions are as indicated by aerial imagery.	Yes, portions are as indicated by aerial imagery.	Yes, portions are as indicated by aerial imagery.
Is site located adjacent to degraded and impacted private lands?	Adjacent to private lands; remote desert conditions, may have been used for grazing but not suitable for farming	Adjacent to private lands; remote desert conditions, may have been used for grazing but not suitable for farming	Adjacent to private lands; remote desert conditions, may have been used for grazing but not suitable for farming	Adjacent to private lands; remote desert conditions, may have been used for grazing but not suitable for farming	Adjacent to private lands; remote desert conditions, may have been used for grazing but not suitable for farming
Is site a Brownfield?	No	No	No	No	No
Is site located adjacent to urbanized areas (indicate distance)?	19 miles to Blythe.	38 miles to Blythe.	9 miles to Blythe.	11 miles to Blythe.	8 miles to Blythe.
Does site require the building of new roads (indicate length)?	Yes, approximately 6.5 miles to the Blythe transmission line	Yes, approximately 10 miles to the 1-10 transmission line corridor	Yes, approximately 8 miles to the 1-10 transmission line corridor	Yes, approximately 2 miles to the 1-10 transmission line corridor	Yes, approximately 12 miles to the 1-10 transmission line corridor
Could site be served by existing substations (indicate name and distance)?	No nearby Sub-Stations.	No nearby Sub-Stations.	No nearby Sub-Stations.	Of the five alternatives discussed here, closest to the proposed Colorado River substation	No nearby Sub-Stations.
Is site located proximate to sources of municipal wastewater (indicate name and distance)?	Blythe- 19 miles. However, no wastewater is available from Blythe	Blythe- 38 miles. However, no wastewater is available from Blythe	Blythe- 9 miles. However, no wastewater is available from Blythe	Blythe- 11 miles. However, no wastewater is available from Blythe	Blythe- 8 miles. However, no wastewater is available from Blythe
Is site located proximate to load centers (indicate name and distance?)	No	No	No	No	No

Environmental Criteria	Proposed Project Site	Desert Center 1	McCoy	Mule Mountain	Black Hill
Is site located adjacent to federally designated corridors with existing transmission lines?	Yes	No	No	Yes	No
Does site support sensitive biological resources, including federally designated and proposed critical habitat; significant populations of federal or state threatened and endangered species, significant populations of sensitive, rare and special status species and rare or unique plant communities?	No (surveys and CNDDB)	Yes (CNDDB- Coachella Valley Milk-Vetch, Prairie Falcon)	Yes (CNDDB Desert Tortoise)	Yes (CNDDB Desert Tortoise, Harwood's Milk-Vetch, Cave Myotis, California leaf-nosed bat, Desert Tortoise)	Yes (CNDDB Desert Tortoise)
Is site within an Area of Critical Environmental Concern, Wildlife Habitat Management Area, proposed HCP and NCCP Conservation Reserves?	Palen-Ford Multi Species WHMA.	Palen-Ford Multi Species WHMA.	Bighorn Sheep WHMA.	Mule Multi Species WHMA.	Multi Species WHMA.
Does site contain land purchased for conservation including those conveyed to BLM?	No	None known	None known	None known	None known
Does site contain landscape-level biological linkage areas required for the continued functioning of biological and ecological processes?	No	No biological linkages known.	No biological linkages known.	No biological linkages known.	No biological linkages known.
Is the site within Proposed Wilderness Area, proposed National Monuments, and Citizens' Wilderness Inventory Areas	No	None known	None known	None known	None known
Does the site contain wetlands and riparian areas, including the upland habitat and groundwater resources required to protect the integrity of seeps, springs, streams or wetlands?	No	Unknown	Unknown	Unknown	Unknown
Is the site a National Historic Register eligible site and does it contain other known cultural resources?	No previously existing NRHP cultural resources, field surveys resulted in the identification of Cultural Resources	Potential for Cultural Resources	No previously existing NRHP cultural resources, project site has a potential for Cultural Resources	Potential for Cultural Resources	Potential for Cultural Resources
Is the site located directly adjacent to National or State Park units?	No	No, closest of the five sites to Joshua Tree National Park	No	No	No

Item 43:

Information Required:

Please provide the results of a California Natural Diversity Database (CNDDB) search for the McCoy, Desert Center 1, Mule Mountain, and Black Hill alternative sites.

Response:

The table above provides a summary of the CNDDB records search for the 5 sites. Four Excel tables provided in the back of this Alternatives section contain the details for each site.

Item 44:

Information Required:

Please provide the precise locations (Township/Range/Section and/or parcel numbers) and GIS shapefiles defining boundaries, if available, of any private parcels that were identified that would meet the exclusion criteria.

Response:

The Applicant did conduct a private land search in the Blythe area. Using Riverside County records, three large land parcels were identified as owned by SunWorld, Farmland Reserve and Gabrych. GIS shapefiles and parcel information has been included on a separately submitted CD for each of these properties. When additional research was conducted on the water rights in the area, the Applicant determined that any water use in the Blythe area might impact the Colorado River water basin. Therefore, the private parcels were eliminated from consideration and the research for an appropriate site was moved outside the basin area, minimizing potential environmental impact.

Item 45:

Information Required:

Please identify any private parcels that include disturbed lands (e.g., previously used for agriculture) that met the applicant's criteria.

Response:

See response to Item 44.

Item 46:

Information Required:

Please indicate the number of individual landowners for the private land parcels identified, and provide the acreage of each separate parcel and landowner.

Response:

The following properties were identified:

- Farmland Reserve: ~10,400 total separated in more than 25 parcels
- Gabrych: ~2,200 acres, mostly a continuous parcel
- SunWorld: ~ 4,033 acres total, separated in three parcels

Item 47:

Information Required:

Please provide:

a. In order to facilitate preparation of the PSA/DEIS and allow further analysis of the transmission and linear facilities please provide a detailed map illustrating the route of the proposed transmission line, based on the Applicant's discussion with BLM, and a map of the alternative transmission line routes described in the AFC.

b. As stated above, the linear routes (transmission, gas and access roads) were designed primarily to avoid cultural resources. However, the linear routes, as shown on Figure 5.3-1 would cross Sand Dunes, which provide valuable habitat for protected species, immediately east of the project site and Desert Wash habitat where it parallels the I-10. Please provide an alternative route for these linear facilities that would avoid both the Sand Dune habitat and the Desert Wash habitat in these regions.

Response:

Figure ALT-DR 47a shows the current linear corridor configuration and Figure ALT-DR 47b shows the variations of the corridor considered over the last year. Figures ALT-DR 47a and 47b are provided at the end of this section.

The current linear corridor route is different than what was shown in the AFC submitted on August 31, 2009. Since that time, discussions with BLM have occurred regarding the Sand Dune habitat. Per BLM request, the line was shifted at the southeast corner of the facility footprint to avoid the Sand Dunes. Additionally, BLM requested that the linear corridor would skirt the enXco ROW filing (CACA 049488), rather than traversing through it. These changes were made and are reflected on Figure ALT-DR 47a that shows the current linear corridor configuration. A new BLM SF 299 filing was submitted for the changes to the linear corridor, because the overall Genesis project ROW did not include this entire area needed for the new linear corridor configuration.

Item 48:

Information Required:

Please provide:

a. data shown on AFC Figures 5.3-2 and Figures 5.3-6 through 5.3-10 on one map (scale of 1:24,000) illustrating the distribution of all biological resources within the site, and the boundaries of each unit, and also the resources on what the Applicant calls the western portion of the ROW application.

b. Please also provide a tabular list of resources within each unit and on the western portion of the ROW application.

Response:

Figures ALT DR-48a and ALT DR-48b at the end of the Alternatives section shows all of the biological resources on one map. (A scale of 1:24:000 would have resulted in numerous maps, rather than one) A tabular list of these resources is also included on a separately submitted CD.

Item 49:

Information Required:

Please describe in detail the engineering constraints, if any, to the development of a revised configuration of each 125 MW unit. A revised configuration may result in the rows of troughs not being as long and not configured in a solid rectangular area. As an example, it may be desirable to allow existing washes to pass through an undeveloped portion of the site and to allow troughs to be installed on either side of the wash. Specifically, please answer the following questions:

a. Please define whether there is a specific minimum or maximum length that each individual solar collector assembly must be, and if it is necessary that the solar collector assemblies be identical in length.

b. Please define both engineering and economic constraints to having variable collector assembly lengths.

c. Please describe in detail whether there is flexibility in the lengths of the heat collection elements or if these are specific to the solar collector assemblies, and if so, what is the flexibility.

d. Please describe whether there is a distance between components of the solar field and the power block that would result in a loss of heat in the heat transfer fluid, such that it would reduce the economic or engineering feasibility of the project?

e. Please describe any limitations based on engineering requirements for the supply and return piping and whether this would allow for different lengths of solar collectors.

f. Discuss what, if anything, would be the limitations relating to extending the solar collectors onto currently undeveloped portions of the site?

Response:

a. Please define whether there is a specific minimum or maximum length that each individual solar collector assembly must be, and if it is necessary that the solar collector assemblies be identical in length.

Response:

There are multiple solar collector assembly designs available by various vendors. Typically solar collector assemblies are provided as a turnkey product and are standardized by each vendor. It is not anticipated that custom design would be provided by a specific vendor. Genesis solar as proposed plans to use a 150 meter solar collector assembly which is similar to designs tested at the Kramer Junction site and used in Spain. There is no flexibility in the design length since it is a packaged design by a specific vendor. Although the 150 meter collector has been proposed final collector design will not be determined until final vendor bids are available for evaluation.

Solar Collector Lengths by Vendor

- Solel - Solar Collector Length: 100 meter
- SkyFuel - Solar Collector Length: 115 meter

- Solar Millennium - Solar Collector Length: 150 or 100 meter
- Sener - Solar Collector Length: 150 meter
- Acciona (Solargenix) - Solar Collector Length: 150 or 100 meter

Note: Data based on available vendor information. Information is subject to change.

b. Please define both engineering and economic constraints to having variable collector assembly lengths.

Response:

Although feasible, to date no solar project with exception of SEGs has used multiple collector designs in a solar field, which was mainly used to test different collector designs and was not done for performance or economic reasons. It is difficult to estimate the impacts of such a design relating to pressure drop, installation, performance guarantees, and maintenance at this stage of the project. In general smaller collector designs would require more components and this cost impact would need to be evaluated. Using a single solar collector design will simplify design, construction, and maintenance. This type of evaluation would typically be developed during detailed design and should not affect the evaluation of the proposed facility.

c. Please describe in detail whether there is flexibility in the lengths of the heat collection elements or if these are specific to the solar collector assemblies, and if so, what is the flexibility.

Response:

Currently heat collection elements are provided by two leaders in the heat collection element industry, Solel and Schott. Both vendors supply heat collection elements that are approximately 4 meter in length. Depending on the solar field vendor either heat collection element could be used in the design.

It is unclear how the response to this data request affects the evaluation of the proposed facility.

Data based on available vendor information. Information is subject to change.

d. Please describe whether there is a distance between components of the solar field and the power block that would result in a loss of heat in the heat transfer fluid, such that it would reduce the economic or engineering feasibility of the project?

Response:

Heat loss increases with surface area; therefore, longer piping would increase heat loss which would have a negative impact on plant performance; however, pipe insulation is included in the design to minimize this impact. This optimization has not be performed for the project and will not be performed until detailed design and should not impact the evaluation of the proposed project.

e. Please describe any limitations based on engineering requirements for the supply and return piping and whether this would allow for different lengths of solar collectors.

Response:

A detailed optimization of the pipe network has yet to be completed for the proposed project; however, header design will affect pump sizing, heat loss, and material supply since cost of piping increases substantially once diameters increase to non-standard sizes. It is not anticipated that header design would change drastically by using different collector designs. This is due to the fact that most of the current designs absorb the same amount of energy per unit length. A 100 meter design will have approximately the same total loop length as a 150 meter design; however, the 100 meter design would require more solar collectors. Detailed header sizing and layout will be determined during detailed design and should not affect evaluation of the proposed project.

Data based on available vendor information. Information is subject to change.

f. Discuss what, if anything, would be the limitations relating to extending the solar collectors onto currently undeveloped portions of the site?

Response:

The proposed project has been developed to minimize impacts to sensitive biological habitat and cultural resources. Specifically, the western facility was located to avoid culturally sensitive areas while the eastern facility was located to avoid sand dunes located to the east.

Item 50:

Information Required:

In order to determine the feasibility of using reclaimed water as an alternative to proposed on-site wells, please discuss the amount of water that each of the facilities identified above has available.

Response:

As identified in the Genesis Solar Energy Project, Application for Certification (AFC), the City of Blythe Water Production and Treatment Facility reclaimed water supply is not a viable alternative water supply due to the limited amount of potential water available after treatment and prior to percolation and recharge as return flow into the Colorado River. The Palo Verde Irrigation District is water rights holder to this supply, which is an adjacent but separate district to the Chuckwalla Valley Groundwater Basin in which the Project will be.

The current estimated available water supply prior to recharge but after constructing the necessary infrastructure improvements and treatment facilities is approximately 400 acre feet per year. This is an approximation based on similar case studies incorporating comparable water supply, wastewater treatment and recharge quantities as a comprehensive study on the City of Blythe Water Production and Treatment Facility reclaimed water supply has not been conducted due to the infeasibility of incorporating this water supply into the Project. Additionally, the Palo Verde Irrigation District and Metropolitan Water District are implementing a program to reduce water consumption throughout the District. A reduction to the water consumption would create a corresponding decrease to the available reclaimed water supply.

Utilizing this alternative source would also require extensive pipeline disturbance, tertiary treatment facilities, pumping equipment and additional distribution pipeline construction to the Project site. As the City of Blythe Water Production and Treatment Facility is currently treating the water to Class III required levels, extensive upgrades to the facility would be required.

As identified in the AFC, the Chuckwalla Valley State Prison wastewater reclaimed water supply is not a viable alternative water supply due to the limited amount of potential water available after treatment however this supply is being pursued as one of supplemental water supply options to the Project as indicated section 3.10.5 of the AFC.

The current estimated available water supply from the wastewater reclaimed water supply prior to percolation from the Facility's evaporation and treatment ponds is 600 acre feet per year. This facility is currently being evaluated to determine the actual amount available as a supplemental water supply for the Project and the necessary treatment facility upgrades required. The facility is currently treating the water to secondary levels, however a facility design upgrade is planned which may alter the amount of reclaimed water available for the Project. Genesis Solar, LLC is currently discussing the potential supplemental water supply and requirements with the Chuckwalla Valley State Prison.

Utilizing this alternative source would require various pipeline disturbances, tertiary treatment facilities or upgrades, pumping equipment and additional distribution pipeline construction to the Project site.

As identified in the AFC, the Metropolitan Water District of Southern California, Desert Center Plant Wastewater reclaimed water supply is not a viable alternative water supply due to the limited amount of potential water available after treatment and prior to percolation and recharge as return flow into the Chuckwalla Valley Groundwater Basin.

The current estimated available water supply prior to recharge but after constructing the necessary infrastructure improvements and treatment facilities is approximately 10 to 20 acre feet per year maximum. This is an approximation based on current water supply use and recharge quantity estimates at the facility as a comprehensive study on the Desert Center Plan Wastewater reclaimed water supply has not been conducted due to the infeasibility of incorporating this water supply into the Project.

Utilizing this alternative source would also require extensive pipeline disturbance, tertiary treatment facilities, pumping equipment and additional distribution pipeline construction to the Project site. As the Desert Center Plan Wastewater facility is currently treating the water to secondary levels, a tertiary treatment facility or extensive upgrades to the existing facility would be required.

<u>Item 51:</u>

Information Required:

Please indicate the relative construction and operational costs of a pipeline from Blythe or Desert Center to the proposed site compared with the costs of constructing and operating two onsite wells at the proposed site over the life of the project.

Response:

In order to utilize the City of Blythe Water Production and Treatment Facility reclaimed water supply, extensive pipeline disturbance, tertiary treatment facilities, pumping equipment and additional distribution pipeline to the Project site would have to be constructed. The estimated costs for the construction of the treatment facility, pipeline installation and pumping facilities is approximately ten to twelve million dollars. The additional operations and maintenance costs are approximately $1,000,000 per year. This is a preliminary order of magnitude cost estimate established using similar facilities as a basis and unit rates and in should not be considered a final estimate of costs.

This estimate does not include the potential net plant electrical output decrease due to the increased pumping loads this facility would require.

In order to utilize the Chuckwalla Valley State Prison wastewater reclaimed water supply, certain pipeline disturbances, tertiary treatment facility upgrade or construction, pumping equipment and additional distribution pipeline to the Project site would have to be constructed. The estimated costs for the construction of the treatment facility, pipeline installation and pumping facilities is approximately four to five million dollars. The additional operations and maintenance costs are approximately $250,000 per year. This is a preliminary order of magnitude cost estimate established using similar facilities as a basis and unit rates and in should not be considered a final estimate of costs.

In order to utilize the Metropolitan Water District of Southern California, Desert Center Plant Wastewater reclaimed water supply, extensive pipeline disturbances, tertiary treatment facility upgrade or construction, pumping equipment and additional distribution pipeline to the Project site would have to be constructed. The estimated costs for the construction of the treatment facility, pipeline installation and pumping facilities is approximately nine to eleven million dollars. The additional operations and maintenance costs are approximately $500,000 per year. This is a preliminary order of magnitude cost estimate established using similar facilities as a basis and unit rates and in should not be considered a final estimate of costs.

To install and utilize two onsite wells at the Project location, the construction costs to install two wells to the required depth to achieve a viable water supply and distribution is approximately $1,000,000 to $1,500,000 per well installation. The additional operations and maintenance costs are approximately $10,000 to $20,000 per year, or approximately one to two percent of the well construction costs.

Item 52:

Information Required:

Please demonstrate specifically that using a dry cooling technology would not be economically viable over the life of the project. The Preliminary Staff Assessment for the Beacon Power Plant [CEC-700-2009-005-PSA; see Appendix A of the Alternatives Section] can be used as an example of a feasibility study for a 250 MW solar power plant using dry-cooling technology. This study is available at

> http://www.energy.ca.gov/2009publications/CEC-700-2009-005/CEC-700-2009-005-PSA.PDF

Response:

A study analyzing the impacts of dry cooling versus wet cooling is included at the end of this section. Some areas of the report have been redacted due to proprietary information. A complete copy of this report will be submitted under an application for confidentiality. Project financial viability is based on the output of a wet cooled plant. The study shows a very small difference in capital cost of equipment between wet and dry cooling; however, it finds that there is a 6.8% loss of output due to inefficiencies of a dry cooling system during peak production times of the year.

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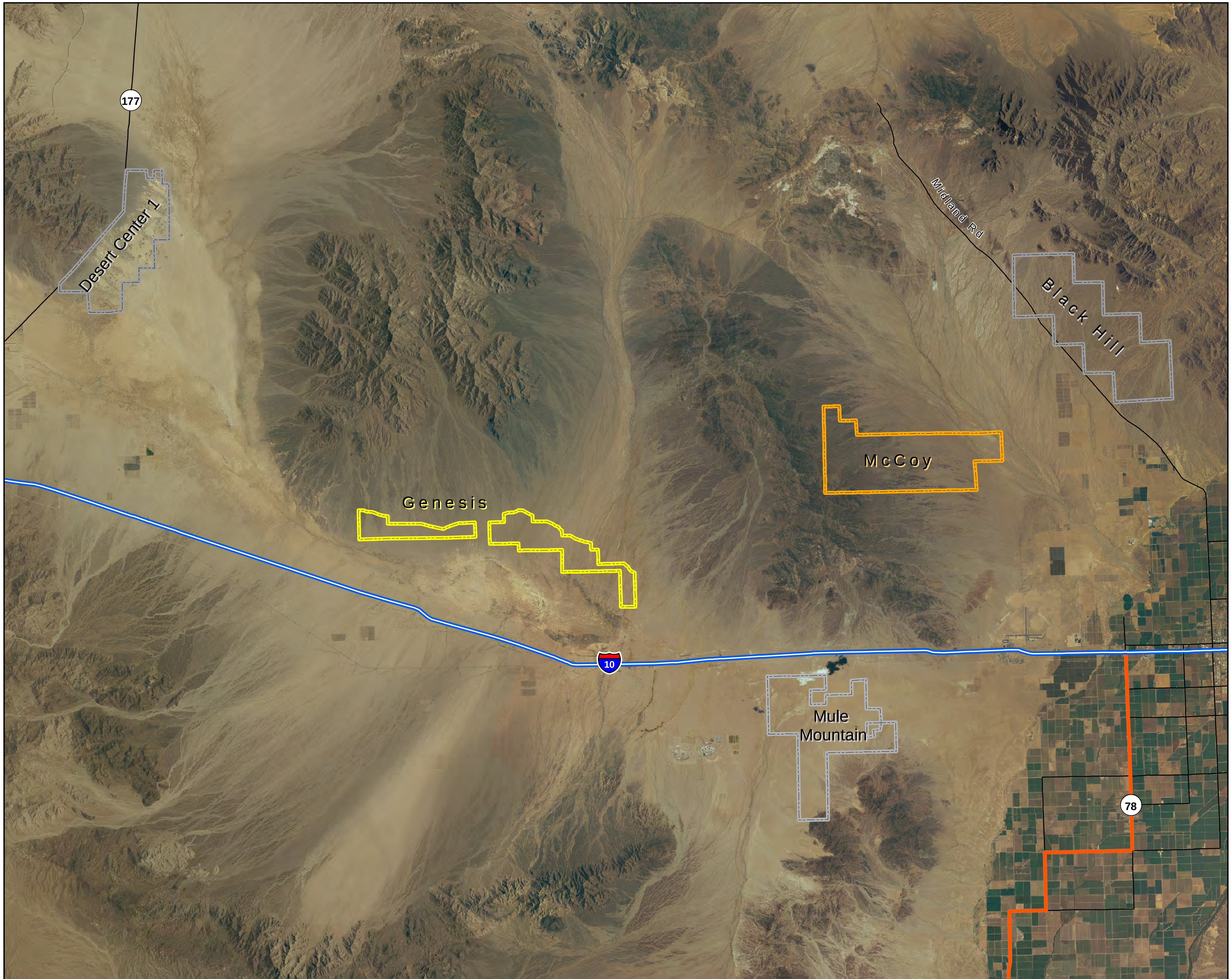
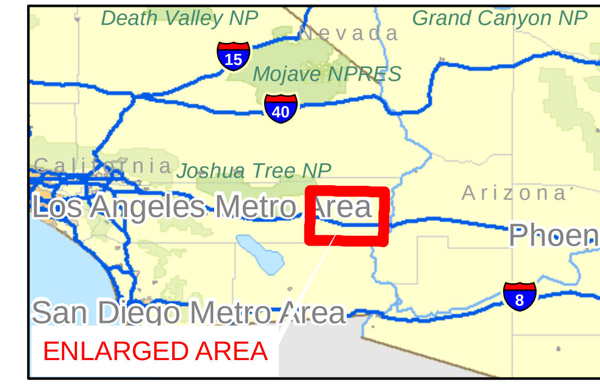


Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA



Legend

- Limited Access
- Highway
- Street
- Minor Road
- Project Site
- ROW Retained - Potential Future Development
- Project Site - Withdrawn

N

0 2.5 5
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: ESRI, BLM

Figure ALT-DR39
Ford Dry Lake and
Other Prospected Solar Sites
2006 - 2008

TETRA TECH EC, INC

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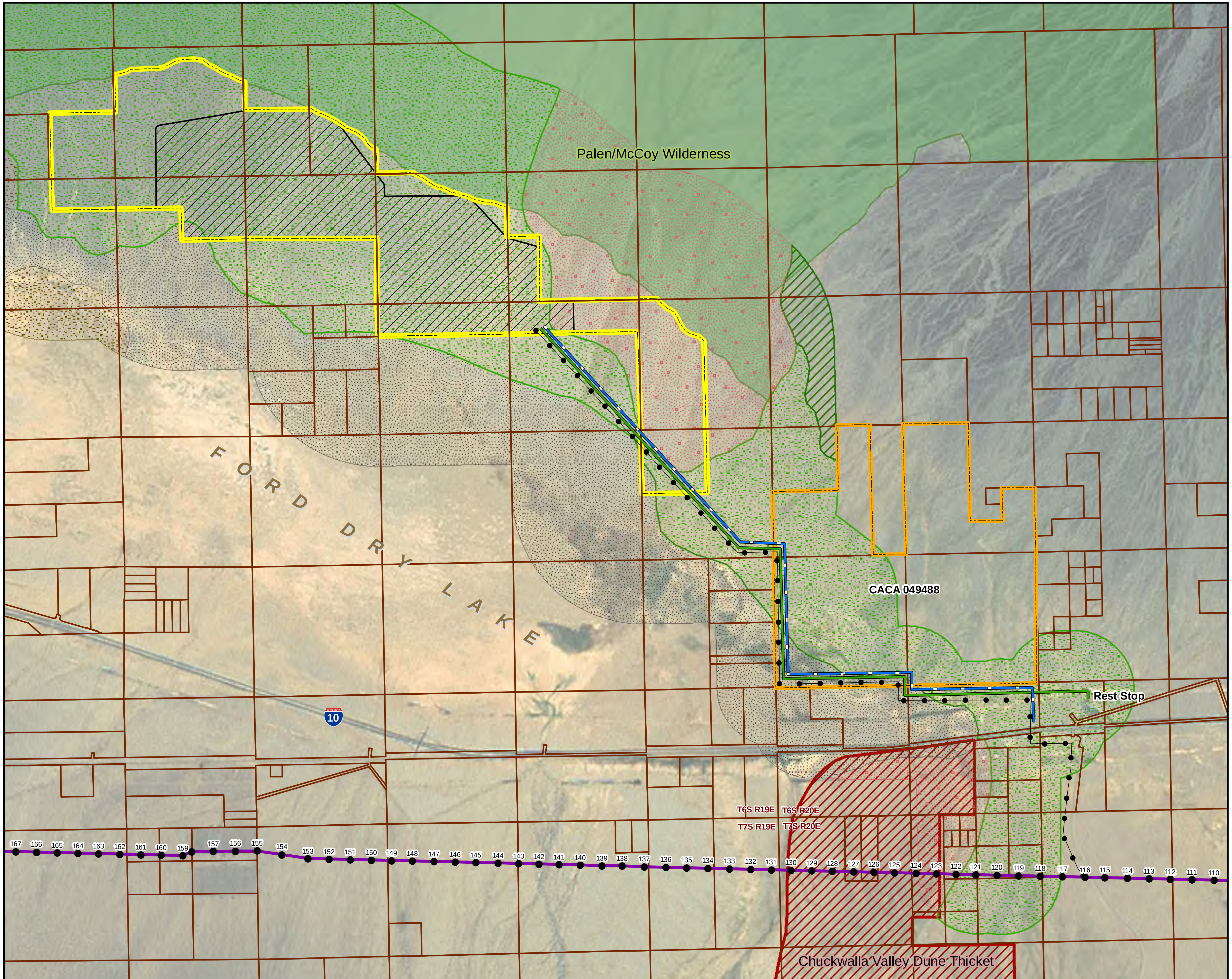
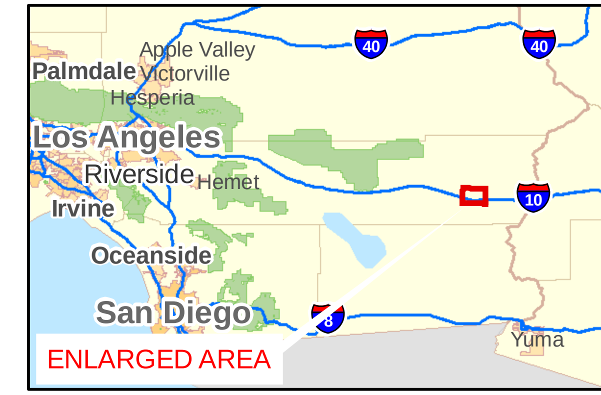


GENESIS SOLAR, LLC

**GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA**



Legend

- Proposed Interconnect (7.5 Miles)
- Proposed Gas Line (5.9 Miles)
- Proposed Access Road (6.1 Miles)
- Blythe Transmission Line
- Blythe Transmission Line Structure
- Project Site
- Facility Footprint
- CACA 049488
- Chenopod Scrub
- Sonoran Creosote Bush Scrub
- Dry Desert Wash Woodland
- Playa and Sand Drifts over Playa
- Stabilized and Partly-Stabilized Sand Dune
- Area of Critical Environmental Concern
- BLM Wilderness
- APN Lines

N

0 0.5 1 1.5 2
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: ESRI, BLM, Riverside County, TTEC, Alice Karl & Assoc.

**FIGURE ALT-47a
FACILITY FOOTPRINT
AFND LINEAR CORRIDOR
REVISION- DECEMBER 2009**

TETRA TECH EC, INC.

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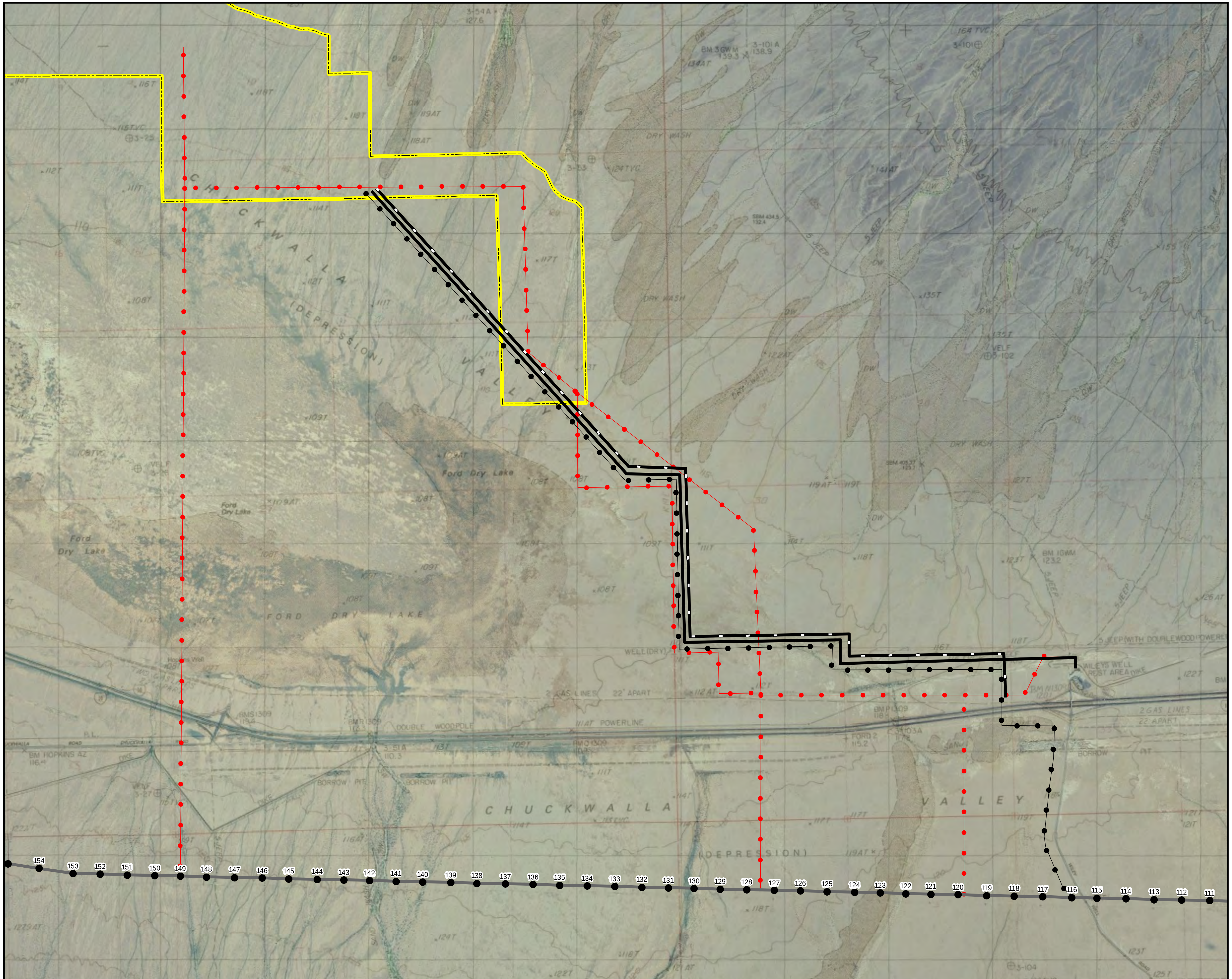

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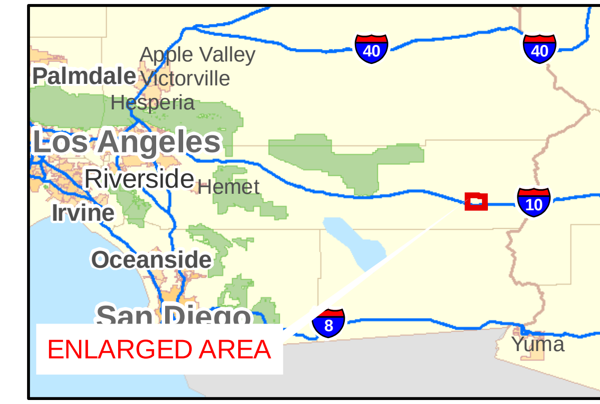
GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA



Legend

- Project Site
- Blythe Transmission Line Structure
- Blythe Transmission Line
- Previously Studied Routes
- Currently Proposed Alternate Interconnect Route (7.5 Miles)
- Currently Proposed Alternate Gas Line Route (5.9 Miles)
- Currently Proposed Alternate Access Road Route (6.1 Miles)

N

0 0.25 0.5 0.75 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: ESRI, BLM, TTEC

FIGURE ALT-47b
ALTERNATIVE LINEAR ROUTES

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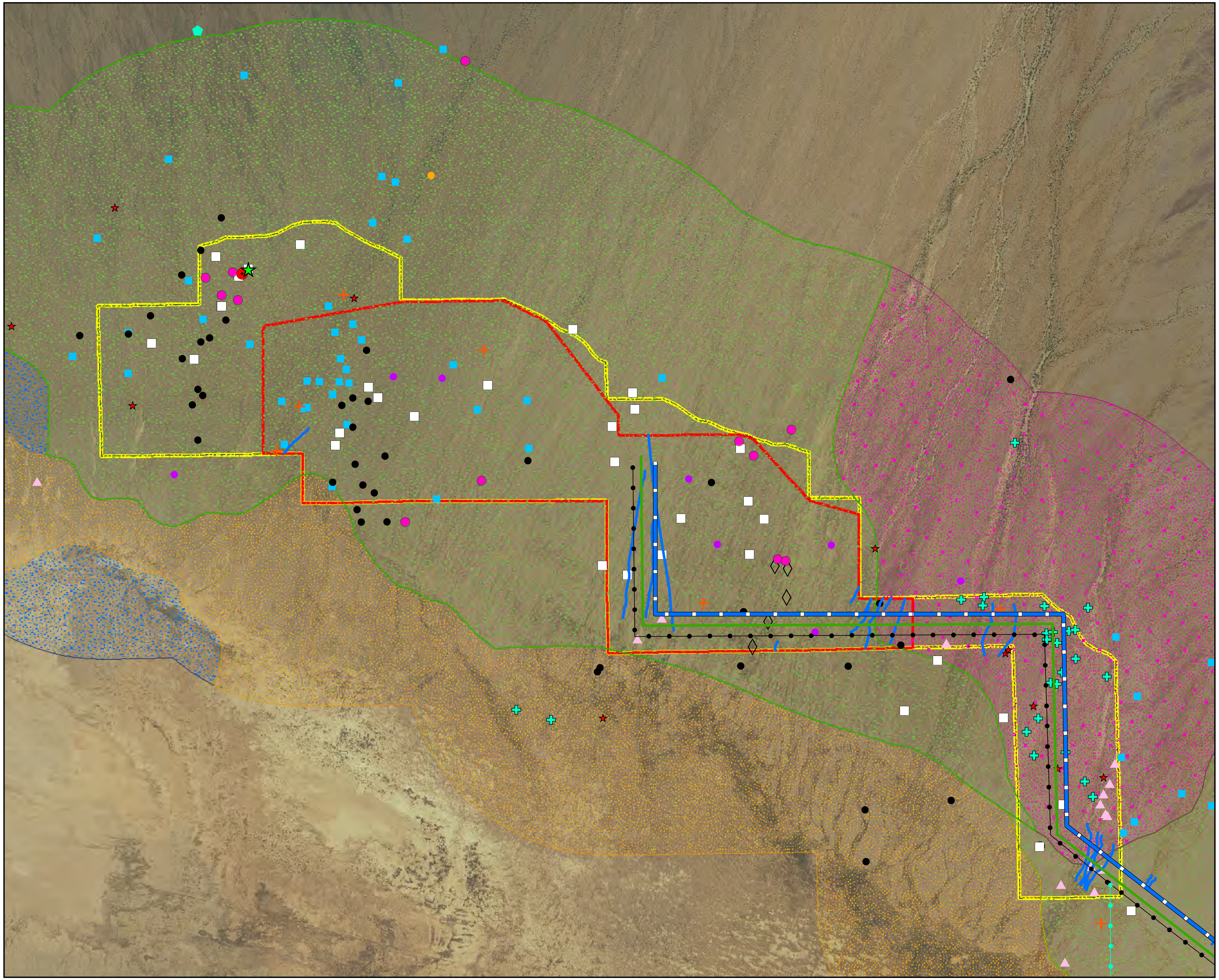
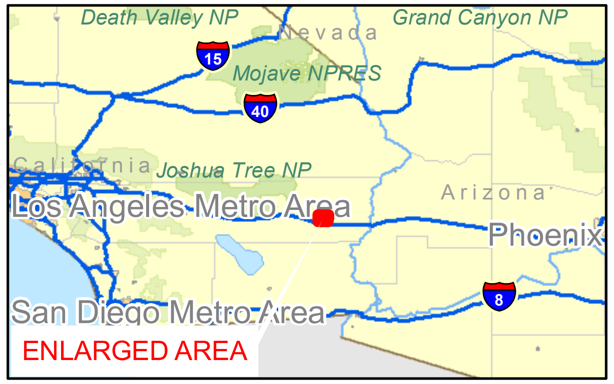


Genesis Solar, LLC

**GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA**



Legend

Desert Tortoise Observations
- Burrow
- Carcass
- Bone Fragments 10-15 years old
- Bone Fragments 3,000 - 5,000 years old
- Tracks

Borrowing Owl sign/Observation
- Owl
- Inactive Burrow
- Active Burrow
- Pellet

Special Status Plant Observations
- Harwood's Milkvetch
- Las Animas Colubrina
- Wiggins' Cholla [Possible]
- Harwood's Phlox [Possible]
- Desert Unicorn Plant

Wildlife Sign
- American Badger Burrow
- Kit Fox Burrow Complex
- Loggerhead Shrike
- Northern Harrier
- Short-eared Owl
- Mojave and/or Colorado Fringe-toed Lizard

A. Karl Mapped Vegetation Cover
- Chenopod Scrub
- Sonoran Creosote Bush Scrub
- Dry Desert Wash Woodland
- Playa and Sand Drifts over Playa
- Stabilized and Partly-Stabilized Sand Dune
- Ephemeral Wash
- Previously Proposed Linear Route
- Proposed Transmission Interconnect
- Proposed Gas Line
- Proposed Access Road
- Project Site
- Solar Facility

N

0 0.5 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: ESRI, USDA, TTEC, Alice Karl

**FIGURE ALT - DR48a
Biological Resources - Eastern ROW
Observed During Field Surveys**

TETRA TECH EC, INC

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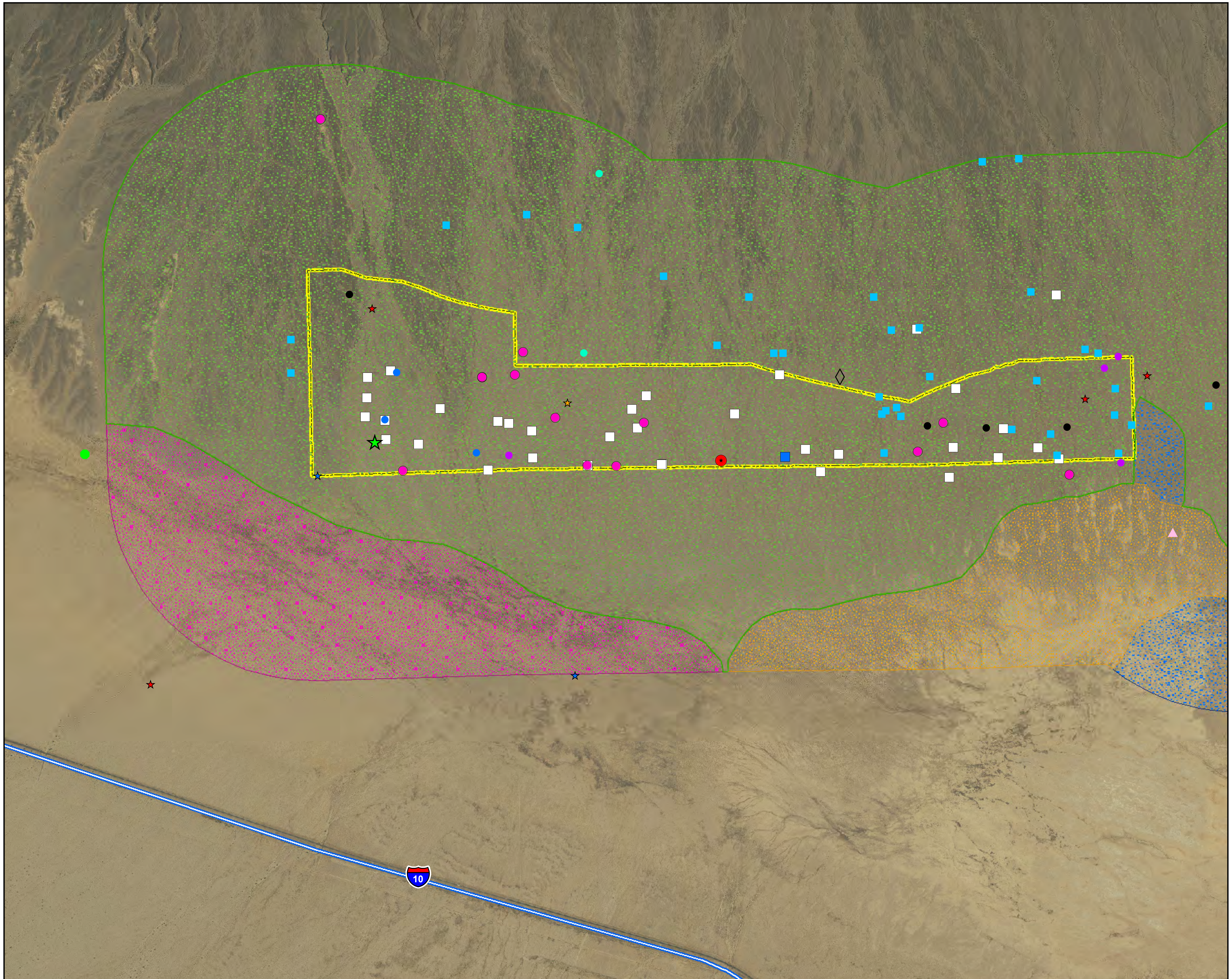
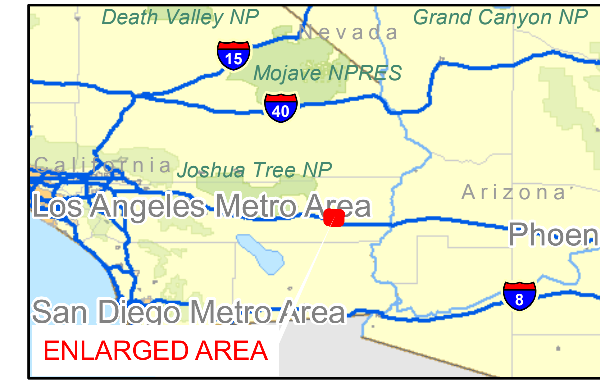


Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA



Legend

Desert Tortoise Observations
- Burrow
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- Tracks

Borrowing Owl sign/Observation
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- Harwood's Milkvetch
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- Ephemeral Wash
- Previously Proposed Linear Route
- Proposed Transmission Interconnect
- Proposed Gas Line
- Proposed Access Road
- Project Site
- Solar Facility

N

0 0.5 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: ESRI, USDA, TTEC, Alice Karl

FIGURE ALT - DR48b
Biological Resources - Western ROW
Observed During Field Surveys

TETRA TECH EC, INC

WorleyParsons

resources & energy

NEXTERA ENERGY RESOURCES – GENESIS SOLAR ENERGY PROJECT

COOLING STUDY – 125 MW Solar Project


11 August 2009

Sacramento, CA, USA
Tel: 916.817.3983
Fax: 916.983.1935

NEXTERA ENERGY RESOURCES – GENESIS SOLAR ENERGY PROJECT
COOLING STUDY

SYNOPSIS

This report documents a comparative study of different cooling configurations for the proposed Genesis Solar Energy Project

Disclaimer

NEXTERA ENERGY RESOURCES – GENESIS SOLAR ENERGY PROJECT – COOLING STUDY

REV	DESCRIPTION	ORIG	REVIEW	WORLEY-PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
A	Issued for Information	B. Doar	G.Pratt	C.Nitoff	11-Aug-09	N/A	
						N/A	

CONTENTS

Appendices

1. EXECUTIVE SUMMARY

WorleyParsons was requested to provide an initial comparative analysis of wet and dry cooling technologies for a solar parabolic trough project. The plant configuration evaluated was a net 125 MW facility, which did not include thermal energy storage or Co-Firing. For each technology, the evaluation included an estimate of installed costs for those portions of the facility that are impacted by the different cooling technologies, the difference in annual facility output, and an estimate of water consumption and discharge.

Installed cost for each technology are summarized as follows:

Wet Cooling: $29,878,000

Dry Cooling: $31,136,000

Due to the brackish water being proposed for the site, the evaluated installed cost difference between wet and dry cooling was less than 1%.

The evaluation of performance based on GateCycle models and Solar Advisor Models estimated the following net annual generation:

[redacted]

Water consumption was evaluated for each cooling technology. The following annual water usage estimate for each technology is as follows:

Wet Cooling: 822 acre-ft/year

Dry Cooling: 66 acre-ft/year

2. INTRODUCTION

NextEra Energy Resources (NextEra) has requested WorleyParsons to present a comparative study of wet and dry cooling technologies for the Genesis Solar Energy Project. The prospective site is planned for a parabolic trough solar facility with a net generation of 125 MW.

Two different cooling alternatives were analyzed. The base option uses wet cooling by means of an induced draft counterflow cooling tower and a surface condenser. Groundwater is assumed to be the source of the makeup water for this evaluation. The alternative option is for dry cooling utilizing an Air Cooled Condenser (ACC).

Installed costs were estimated for each option. The solar field and power block are assumed fixed for this analysis. Only equipment and systems that are impacted by the two different cooling options were evaluated in order to show a true comparison of the difference in installed costs.

The selection of a wet or dry cooling system has a significant influence on plant design, impact on the environment with respect to water consumption and waste generated, and potentially with the installed and operating cost of the plant. Water treatment options for wet and dry cooling were also evaluated and are discussed in detail in Section 5.

For each option a preliminary model was set up and run using GateCycle version 5.61.0.r software. System performance for each configuration was estimated at various ambient conditions and at part load conditions. The Solar Advisor Model version 3.0.0.3 (SAM) was also run to estimate a net annual generation. Plant specific correction curves for the different cooling technologies were derived from the GateCycle results and used in the SAM model for more accurate and project specific results.

Hybrid or parallel cooling, with a combination of both wet and dry cooling systems was also considered and is discussed at a high level in this report. However, detailed performance modeling, cost estimates and water consumption have not been analyzed. Hybrid cooling is best suited to a facility with a hard limit on quantity of water supply or wastewater discharge. Without such a limit, the duty split between the cooling tower and ACC is somewhat arbitrary. In absence of fixed design criteria, hybrid cooling is discussed in general.

3. INSTALLED COSTS

Installed costs have been determined using a combination of vendor budgetary proposals and WorleyParsons' equipment, commodity, and installation labor database. The installed costs are within a +/- 40% confidence range based on a conceptual engineering effort. Since many systems will not change from wet to dry cooling, only specific systems that are cooling technology dependent were evaluated. The following equipment and systems were compared:

- Circulating Water System.
- Electrical buildings associated with each cooling technology.
- Electrical Equipment associated with each cooling technology.
- Auxiliary Cooling Water System to the extent that the auxiliary cooling system will be supplied by the circulating water system.
- Closed Cooling System to the extent that the heat exchange/rejection systems are different for each cooling technology.
- Steam Condensing System (Surface Condenser for Wet Cooling and Air Cooled Condenser for Dry Cooling).
- Cooling Tower
- Air Cooled Condenser
- Chemical Feed System
- Water Treatment System.
- Water Storage Tanks
- Evaporation Pond System.

WorleyParsons used project specific budgetary quotes from vendors and an internal database for various equipment from similar sized projects. These costs were scaled up or down based on equipment criteria. Quotes were gathered for the following equipment:

- Cooling Tower
- Air Cooled Condenser
- Plate and Frame Heat Exchangers (Closed Cooling System – Dry Cooling)
- Surface Condenser
- Wet Surface Air Cooler (Closed Cooling System – Dry Cooling)
- Pre-Fabricated Buildings
- Pumps

Quotes and data sheets for the WetSAC, Surface Condenser, Cooling Tower and ACC are included in Appendix 1. Other internal estimates were used for piping systems, electrical systems, water storage tanks, pre-fabricated buildings, water treatment system, civil and structural systems and evaporation ponds.

As shown below in Table 3-1 the installed cost for the evaluated equipment and systems associated with the wet cooled plant is approximately 1% less than the evaluated equipment and systems associated with the dry cooled plant. One would normally expect the dry cooled plant to have a higer installed cost. The primary reason for the increased cost associated with wet cooling is the water treatment system. For this evaluation, preliminary water samples were used which indicated brackish water in the 5000 TDS range. These costs for wet cooling will be reduced if better water is found for the project.

To evaluate wet cooling, a budgetary cost estimate for the cooling tower was provided by SPX. In addition to the cost of the cooling tower, additional equipment will be required for the wet cooled configuration. Cost for the cooling tower basin, circ water pumps, circ water piping, and the surface condenser are all included in the total installed cost for the wet cooled option. Material estimates were developed from the General Arrangement Drawing in Appendix 7 and line size estimates were based on preliminary engineering information. With material quantities and sizes Worley Parsons developed an installed cost estimate for each system based on internal estimating tools. The results of these estimates are shown in Appendix 2 and summarized in Table 3-1.

Similarly, for dry cooling a budgetary estimate was provided by SPX. In order to maintain the same net output at the design point, the steam flow and the STG are slightly different for the dry cooled case. Due to the increased backpressure at the design point, the steam turbine exit enthalpy is higher; therefore more mass flow is required to maintain the same output to match the wet cooled case. In order to accommodate the change in volumetric flow and minimize the exhaust loss at the design point, the steam turbine generator LP last stage blade length is changed from 37” to 30”. This change in cost is relatively minor when considering the cost of the entire steam turbine, and is not taken into account for this cost analysis.

In addition to the ACC, a small Wet Surface Air Cooler (WetSAC) will be needed in order to provide adequate auxiliary cooling during extremely hot days. This additional cost has been included in the total cost for the dry cooling configuration. To develop total installed costs for the dry cooling options Worley Parsons used the same approach as outlined above in the wet cooling evaluation. The results of these estimates are shown in Appendix 2 and summarized in Table 3-1.

Although hybrid cooling was not modeled in this evaluation, cost for a hybrid system could potentially be higher than either wet and dry cooling since hybrid cooling requires installation of parallel cooling equipment. A hybrid system could be designed for anything in between, and would be priced accordingly. More specific site constraints, plant model, and vendor information are required in order to come up with an accurate installed cost estimate for a hybrid cooled system.

Table 3-1 – Total Installed Cost Table

Description	Wet Cooling Tower	Air Cooled Condenser
Number of Cooling Tower Cells	7	NA
Number of ACC Cells	NA	18
Steam Surface Condenser	$4,208,000	$0
Closed Cooling Water System	$117,000	$611,000
Circulating Water System	$2,898,000	$0
Auxiliary Cooling System	$131,000	$0
Cooling Tower Basin	$1,168,000	$0
Chemical Feed Building	$212,000	$0
Electrical Building	$420,000	$1,291,000
Cooling Tower	$2,973,000	$0
Cooling Tower Chemical Feed System	$75,000	$0
Switchgear and Motor Control Centers	$427,000	$779,000
Air Cooled Condenser	$0	$23,633,000
Raw Water Tank	$210,000	$210,000
Waste Storage Tank	$135,000	$0
Treated Water Tank	$675,000	$0
Water Treatment Costs	$10,349,000	$672,000
Evaporation Pond Costs	$5,880,000	$2,940,000
Total Installed Cost	$29,878,000	$30,136,000

4. PERFORMANCE

4.1 Design Basis

Design point conditions have been defined as:

Dry Bulb (°F)	112.9
Wet Bulb (°F)	78.6
Relative Humidity (%)	22
Ambient Pressure (psia)	14.67
Net Plant Output (MW)	125

Both wet and dry cooled plant models were setup and run in GateCycle (GC) at this design point. Full load operation was also run for a variety of ambient conditions (32, 50, 68, 86, 104, and 122°F). Though it is recognized that a solar plant cannot achieve full plant load at levels of solar energy available during periods of low ambient temperatures, the analysis was prepared this way as input to SAM as described in the following sections. The mean coincident wet bulb (MCWB) temperature for each corresponding dry bulb temperature was calculated based on the DB vs. MCWB joint frequency matrix from ASHRAE for Blythe, CA. For each "off design" ambient condition, the steam generation from the solar field was held constant. Each model was also run at part load operation (20, 40, 60, 80% load) at design point ambient conditions.

[redacted]

Auxiliary loads for both models were assumed as 12 MW plus any additional cooling auxiliary load. For dry cooling this includes the ACC fans for a total auxiliary load of 15,085 kW. For wet cooling, this includes the cooling tower fans as well as the circulating water pumps for a total auxiliary load of 15,000 kW.

4.2 Wet Cooling

STG performance was based on a Siemens STG Heat and Mass Balance for the SST700 reheat machine. The cooling tower was modeled with a 10 °F approach and the surface condenser was modeled with a 17 °F rise and a 5 °F Terminal Temperature Difference (TTD). Base load operation at the design point conditions achieves a turbine backpressure of 1.29 psia with a gross plant efficiency of 38.0%. As ambient temperature decreases with a constant steam flow, the turbine backpressure decreases correspondingly, approaching the minimum back pressure with a surface condenser of 0.5 psia, and the overall gross plant output increases. It is assumed that for full load operation, all of the cooling tower fans will be in operation for temperatures of 50°F and above. Below this ambient condition, it would be advantageous to reduce the number of cooling tower fans in operation to reduce the cooling auxiliary load while still maintaining a backpressure close to the minimum threshold and staying above the recommended minimum circulating water temperature. [redacted]

[redacted]

[redacted]

Part load performance was analyzed for several load conditions at design point ambient conditions. [redacted]

[redacted]

See Appendix 3 for a complete performance summary table of the wet cooled plant.

4.3 Dry Cooling

STG performance is based on a Siemens STG HMB for the SST700 reheat machine. However, the LP section was modeled using Spencer Cotton Cannon assumptions due to the fact that the STG HMB provided by Siemens was for a wet cooled plant. As a result of the dry cooling, the last stage blades and the LP section were redesigned for the increased backpressure. The last stage blade length was changed from 37 inches to 30 inches in order to accommodate the decreased volumetric flow due to the increase in backpressure while maintaining minimal exhaust losses. Base load operation at the design point conditions achieves a turbine backpressure of 3.98 psia with a gross plant efficiency of 34.6%.

ACC performance was included in the budgetary proposal provided by SPX. Initial performance estimates were input into the GC model to calculate the STG backpressure as a function of heat load and inlet air temperature. Similar to the cooling tower fan operation, it was assumed that for temperatures of 50°F and above that all ACC fans would be in operation. Below 50°F, it was assumed that only 10 of the 18 ACC fans would be required to be in operation while still maintaining a minimum backpressure of 1.0psia. [redacted]

Figure 4.3-1 – Cooling Tower Correction Curve (dry) vs. SAM Default

[redacted]

[redacted]

[redacted]

For the wet and dry performance curves described, WorleyParsons has no basis behind any of the assumptions or estimations that went into developing the SAM default temperature correction curves. Furthermore, the SAM default temperature correction curve for dry cooling indicates a larger impact to dry cooling then the WorleyParsons derived curves. Since the origin of the SAM default curves could not be independently verified the Worley Parsons derived curves, which are based on specific thermal models were used in the analysis. [redacted]

[redacted] Auxiliary loads at part load operation were based on previous projects and vendor data. [redacted] As noted in the Figure 4.3-2 the part load curves developed by Worley Parsons show a decrease in part load efficiency which is due to back pressure limits of the ACC

Figure 4.3-2 –STG Part Load Factor Curve (Dry) vs. SAM Default

[redacted]

[redacted]

See Appendix 4 for a complete performance summary table of the dry cooled plant.

4.4 Hybrid Cooling

The 100% dry cooled case and the 100% wet cooled case define the boundaries for plant performance. Performance utilizing a hybrid cooling system will fall somewhere between the two. A hybrid system will split the cooling duty between the wet and the dry cooling and could be designed for any ratio in between the two extremes of 100% dry or 100% wet. Site specific constraints including available water, capital and operating costs, and site location are some typical determining factors of the viability and design of a hybrid cooling system.

5. WATER TREATMENT AND CONSUMPTION

5.1 Water Chemistry

Samples were collected from the Ford Dry Lake region to identify the quality of the water that is representative of the water to feed the Genesis Solar Energy Project. Samples collected at 800 feet below ground surface (bgs) were analyzed for key chemistry parameters important for determining the water and wastewater treatment systems, as well as for estimating the concentration of species likely to be in the evaporation ponds or the site effluent. Key species analyzed include those listed below in Table 5-1:

Table 5-1 - Analyses from Ford Dry Lake at 800 Feet Below Grade Surface

Analyte	Concentration at 800 ft bgs (mg/L unless noted)
pH	7.8 units
TDS	5,000
Total Alkalinity (as CaCO3 @ pH 4.3)	150
Specific Conductance (@ 25 deg. C)	8,800 uS/cm
Total Hardness (as CaCO3)	220
Chloride	2,300
Sulfate	810
Fluoride	1.1
Nitrite	ND
Nitrate	0.5
Dissolved Silica	15
Sodium	1,500
Magnesium	14
Potassium	12
Calcium	66
Manganese	0.029
Iron	0.46
Beryllium	ND
Vanadium	ND
Chromium	ND
Cobalt	ND

Nickel	ND
Copper	ND
Zinc	ND
Arsenic	0.0092
Selenium	ND
Molybdenum	0.24
Silver	ND
Cadmium	ND
Antimony	ND
Barium	0.033
Mercury	ND
Thallium	ND
Lead	ND

ND = Not Detected

Notable in the report were the total dissolved solids (TDS) measurement of 5000 mg/L, along with the primary contributors to the TDS consisting of chloride (Cl) of 2300 mg/L, sodium (Na) of 1500 mg/L, and sulfate (SO4) of 800 mg/L. These high-solubility species comprised greater than 90% of the TDS, with low-solubility species such as calcium (Ca) of 66 mg/L, magnesium (Mg) of 14 mg/L and silica (SiO2) of 15 mg/L making up less than 10%. This concentration of high-solubility species suggested that precipitation methods of water treatment such as clarification may not be an optimal means for purification, and methods such as membrane separation (e.g., reverse osmosis) would be more conducive to significantly reducing the TDS.

Low-solubility species, such as hardness elements and silica, are known to precipitate and deposit on system components when in excess of their solubility limits (sometimes identified by cooling tower manufacturer's limits). Silica saturation limit at cooling water chemistry conditions is approximately 150 ppm (without chemical treatment). Silica at 15 mg/L becomes a limiting parameter at 10 COC without pre-treatment. Also, calcium at 66 mg/L (or 165 mg/L as CaCO3) at cooling water chemistry conditions reaches the cooling tower manufacturer's limits of <800 mg/L (as CaCO3) at about 5 COC, and therefore calcium becomes a limiting parameter at 5 COC without pre-treatment. The data suggests that pre-treatment of these low-solubility species could remove enough of these ions that the system could achieve a target of 15 cycles of concentration.

5.2 Wet Cooling Vs. Dry Cooling

5.2.1 Wet Cooling

Parallel work on the water treatment systems has been done to support the two options of cycle heat rejection; wet cooling via a surface condenser and wet cooling tower and dry cooling via an air cooled condenser. The wet cooling option consists of a pre-treatment system upstream of the cooling tower, and a post-treatment system downstream of the cooling tower. The wet cooling system is limited by the calcium concentration to about 5 cycles of concentration due to the potential to form calcite (CaCO3), and silica is limited to 10 cycles of concentration due to the formation of silica (SiO2) and magnesium silicate ($Mg_3Si_4O_{10}(OH)_2$.). Because of the limited cycles of concentration that can be achieved without makeup water treatment using a wet condenser design, the pre-treatment option is recommended for Genesis Solar Energy Project. In addition, post-treatment is needed to recover most of the wastewater for reuse which reduces the volume of incoming water required and reduces the size of the evaporation ponds. As a result, the pre- and post-treatment systems together are considered the base case for this evaluation, and the costs for this design are aligned with the wet cooling base design.

The pre-treatment option for Genesis Solar Energy Project takes into account the high concentrations of chloride and sodium present in the feed water to the site. Since the incoming water has high concentrations of highly-soluble species (e.g., sodium, chloride and sulfate), and relatively low concentrations of low-solubility species (e.g., calcium and magnesium), a two-stage reverse osmosis unit was selected for pre-treatment upstream of the cooling tower. In the two-stage design, reject from the first-stage RO unit is used to feed the second-stage RO, with the permeate of both units combined as the source of treated water for cooling tower makeup.. Multimedia filters have been included upstream of the RO units to ensure larger particles are not caught in the RO membranes.

The concentration of species in the site makeup water impacts the concentration of species feeding the cooling tower. A pre-treatment reverse osmosis unit provides the benefit of reducing the concentration of TDS as well as removing most of the calcium and silica from the makeup water, thus allowing the cooling tower cycles of concentration to increase (e.g., ~15), thereby reducing the wastewater. Modeling of the cooling tower water chemistry suggests that chloride, sodium and sulfate will similarly be the primary species present in the cooling tower blowdown, along with smaller concentrations of scale forming species (i.e., calcium, magnesium and silica.

Therefore, a reverse osmosis unit was also selected as the post-treatment system. This component will maximize the amount of water that can be returned to the cooling tower for reuse, and minimizes the water discharged to evaporation ponds. Maximizing the reuse of water will also minimize the water required for makeup to the site.

For the wet cooling option, the bulk of raw water is eventually used for cooling tower makeup, but other flows are needed for steam cycle makeup (61 gpm), mirror washing (33 gpm) quench water (31 gpm) and domestic use (5 gpm). The annual average makeup flow to the plant for all uses is 1710 gpm.

A 500,000 gallon Raw Water and Fire Water Storage Tank will be located upstream of the pretreatment system. A 1,250,000 gallon Treated Water Storage Tank.will be located downstream of the pre-treatment system. Tanks are sized to provide operational support of the plant during normal operating conditions as well as to provide a buffer capacity to enable continued operation should a failure interrupt water or wastewater treatment capabilities for up to 12 hours. Tanks are also required for wastewater storage (ie, cooling tower blowdown) and de-ionized (DI) water storage. The wastewater and DI tanks are 250,000 and 40,000 gallons respectively.

This base-case option of wet cooling will result in an average makeup of approximately 732,000 gallons per day, with a summer peak makeup increasing to approximately 1,311,000 gallons per day. On average, blowdown to the evaporation ponds will be approximately 45,000 gallons per day, increasing to 81,000 gallons during peak summer conditions. Water balances for peak and annual instantaneous rates are included in Appendix 5

In the base case option, the cooling tower and circulating water system may require commonly used chemicals, including sulfuric acid, sodium hypochlorite, scale inhibitor, and a corrosion inhibitor.

Installed costs for the wet cooling option (i.e., pre-treatment and post-treatment) include a multi media filter, two-stage reverse osmosis unit for pre-treatment (site makeup) and a two-stage reverse osmosis unit for post-treatment (wastewater). Also included are ion exchange vessels (regenerated offsite) for demineralized water, chemical feed for cooling tower water, chemical and water storage tanks, and 24 acres of evaporation ponds. An estimate for the Installed Cost for these items is $17,200,000. O&M costs for the water treatment system are $971,000 per year, including labor. The volume required for makeup is approximately 822 acre-feet per year (AFY).

5.2.2 Dry Cooling

In comparison to wet cooling, approximately 161 gpm would be required to support the dry cooling option. Flows would consist primarily of the volumes necessary for the demineralized water needed for the steam cycle makeup (61 gpm), mirror washing (33 gpm), quench water (31 gpm), and domestic use (5 gpm). A reverse osmosis unit supporting the 94 gpm of demineralized water would require approximately 125 gpm makeup, with 31 gpm reject. The ACC option would require a Wet Surface Air Cooler (WetSAC) that could use approximately 10 gpm, reducing to zero during the winter months.

The water system required with an ACC would consist of components designed to provide high-purity water to the steam cycle and for mirror washing. This system would consist primarily of a Raw Water and Fire Water Storage Tank, multi-media filter (solids removal and protection of reverse osmosis membranes), a reverse osmosis system and an ion exchange system (e.g., mixed bed polishing vessel). A similar tank would be required for the Raw Water / Fire Water Storage Tank at 500,000 gallons and Demin Water Storage Tank would remain at 40,000 gallons. Reverse osmosis reject and steam cycle blowdown would be diverted to evaporation ponds. Since waste discharge to the evap ponds using the ACC is approximately 50% of the wet cooling option (i.e., 92 gpm compared to an annual average of 182 gpm), the acreage of evaporation ponds would also be reduced proportionately from 24 acres for wet cooling to approximately 12 acres for an ACC. A water balance for peak instantaneous rates has been included in Appendix 5.

This alternate option of dry cooling will result in an average makeup of approximately 59,000 gallons per day, with a summer peak makeup increasing to approximately 99,000 gallons per day. On average, discharge to the evaporation ponds will be approximately 38,000 gallons per day, increasing to 62,000 gallons during peak summer conditions.

Installed costs for the water treatment components to support an air cooled condenser include an inlet multi-media filter, a reverse osmosis unit, a Raw Water / Fire Water Storage Tank (500,000 gallons) and a Demineralized Water Storage Tank (40,000 gallons), and approximately 12 acres of evaporation ponds. An estimate for the Installed Cost for these items is $3,800,000. O&M costs for the water treatment system are $225,000 per year. The volume required for makeup is approximately 66 acre-feet per year. See Appendix 6 for a full cost comparison of installed and O&M costs between the wet cooling tower and the ACC water treatment systems. (Note:

These values are rough estimates based on a conceptual design, and are not based on quoted prices from suppliers. O&M costs are based on chemicals and power, and include labor).

Table 6 – Estimated Water Consumption and Water Treatment Costs at Annual and Summer Conditions

	WET COOLED	DRY COOLED
	Pre-Treatment and Post-Treatment	Air Cooled Condenser
Annual/Summer Makeup (gpm)	1710 / 2013	161 /171
Annual Makeup (AFY)	822	66
Annual/Summer Flow to Evap Ponds (gpm)	182 / 215	92 / 94
O&M Costs ($1000) per year	$971	$225
Installed Costs ($1000)	$17,200	$3,800

6. CONCLUSIONS AND RECOMMENDATIONS

The wet cooling tower has advantages of lower installed cost and better thermal performance over dry cooling. Dry cooling has the advantage of significantly reduced water consumption. For this evaluation water cost was not evaluated since the project is proposing onsite ground water.

There is a notable difference in the cooling tower correction curves for the dry cooled option. The WorleyParsons estimation for dry cooling at the high ambient temperatures is much better than the default SAM estimates; therefore, the estimated performance degradation results in this evaluation should be considered conservative.

Although this evaluation indicates similar installed cost between wet and dry cooling, this evaluation does not account for the impacts due to decreased plant performance, which may be significant. To fully understand the economic impacts of dry cooling, a lifecycle analysis should be developed for the two technologies which would consider impacts to production, annual operation, and maintenance costs. It can be surmised that over a 30 year lifespan dry cooling will have a negative impact to the economic feasibility of the project. Furthermore the water source used for this evaluation indicated water quality that is not common. If a water source with more typical water quality was located close to the proposed site, the installed cost should decrease, which would increase the financial impacts of dry cooling when compared to the wet cooling base option. Once more information about a feasible water source is gathered hybrid cooling should also be evaluated in more detail.

Appendix 1 - Budgetary Equipment Quotes

SPX
COOLING TECHNOLOGIES

PO Box 1055, El Dorado, CA 95623-1055 / Tel: 916-705-2369 / Fax: 913-693-9639 / joseph.padilla@ct.spx.com

MARLEY FIELD ERECTED COOLING TOWER

TO:	Worley Parsons	DATE:	August 10, 2009
ATTN:	Ben Doar (Benjamin.Doar@WorleyParsons.com)	FROM:	Joe Padilla

PROJECT: Project Genesis
7-Cell Counterflow Fiberglass Cooling Tower

BUDGETARY SELECTION

DESIGN CONDITIONS:	Flow	94,623 gpm
	Hot Water	105.3 °F
	Cold Water	88.3 °F
	Wet Bulb	79.6 °F
TOWER DESCRIPTION:	Model	F477-6.6-7
	Number of Cells	7
	Fill Type / Height	DF254 Low Foul / 6.6 ft
	Pump Head	26.09 ft
	Fan Diameter	28 ft
	Motor Size	7 @ 250 Hp
	Brake Horsepower	7 @ 233.6 Hp
	Evaporation	1729 gpm
	Drift Rate	0.0010 %
TOWER DIMENSION:	Tower Width	42.67 ft
	Tower Length	294.7 ft
	Tower Height	45.34 ft
	Fan Deck Height	31.59 ft
BASIN DIMENSION:	Basin Width	48.33 ft
	Basin Length	295 ft
BUDGET PRICE:	$2,750,000 USD	

This budget price is based upon a scope that includes engineering, prefabrication of materials, freight to jobsite and supervision and non-union labor to field assemble the above field erected cooling tower. The following are not included, and should be provided by the purchaser: Sales and/or use taxes, concrete cold water basin, anchor bolts, fire protection sprinkler system (if required by Owner's insurance underwriter), pumps, piping, valves, water make-up, motor starter, disconnects, and controls.

BEST™ Version 2.48
Product Data: 6/17/2008

Optimization 1.opt
Revised 6/26/2009 5:08:32 PM by Joe Padilla

Customer

Solar Project
Worley Parsons
Mohave, CA

Contact

SPX Cooling Technologies, Inc.
PO Box 1055
El Dorado, CA 95623-1055
joseph.padilla@ct.spx.com

Joe Padilla
Tel 916-705-2369
Fax 913-693-9639

Definition

Model (ID 9)	F477-6.6-7	Fill	DF254-6.6
Fan	336HP7-9	Eliminator	TU12C
Stack	336"x14' Rflx/V Rib	Louver	No louvers
Speed Reducer	4000, 12.18:1	Spray System	24x8 Rotomold
Drive	301 Shaft	Nozzles	252 NS5A-120 per cell
Motor	1800 rpm, TEFC		28 NS6-160 per cell

Dimensions

Tower Width	42.67 ft	Basin Width Min	48.33 ft
Tower Length	294.67 ft	Basin Length Min	295.00 ft
Tower Height (TOC)	45.34 ft	Basin Depth	4.00 ft
Fan Deck Height (TOC)	31.59 ft	Water Depth	3.00 ft
Static Lift (TOC)	19.62 ft	Curb Offset Min	3.17 ft
Pump Head (TOC)	26.09 ft	Plenum Height	7.69 ft
Air Inlet Elev. (TOC)	10.00 ft	Effective Air Inlet Ht.	11.00 ft
Closed Sides	0	Transverse Partitions	Yes
Closed Ends	2	Wind Walls	Yes

Conditions

–

Tower Water Flow	94623 gpm	Altitude	0 ft
Hot Water Temperature	105.30 °F	Barometric Pressure	29.92 in Hg
Range	17.00 °F	Air Density In	0.06869 lb/ft³
Cold Water Temperature	88.30 °F	Air Density Out	0.06924 lb/ft³
Approach	8.70 °F	Humidity Ratio In	0.0141
Wet-Bulb Temperature	79.60 °F	Humidity Ratio Out	0.0424
Dry-Bulb Temperature	112.86 °F	Wet-Bulb Temp. Out	99.39 °F
Relative Humidity	23.5 %	Evaporation	1729 gpm
Total Dissolved Solids	5000 ppm	Drift	<0.0010 %
Site Factor	1.030		

Thermal Analysis

Fill Area	11760 ft²	Water Rate	8.046 gpm/ft²
Fill Height	6.56 ft	Dry Air Rate	43.42 lb/min/ft²
KaV/L (CTI)	1.647	L/G	1.543

Air Flow

Flow/Fan Tower Air Inlet	1077000 cfm	External P.D. In	0.000 in H2O
Flow/Fan Discharge	1098000 cfm	Entrance P.D.	0.047 in H2O
Inlet Velocity	1166 fpm	Louver P.D.	0.000 in H2O
Fill Velocity	647 fpm	Falling Water P.D.	0.137 in H2O
Eliminator Velocity	654 fpm	Fill P.D.	0.537 in H2O
Discharge Velocity	1398 fpm	Eliminator P.D.	0.066 in H2O
Air Inlet Pressure Ratio	9.544	Plenum P.D.	0.037 in H2O
Air Inlet Guide	No	Buoyancy P.D.	0.000 in H2O
Inlet P.D. Vel. Heads	0	External P.D. Out	0.000 in H2O
Outlet P.D. Vel. Heads	0	Static P.D.	0.824 in H2O
		Velocity P.D.	0.113 in H2O

Fan Information

Fan Speed (100 %)	146 rpm	Fan Tip Speed	12840 fpm
Fan Power	224.7 Hp	Static Fan Efficiency	63.4 %
Motor Output	233.6 BHp	Total Fan Efficiency	72.0 %
Motor Capacity	250.0 BHp	Fan Pitch	14.5 °

Fill note: Tall fill height requires review by Engineering.

Ben,

As per your below request, we propose an ACC utilizing our proprietary **SRC^{R}, Single Row^{R}** Aluminized Carbon Steel Tube/Aluminum Fin Tube Bundle. This SRC is similar to units that we have supplied for over 20 years. Our SRC is a proven design with a well established operational history.

We generally propose our standard technical and commercial scope. Our proposed ACC scope would start at the ST exhaust connection and include the steam duct, the ACC, condensate tank, SJAE evacuation system, and other lesser ancillary equipment and instrumentation. Bypass system and spargers, as may be required, shall be provided by others.

The proposed price is based only upon current conditions as they relate to aluminum and zinc costs, steel cost, transport cost, labor cost and international currency exchange. Please apply the escalation as deemed appropriate to meet your needs in anticipation of the actual ACC purchase date and project schedule. Prior to any ACC contract award based upon more detailed technical and commercial specifications, we will be pleased to provide up to date pricing.

ACC Design - Case A
Inlet Air Temperature: 112.9 F / 20% RH
Elevation: 0 ft above sea level
LP Turbine Exhaust Pressure: 8.0 "HgA
LP Turbine Exhaust Flowrate: 932,476 lb/h
LP Turbine Exhaust Enthalpy: 1,068.0 btu/lb

Number of Modules: 18 (3 x 6 configuration)
Length: 279' Width: 127' Height: 98'
Far Field Sound Pressure Level: 60 +/-2 dBa @ 400'
ACC Fan Power: 3,085 kW @ MIT (18 x 250 HP Motors)

Air Cooled Condenser Price
Terms: SPX Terms & Conditions (Available upon request)
Price Basis: Budgetary (+/- 10% based upon current conditions)
Quotation Validity: 30 days
Material Delivery: Starting about 28 weeks from Approval of Basic Engineering Documents with sequential deliveries to meet typical erection sequence; Ending about 33 weeks thereafter.
Warranty: 12 months from 1st use / 18 months from final delivery, whichever comes first
Payment: Down Payment and Progress Payments based on engineering and material deliverables, net 30 days

Material Supply Price Alternative A (FOB / DDP Jobsite): ....$16.5 MM US
Immediate Unloading Handling and Storage of Deliverables: ..... By Others
ACC Mechanical Erection: .... By Others

Taxes, Duties & Fees
Outside USA: .... Included
Within USA (Import Duties, Permits and Fees):..................................Included
Within USA (Local, State, Federal or Other Taxes, Fees, Etc):..... Excluded

We trust that the provided information supports your immediate needs and we look forward to speaking with you to see if our design selection and price are in line with expectations and to further assist your effort. Please feel free to call if you have any questions regarding our proposal.

Best Regards,
Ralph W. Wyndrum III, P.E.
Principal Systems Engineer - Dry Cooling
SPX Cooling Technologies, Inc.
7401 West 129th Street
Overland Park, KS 66213 USA
Tel: +1 913 664 7515
Mob:+1 913 530 4106
Fax : +1 913 693 9616
ralph.wyndrum@spx.com

SPX COOLING TECHNOLOGIES

AIR COOLED STEAM CONDENSER (ACC)

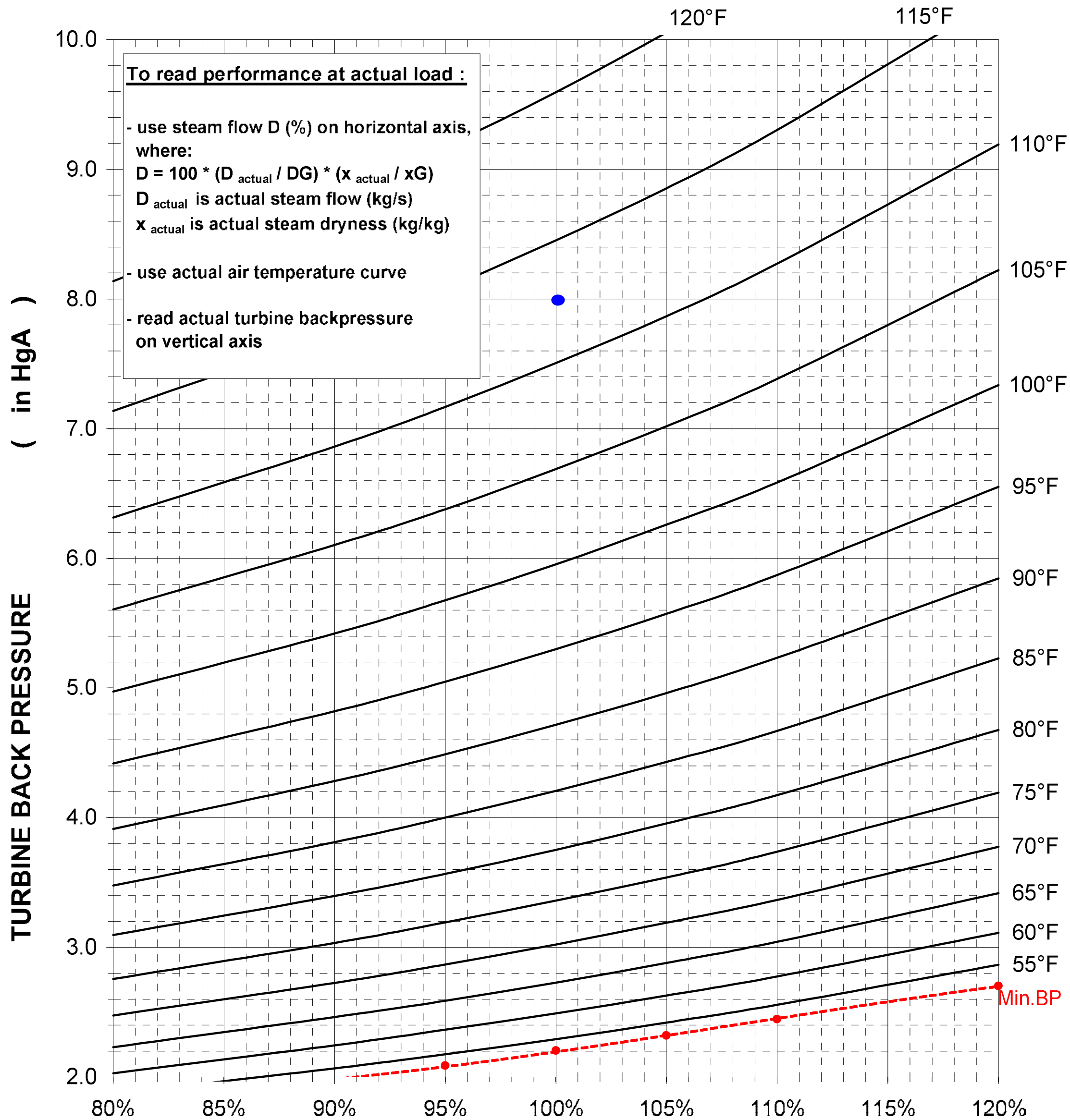
Client	WorleyParsons	Document Reference	09-918 A_PCUB0001
Location	Project Genesis, Mojave, CA		
Document	**PERFORMANCE CURVES FOR CONSTANT DRYNESS**	Proposal Nr	09-918 A
		ONLY FOR INFORMATION	

DESIGN CONDITIONS **07/13/09, Rev. A**

Steam Flow	DG	932,476 lb/hr	Steam Dryness	xG	0.942 lb/lb
Back Pressure	PG	8.00 in HgA	Barom. Pressure	bG	29.9 in HgA
Air Temperature	tLG	112.9 °F	Wind Speed (*) (max.)		9.8 ft/s
Condensing Duty		884.0 MM Btu / h	(*) 3.3 ft above top manifold level		

All Fans at Full Speed

Inlet Air Temperature (°F)

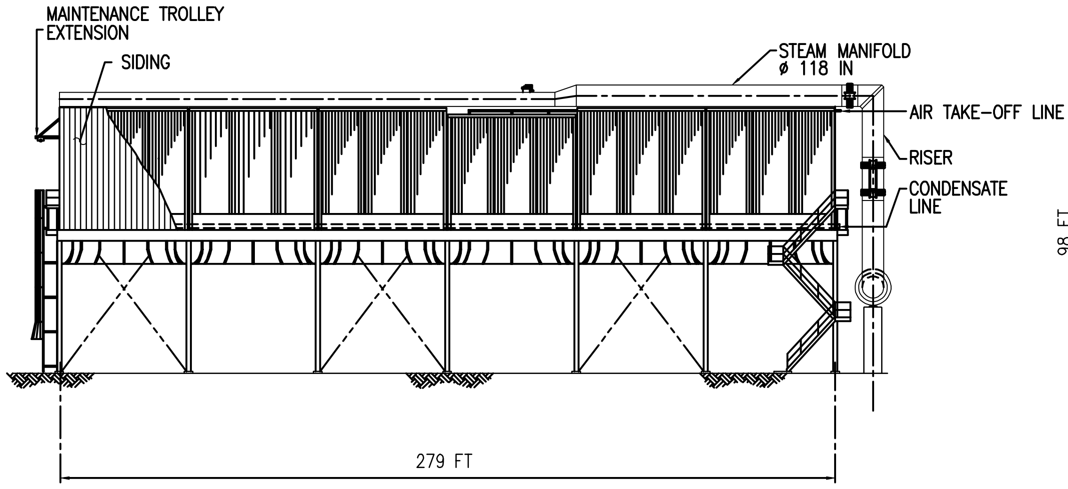


Steam flow range for contractual acceptance test: **Steam Flow (%)**

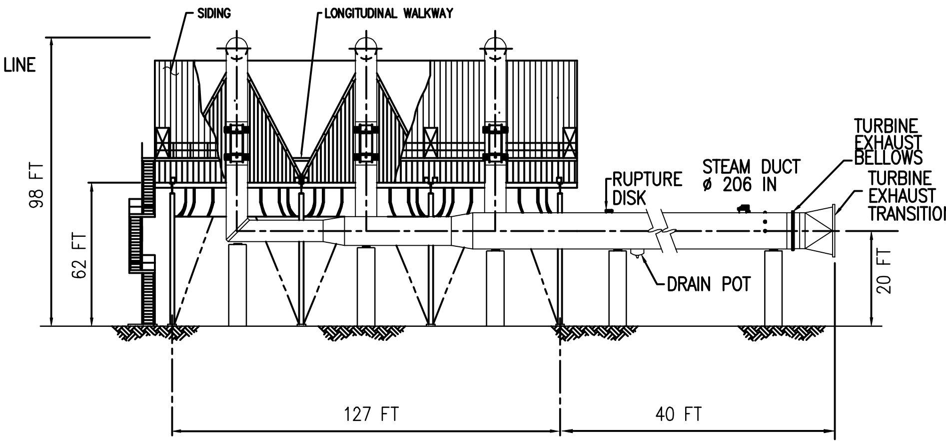
90% - 110% (according to VGB R131 Me 1997)

Revision	-	A	B	C	D	E	F
Date	14-Jul-09						
Issued							
Approved							
Released							
Status							

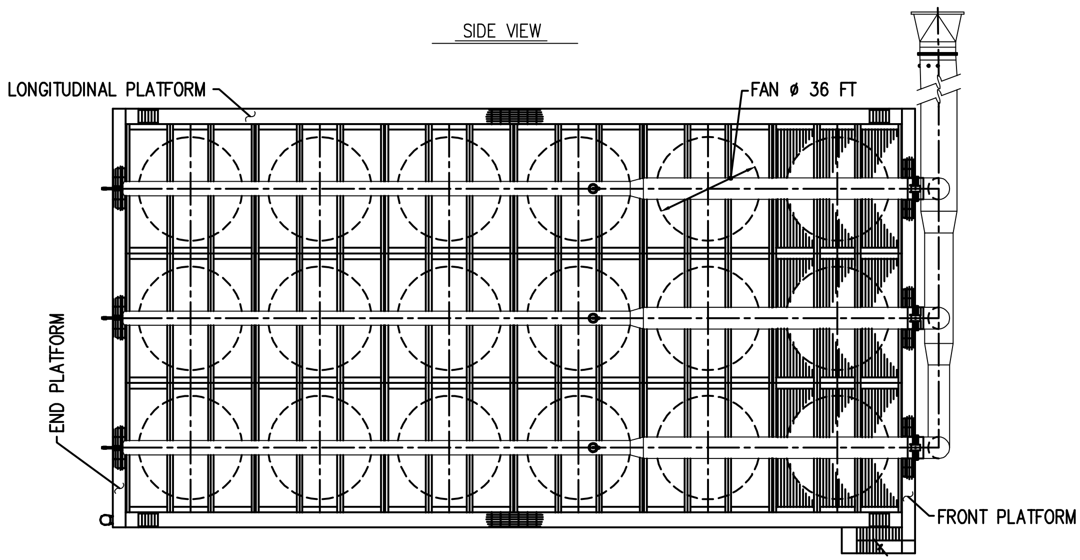
Program N° 37 Perftab3-7 Ver. 3 Rev. 7 - 09 Dec 2008



SIDE VIEW



END VIEW



PLAN

NOTES:

1. FREE AIR ACCESS FROM BOTH LONGITUDINAL AND BOTH NARROW SIDE IS ASSUMED.
2. ALL INFORMATION SHOWN IS PRELIMINARY AND SUBJECT TO CHANGE UPON FINAL OPTIMIZATION.

NO.	DATE	BY	APPD.	REVISION	ISSUED FOR	DATE	BY
–	–	–	–	–	PROPOSAL	07/14/09	RW

PROJECT GENESIS SOLAR PROJECT
MOJAVE, CA
18 MODULE
AIR-COOLED CONDENSER
WORLEY PARSONS
SACRAMENTO, CA
WP RFP. NO. –
SPXCT PROP. NO. 09-918

FILE LOCATION:

ga09918-18

SPX COOLING TECHNOLGIES
Balcke | Hamon Dry Cooling | Marley

DRAWING TITLE	GENERAL ARRANGEMENT AIR-COOLED CONDENSER

		REV.	DWG. NO.
DRAWN	DATE	0	GA-001
CHECKED	DATE		
APPRVD.	DATE		
SCALE: NONE	DWG.SIZE: 11X17		

WorleyParsons

resources & energy

Engineer: B. Doar
Date: 7/13/2009
Rev: A

ACC Performance Datasheet

			Summer Design Point
Parameter		**Units**	**Value**
Ambient Conditions			
	Elevation	ft	0
	Temperature (DB)	°F	112.9
	Temperature (WB)	°F	78.6
System Net Output		MW	125.0
Net Cycle Efficiency		%	30.9
Dry Cooling			
Exhaust Flow		lb/hr	932,475
Exhaust Enthalpy		Btu/lb	1068.0
Exhaust Back Pressure		psia	3.93
ITD		°F	38.5
Design Heat Load		MMBtu/hr	884.5

NOTES:
1)

Date:	June 5, 2009	**SPXCT Ref :**	1945
To:	Worley Parsons	**E-Mail / Fax №:**	303-928-4231
Attn:	Jeffrey J. Jantos	**From:**	Rajesh Gupta
Subject:	Budget quote for Air Cooled Heat Exchanger		

Dear Jeff,

As per your recent request, SPX cooling technologies is pleased to provide its budgetary quotation for an Air Cooled Heat Exchanger propose our standard technical and commercial scope.

We trust that the provided information supports the your immediate needs and we look forward to speaking with you to see if our design selection and price in line with expectations and to further assist in the development effort. Please feel free to call if you have any questions regarding our proposal.

Sincerely,

SPX cooling technologies

Rajesh Gupta
Sales Manager – Dry Cooling
rajesh.gupta@spx.com

SPX COOLING TECHNOLOGIES, INC
7401 WEST 129 STREET
OVERLAND PARK, KANSAS 66213
UNITED STATES

TEL 913 | 664 | 7400
FAX 913 | 664 | 7439

spxcooling.com

ACHE DESIGN CONDITION		*ACHE Design Case 2*
Fluid		Water
Total Fluid Flow	GPM	3,000
Inlet Temperature	°F	111.9
Outlet Temperature	°F	100
Design heat duty	MM btu/hr	17.9
Inlet Air Dry Bulb Temperature	°F	85.0
Tube side pressure drop	psi	5.4
Site Elevation	ft	1,850

ACHE DESIGN SELECTION		*ACHE Design Case 2*
Number of Bays/cells per unit	-	2
Plot Arrangement		
Unit Length	ft	54.0
Unit Width	ft	29.0
Drive Equipment		
Number of Drive motor	-	6
Fan Diameter	ft	12
Motor Size	HP	40
Sound Pressure Level @400' from ACHE Perimeter	dB(A)	60
Total Design Fan Power @ Fan shaft (all Fans Full)	HP	190

SCOPE OF SUPPLY FOR ACHE

- Forced draft design, horizontal finned tube bundles
- Modular design of Tube Bundle
- Galvanize carbon steel plenum, fan rings, fan guards, support structures
- Zinc metal spraying of Header boxes as per specification
- Single- Speed, 1.15 service factor, IP 55 Electric Motors with space heater
- V-Belt Drives
- Mechanical equipment to be coated with manufacturers' standard coating
- Hydrostatic Test on Tube Bundle per ASME Section VIII, Div. I
- Vibration cut off switch for each fan to trip the motor in case of excessive vibration
- The tubes will be SA214 welded carbon steel, 1.0" diameter with 0.060" min. wall thickness. The fin type will be an L type fin. The Carbon Steel header boxes will be fabricated from SA-516-70 and supplied with carbon steel plugs. The tube-to-tube sheet joints will be roller expanded.

SCOPE OF DESIGN, SUPPLY AND SERVICES BY OTHERS

The following items, equipment and services shall be furnished by others and are not included in our price.

- Isolation valves and Interconnecting piping
- PLC Control System
- Expansion tankand instruments.
- Control Panels, Junction box including control wiring and power wiring external to motor, MCCs / motor starters if required
- Unloading, Storage and Site Installation
- Foundations, Grouting for Support of Equipment
- Final touch up painting of components at site
- Performance Test, site noise test, site air flow test, or any other site test

Price- FOB Tulsa OK USA

Description	Unit price USD	qty	Total Price USD
Air Cooled Heat Exchanger-Case-1 (2 bays, 2 bundles, 4 fans per unit) Ex Works FOB Tulsa OK.	$360,900	1	$360,900
Transportation up to job site Las Vegas ,NV	$ 41,600	1	$ 41,600
Air Cooled Heat Exchanger-Case-2 (2 bays, 2 bundles, 6 fans per unit) Ex Works FOB Tulsa OK.	$434,900	1	$434,900
Transportation up to job site Las Vegas ,NV	$ 48,600	1	$ 48,600

Terms: SPX Terms & Conditions (Available upon request)

Price Basis: Budget +/- 10%

Quotation Validity: 30 days

Material Delivery: Within 30-32 weeks from Approval of Basic Engineering Documents

Payment: Down Payment and Progress Payments based on engineering and material deliverables, net 30 days, essentially as follows:

- 15% Upon Submittal of Basic Engineering Documents (GA, FL)
- 35% Upon Receipt of Tube and Fin Materials at Shop
- 50% Payments against bill of lading

Foster, Jared (Sacramento)

From: Ross, Dylan (Denver)
Sent: Thursday, July 23, 2009 3:31 PM
To: Foster, Jared (Sacramento)
Subject: FW: Worley Parsons - Nevada Solar Project 100MW - ACHE RFQ - Budget Price
Importance: High
Attachments: ACHE budget proposal_1945.pdf

From: Jantos, Jeffrey (Denver) [mailto:Jeffrey.Jantos@WorleyParsons.com]
Sent: Thursday, June 04, 2009 11:37 AM
To: Jim Mick
Subject: RE: NV Test site Aux Cooler Equipment for Dry Case

Jim,

See changes below in red. Thanks.

The closed cooling water equipment will be one 100% Fin-Fan with 15F approach in parallel with one partial duty WSAC for dry bulb > 85F. The Fin-Fan will operate 100% load up to 85F DB ambient; the WSAC will assume the STG lube oil/sample panel/BFP loads to achieve 100F cooling water for ambient DB >85F.

Design Conditions
Atm Pressure: 13.72psia
WSAC Design Temp (db / wb): 110 F / 72.1 F
Fin-Fan Design Temp (db / wb): 85F
Fin-Fan Approach: 15F
Winter Design Temp: 28 F (ASHRAE Heating DB at 99.6%), glycol mix not necessary
Max Cool Water Temp: 100F
Process Water Quality: Condensate
Make-up Water Quality: non-treated well water (assume 5 COC)

Case 1: 100% Dry w/out storage
Fin-Fan Design: 13.7 MMBtu/hr, 2,400 gpm, 11.4 temp rise
WSAC Design: 5.5 MMBtu/hr, 1000 gpm, 11F temp rise

Case 2: 100% Dry w/ storage

Fin-Fan Design: 17.9 MMBtu/hr, 3,000 gpm, 11.9 temp rise
WSAC Design: same as Case 1

Info Requested
FOB Jobsite Cost (Las Vegas, NV)
WSAC Makeup Rate (gpm)
Fin-Fan Aux Load (kW)
WSAC Aux Load (kW), breakout fans and pumps
Equipment Footprints & # cells/bays

UPDATE™ Version 4.12.3
Product Data: 5/20/2009 (Current)

6/4/2009 6:14:47 PM

Job Information

100 MW Solar Project
Worley Parsons
JLH No. W01-9-4905

Selected By

JL Hermon & Associates, Inc.
7342 South Alton Way
Suite H
jmick@jlhermon.com

JIM MICK
Tel 303-771-4045
Fax 303-771-6657

Fluid Cooler Definition

Manufacturer	Marley
Product	MH Fluid Cooler
Model	MHF703E124G-1
Cells	1
CTI Certified	Yes
Coil Material	Galvanized Steel
Fan	4.500 ft, 6 Blades
Fan Speed	728 rpm, 10292 fpm
Fans per cell	2
Pumps per cell	1

Fan Motor Speed	1800 rpm
Fan Motor Capacity per cell	20.00 BHp
Fan Motor Output per cell	20.00 BHp
Fan Motor Output total	20.00 BHp
Air Flow per cell	76310 cfm
Air Flow total	76310 cfm
Pump Motor Output per cell	3.00 BHp
Pump Water Flow per cell	470 gpm

Model Group	Standard Single Flow, Galvanized Coil
Sound Pressure Level	85 dBA (Single Cell), 5.000 ft from Air Inlet Face. See sound report for details.

Conditions

Total Process Flow	1000 gpm
Hot Water Temperature	111.00 °F
Range	11.00 °F
Cold Water Temperature	100.00 °F
Approach	27.90 °F
Wet-Bulb Temperature	72.10 °F
Relative Humidity	50 %
Additive Content	0.0 %

Air Density In	0.07201 lb/ft³
Air Density Out	0.07106 lb/ft³
Humidity Ratio In	0.01361
Humidity Ratio Out	0.02996
Wet-Bulb Temp. Out	88.78 °F
Estimated Evaporation	10 gpm
Coil Pressure Drop	8.4 psi
Total Heat Rejection	5463700 Btu/h

- This selection satisfies your design conditions.

Weights & Dimensions

	Per Cell	Total
Shipping Weight	11200 lb	11200 lb
Heaviest Section	7250 lb	
Max Operating Weight	18800 lb	18800 lb
Width	8.417 ft	8.417 ft
Length	12.062 ft	12.062 ft
Height	16.990 ft	

Minimum Enclosure Clearance

Clearance required on air inlet sides of tower without altering performance. Assumes no air from below tower.

Solid Wall	8.863 ft
50 % Open Wall	7.270 ft

Weights and dimensions do not include options; refer to sales drawings. For CAD layouts refer to file MHF703.dxf

Cold Weather Operation

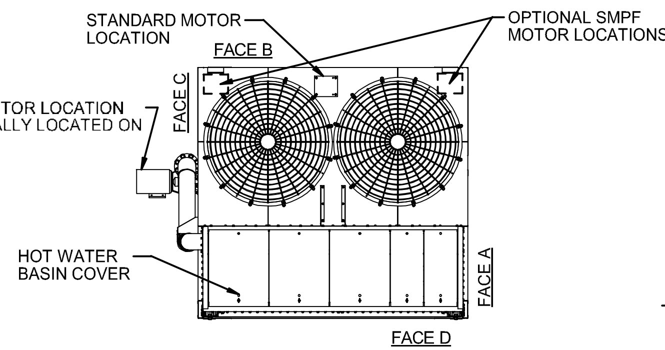
Heater Sizing (to prevent freezing in the collection basin during periods of shutdown)

Heater kW/Cell	9.0	7.5	6.0	4.5	3.0
Ambient Temperature °F	-12.21	-2.91	6.38	15.68	24.98

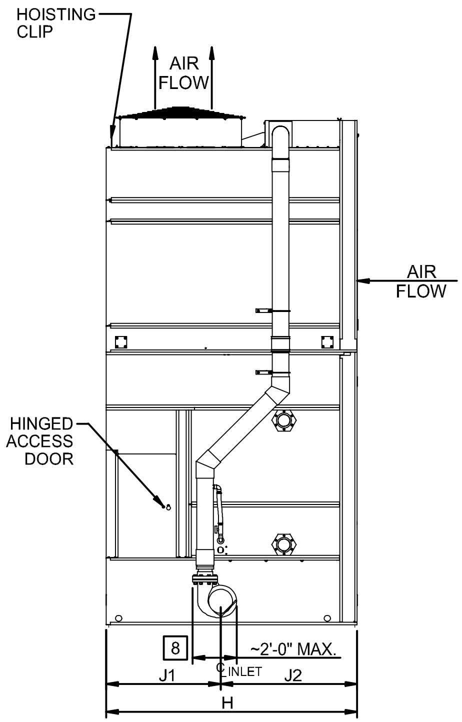
Heat Loss (50 °F inlet fluid temperature, -10 °F ambient temperature, 45 mph wind, fans and pumps off)

Standard Unit	221000 Btu/h
with Dampers	90600 Btu/h
with Dampers & Insulation	76900 Btu/h

DIM	TOWER MODEL MHF 702	MHF 703	MHF 704
A	7'-10 3/8"	7'-10 3/8"	9'-11 1/2"
B	9'-4 7/8"	9'-4 7/8"	9'-4 7/8"
C	16'-11 7/8"	16'-11 7/8"	19'-1 1/4"
D	6'-7 1/2"	9'-7 1/2'	9'-7 1/2"
E	1'-2 5/8"	1'-2 5/8"	1'-2 5/8"
F	9'-0 3/4"	12'-0 3/4"	12'-0 3/4"
G	11'-1 3/4"	14'-1 1/4"	14'-2 1/4" 8
H	8'-5"	8'-5"	11'-11"
J1	3'-10"	3'-10"	4'-2
J2	4'-7"	4'-7"	7'-9"
L9	9'	9'	12'

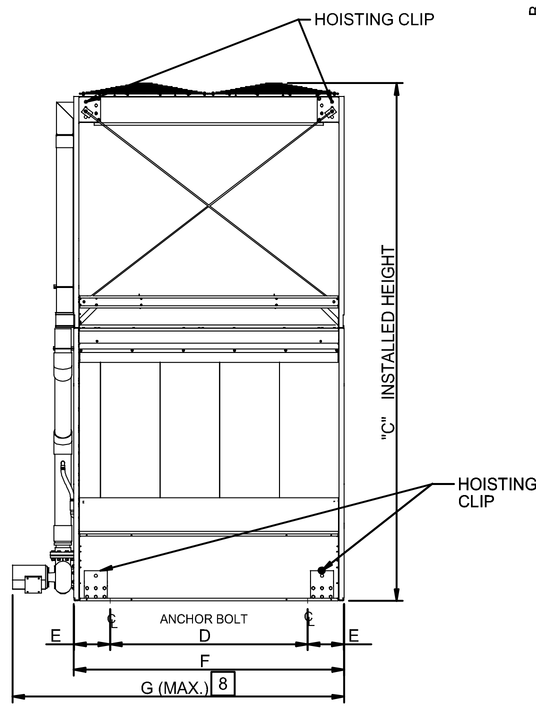


PLAN



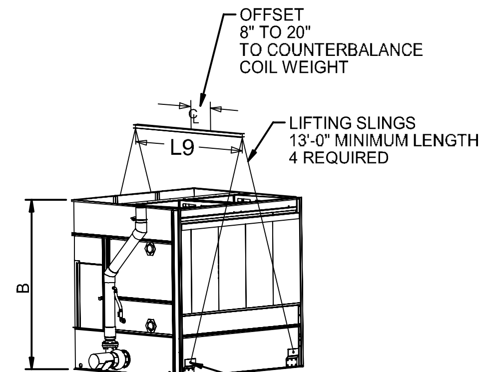
SIDE ELEVATION

FACE C

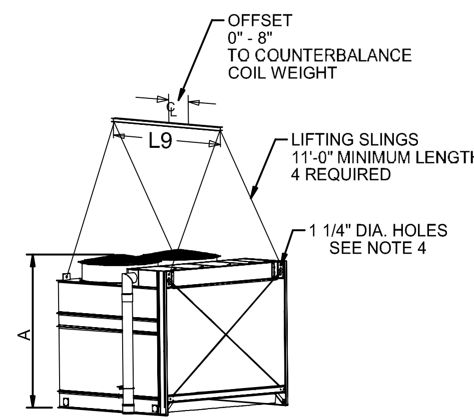


AIR INLET ELEVATION

FACE D



BOTTOM MODULE HOISTING DETAIL



TOP MODULE HOISTING DETAIL

NOTES

1. THE EQUIPMENT MUST BE INSTALLED LEVEL TO INSURE MAXIMUM THERMAL PERFORMANCE AND TO AVOID RACKING.

2. AIR INLET FACE MUST HAVE AN ADEQUATE AIR SUPPLY. IF OBSTRUCTIONS EXIST, CONSULT YOUR MARLEY REPRESENTATIVE.

3. ROUTINE MAINTENANCE DOES NOT REQUIRE WORKERS TO USE THE TOP OF THE TOWER AS A WORK PLATFORM. HOT WATER BASIN INSPECTION AND CLEANING CAN BE DONE FROM A PORTABLE LADDER, STAIR, OR SCAFFOLD. MECHANICAL MAINTENANCE CAN BE DONE FROM A PORTABLE LADDER INSIDE THE TOWER. TAKE ADEQUATE SAFETY PRECAUTIONS WHEN USING PORTABLE LADDERS.

FOR ADDED SAFETY AND CONVENIENCE, MARLEY OFFERS AN OPTIONAL LOUVER FACE PLATFORM OPTION FOR IMPROVED ACCESS FOR HOT WATER BASIN MAINTENANCE. FOR INTERIOR MAINTENANCE, AN OPTIONAL ELEVATED MECHANICAL EQUIPMENT PLATFORM WITH LADDER IS ALSO AVAILABLE. DETAIL DRAWINGS FOR THESE AND OTHER TOWER OPTIONS ARE AVAILABLE FROM YOUR MARLEY REPRESENTATIVE.

4. HOISTING CLIPS ARE PROVIDED FOR EASE OF UNLOADING AND POSITIONING. FOR OVERHEAD LIFTS OR WHERE ADDITIONAL SAFETY PRECAUTIONS ARE PRUDENT, ADD SLINGS BENEATH THE TOWER.

5. ASSEMBLY TOLERANCE IS ± 1/8". CONSULT SUPPLIERS OF SUPPORTING STRUCTURE FOR CONSTRUCTION TOLERANCE. ALL OF THESE DIMENSIONS SHOWN ARE IN I-P (INCH-POUND) UNITS UNLESS OTHERWISE NOTED.

6. REFERENCE "SUGGESTED SUPPORTING STEEL ARRANGEMENT" DRAWINGS FOR MULTI-CELL SPACING.

7. COLLECTION BASIN FLOOR SLOPES UNDERNEATH COIL FROM LOUVER FACE TOWARDS MECHANICAL EQUIPMENT END OF TOWER.

8 DIMENSION IS BASED ON A STANDARD SCOT 57 FRAME 60HZ. PUMP ON MODEL MHF702 AND A SCOT 59 FRAME 60HZ. PUMP ON MODELS MHF703 & 704. 50HZ. FRAMES, OR OTHER OPTIONS MAY INCREASE DIMENSION.

Solid Edge

ECO NUMBER 11383	SCHEMATIC DETAILS MHF702 THRU MHF704 FAP				SPX Cooling Technologies Balcke | Hamon Dry Cooling | Marley			
REV BY RJH / CHECKED MN								
REV DATE 12-12-2008	DRAWN BY B Cox	DATE 11-18-2004	CHECKED EJW	APPROVED EJW	ORDER NUMBER	PLOT 1=1	DRAWING NUMBER 04-26614	REV D

100 MW

SURFACE CONDENSER QUOTE

Customer Budget Price Sheet							
Surface Condenser Calculations							
Engineer: Worley Parsons							
Contact: Bob Pieksma - 303-810-8360							
Project: Nevada Test Site - 100 MW Solar							
JLH Ref No. W07-9-234							
Date: 062009							
STG Size and Type:							GENESIS
		Case 1 - App = 5	Case 2 - App=10	Case 3 - App=12	Case 4 - App=15	Case 5 - 100% Wet	
Steam Load - lbm per hr	M	335,984	335,984	335,984	335,984	731,854	810,996
Net Heat Load - btu per lbm	H	925.38	925.38	925.38	925.38	912.00	
Heat Load - btu per hr	Q	310,912,874	310,912,874	310,912,874	310,912,874	667,450,848	756,925,000.
Abs Pressure - "hgA - (Table I)	P	7.53	7.53	7.53	7.53	2.55	1.31
Steam Temp - deg F - (Table I)	Ts	150.81	150.81	150.81	150.81	109.00	111
Enthalpy at Condenser Inlet	Hg	1044.16	1044.16	1044.16	1044.16	989.10	1012
Enthapy at Condenser Outlet	Hf	118.78	118.78	118.78	118.78	77.10	79
Number of Passes	NP	2	2	2	2	2	
Tube OD	In	1	1	1	1	1	
Tube Gauge	BWG	22	22	22	22	22	
Tube Material		316	316	316	316	316	
Surface Ratio Factor - (Table II) (sqft / ft)	m	0.2618	0.2618	0.2618	0.2618	0.2618	
Velocity Ratio Factor - (Table II) (gpm / tube / fps)	g	2.182	2.182	2.182	2.182	2.182	
Transfer Coefficient - (Table III)	U1	743.9	743.9	743.9	743.9	743.9	
Velocity - fps - (Table III)	V	8.00	8.00	8.00	8.00	8.00	
Correction Factors							
Water - (Table V)	f	1.033	1.051	1.057	1.066	1.051	
Cleanliness (50% to 100%)	c	0.85	0.85	0.85	0.85	0.85	
Material & Gauge - (Table IV)	b	0.85	0.85	0.85	0.85	0.85	
Cooling Water Flow - GPM	GPM=Q/500(R*ITD)	14,573	16,442	17,340	18,843	66,745	
Water Temp In - Deg F	T1	77.33	82.18	84.14	87.00	82.00	59
Water Temp Out - Deg F	T2	120.00	120.00	120.00	120.00	102.00	106
Wet Bulb Temp - Deg F		72.30	72.30	72.30	72.30	72.30	79 F
TTD - Deg F (Min 5 deg F)	(Ts - T2)	30.81	30.81	30.81	30.81	7.00	
ITD - Deg F	(Ts - T1)	73.48	68.63	66.67	63.81	27.00	
TR - Deg F	(ITD - TTD)	42.67	37.82	35.86	33.00	20.00	
R	(TR / ITD)	0.581	0.551	0.538	0.517	0.741	
K (Table VI)		0.870	0.800	0.772	0.727	1.250	
Effective Tube Length - Ft	L	26.00	23.50	22.55	21.05	36.71	
Number of Tubes	NT	1,670	1,884	1,987	2,159	7,647	
Surface Area - SqFt	S	11,354	11,586	11,727	11,899	73,503	
Budget Price		$560,000	$563,000	$569,000	$576,000	$3,000,000	

10° approach
20° rise
7° TTD

GENESIS SCALED COST = $3,000,000 (756,925,000 / 667,450,848) = $3,402,164

ADD 3 X TO COST FOR GENESIS DESIGN ≈ $3,500,000

Appendix 2 - Wet and Dry Cooling Equipment and Material Cost Estimate

Client: FPLE Solar
Project Name Project Genesis - Ford Dry Lake
Location: Blythe, CA
Capacity: 125 MW Net
Type: Solar Currency: USD Seismic Zone

WorleyParsons
Estimate Report: Unit x Island x PBS - Detail

Proposal Number 0 Partner(s): NA
Configuration: Solar - Wet Cooling Study

Present Day: 7/26/2009
Revision Number: R
Estimate Coordinator
Lead Estimator: Weiss
Checked By:

I-06

User 1	Island	User 2	PBS Code	Acct Code	Mat Stat	Description	Quantity	U/	Material Unit	Labor Unit	Crew	Crew Rate	Material Cost	Labor Cost	Total Cost	Manhours
Power Block																
	310 STEAM TURBINE ISLAND EQUIPMENT & BOP															
			41102 STEAM TURBINE GENERATOR-COMPLETE													
1	310	'ower	41102	1340	25	Steam Surface Condenser 756,925,000 btu/hr, 326 ss tubes,	1.00	EA	3,504,000.00	6,825.000	M02AS	103.19	3,504,000	704,272	4,208,272	6,825.0
						Subtotal For PBS: 41102 STEAM TURBINE GENERATOR-COMPLETE							**3,504,000**	**704,272**	**4,208,272**	**6,825.0**
						Subtotal For Island: 310 STEAM TURBINE ISLAND EQUIPMENT & BOP							**3,504,000**	**704,272**	**4,208,272**	**6,825.0**
	320 CIRCULATING WATER BLOCK															
			46402 CLOSED COOLING WATER SYSTEM													
1	320	'ower	46402	1360	35	Closed cooling water heat exchanger, 2 x 100%, plate & frame, CS frame, 316SS plates, 5000 SF (allowance)	2.00	EA	50,000.00	84.000	M02AS	103.19	100,000	17,336	117,336	168.0
						Subtotal For PBS: 46402 CLOSED COOLING WATER SYSTEM							**100,000**	**17,336**	**117,336**	**168.0**
						Subtotal For Island: 320 CIRCULATING WATER BLOCK							**100,000**	**17,336**	**117,336**	**168.0**
	321 CIRCULATING WATER PUMPS & PIPE															
			46100 CIRCULATING WATER SYSTEM													
1	321	'ower	46100	1521	35	Circulation Water Pumps, 2 X 50%; 44,300 gpm @ 70' TDH; 1000 HP, 3/60/4160; Cast Iron	2.00	EA	540,000.00	682.500	M02AS	103.19	1,080,000	140,854	1,220,854	1,365.0
1	321	'ower	46100	4212	35	Pipe & fittings, CS, Sch. STD WT, class 150, 8", Circulating Water	10.00	LF	100.44	1.157	P02AS	94.92	1,004	1,098	2,103	11.6
1	321	'ower	46100	4213	35	Pipe & fittings, CS, Sch. STD WT, class 150, 60", Circulating Water	60.00	LF	1,333.13	8.440	P02AS	94.92	79,988	48,067	128,055	506.4
1	321	'ower	46100	4213	35	Pipe & fittings, CS, Sch. STD WT, class 150, 46", Circulating Water	200.00	LF	1,019.34	6.470	P02AS	94.92	203,868	122,828	326,696	1,294.0
1	321	'ower	46100	4213	35	Pipe & fittings, CS, Sch. STD WT, class 150, 24", Circulating Water (to risers)	210.00	LF	527.81	3.376	P02AS	94.92	110,840	67,289	178,130	708.9
1	321	'ower	46100	4222	35	Valve, Butterfly, Manual, CS, class 150, 24", Circulating Water	7.00	EA	6,640.00	44.100	P02AS	94.92	46,480	29,302	75,782	308.7
1	321	'ower	46100	4223	35	Valve, Gate, Manual, CS, class 150, 8", Circulating Water	3.00	EA	302.00	15.750	P02AS	94.92	906	4,485	5,391	47.3
1	321	'ower	46100	4235	35	Valve, Auto Air Relief, ARV, CS, class 150, 8", Circulating Water	3.00	EA	5,503.00	15.750	P02AS	94.92	16,509	4,485	20,994	47.3
1	321	'ower	46100	4238	35	Control valve, Butterfly, MBV, motorized actuator, CS, class 150, 42", Circulating Water	4.00	EA	28,252.00	88.725	P02AS	94.92	113,008	33,687	146,695	354.9
1	321	'ower	46100	4292	35	42", Expansion Joint, CS - Circ Water Pump Discharge	3.00	EA	3,179.00	80.262	P02AS	94.92	9,537	22,855	32,392	240.8

Client: FPLE Solar
Project Name Project Genesis - Ford Dry Lake
Location: Blythe, CA
Capacity: 125 MW Net
Type: Solar Currency: USD Seismic Zone

WorleyParsons
Estimate Report: Unit x Island x PBS - Detail

Proposal Number 0 Partner(s): NA
Configuration: Solar - Wet Cooling Study

Present Day: 7/26/2009
Revision Number: R
Estimate Coordinator
Lead Estimator: Weiss
Checked By:

I-06

User 1	Island	User 2	PBS Code	Acct Code	Mat Stat	Description	Quantity	U/	Material Unit	Labor Unit	Crew	Crew Rate	Material Cost	Labor Cost	Total Cost	Manhours
Power Block																
321 CIRCULATING WATER PUMPS & PIPE																
46100 CIRCULATING WATER SYSTEM																
1	321	'ower	46100	4292	35	42", Expansion Joint, CS - Condenser Inlet / Outlet - INSTALL (Provided with Condenser)	2.00	EA	0.00	80.262	P02AS	94.92	0	15,237	15,237	160.5
1	321	'ower	46100	4292	35	Expansion Joints - 24" for Cooling Tower Riser Pipes	7.00	EA	1,750.00	3.376	P02AS	94.92	12,250	2,243	14,493	23.6
1	321	'ower	46100	5210	35	Pipe & fittings, PRESTRESSED CONCRETE, Sch. N/A, class 150, 24", Circulating Water	45.00	LF	307.56	0.982	P02AS	94.92	13,840	4,193	18,034	44.2
1	321	'ower	46100	5210	35	Pipe & fittings, PRESTRESSED CONCRETE, Sch. N/A, class 150, 32", Circulating Water	45.00	LF	383.02	1.277	P02AS	94.92	17,236	5,454	22,690	57.5
1	321	'ower	46100	5210	35	Pipe & fittings, PRESTRESSED CONCRETE, Sch. N/A, class 150, 40", Circulating Water	45.00	LF	472.13	1.776	P02AS	94.92	21,246	7,584	28,830	79.9
1	321	'ower	46100	5210	35	Pipe & fittings, PRESTRESSED CONCRETE, Sch. N/A, class 150, 46", Circulating Water	45.00	LF	531.67	2.041	P02AS	94.92	23,925	8,719	32,644	91.9
1	321	'ower	46100	5210	35	Pipe & fittings, PRESTRESSED CONCRETE, Sch. N/A, class 150, 50", Circulating Water	45.00	LF	539.82	2.144	P02AS	94.92	24,292	9,158	33,450	96.5
1	321	'ower	46100	5210	35	Pipe & fittings, PRESTRESSED CONCRETE, Sch. N/A, class 150, 56", Circulating Water	45.00	LF	634.82	2.401	P02AS	94.92	28,567	10,257	38,824	108.1
1	321	'ower	46100	5210	35	Pipe & fittings, PRESTRESSED CONCRETE, Sch. N/A, class 150, 60", Circulating Water	450.00	LF	680.15	2.573	P02AS	94.92	306,068	109,882	415,949	1,157.6
						Subtotal For PBS: 46100 CIRCULATING WATER SYSTEM							**2,109,564**	**647,679**	**2,757,243**	**6,704.5**
46103 CIRCULATING WATER SYSTEM - GENERAL																
1	321	'ower	46103	4221	35	Valve, Ball 2", CS, Class 150 - Circ Water	3.00	EA	194.00	2.415	P02AS	94.92	582	688	1,270	7.2
1	321	'ower	46103	4224	35	Valve, Gate 2", CS Class 150, - Circ Water	4.00	EA	194.00	2.415	P02AS	94.92	776	917	1,693	9.7
						Subtotal For PBS: 46103 CIRCULATING WATER SYSTEM - GENERAL							**1,358**	**1,605**	**2,963**	**16.9**
46401 AUXILIARY COOLING WATER SYSTEM																
1	321	'ower	46401	4212	35	Pipe & fittings, 10" 15A1S CS Seamless ASTM A106 Gr B STD wall - Aux Cooling Water (from header to heat exchanger)	100.00	LF	131.60	1.411	P02AS	94.92	13,160	13,397	26,557	141.1

Client: FPLE Solar
Project Name Project Genesis - Ford Dry Lake
Location: Blythe, CA
Capacity: 125 MW Net
Type: Solar   Currency: USD   Seismic Zone

WorleyParsons
Estimate Report: Unit x Island x PBS - Detail

Proposal Number 0   Partner(s): NA
Configuration: Solar - Wet Cooling Study

Present Day: 7/26/2009
Revision Number: R
Estimate Coordinator
Lead Estimator: Weiss
Checked By:

I-06

User 1	Island	User 2	PBS Code	Acct Code	Mat Stat	Description	Quantity	U/	Material Unit	Labor Unit	Crew	Crew Rate	Material Cost	Labor Cost	Total Cost	Manhours
Power Block																
321 CIRCULATING WATER PUMPS & PIPE																
			46401 AUXILIARY COOLING WATER SYSTEM													
1	321	'ower	46401	4212	35	Pipe & fittings, 16" 15A1S CS Seamless ASTM A106 Gr B STD wall - Aux Cooling Water	200.00	LF	246.76	2.287	P02AS	94.92	49,352	43,415	92,767	457.4
1	321	'ower	46401	4221	35	Valve 3/4", 150#, CS Metal Seat Ball - Aux Cooling Water	2.00	EA	2,239.00	1.050	P02AS	94.92	4,478	199	4,677	2.1
1	321	'ower	46401	4221	35	Valve 1", 150#, CS Metal Seat Ball - Aux Cooling Water	1.00	EA	2,985.00	1.365	P02AS	94.92	2,985	130	3,115	1.4
1	321	'ower	46401	4222	35	Valve, butterfly, CS, class 150, 1 1/2", - Aux Cooling Water	4.00	EA	146.00	2.415	P02AS	94.92	584	917	1,501	9.7
1	321	'ower	46401	4222	35	Valve, butterfly, 304 SS, class 150, 2" - Aux Cooling Water	2.00	EA	1,031.00	2.415	P02AS	94.92	2,062	458	2,520	4.8
						Subtotal For PBS: 46401 AUXILIARY COOLING WATER SYSTEM							**72,621**	**58,516**	**131,137**	**616.5**
						Subtotal For Island: 321 CIRCULATING WATER PUMPS & PIPE							**2,183,543**	**707,799**	**2,891,342**	**7,337.9**
324 COOLING TOWER																
			14601 COOLING TOWER BASIN & PUMP STRUCTURE													
1	324	'ower	14601	4022	35	Spoils, haul 2 mile RT, cooling tower & pump pit	2,100.00	CY	0.00	0.067	C01CS	94.74	0	13,370	13,370	141.1
1	324	'ower	14601	4026	35	Crushed stone, cooling tower & pump pit	280.00	CY	19.05	0.315	C01CS	94.74	5,334	8,356	13,690	88.2
1	324	'ower	14601	4051	35	Excavate & fine grade, cooling tower & pump pit	3,700.00	CY	0.00	0.158	C01DS	154.05	0	89,773	89,773	582.8
1	324	'ower	14601	4055	35	Backfill & compact, cooling tower & pump pit	1,600.00	CY	0.00	0.210	C01CS	94.74	0	31,833	31,833	336.0
1	324	'ower	14601	4118	35	Rebar & ties, cooling tower & pump pit	70.00	TN	640.00	15.750	S01BS	91.48	44,800	100,857	145,657	1,102.5
1	324	'ower	14601	4120	35	Forms & chamfers, cooling tower & pump pit	27,000.00	SF	2.94	0.210	S01AS	83.90	79,380	475,713	555,093	5,670.0
1	324	'ower	14601	4123	35	Concrete, cooling tower & pump pit	1,100.00	CY	98.00	1.260	S01CS	94.35	107,800	130,769	238,569	1,386.0
1	324	'ower	14601	4127	35	Embeds & anchor bolts, cooling tower & pump pit	5.30	TN	3,600.00	126.000	S01BS	91.48	19,080	61,090	80,170	667.8
						Subtotal For PBS: 14601 COOLING TOWER BASIN & PUMP STRUCTURE							**256,394**	**911,760**	**1,168,154**	**9,974.4**
			17900 MISCELLANEOUS BUILDINGS													
1	324	'ower	17900	4022	35	Spoils, haul 2 mile RT, cooling tower chemical feed storage	198.00	CY	0.00	0.067	C01CS	94.74	0	1,261	1,261	13.3
1	324	'ower	17900	4026	35	Crushed stone, cooling tower chemical feed storage	64.00	CY	19.05	0.315	C01CS	94.74	1,219	1,910	3,129	20.2

Client: FPLE Solar
Project Name Project Genesis - Ford Dry Lake
Location: Blythe, CA
Capacity: 125 MW Net
Type: Solar Currency: USD Seismic Zone

WorleyParsons
Estimate Report: Unit x Island x PBS - Detail

Proposal Number 0 Partner(s): NA
Configuration: Solar - Wet Cooling Study

Present Day: 7/26/2009
Revision Number: R
Estimate Coordinator
Lead Estimator: Weiss
Checked By:

I-06

User 1	Island	User 2	PBS Code	Acct Code	Mat Stat	Description	Quantity	U/	Material Unit	Labor Unit	Crew	Crew Rate	Material Cost	Labor Cost	Total Cost	Manhours
Power Block																
324 COOLING TOWER																
17900 MISCELLANEOUS BUILDINGS																
1	324	'ower	17900	4051	35	Excavate & fine grade, cooling tower chemical feed storage	224.00	CY	0.00	0.158	C01CS	94.74	0	3,342	3,342	35.3
1	324	'ower	17900	4055	35	Backfill & compact, cooling tower chemical feed storage	26.00	CY	0.00	0.210	C01BS	82.67	0	451	451	5.5
1	324	'ower	17900	4118	35	Rebar & ties, cooling tower chemical feed storage	8.67	TN	640.00	15.750	S01BS	91.48	5,549	12,492	18,041	136.6
1	324	'ower	17900	4120	35	Forms & chamfers, cooling tower chemical feed storage	470.00	SF	2.94	0.210	S01AS	83.90	1,382	8,281	9,663	98.7
1	324	'ower	17900	4123	35	Concrete, cooling tower chemical feed storage	133.00	CY	98.00	1.260	S01CS	94.35	13,034	15,811	28,845	167.6
1	324	'ower	17900	4127	35	Embeds & anchor bolts, cooling tower chemical feed storage	0.17	TN	3,600.00	126.000	S01BS	91.48	612	1,960	2,572	21.4
1	324	'ower	17900	4910	35	Pre-engineered roof structure , 55' x 60' x 20'h, cooling tower chemical feed storage (F&E)	3,300.00	SF	43.80	0.000	S07AS	115.71	144,540	0	144,540	0.0
						Subtotal For PBS: 17900 MISCELLANEOUS BUILDINGS							**166,336**	**45,508**	**211,844**	**498.5**
17902 COOLING TOWER ELECTRICAL BUILDING & FOUNDATIONS																
1	324	'ower	17902	4022	35	Spoils, haul 2 mile RT, cooling tower PDC bldg	81.00	CY	0.00	0.067	C01CS	94.74	0	516	516	5.4
1	324	'ower	17902	4026	35	Crushed stone, cooling tower PDC bldg	16.00	CY	19.05	0.315	C01CS	94.74	305	477	782	5.0
1	324	'ower	17902	4051	35	Excavate & fine grade, cooling tower PDC bldg	92.00	CY	0.00	0.158	C01CS	94.74	0	1,373	1,373	14.5
1	324	'ower	17902	4055	35	Backfill & compact, cooling tower PDC bldg	11.00	CY	0.00	0.210	C01BS	82.67	0	191	191	2.3
1	324	'ower	17902	4118	35	Rebar & ties, cooling tower PDC bldg	4.20	TN	640.00	15.750	S01BS	91.48	2,688	6,051	8,739	66.2
1	324	'ower	17902	4120	35	Forms & chamfers, cooling tower PDC bldg	218.00	SF	2.94	0.210	S01AS	83.90	641	3,841	4,482	45.8
1	324	'ower	17902	4123	35	Concrete, cooling tower PDC bldg	63.00	CY	98.00	1.260	S01CS	94.35	6,174	7,490	13,664	79.4
1	324	'ower	17902	4127	35	Embeds & anchor bolts, cooling tower PDC bldg	0.33	TN	3,600.00	126.000	S01BS	91.48	1,188	3,804	4,992	41.6
1	324	'ower	17902	4313	35	Stru Steel, medium (20-39#/lf), cooling tower PDC bldg	1.20	TN	2,885.00	19.950	S03AS	110.35	3,462	2,642	6,104	23.9
1	324	'ower	17902	4314	35	Stru Steel, light (0-19#/lf), cooling tower PDC bldg	1.10	TN	3,501.00	24.150	S03AS	110.35	3,851	2,931	6,783	26.6

Client: FPLE Solar
Project Name Project Genesis - Ford Dry Lake
Location: Blythe, CA
Capacity: 125 MW Net
Type: Solar Currency: USD Seismic Zone

WorleyParsons
Estimate Report: Unit x Island x PBS - Detail

Proposal Number 0 Partner(s): NA
Configuration: Solar - Wet Cooling Study

Present Day: 7/26/2009
Revision Number: R
Estimate Coordinator
Lead Estimator: Weiss
Checked By:

I-06

User 1	Island	User 2	PBS Code	Acct Code	Mat Stat	Description	Quantity	U/	Material Unit	Labor Unit	Crew	Crew Rate	Material Cost	Labor Cost	Total Cost	Manhours
Power Block																
	324 COOLING TOWER															
			17902 COOLING TOWER ELECTRICAL BUILDING & FOUNDATIONS													
1	324	'ower	17902	4910	35	Pre-fabricated bldg ,40' x 15' x 12'h, cooling tower PDC bldg, includes 480V power panel, 208/120V power panel, 480V to 208/120V power transformer, 208/120V lighting panel, 480 to 208/120V lighting transformer, 125V DC panel, HVAC system, portable fire extinguisher, lighting & receptacles, internal raceway & cable system, misc tool box, ground bus, provisions for fire detection system (F&IBO); external stairs, platforms, ladders (IBO), 4 shipping splits	1.00	LS	360,000.00	84.000	S07AS	115.71	360,000	9,720	369,720	84.0
1	324	'ower	17902	4910	35	Fire protection , 60' x 15' x 12'h, cooling tower PDC bldg (F&E)	600.00	SF	4.00	0.000	S07AS	115.71	2,400	0	2,400	0.0
						Subtotal For PBS: 17902 COOLING TOWER ELECTRICAL BUILDING & FOU							**380,709**	**39,035**	**419,744**	**394.7**
			46100 CIRCULATING WATER SYSTEM													
1	324	'ower	46100	1521	35	Cooling Tower Aux Pumps, 1 X 100%; 5000 gpm @ 150' TDH, 300 HP, Cast Iron	1.00	EA	100,000.00	367.500	M02AS	103.19	100,000	37,922	137,922	367.5
						Subtotal For PBS: 46100 CIRCULATING WATER SYSTEM							**100,000**	**37,922**	**137,922**	**367.5**
			46102 COOLING TOWER													
1	324	'ower	46102	1550	35	Cooling Tower Blowdown Transfer Pumps, 2 X 100%; 400 gpm @ 60 ft TDH; 10 HP, 3/60/460; Cast Iron	2.00	EA	20,000.00	31.500	M02AS	103.19	40,000	6,501	46,501	63.0
1	324	'ower	46102	1700	25	Cooling Tower, 7-cell, fiberglass, mechanical draft, 1 X 100%; 808 MMBtu/hr, 94,600 gpm; 250 HP (each); FRP with 316SS hardware; Hot Wof concentration. (F&E)	1.00	EA	2,750,000.00	0.000	M02AS	103.19	2,750,000	0	2,750,000	0.0
1	324	'ower	46102	1952	35	Cooling Tower Blowdown Tank; 7,000 gal; ; Coated Carbon Steel; 30 min retention	1.00	EA	58,000.00	42.000	M02AS	103.19	58,000	4,334	62,334	42.0
1	324	'ower	46102	4212	35	Pipe & fittings, CS, Sch. STD WT, class 150, 4", Steam Blowdown	100.00	LF	52.48	0.792	P02AS	94.92	5,248	7,515	12,763	79.2
1	324	'ower	46102	4212	35	Pipe & fittings, CS, Sch. STD WT, class 150, 3", Steam Blowdown	181.00	LF	41.60	0.735	P02AS	94.92	7,530	12,628	20,157	133.0
1	324	'ower	46102	4212	35	Pipe & fittings, CS, Sch. 60, class 2500, 3", HC insulation, Steam Blowdown	440.00	LF	47.64	0.847	P02AS	94.92	20,962	35,389	56,351	372.8
1	324	'ower	46102	4212	35	Pipe & fittings, CS, Sch. STD WT, class 150, 3", Steam Blowdown	20.00	LF	41.60	0.792	P02AS	94.92	832	1,503	2,335	15.8

Client: FPLE Solar
Project Name Project Genesis - Ford Dry Lake
Location: Blythe, CA
Capacity: 125 MW Net
Type: Solar Currency: USD Seismic Zone

WorleyParsons
Estimate Report: Unit x Island x PBS - Detail

Proposal Number 0 Partner(s): NA
Configuration: Solar - Wet Cooling Study

Present Day: 7/26/2009
Revision Number: R
Estimate Coordinator
Lead Estimator: Weiss
Checked By:

I-06

User 1	Island	User 2	PBS Code	Acct Code	Mat Stat	Description	Quantity	U/	Material Unit	Labor Unit	Crew	Crew Rate	Material Cost	Labor Cost	Total Cost	Manhours
Power Block																
	324 COOLING TOWER															
			46102 COOLING TOWER													
1	324	'ower	46102	4223	35	Valve, Gate, Manual, CS, class 150, 4", Steam Blowdown	2.00	EA	399.00	11.025	P02AS	94.92	798	2,093	2,891	22.1
1	324	'ower	46102	4223	35	Valve, Gate, Manual, CS, class 150, 3", Steam Blowdown	2.00	EA	302.00	7.875	P02AS	94.92	604	1,495	2,099	15.8
1	324	'ower	46102	4223	35	Valve, Check, Swing, CS, class 150, 3", Steam Blowdown	2.00	EA	275.00	7.875	P02AS	94.92	550	1,495	2,045	15.8
1	324	'ower	46102	4720	35	Insulation, piping 3" dia x 1.5" thick, HC insulation, Steam Blowdown	440.00	LF	6.97	0.326	I01AS	84.83	3,067	12,149	15,216	143.2
						Subtotal For PBS: 46102 COOLING TOWER							**2,887,590**	**85,102**	**2,972,692**	**902.6**
			46303 COOLING TOWER CHEMICAL FEED SYSTEM													
1	324	'ower	46303	4208	35	Pipe & fittings, 2" and smaller, CPVC, sch. 80 - cooling tower chem feed	200.00	LF	14.58	0.525	P02AS	94.92	2,916	9,967	12,883	105.0
1	324	'ower	46303	4214	35	Pipe & fittings, 1", Alloy 20, sch. 40 - cooling tower chem feed	100.00	LF	98.78	0.793	P02AS	94.92	9,878	7,525	17,403	79.3
1	324	'ower	46303	4217	35	Pipe & fittings, 1/2", SS - Cycle Chemical Feed Tubing	400.00	LF	12.17	0.113	P02AS	94.92	4,868	4,306	9,174	45.4
1	324	'ower	46303	4217	35	Pipe & fittings, 1", sh.40 type 304 SS - Cooling Tower Chem Feed	100.00	LF	62.29	0.634	P02AS	94.92	6,229	6,020	12,249	63.4
1	324	'ower	46303	4221	35	Valve 4", 150#, CS Metal Seat Ball	2.00	EA	3,506.00	11.025	P02AS	94.92	7,012	2,093	9,105	22.1
1	324	'ower	46303	4720	35	Insulation 2" thick, 2" and smaller pipe - cooling tower chem feed	400.00	LF	8.06	0.326	I01AS	84.83	3,224	11,045	14,269	130.2
						Subtotal For PBS: 46303 COOLING TOWER CHEMICAL FEED SYSTEM							**34,127**	**40,955**	**75,082**	**445.3**
			62505 MEDIUM VOLTAGE SWITCHGEAR, 2.3KV TO7.2KV													
1	324	'ower	62505	0211	25	Switchgear, 4160V, Cooling Tower Swgr./MCC A/B	1.00	EA	310,000.00	378.000	E02BS	94.41	310,000	35,687	345,687	378.0
						Subtotal For PBS: 62505 MEDIUM VOLTAGE SWITCHGEAR, 2.3KV TO7.2KV							**310,000**	**35,687**	**345,687**	**378.0**
			63103 MOTOR CONTROL CENTERS, 380V TO 480V													
1	324	'ower	63103	0232	25	MCC A & B, 480V, Cooling Tower	2.00	EA	34,695.00	63.000	E02BS	94.41	69,390	11,896	81,286	126.0
						Subtotal For PBS: 63103 MOTOR CONTROL CENTERS, 380V TO 480V							**69,390**	**11,896**	**81,286**	**126.0**
						Subtotal For Island: 324 COOLING TOWER							**4,204,546**	**1,207,865**	**5,412,411**	**13,087.0**
						Subtotal For: Power Block							**9,992,088**	**2,637,272**	**12,629,360**	**27,417.8**

Client: FPLE Solar
Project Name Project Genesis - Ford Dry Lake
Location: Blythe, CA
Capacity: 125 MW Net
Type: Solar Currency: USD Seismic Zone

WorleyParsons
Estimate Report: Unit x Island x PBS - Detail

Proposal Number 0 Partner(s): NA
Configuration: Solar - Wet Cooling Study

Present Day: 7/26/2009
Revision Number: R
Estimate Coordinator
Lead Estimator: Weiss
Checked By:

I-06

User 1	Island	User 2	PBS Code	Acct Code	Mat Stat	Description	Quantity	U/	Material Unit	Labor Unit	Crew	Crew Rate	Material Cost	Labor Cost	Total Cost	Manhours
											Grand Total		9,992,088	2,637,272	12,629,360	27,417.8

WorleyParsons/NA Proprietary Information

Client: FPLE Solar
Project Name Project Genesis Ford Dry Lake
Location: Blythe, Ca
Capacity: 125 MW Net
Type: Solar   Currency: USD   Seismic Zone

WorleyParsons
Estimate Report: Unit x Island x PBS - Detail

Proposal Number 0   Partner(s): NA
Configuration: Solar - Dry Cooling Study

Present Day: 7/28/2009
Revision Number: R
Estimate Coordinator
Lead Estimator: Weiss
Checked By:

I-06

User 1		Island	User 2	PBS Code	Acct Code	Mat Stat	Description	Quantity	U/	Material Unit	Labor Unit	Crew	Crew Rate	Material Cost	Labor Cost	Total Cost	Manhours
Unit 1																	
		321					**CIRCULATING WATER PUMPS & PIPE**										
				46401			**AUXILIARY COOLING WATER SYSTEM**										
1	C	321	25-19	46401	1360	35	Fin Fan Cooler (Allowance) (Duty???)	1.00	EA	435,000.00	661.500	M02AS	103.19	435,000	68,260	503,260	661.5
1	C	321	25-04	46401	4051	35	Excavate, Fin Fan Cooler	700.00	CY	0.00	0.165	C01CS	94.74	0	10,967	10,967	115.8
1	C	321	25-04	46401	4059	35	Backfill & Compaction, Fin Fan Cooler	530.00	CY	19.05	0.331	C01BS	82.67	10,097	14,492	24,588	175.3
1	C	321	25-04	46401	4118	35	Rebar, Fin Fan Cooler	8.00	TN	640.00	16.538	S01BS	91.48	5,120	12,103	17,223	132.3
1	C	321	25-04	46401	4120	35	Formwork, Fin Fan Cooler	750.00	SF	2.94	0.221	S01AS	83.90	2,205	13,875	16,080	165.4
1	C	321	25-04	46401	4122	35	Mud Mat, Fin Fan Cooler	10.50	CY	90.00	0.551	S01CS	94.35	945	546	1,491	5.8
1	C	321	25-04	46401	4123	35	Concrete, Fin Fan Cooler	100.00	CY	98.00	1.323	S01CS	94.35	9,800	12,483	22,283	132.3
1	C	321	25-04	46401	4127	35	Embeds,Fin Fan Cooler	1.00	TN	3,600.00	132.300	S01AS	83.90	3,600	11,100	14,700	132.3
							Subtotal For PBS: 46401 AUXILIARY COOLING WATER SYSTEM							**466,767**	**143,826**	**610,592**	**1,520.6**
							Subtotal For Island: 321 CIRCULATING WATER PUMPS & PIPE							**466,767**	**143,826**	**610,592**	**1,520.6**
		324					**COOLING TOWER**										
				17902			**COOLING TOWER ELECTRICAL BUILDING & FOUNDATIONS**										
1	C	324	25-04	17902	4051	35	Excavate, ACC PDC bldg	1,200.00	CY	0.00	0.165	C01CS	94.74	0	18,801	18,801	198.5
1	C	324	25-04	17902	4055	35	Backfill & compact, ACC PDC bldg	520.00	CY	0.00	0.221	C01CS	94.74	0	10,863	10,863	114.7
1	C	324	25-04	17902	4118	35	Rebar, ACC PDC bldg	5.00	TN	640.00	16.538	S01BS	91.48	3,200	7,564	10,764	82.7
1	C	324	25-04	17902	4120	35	Forms, ACC PDC bldg	4,800.00	SF	2.94	0.221	S01AS	83.90	14,112	88,800	102,912	1,058.4
1	C	324	25-04	17902	4122	35	Mud mat, 3", ACC PDC bldg	24.00	CY	90.00	0.551	S01CS	94.35	2,160	1,248	3,408	13.2
1	C	324	25-04	17902	4123	35	Concrete, ACC PDC bldg	94.00	CY	98.00	1.323	S01CS	94.35	9,212	11,734	20,946	124.4
1	C	324	25-04	17902	4127	35	Embeds, ACC PDC bldg	0.50	TN	3,600.00	132.300	S01BS	91.48	1,800	6,051	7,851	66.2
1	C	324	25-07	17902	4313	35	Stru Steel, medium, ACC PDC bldg	2.60	TN	2,885.00	21.147	S03AS	110.35	7,501	6,067	13,568	55.0
1	C	324	25-07	17902	4314	35	Stru Steel, light, connections @ 10%, ACC PDC bldg	0.26	TN	3,501.00	25.599	S03AS	110.35	910	734	1,645	6.7
1	C	324	25-35	17902	4910	35	Pre-engineered bldg, 60' x 30' x 12'h, - 1,800 sf, ACC PDC (4 shipping splits)	1.00	LS	1,080,000.00	176.400	S07AS	115.71	1,080,000	20,411	1,100,411	176.4
							Subtotal For PBS: 17902 COOLING TOWER ELECTRICAL BUILDING & FOU							**1,118,895**	**172,274**	**1,291,170**	**1,896.0**
				47105			**AIR COOLED CONDENSER**										
1	C	324	25-20	47105	1320	15	Air Cooled Condenser, 18 cell including Steam Duct, Holding Air Ejector, Hogging Vacuum Pump & Condensate tank ( )	1.00	EA	16,500,000.00	62,970.600	M02AS	103.19	16,500,000	6,497,936	22,997,936	62,970.6
1	C	324	25-04	47105	4051	35	Excavate, Air Cooled Condenser	4,700.00	CY	0.00	0.165	C01CS	94.74	0	73,638	73,638	777.3

Client: FPLE Solar
Project Name Project Genesis Ford Dry Lake
Location: Blythe, Ca
Capacity: 125 MW Net
Type: Solar Currency: USD Seismic Zone

WorleyParsons
Estimate Report: Unit x Island x PBS - Detail

Proposal Number 0 Partner(s): NA
Configuration: Solar - Dry Cooling Study

Present Day: 7/28/2009
Revision Number: R
Estimate Coordinator
Lead Estimator: Weiss
Checked By:

I-06

User 1	Island	User 2	PBS Code	Acct Code	Mat Stat	Description	Quantity	U/	Material Unit	Labor Unit	Crew	Crew Rate	Material Cost	Labor Cost	Total Cost	Manhours
Unit 1																
	324 COOLING TOWER															
			47105 AIR COOLED CONDENSER													
1 C	324	C5-04	47105	4059	35	Backfill & Compaction, Air Cooled Condenser	3,538.00	CY	19.05	0.331	C01BS	82.67	67,399	96,740	164,139	1,170.2
1 C	324	C5-04	47105	4118	35	Rebar, Air Cooled Condenser	54.00	TN	640.00	16.538	S01BS	91.48	34,560	81,694	116,254	893.0
1 C	324	C5-04	47105	4120	35	Formwork, Air Cooled Condenser	5,000.00	SF	2.94	0.221	S01AS	83.90	14,700	92,500	107,200	1,102.5
1 C	324	C5-04	47105	4122	35	Mud Mat, Air Cooled Condenser	70.00	CY	90.00	0.551	S01CS	94.35	6,300	3,641	9,941	38.6
1 C	324	C5-04	47105	4123	35	Concrete, Air Cooled Condenser	668.00	CY	98.00	1.323	S01CS	94.35	65,464	83,383	148,847	883.8
1 C	324	C5-04	47105	4127	35	Embeds, Air Cooled Condenser	1.00	TN	3,600.00	132.300	S01AS	83.90	3,600	11,100	14,700	132.3
						Subtotal For PBS: 47105 AIR COOLED CONDENSER							**16,692,023**	**6,940,631**	**23,632,654**	**67,968.2**
			62505 MEDIUM VOLTAGE SWITCHGEAR, 2.3KV TO7.2KV													
1 C	324	C5-27	62505	0211	35	ACC - 4160- Volt, 1200-Amp, Switchgear With (1) 1,200-Amp Load Break Disconnects, And (3) 400-Amp Vacuum Break Contactors.	1.00	EA	108,000.00	126.000	E02BS	94.41	108,000	11,896	119,896	126.0
1 C	324	C5-27	62505	0213	35	ACC - 480 Volt, 3200-Amp, Substation With (1)2000/2666-4.16-480 transformer, (1) 3,200-Amp Main Breakers,(2) 1,600-Amp Feeder Breakers, And (1) 3,200-Amp Feeder Breaker.	3.00	EA	162,000.00	168.000	E02BS	94.41	486,000	47,583	533,583	504.0
1 C	324	C5-27	62505	0232	35	ACC - 480 Volt, 1600-Amp, Motor Control Center With 6-Sections C	3.00	EA	36,000.00	63.000	E02BS	94.41	108,000	17,843	125,843	189.0
						Subtotal For PBS: 62505 MEDIUM VOLTAGE SWITCHGEAR, 2.3KV TO7.2KV							**702,000**	**77,322**	**779,322**	**819.0**
						Subtotal For Island: 324 COOLING TOWER							**18,512,918**	**7,190,228**	**25,703,146**	**70,683.2**
						Subtotal For: Unit 1							**18,979,685**	**7,334,053**	**26,313,738**	**72,203.8**

Client: FPLE Solar
Project Name Project Genesis Ford Dry Lake
Location: Blythe, Ca
Capacity: 125 MW Net
Type: Solar Currency: USD Seismic Zone

WorleyParsons
Estimate Report: Unit x Island x PBS - Detail

Proposal Number 0 Partner(s): NA
Configuration: Solar - Dry Cooling Study

Present Day: 7/28/2009
Revision Number: R
Estimate Coordinator
Lead Estimator: Weiss
Checked By:

I-06

User 1	Island	User 2	PBS Code	Acct Code	Mat Stat	Description	Quantity	U/	Material Unit	Labor Unit	Crew	Crew Rate	Material Cost	Labor Cost	Total Cost	Manhours
											Grand Total		**18,979,685**	**7,334,053**	**26,313,738**	**72,203.8**

Appendix 3 - Wet Cooled Performance Summary

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NextEra - Ford Dry Lake
Wet Cooled CSP Plant Performance Evaluation

Location	Ford Dry Lake, CA
Data File	Ford Dry Lake (TDY).tm2
Lat/Long Coordinates	114.99 W, 33.66 N
Date	08/10/09
Revision	A
Model Run By	B. Doar
Check By	J.Foster

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Wet Cooled Net Electricity Generation (MW) @ Ford Dry Lake, CA

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CONFIDENTIAL

Appendix 4 - Dry Cooled Performance Summary

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NextEra - Ford Dry Lake
Dry Cooled CSP Plant Performance Evaluation

Location	Ford Dry Lake, CA
Data File	Ford Dry Lake (TDY).tm2
Lat/Long Coordinates	114.99 W, 33.66 N
Date	08/10/09
Revision	A
Model Run By	B. Doar
Check By	J.Foster

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Dry Cooled - Net Electricity Generation (MW) @ Ford Dry Lake, CA

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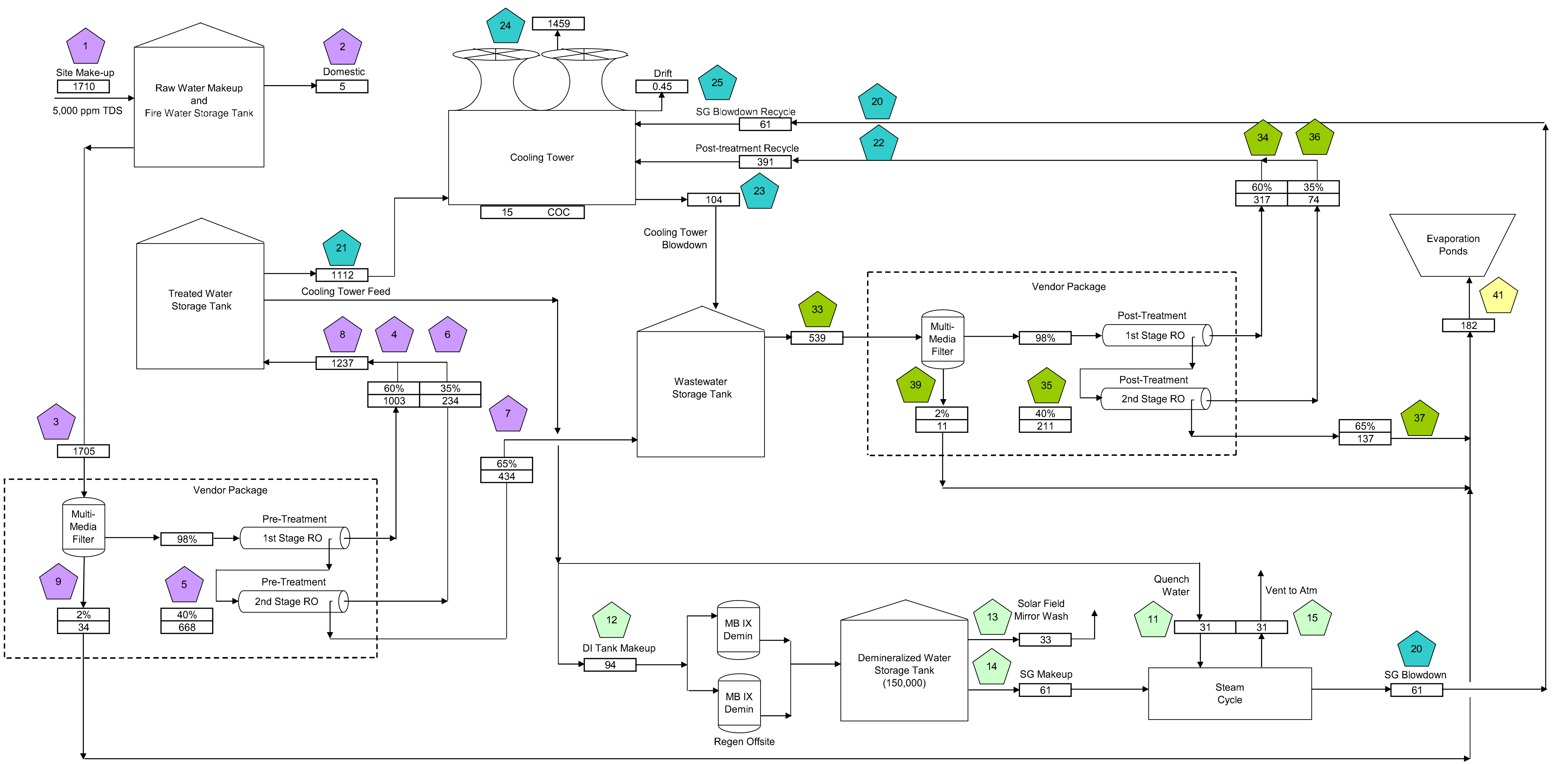
Appendix 5 - Water Balance Diagrams

ANNUAL AVERAGE CONDITIONS



Rev.	Description	By	Date	Checked
B	Updated Flow Rates	SDS	8/7/2009	
A	Updated for water Quality	SDS	7/29/2009	JWL

Design Case:

Configuration	Solar/Steam Cycle	
Dry bulb Temp	83.20	Deg F
Wet Bulb Temp	57.80	Deg F
Amb Pressure	14.67	psia

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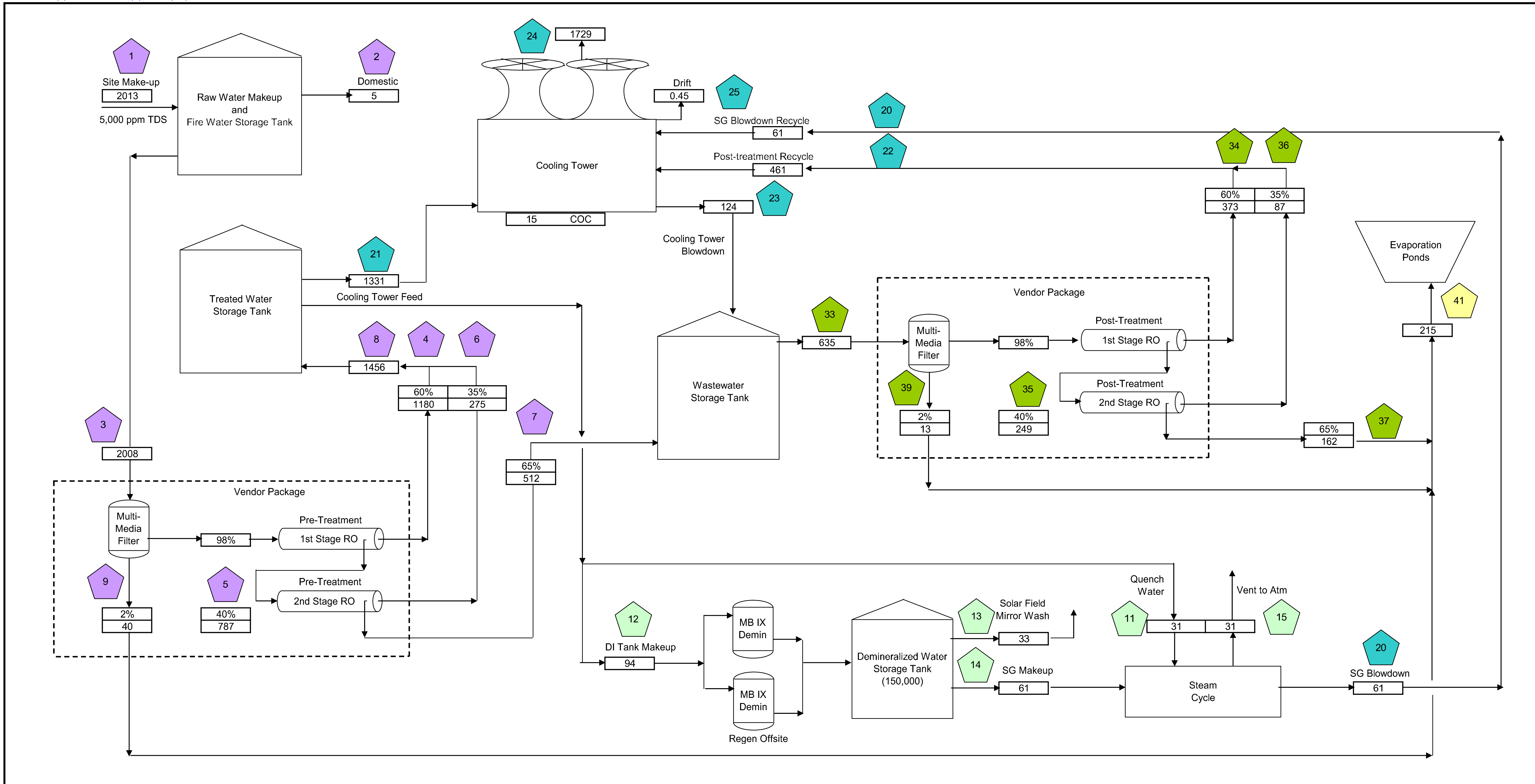
Water Balance - Annual Average (5000 TDS)

Genesis Solar Energy Project

Rev B

SUMMER PEAK CONDITIONS



Rev.	Description	By	Date	Checked
B	Updated Flow Rates	SDS	8/7/2009	
A	Updated for water Quality	SDS	7/29/2009	JWL

Design Case:

Configuration	Solar/Steam Cycle	
Dry bulb Temp	112.90	Deg F
Wet Bulb Temp	78.60	Deg F
Amb Pressure	14.67	psia

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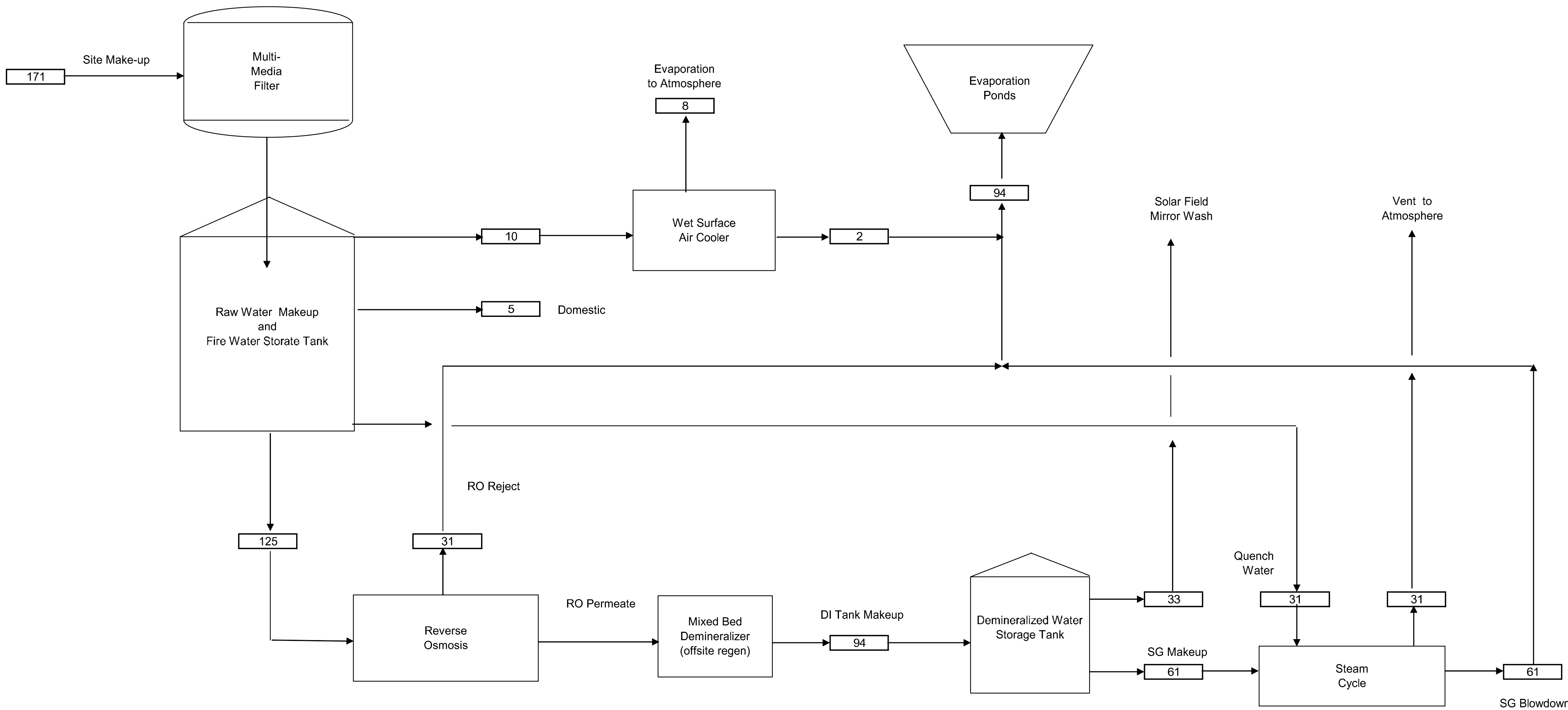
Water Balance - Summer Peak (5000 TDS)

Genesis Solar Energy Project

Rev B



A	Issued for Review	SDS	8/6/2009	JLF
Rev.	Description	By	Date	Checked

Design Case:

Configuration	Solar/Steam Cycle	
Dry bulb Temp	112.9	Deg F
Wet Bulb Temp	78.6	Deg F
Amb Pressure	14.67	psia

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resources & energy

Water Balance - Air Cooled Condenser

Genesis Solar Energy Project

Rev A

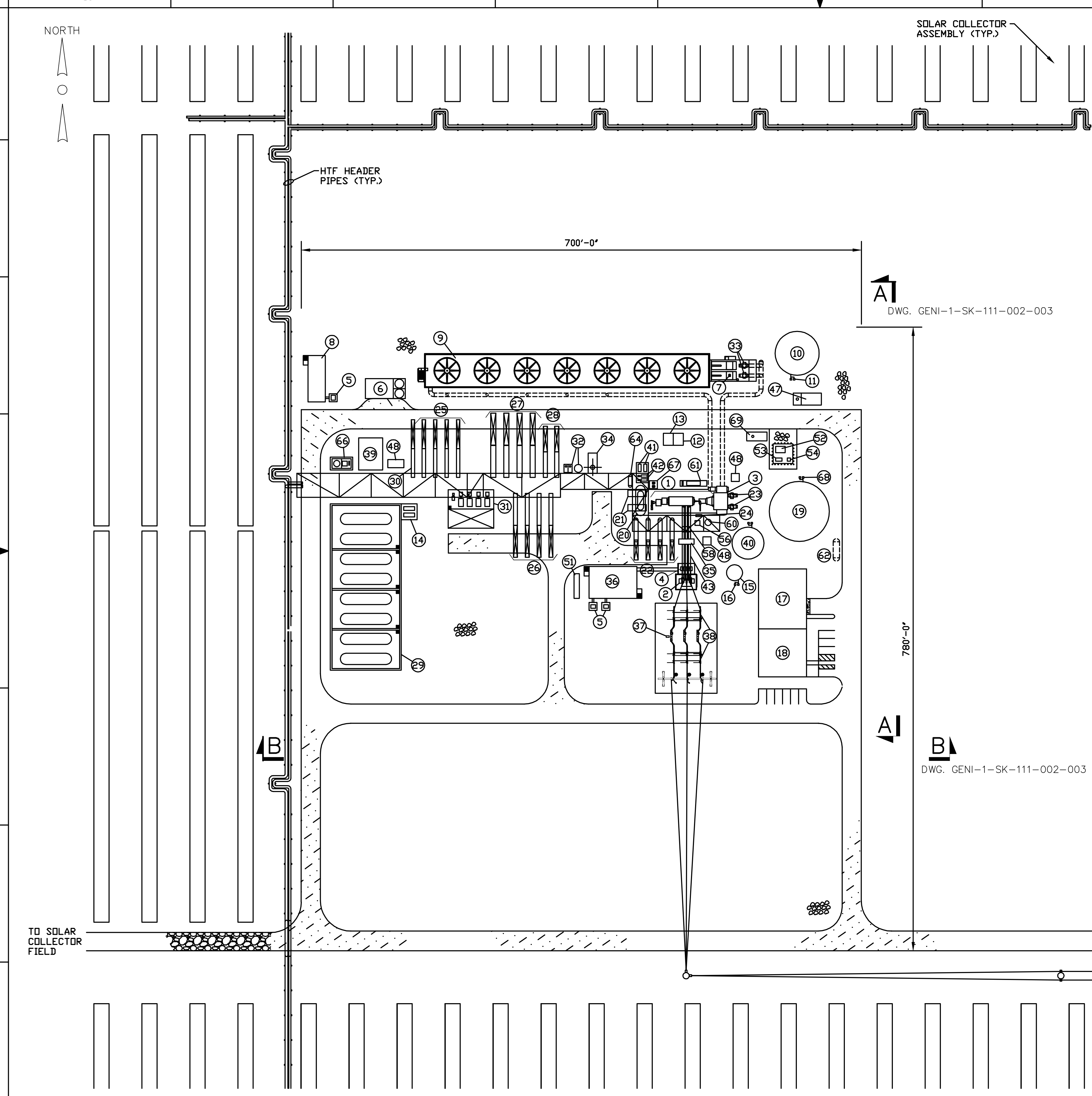
Appendix 6 - Water Treatment Cost

	GENESIS 1: RO Pre-Treat & RO Post-Treat	GENESIS 2: Air Cooled Condenser
	1,710 gpm Makeup (annual)	161 gpm Makeup (annual)
	2,013 gpm Makeup (summer)	171 gpm Makeup (summer)
	182 gpm to Evap Pond (annual)	92 gpm Blowdown (annual)
	215 gpm to Evap Pond (summer)	94 gpm Blowdown (summer)
	67 24-hr avg gpm to Pond (annual)	26 24-hr avg gpm to Pond (annual)
	96 24-hr avg gpm to Pond (summer)	42 24-hr avg gpm to Pond (summer)
	822 Makeup (annual AFY)	66 Makeup (annual AFY)
	50.6 Blowdown (annual AFY)	42 Blowdown (annual AFY)

O&M Costs	Units		Conc.	Cost	Genesis 1	Genesis 1	Genesis 2	Genesis 2
Cooling Tower Chem Feed	$/mmLb BD		100.00%	$245.00		$71,940		
Sulfuric Acid (cooling tower lb/day)	$/Lb		93.00%	$0.15		$21,163		
Oxidizing Biocide (NaOCl lb/day)	$/Lb		12.50%	$0.65		$15,335		
RO Anti-Scalant	$/Lb			$2.90		$5,142		
Sludge Disposal (tons/year)	$/Wet Ton			$45.00		$377,145		$35,471
Labor (annual O&M)	$/Hr			$48.00	50%	$210,240	20%	$84,096
Membrane Replacement						$42,295		
Power (motors/heaters)	$/MW-Hr			$150.00	139	$149,055	27	$26,736
Mixed Bed IX (Offsite Regen)						$78,767		$78,767
TOTAL O&M COSTS						$971,083		$225,069
Capital Costs	**Units**		**Install Factor**	**Value**				
Multimedia Filter - Pre-treatment	$/1000 GPM		1.00	$150,000	2	$300,000	1	$150,000
Multimedia Filter - Post-treatment	$/1000 GPM		1.00	$150,000	1	$150,000		
Make-Up Reverse Osmosis	$/100 GPM		1.00	$100,000	28	$2,800,000	1.5	$150,000
Waste Water Reverse Osmosis	$/100 GPM		1.00	$200,000	9	$1,800,000		
Evaporation Ponds	$/ACRE	Installed	0.00	$245,000	# of acres 24	$5,880,000	# of acres 12	$2,940,000
Shop Fab Tanks (H2SO4) Demin	$/GALLON		1.00	$2.00	gallon tank 8,000	$16,000		
Shop Fab Tanks (H2SO4) Cooling Tower	$/GALLON		1.00	$2.00	gallon tank 8,000	$16,000		
Shop Fab Tanks (NaOCl) Inlet to Site	$/GALLON		1.00	$2.00	gallon tank 8,500	$17,000		
Shop Fab Tanks (NaOCl) Cooling Tower	$/GALLON		1.00	$2.00	gallon tank 8,500	$17,000		
Shop Fab Tanks (Scale Inhibitor)	$/GALLON		1.00	$15.00	gallon tank 1,500	$22,500		
Field Erected Tanks (Raw/Service Water)	$/GALLON	Installed	0.00	$0.42	gallon tank 500,000	$210,000	gallon tank 500,000	$210,000
Field Erected Tanks (Treated Water)	$/GALLON	Installed	0.00	$0.54	gallon tank 1,250,000	$675,000		
Field Erected Tanks (Demin Water)	$/GALLON	Installed	0.00	$1.80	gallon tank 40,000	$72,000	gallon tank 40,000	$72,000
Field Erected Tanks (Wastewater)	$/GALLON	Installed	0.00	$0.54	gallon tank 250,000	$135,000		

	Genesis 1	Genesis 2
Estimated O&M Costs (annual excluding labor and power) ($1MM)	$0.6	$0.1
Estimated O&M Costs (annual for labor and power) ($1MM)	$0.4	$0.1
Total Annual O&M Costs ($1MM)	**$1.0**	**$0.2**
Estimated Evap Pond Capital Costs ($1MM)	$5.9	$2.9
Estimated Equipment Capital Costs ($1MM) Excluding Evap Ponds	$6.2	$0.6
Estimated Installation Costs ($1MM) Excluding Evap Ponds	$5.1	$0.3
Total Installed Capital Costs ($1MM)	**$17.2**	**$3.8**

Appendix 7 - Power Block General Arrangement



EQUIPMENT DESCRIPTIONS

1 STEAM TURBINE/GENERATOR
2 GSU TRANSFORMER
3 SURFACE CONDENSER
4 UNIT AUXILIARY TRANSFORMER
5 STATION SERVICE TRANSFORMERS
6 COOLING TOWER CHEMICAL FEED/STORAGE AREA
7 AUXILIARY COOLING PUMP (BACK-UP/START-UP)
8 COOLING TOWER ELECTRICAL ENCLOSURE
9 COOLING TOWER
10 RAW, FIRE, TANK (500,000 GAL)
11 SERVICE WATER PUMPS
12 CO2 BOTTLE STORAGE
13 H2 BOTTLE STORAGE
14 OVERFLOW TANK PUMPS
15 DEMIN WATER STORAGE TANK (40,000 GAL)
16 DEMIN WATER PUMP SKID
17 WATER TREATMENT AREA (CYCLE CHEM FEED, DEMIN TRAIN, MMF, RO, SAMPLE PANEL, LAB, AIR COMP)
18 CONTROL ROOM/WAREHOUSE BUILDING
19 TREATED WATER TANK (1,250,000 GAL)
20 DEAERATOR/STORAGE TANK/FEEDWATER HEATER
21 FEEDWATER PUMPS
22 FEEDWATER HEATERS
23 CONDENSATE PUMPS
24 GLAND STEAM CONDENSER
25 ECONOMIZERS
26 REHEATERS
27 EVAPORATORS
28 SUPERHEATERS
29 EXPANSION TANKS AND CONTAINMENT AREA
30 HTF FREEZE PROTECTION HEAT EXCHANGER
31 HTF CIRCULATING PUMPS AND CONTAINMENT AREA
32 BLOWDOWN TANK AND SUMP/PUMPS
33 CIRCULATING WATER PUMPS
34 AUXILIARY BOILER
35 GENERATOR CIRCUIT BREAKER
36 MAIN ELECTRICAL ENCLOSURE
37 MAIN CIRCUIT BREAKER
38 MAIN DISCONNECT
39 ULLAGE SYSTEM AND CONTAINMENT AREA
40 WASTE WATER TANK (250,000 GAL)
41 CLOSED COOLING WATER HEAT EXCHANGERS
42 CLOSED COOLING WATER PUMPS
43 ISOLATED PHASE BUS DUCT
44 NOT USED
45 NOT USED
46 NOT USED
47 FIRE PUMP HOUSE
48 FIRE PROTECTION SPRINKLER HOUSE
49 NOT USED
50 NOT USED
51 4KV, 2500KVA UPS
52 ABOVE GROUND DIESEL FUEL STORAGE TANK (3,000 GAL)
53 DIESEL FUEL PUMP
54 WASH TRUCK DEMIN FILL STATION
55 NOT USED
56 STEAM JET AIR INJECTOR
57 NOT USED
58 EXCITATION TRANSFORMER
59 NOT USED
60 TURBINE AREA FLASH TANK
61 LUBE OIL AND EHC SKID
62 OIL/WATER SEPARATOR
63 NOT USED
64 CLOSED COOLING WATER EXPANSION TANK
65 NOT USED
66 NITROGEN BULK STORAGE AND VAPORIZER
67 EQUIPMENT DRAINS SUMP AND PUMPS
68 TREATED WATER PUMP SKID
69 EMERGENCY DIESEL GENERATOR

NOTES:

1. NOT FOR CONSTRUCTION.

LEGEND:

YARD AGGREGATE
ROAD AGGREGATE
ASPHALT
CONCRETE
PIPE RACK
PULL SPACE

60 0 60 120 180
SCALE: 1" = 60'

REV	DATE	DESCRIPTION	DRAWN	CHECKED	LEAD DESIGNER	ENGINEER/TECH SPECIALIST	LEAD DESIGN ENGINEER	PROJ ENGR MANAGER	PROJECT MANAGER
C	08/12/09	ISSUED FOR REVIEW	PL	JF	PL	JF	JF	JF	CN
B	07/09/09	ISSUE FOR REVIEW	RVG	TR	PL	TR	JF	JF	BP
A	04/27/09	ISSUED FOR REVIEW	SC	TR	PL	TR	JF	JF	BP

PRELIMINARY STATUS — DATE — REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.
LDE J. FOSTER 4/27/09
APPROVED STATUS — DATE — REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.
LDE

ORIGINATING PERSONNEL — PROFESSIONAL ENGINEER'S SEAL
DRAWN BY: S. CHERRY
CHECKED BY: J. FOSTER
LEAD DESIGNER: P. LOUEN
ENGINEER/TECH SPECIALIST: J. FOSTER
PROJECT ENGINEERING MANAGER: J. FOSTER
PROJECT MANAGER: C. NITOFF

Zero Harm — Leadership, No Incidents, Safe Behavior

ORIGINALLY PREPARED UNDER THE RESPONSIBLE SUPERVISION OF
PE: STATE:
LIC. NO.: DATE:

WorleyParsons
resources & energy

CLIENT/PROJECT TITLE
GENESIS SOLAR, LLC
GENESIS SOLAR ENERGY PROJECT

GENERAL ARRANGEMENT
CONCEPTUAL POWER BLOCK LAYOUT UNIT 1
FIGURE 3-2

SCALE 1"=60'
DRAWING SIZE ARCH D (36" x 24")
WORLEYPARSONS DWG. NO. GENI-1-SK-111-002-002
REV C

GENI-1-SK-111-002-002-RC.dwg
11-Aug-2009 - 13:48

Biological Resources

Item 53:

Information Required:

USGS Desert Tortoise Habitat Model. Please provide a figure depicting desert tortoise habitat within the project area based on the recent United States Geological Survey (USGS) model (Nussear et al. 2009). Please provide this figure at a 1:250,000 scale so that this information is depicted in a regional context (eastern Riverside County).

Response:

Please see attached figure BIO-DR 53, located at the end of the Biological Resources Data Responses, depicting the USGS model at a 1:250,000 scale.

Item 54:

Information Required:

Desert Tortoise Critical Habitat. Please provide a discussion of the effects of construction and operation of the project on primary constituent elements of desert tortoise critical habitat as described in *Endangered and Threatened Wildlife and Plants: Determination of Critical Habitat for the Mojave Population of the Desert Tortoise; Final Rule* (USFWS 1994). Please provide a table with the acreage of critical habitat that would be directly and indirectly impacted by project construction and operation, and a detailed discussion of those potential indirect impacts.

Response:

The discussion below summarizes impacts to critical habitat.

The primary constituent elements of desert tortoise critical habitat are (USFWS 1994):

1. Sufficient space to support viable populations within each of the six recovery units and provide for movements, dispersal, and gene flow;
2. Sufficient quantity and quality of forage species and the proper soil conditions to provide for the growth of such species;
3. Suitable substrates for burrowing, nesting, and overwintering;
4. Burrows, caliche caves, and other shelter sites;
5. Sufficient vegetation for shelter from temperatures extremes and predators; and
6. Habitat protected from disturbance and human-caused mortality.

The Project transmission line (2.8 miles), gas line (1 mile) and access road (1.8 miles) will intersect the edge of designated desert tortoise critical habitat (AFC Figure 5.4). The AFC (Table 5.3-5) identified that 11.5 acres of critical habitat would be directly impacted by construction of these facilities, including the loss of forage. The loss of important shelter sites will not occur based on survey results that found no desert tortoise burrows along the Project linears. (Note: portions of a newly proposed linear alignment are different than what was originally surveyed. However, three different alignments were surveyed in the immediate vicinity of the proposed alignment, some of which completely coincided with or sampled the area around the new alignment. The new alignment will be surveyed for desert tortoises in spring 2010 and is expected to produce results similar to the 2009 surveys. Changes to the amount of acreage, if any, of critical habitat affected are anticipated to be minor.) Because of the nature of Project facilities that will traverse critical habitat, tortoises, if present, will be able to continue to use the critical habitat without restriction, although vegetation resources will have been removed from those facilities. Revegetation will be implemented for areas disturbed solely for construction.

Indirect impacts to critical habitat outside the directly affected areas could occur through sand deposition downwind of the Project and the spread of the existing exotic weed population. If these impacts occur, they are anticipated to happen during the construction phase only. A weed control program will be implemented to prevent and eliminate the spread of existing weed populations (see DR 121). Heightened use of the critical habitat due to Project-induced changes in off-high-vehicle recreational activity is not expected in the critical habitat intersecting the Project.

Desert tortoise critical habitat boundaries contain both suitable and unsuitable habitat (USFWS 1993). The term “suitable” generally refers to habitat that provides the constituent elements for nesting, sheltering, foraging, dispersal and/or gene flow (USFWS 1994). A complete lack of tortoise sign in the survey area that intersects critical habitat (AFC Section 5.3) strongly suggests that the critical habitat overlapping the Project does not have suitable habitat. This is not surprising, as the Project-intersected critical habitat lies at the edge of the critical habitat unit. Furthermore, the ability of critical habitat here to support desert tortoises is highly compromised by Interstate 10. This freeway both interferes with tortoise movement and gene flow and is also likely to be a mortality sink (Nicholson 1978, Karl 1989, Boarman 1992, LaRue 1993, Marlow et. al 1997).

Item 55:

Information Required:

Desert Tortoise Relocation/Translocation Plan. Please provide a draft Desert Tortoise Relocation/Translocation Plan that incorporates the most recent guidance from the USFWS and CDFG. A translocation is required when a desert tortoise must be moved more than 1,000 meters to clear it from the project site, while a relocation is required when a desert tortoise can be moved less than 1,000 meters to clear it from the project site. The goals of this relocation/translocation effort should be to:

- Relocate/translocate all desert tortoises from the project site to nearby suitable habitat,
- Minimize impacts on resident desert tortoises outside the project site,
- Minimize stress, disturbance, and injuries to relocated/translocated tortoises, and
- Assess the success of the relocated/translocated effort through monitoring.

Please discuss relocation/translocation procedures and guidance in the plan, including a description of clearance survey protocol and desert tortoise transportation and release procedures, and develop a post-translocation monitoring and reporting plan. All methods discussed in the plan should be consistent with the *Guidelines for Handling Desert Tortoises During Construction Projects* (Desert Tortoise Council 1999) or the most recent handling guidance provided by the U. S. Fish and Wildlife Service.

Generally, the relocation/translocation plan should include the following information:

a. Identify potential relocation areas within 1,000 meters of the project site based on the presence of suitable soils, vegetation community, vegetation density and abundance, perennial plant cover, forage species, geomorphology, and slope;

b. Identify potential translocation sites based on the presence of suitable soils, vegetation community, vegetation density and abundance, perennial plant cover, forage species, geomorphology, and slope;

c. Surveys of resident populations at translocation sites, including health assessment sampling;

d. Description of measures that would be implemented to prevent relocated/translocated desert tortoise entering the site or other hazardous areas;

e. Description of quarantine facilities to provide individual quarantine for all tortoises prior to translocation;

f. Description of health assessments that would be performed by qualified biologist or veterinarian on each tortoise prior to translocation;

g. A treatment/disposition plan for each tortoise, including those unfit for translocation;

h. Description of translocation procedures, including timing (e.g., time of year, time of day);

i. Description of post-translocation monitoring and adaptive management activities;

j. Description of methods used to mark relocated/translocated tortoises and fit them with transmitters to so that they can be located and identified during post-relocation/translocation monitoring; and

k. Description of how data would be compiled, synthesized, and reported to USFWS, CDFG, BLM, and Energy Commission staff.

The translocation site must:

a. be on Federal or State lands in California within the Eastern Colorado Desert Recovery Unit for the desert tortoise;

b. have no proposed rights-of-way or other encumbrances at the time of its establishment; and

c. be sufficiently distant from major highways (e.g. Interstate 10) to provide a safety buffer for long-distance movements that some desert tortoises are likely to make following translocation.

Response:

A Desert Tortoise Relocation/Translocation Plan is currently being prepared to address desert tortoise translocation associated with the Genesis Project. Per the Data Request Workshop held on November 23, 2009, the CEC has granted approval to submit this plan no later than 5 January 2010.

Item 56:

Information Required:

Please submit an Incidental Take Permit application to the California Department of Fish and Game, including measures to avoid and minimize the take of desert tortoise and to fully mitigate the impact of that take.

Response:

During the November 23, 2009 Data Request Workshop a discussion was held regarding the requirement for an Incidental Take Permit (ITP) versus a Consistency Determination. It was determined that Rick York of the CEC would contact the appropriate personnel at CDFG to receive clarification on which process is necessary. At this time, no decision has been reached; however, as soon as the question is resolved, the Applicant plans to proceed accordingly in a timely manner. If an ITP application is required, the Applicant will submit an ITP application to CDFG within 15 days.

Item 57:

Information Required:

Raven Monitoring & Control Plan. Please provide a draft Raven Monitoring/Control Plan that describes methods to avoid attracting common ravens and/or providing subsidies during all phases of development and use, including construction, operation, and decommissioning. In situations where subsides such as power lines and structures for perching cannot be eliminated, the plan should require implementation of best management practices such as reduction of available subsidies, raven monitoring and raven nest removal. Potential subsidies to be considered in the plan should include but not be limited to:

- Availability of water from dust abatement activities, equipment cleaning and maintenance, evaporation and retention ponds, drainage areas or landscaping;
- Potential perching, roosting, or nesting sites;
- Food sources from soil disturbance and road kill (e.g., small mammals, insects); and
- Food sources and attractants from human and animal food and waste.

To address the indirect and cumulative effects of the project, participation would also be recommended in a regional raven management plan either through monetary or in-kind contributions coordinated by the Desert Managers Group. The draft Raven Monitoring and Control Plan should incorporate the most recent guidance from the USFWS and include at least the following elements:

a. Purpose/objectives of the Plan;
b. Identification of project design features and other measures to manage potential introduction of subsidies that may attract ravens to the area;
c. Identification of the area covered by the monitoring and raven control activities;

d. Description of baseline data documenting the abundance of raven on the project site and out to one mile from the project boundaries;

e. Establishment of quantitative success criteria for achieving the objectives of the plan;

f. Documentation of the effectiveness of project design features and BMPs;

g. Identification of triggers that will prompt implementation of management actions to control ravens, and a description of those management actions (e.g., nest removal, elimination of problem ravens);

h. Description of a monitoring plan, including a discussion of survey methods and frequency, for establishing baseline data on pre-project raven numbers and activities and assessing post-project changes from this baseline;

i. Description of adaptive management practices used to ensure effectiveness of accomplishing the purpose of the raven management plan;

j. Regular reporting to document raven management measures that have been implemented and results of raven abundance and effectiveness monitoring throughout the life of the project; and

k. Description of worker education, at all phases of development, as it pertains to avoiding and reducing subsidies for ravens and to promoting desert tortoise awareness.

Response:

Per the Data Request Workshop held on November 23, 2009, the Raven Monitoring Plan is not immediately needed by staff to assess impacts to the project and the due date for a monitoring plan was moved to January 5, 2010. We have developed a Draft Common Raven Monitoring, Management, and Control Plan and, following internal review, will submit it to Staff in mid to late January 2010.

Item 58:

Information Required:

Sand Dune Ecosystem Maintenance. Please provide information, including any appropriate modeling and quantitative analysis, describing how wind and water contributes to the creation and maintenance of the sand dunes and partially stabilized sand dunes in the vicinity of the project area.

Response:

A detailed summary of the site geomorphic setting and surface conditions, including assessment of alluvial and aeolian processes, Appendix E-4 of the AFC, is included as Appendix WR-DR58 to this response.

Regional Aeolian Deposits

Within the Mojave Desert, sand dune deposition (aggredation-growth) generally occurred during relatively dry periods following wetter climates that generated considerable sediment supply within regional drainages and dried up pluvial lake basins (Lancaster and Tchakerian., 2003). The last major regional sand dune aggredational event occurred near the Holocene-Pleistocene boundary. However, a global dry period during the mid Holocene that followed a relatively wetter climate cycle (Forman, et. al., 2001; Jenny et. al., 2002; Fahu et. al., 2003; Umbanhowar et. al., 2006; An, et. al., 2006) also allowed for the growth of some sand dunes in the Mojave Desert region.

Most of the sand dunes in the Mojave Desert region are produced by sand moving east to southeast due to resultant annual wind directions. However, this migration is also altered by topographic controls on wind when channeled along mountain fronts and within valleys (Laity, 1987). Zimbelman et. al. (1995) identified two primary sand corridor systems in the eastern Mojave Desert near the site. These include: The Bristol Trough system which extends over 150 kilometers (km) southeast from the Bristol Playa to the Colorado River and the Clarks Pass system that extends from Dale Dry Lake to just east of Ford Dry Lake (also see Lancaster and Tchakerian, 2003).

The source for sand dune sediment within most Mojave Desert dune fields likely comes from a combination of regional sand corridors and local active washes along the sand corridors. Recent work suggests that sediment for most dune fields in the Mojave Desert west of the Colorado River is originally derived from active stream washes (both locally and regionally along the sand corridors), migration along sand corridors, and transport from dry playa lakes (Lancaster and Tchakerian, 2003; Muhs et. al., 2003; Ramsey et. al., 1999). However, it is clear from review of available literature that site specific studies typically need to be conducted within dune fields to identify the relative contribution from these sources. For example, a study by Muhs et. al. (2003) found that dune fields on opposite sides of the Colorado River are mineralogically distinct and have different sources. They identified that the Parker Dune field located just east of the Colorado River and northeast of the site is supplied by sediment derived from the Colorado River valley itself and not transport of sand from the Danby dune field located west of the Colorado River valley. This study indicated that large washes can be both a large source of sediment for dune fields, and also a large impediment to sand wind entrainment.

A preliminary review of the data suggests that most dune fields in the Mojave Desert primarily grew during the Pleistocene (latest Pleistocene in particular) but have had minimal growth since the mid-Holocene. There is evidence to suggest that little sand is migrating great distances during the late Holocene within the sand corridors and that some dune fields that appear to be “active” are actually simply reworking the existing sand within the dune field (Dohrenwend, et. al., 1991). This illustrates that in some cases, current sediment source supplies may be less important to dune behavior than the dynamics of sand transport within the dune field. Thus, maintenance of the existing sand within the dunes may be a more important mitigation issue than preservation of potential source areas.

Palen and Ford Dry Lake Dune Fields

Preliminary information regarding aeolian and water-transport processes is presented in Appendix WR-DR58. A preliminary aerial image analysis of the Palen Dry Lake to Ford Dry Lake sand corridor was also performed utilizing Google Earth imagery. The Palen Dune field exists within and adjacent to Palen Dry Lake and exhibits abundant active northeast to southwest trending transverse dunes in the northeastern portion of the field, and active southeast trending longitudinal dunes in the southwestern portion of the field. Dominant wind directions based on the orientation of the Palen Dry Lake dunes is from the northwest and roughly parallel to the valley axis. Active barchan dunes within the Palen Dry Lake dune field have been observed to migrate toward the southeast

(Dohrenwend, et. al., 1991). Areas containing minor vegetated coppice dunes were identified primarily within regions on the outer fringes of the dune field. The central portion of the dune field exhibited much less vegetation and distinct, active dunes. Pleistocene lake bed deposits with abundant bentonitic clay and caliche caps are exposed in low dissected, mesa-like promontories approximately 5 to 10 feet above the northwest end of the playa (DWR, 1963). Quaternary lacustrine deposits likely exist directly beneath the existing dunes and between dune mounds.

The Palen Dry Lake dune field may contain separate sources from both the Dale Lake-Clarks Pass corridor between the Coxcomb and Eagle Mountains to the northwest and the pass between the Coxcomb and Palen-Granite Mountains to the north. This hypothesis is based on color contrasts and dominant wind directions for the sand dunes in the western verses eastern portions of the Palen Dry Lake dune field. These two separate sources possibly mix within the eastern portion of the Palen Dry Lake dune field as it narrows and begins to turn more easterly at the south end of the Palen Mountains. Mixing of these two sources may be complete within a couple of smaller dune fields identified southeast of the main Palen Dry Lake dune field at the southern end of the Palen Mountains alluvial fan complex. These smaller dune fields exhibit primarily active transverse dunes.

Sand dunes deposits identified during a preliminary Google Earth imagery review of the Ford Dry Lake dunes suggest that these dunes are of smaller scale and lower activity level than those identified at Palen Dry Lake. Coppice “vegetated” dunes with relatively low topographic relief cover large portions of the Ford Dry Lake dune field, primarily east and southeast of the Ford Dry Lake playa. Areas exhibiting low relief sand sheets cover large regions of the area of Ford Dry Lake playa, and contain surficial wind blown sand-derived sediments. Few distinct active dunes were identified with the Google Earth non-stereographic imagery; however, their potential presence cannot be discounted until more detailed mapping and imagery analysis can be conducted. The Ford Dry Lake dune field was not mentioned as an active dune field within the Mojave Desert by G. I. Smith (see Dohrenwend, et. al., 1991).

Ford Dry Lake Dune Field Investigation

An investigation of the Ford Dry Lake dune field is proposed and will be submitted to CEC in mid to late January 2010. This investigation will include field mapping, aerial photograph interpretation and quantitative analysis to evaluate dune genesis, dynamics, sand sources and transport pathways. The objectives of the investigation will be (1) to better determine how much sediment actually reaches Ford Dry Lake via the Palen-McCoy valley during relatively large storm events that could later be partially entrained within the playa to feed the local dune fields; (2) to assess whether the sediment source for the Ford Dry Lake sand dunes is primary derived from a sand corridor extending from Palen Lake, or from the local washes delivering sediment into Ford Dry Lake; (3) to assess the dynamics of sand migration in the dune field, including whether or not the dunes are active, migrating or stationary, and how much sand has been added to the dunes during historical times, and 4) assess the potential impacts that the project could have on area dunes.

Examples of other aeolian sand studies performed in the region include Griffiths et. al. (2002; northwest Coachella Valley), Ramsey et. al. (1999; Kelso Dunes), Muhs et. al. (2003; Dale Lake-Cadiz-Danby-Parker Dunes), and Lancaster and Tchakerian (2003;

sand corridors of the eastern Mojave). A good, scientific summary of sand dune studies conducted by prominent Mojave Desert geomorphic researchers is provided in Dohrenwend, et. al., (1991). We recommend the results of these reports be used in concert with quantitative and qualitative techniques to evaluate potential source areas and dynamics of the Ford Dry Lake dune field. Specifically, the following tasks are proposed:

- **Literature Review.** Evaluate existing published data regarding the growth history of dunes within the Mojave Desert.
- **Geologic Mapping.** Geologic Mapping of the area, including dune fields, aeolian and alluvial plains, active desert washes and stable desert pavement surfaces to identify potential sediment sources, transport and depositional areas. This mapping will focus on developing a better understanding of the nature and distribution of aeolian and water transport pathways and mechanisms. The mapping would be completed by convolving field mapping and with available aerial photography of the site and surrounding region.
- **Provenance Study.** Perform a sand provenance study utilizing simple quantitative techniques within the Palen Dry Lake-Ford Dry Lake sand corridor, including analysis of sediment from the Palen and Ford Dry Lake dune fields, and their respective “feeding” washes. The provenance study will include microscopic grain and thin section (composition) analysis, and laboratory grain size analysis. The objective of the provenance study would be to attempt to determine the percentage of sand in the Ford Dry Lake dune field that derived from the Palen-McCoy axial wash versus the Palen-Ford Dry Lake sand corridor or other local sources.
- **Sand Transport Dynamics Evaluation.** Evaluate possible changes in the dune size, type and sand migration within the Ford Dry Lake area due to historical anthropogenic structures. This study would visually evaluate man made structures in the region to determine how the structures may have impacted the natural dunes. The study would involve field mapping and aerial photograph interpretation.

Item 59:

Information Required:

Impacts of Project to Sand Dune Ecosystem. Please provide an analysis, including any appropriate modeling or quantitative assessment, of the potential direct and indirect effects of project construction and operation (for example, alteration of hydrology, dust palliatives, wind fencing) on creation and maintenance of sand dunes and partially stabilized sand dunes.

Response:

A principal application of the Ford Dry Lake Dune Field Investigation proposed in response to DR58, above involves evaluation of potential impacts from the project and proposed off-site linears (transmission lines, access road and subsurface pipelines) to habitat of the Mojave Fringe Toad Lizard (MFTL), which includes active sand dunes. The direct impact by the project has been largely mitigated by adjusting the alignment of the off-site linears to be located outside the identified dune habitat that is located east and southeast of the site. Remaining questions focus largely on the potential indirect impact of the proposed project on dune sand supply and behavior during construction and operation. The understanding derived from the proposed Ford Dry Lake Dune Field Investigation will be applied to evaluate whether the dunes are actively growing via net sand influx from external sources, part of a regional sand transport pathway, and/or fed by local versus regional sand sources. In addition, the impact of anthropogenic structures in the area on existing dune fields and sand transport mechanisms will be evaluated. Based on these data, the potential impact of the project on regional and local sand transport and on dune behavior will be evaluated. The results of this evaluation will be included in the Ford Dry Lake Dune Field Investigation that will be submitted in mid to late January 2010.

Item 60:

Information Required:

Mitigation Plan for Impacts to Sand Dune Ecosystem. Please provide a detailed mitigation plan for avoidance and minimization of direct impacts to stabilized and partially stabilized dune habitat. The mitigation plan should include measures for minimizing direct impacts to preserved habitat during construction, indirect effects of operation, and a plan for compensatory mitigation.

Response:

Warranted recommendations for a mitigation and monitoring plan will be provided in the Ford Dry Lake Dune Field Investigation that will be submitted in mid to late January 2010.

Item 61:

Information Required:

Identification of Colorado Desert/Mojave Fringe-toed Lizards. Please provide a rationale as to why some lizards detected during the surveys were identified as Colorado Desert fringe-toed lizards or hybrids.

Response:

The range of the Colorado Desert fringe-toed lizard (*Uma notata*) is extreme southeastern California to eastern San Diego County, and to Arizona, northeastern Baja California and northwestern Sonora, Mexico; the range of the Mojave fringe-toed lizard (*Uma scoparia*) is eastern Riverside County, west and north in sand deposits of the Mojave Desert to southern Death Valley National Park and east into Arizona at Parker (Smith 1946, Stebbins 2003). The ranges do not appear to overlap, although they are close in eastern California, probably separated by the Chocolate Mountains. However, neither source identifies *Uma* on Palo Verde Mesa, at Blythe. During a biological survey in 2004 on Palo Verde Mesa, the Genesis biology survey leader (Karl) captured two *Uma*. The first captured on 23 April 2004 was clearly *U. scoparia*, but the other captured on 31 May 2004 had coloration and patterning that was ambiguous. Field notes reported a slight greenish wash on sides (*U. scoparia*), crescents on throat consistent with *U. scoparia*, and dorsal ocelli arranged in lines more consistent with *U. notata*.

Because of the proximity of the two species ranges, the lack of documentation in a respected and current field guide (Stebbins 2003) that *Uma* occurred on Palo Verde Mesa, and the ambiguous morphological features, the possibility was proffered that there could be hybrids, localized intra-species variation, or *U. notata* on Palo Verde Mesa.

Based on the geographic range and definitive *U. scoparia* observed on Palo Verde Mesa, the fringe-toed lizards at the Project site are certainly *Uma scoparia*. The Genesis Biological Resources Technical Report stated that *U. scoparia* were observed; of 39 *Uma* observed, six were positively identified to *U. scoparia* (TTEC and Karl 2009: Page 39). Lizards that were sufficiently visible were easily identified as *Uma*, but were not caught to key to species because both *U. notata* and *U. scoparia* have the same sensitivity status (CDFG Species of Special Concern and BLM Sensitive) (http://www.dfg.ca.gov/biogeodata/cnddb/), so further harassment to identify species, when they were almost certainly *U. scoparia*, was unnecessary.

Item 62:

Information Required:

Burrowing Owl Phase III Survey Data. Please provide a summary of the field data for the Phase III surveys, including date, start, and stop times of the surveys (not including travel time to reach the survey area), number and location of burrows surveyed during each visit, and the personnel conducting the survey.

Response:

Burrowing owl surveys were conducted according to the California Burrowing Owl Consortium Guidelines (CBOC 1993). Twenty-two Phase III survey locations were chosen based on owl sightings and burrows with associated white wash, feathers, and/or pellets identified during Phase II surveys. A figure illustrating the results of the Phase II surveys can be found in the AFC, Figure 5.3-10. Each Phase III survey location was associated with one burrow. During Phase III surveys, survey locations were checked repeatedly and the area surrounding these burrows was walked. Additionally, biologists surveyed for owls while driving and walking to each survey location (see the AFC, Section 5.3 for methods). Table BIO-DR 62 provides the requested details of the survey methods used for the Phase III surveys.

Table BIO-DR 62. Survey Data for Burrowing Owl Phase III Surveys*

Survey Date 2009	Survey Start-Stop Times	Survey Location (Corresponds to Figure BIO-DR 62)	Field Biologist
10-Apr	05:05 - 08:12	12 13 11 15	Shawn Lindey
	17:19 - 20:08	15 3 2 16 4 22	Nathan Mudry
	17:06 - 20.06	1 5 6 7 8	Shawn Lindey
11-Apr	05:25 - 10:14	12 13 11	Shawn Lindey
	17:07 - 20:07	8 10	
	17:06-20:07	21 20 19 2	Nathan Mudry
28-May	17:32 - 20:42	2 21	Art Schaub
29-May	04:28 - 07:30	8 10 1 7	
	17:34 - 20:42	12 13	
30-May	04:29 - 07:31	12 13	

* Winter period Phase III surveys are being conducted in December 2009 and results are not yet available

Item 63:

Information Required:

Sensitive Plant Communities. Please provide information on the presence or absence of the rare natural communities listed above within the proposed project footprint or adjacent to the footprint in areas that could be affected indirectly by construction or operation. If present, include a discussion of their distribution and extent and a map showing their location. If any such rare communities occur, please provide an analysis of the project direct and indirect impacts to these communities and any proposed mitigation measures to reduce the level of any significant impacts.

Response:

Table DR 63 identifies natural plant communities on or in the immediate Project area that were identified by CNDDB (2003a) as known or potentially high priority. CNDDB has refined these ranks to actual Global and State ranks (CNDDB 2007) using NatureServe's standard methodology (http:www.natureserve.org/explorer/ranking/htm#interpret). Alliances marked with a G1 through G3 code are considered to be high inventory priority. G4 and G5 alliances are generally considered to be common enough to not be of concern, although certain associations within them (G1 to G3) may be rare.

The first six communities in Table DR 63 are on the Project and in the Project area. All are either currently G4 and G5 or not ranked, so are considered common and not of concern (see above). The three communities with big galleta (*Pleuraphis rigida*), which has a global ranking of G4 but a state ranking of S3 (i.e. vulnerable in California), are found primarily in washes and runnels. Big galleta is a common co-dominant of Sonoran Desert washes and runnels. It is not rare in these habitats. The AFC (Section 5.3) reports its occurrence in the Project area washes that occur as sheet flow and individual washes as "patchily common." Occurrences in the Project area, impacts, and mitigation to Project area washes have been addressed in DRs 64-74.

The remaining communities in Table DR 63 that were originally identified by CNDDB (2003a) as potentially high priority are also associated with washes and other water sources, except the Sonoran Dune Scrub and Saltbush-Creosote Bush community. Occurrences on or in the Project area, impacts, and mitigation to these drainage and high groundwater/surface water-associated communities on or adjacent to the Project have been addressed in DRs 64-74.

Table BIO-DR 63. CNDDB Rare Natural Communities (CNDDB 2003a) Within the Proposed Project Footprint or Adjacent to the Footprint in Areas that Could be Affected Indirectly by Construction or Operation

CNDDB Terrestrial Natural Community[1]	Present in Project or Vicinity?	CNDDB Numerical Code	Representative Species	CNDDB Unique Stand?[1]	CNDDB Rarity Rank[2]
Creosote Bush-White Ratteny-Big Galleta	Yes	33.010.07	*Larrea tridentata* *Krameria grayi* *Pleuraphis rigida*	No No No	G5S5 NR G4S3
Creosote Bush-Big Galleta	Yes	33.010.13	*Larrea tridentata* *Pleuraphis rigida*	No No	G5S5 G4S3
Creosote Bush-White Bursage-Big Galleta	Yes	33.140.17	*Larrea tridentata* *Ambrosia dumosa* *Pleuraphis rigida*	No No No	G5S5 G5S4 G4S3
Creosote Bush - White Bursage - Downey Dalea	Yes	33.140.34	*Larrea tridentata* *Ambrosia dumosa* *Dalea mollissima*	No No No	G5S5 G5S4 NR
Sweetbush Riparian Scrub	Yes	33.260.00	*Bebbia juncea*	No	NR
Sonoran Dune Scrub	Yes	33.010.02	*Abronia villosa* *Larrea tridentata*	No No	NR G5S5
Acacia - Mesquite Thickets	No	61.510.02	*Acacia* spp. *Prosopis* spp.	No No	N/A N/A
Honey Mesquite Scrub	No	61.512.00	*Prosopis glandulosa*	No	G5S3?
Blue Palo Verde, Ironwood, and Smoke Tree Woodland	No woodland, although elements are dominant in several washes on the Project and northeast of the Project	61.530.00	*Cercidium floridum (Parkinsonia florida)* *Olneya tesota* *Psorothamnus spinosus*	No No No	G5S3 (*Parkinsonia florida - Olneya tesota* association) G5S3 (*Parkinsonia florida - Olneya tesota* association) G4S4
Bush Seepweed Scrub	Not on Project; associated with margin of dry lake	36.200.02	*Suaeda moquinii* *Atriplex polycarpa* *Atriplex canescens*	No No No	G4S4 G5S4 G5S4
Salt Bush - Creosote Bush	Not on Project; near dry lake. Regrowth saltbush scrub adjacent to Project	33.010.05	*Larrea tridentata* *Atriplex polycarpa*	No No	G5S5 G5S4

[1]Department of Fish and Game, Natural Diversity Database. 2003. List of California Terrestrial Natural Communities Biogeographic Data Branch, Vegetation Classification and Mapping Program, September 2003 Edition.
[2] Department of Fish and Game. 2007. List of California Vegetation Alliances. Biogeographic Data Branch, Vegetation Classification and Mapping Program. http://www.dfg.ca.gov/biogeodata/vegcamp/pdfs/NaturalCommunitiesList_Oct07.pdf
Ranking Interpretation (from http://www.natureserve.org/explorer/ranking.htm#interpret): The conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by a letter reflecting the appropriate geographic scale of the assessment (G = Global, N = National, and S = Subnational). The numbers have the following meaning:
1 = critically imperiled
2 = imperiled
3 = vulnerable
4 = apparently secure
5 = secure
NR = Not Ranked/Unranked
Rank qualifier:

Impacts to the Sonoran Dune Scrub were addressed in the AFC (Section 5.3) and in DRs 58-60; AFC Figure 5.3-2 is a map of the dune habitat in the Project area. In summary, 57 acres of dune habitat currently intersect the Project (AFC Table 5.3-4), although the linear facilities (29 of the 57 acres) currently are being re-aligned to avoid the sand dunes. A minimum of 28 acres on the solar fields will be affected, then. BIO-13 of the AFC discusses compensation at the ratio of 3:1. Dune habitats in the Sonoran.

Impacts to Salt Bush-Creosote Bush scrub, which is an ecotone of Chenopod Scrub, were addressed in the AFC (Section 5.3) and DR 63; AFC Figure 5.3-2 is a map of the Chenopod Scrub habitat in the Project area. In summary, no Chenopod Scrub or ecotonal Salt Bush-Creosote Bush occurs on the Project. For Chenopod Scrub that occurs outside the Project, but in the Project area, no impacts are anticipated. The upland chenopod patch west of the solar fields will not be affected by Project construction and operation. Nearer the dry lake, this community is expected to remain unaffected by the re-routed drainages that capture and re-route water through and around the solar fields (DRs 74 and 179-181).

The spring 2009 field surveys also included a search for BLM unique plant assemblages (UPA) per BLM's CDCA plan, and there are no BLM UPAs found in the Project footprint or within one mile of the requested ROW. The closest UPA is the Palen Pass Huge Ironwood UPA, located approximately 4.5 miles north of the Project footprint in Palen Wash. See DR 66 for an evaluation of Project impacts to this UPA. The CDCA plan also identifies the Crucifixion Thorn Assemblage UPA to the northwest of the Project; however, because no crucifixion thorn shrubs were found during 2009 field surveys and distance from the Project, this UPA will not be affected by Project development.

Item 64:

Information Required:

Dry Lakes - Groundwater Dependent Communities. Please provide a map and description of the vegetation (including dominant species, physiographic setting, habitat function and values, special-status species associates) that occurs around the margin of Ford Dry Lake. The mapping should be on an aerial photo at a form and scale similar to that submitted in the Data Adequacy Supplement (e.g., Figure 5.3-7B). The mapping should extend out from the lake margin to a distance encompassing any plant communities that include facultative wetland plants as dominants, co-dominants, or important associates. Please include acreage of each plant community type within this mapped area. Please provide an assessment of the potential impact of water table drawdown on Ford and Palen Dry Lake groundwater dependent plant communities, including the desert chenopod scrub community mapped at Ford Dry Lake.

Response:

Ford Dry Lake

Based on spring 2009 field surveys, no groundwater dependent vegetation communities are present within the Project area or occur around the margin of Ford Dry Lake. As discussed in Section 5.4 of the AFC and in the draft Groundwater Resources Investigation dated November 30, 2009, the groundwater table occurs at a depth of approximately 50 feet below the ground surface at Ford Dry Lake. As such, Ford Dry Lake is a "dry playa," which receives occasional inflow of surface water, but does not support groundwater-dependant plant communities. Although surveys partially sampled the margin of Ford Dry Lake, three playa-associated plant species were found on the one-mile and ¾ mile Zone-of-Influence (ZOI) surveys along the margin of Ford Dry Lake, south of the Project ROW: bush seepweed, allscale, and pig nut. All three species were found near or along the dry lake margin, although allscale and pig nut were also found in north of the lake Table BIO-DR 64 depicts the location, wetland-indicator status, and rarity status for each species observed during surveys.

Table BIO-DR 64. Plant Species Found Near the Margin of Ford Dry Lake

Common Name	Scientific Name	Location	Wetland Indicator[1]	Rarity Status[2]
Pig nut	*Hoffmannseggia glauca*	Low topographical areas, mostly south of ROW and along portions of linear routes	FACU	G5SNR
Bush seepweed	*Suaeda moquinii*	South of ROW, along dry lake margin	FAC	G5SNR
Allscale	*Atriplex polycarpa*	South of ROW, along dry lake margin, and upland, west of the ROW	FACU	G5SNR

1. Source: USFWS 1996
FAC (Facultative) - Equally likely to occur in wetlands or nonwetlands
FACU (Facultative Upland) - Usually occur in nonwetlands, but occasionally found in wetlands
2. Source: Nature Serve 2009
The conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by a letter reflecting the appropriate geographic scale of the assessment (G = Global, N = National, and S = Subnational). The numbers have the following meaning:
1 = critically imperiled
2 = imperiled
3 = vulnerable
4 = apparently secure
5 = secure
NR = Not Ranked/Unranked

Pig nut is a tuberous subshrub that occurs in both Creosote Bush Scrub and Chenopod Scrub found on the Project (see AFC, figure 5.3-2). Bush seepweed and allscale are considered part of the Chenopod Scrub community that was observed along the northern margin of Ford Dry Lake during spring 2009 field surveys. This community is generally described as areas of low, sparse, microphyllic shrubs growing in or around dry lake beds. It is found at low, flat elevations in the Mojave and Sonoran Deserts where soils are poorly drained and highly alkaline (BLM 2002). There are two phases of Chenopod Scrub, the halophytic phase and the xerophytic phase. The halophytic phase consists of succulent chenopods (e.g., *Suaeda* spp., *Allenrolfea occidentalis*) growing on playas, in sinks, and near seeps with available surface water or ground water high in mineral content. The xerophytic phase is much less salt tolerant and is found on dry soils, generally somewhat upland of playas. At the Genesis Project, allscale was found growing both upslope, in a disturbed portion of the Sonoran Creosote Bush shrub community, and near the northernmost extension of the dry lake.

Ford Dry Lake is a dry playa that has groundwater well below the ground surface and is fed only periodically by surface water inflow (AFC, Section 5.4), and therefore the plant species growing in and around Ford Dry Lake are considered to be dependent on precipitation and surface water flow and infrequent flooding of the dry lake bed.

There are no desert plants in the Project vicinity that are known to rely on groundwater dependent, deep root systems as a primary strategy for survival (Phillips and Comus

2000). Mesquite (*Prosopis* spp.) has a combination of deep and shallow roots, with most of the roots confined to the upper three feet of soil (Phillips and Comus 2000). Mesquites (*Prosopis glandulosa*) were found during field surveys, but were associated with defined drainages and not the dry lake margin, further suggesting that the groundwater is well below the ground surface. Because there are no groundwater dependent communities near Ford Dry Lake, there are no anticipated impacts to vegetation due to water table drawdown.

Based on species observed and lack of anticipated near-surface groundwater, it can be expected that bush seepweed, allscale and possibly iodine bush (*Allenrolfea occidentalis*) are the main species present around the margins of the in the lakebed. The mapping, acreage calculation, exact identification of dominant species, and the special-status species component of this data request cannot be completed without additional field surveys. Mapping the vegetation surrounding Ford Dry Lake and calculating the acreage of plant communities would be scientifically unsupportable and speculative without surveys. Species identification cannot be accomplished simply via aerial photographs because individual plants and vegetation communities are not discernable, although mesquite could be determined from aerials. Surveys are not warranted based on (1) the apparent lack of surface/near surface groundwater at Ford Dry Lake that would support a wetland community or obligate phreatophytes, and (2) the small drawdown that is within normal groundwater fluctuation values.

Palen Lake

Portions of Palen Lake, particularly the northwest corner, may be acting as a wet playa. In a wet playa, groundwater is at the ground surface or only slightly below and wicks to the surface where it evaporates, or is drawn up by vegetation and lost to evapotranspiration. This would make the nearest, potential groundwater dependent communities at a portion of Palen Lake that is approximately 17 miles from the pumping well; however, field surveys are necessary to determine this for certain. Mesquite trees are reported to grow in old terrace sediments that occur immediately north of the playa. For the same reasons stated above, the mapping, acreage calculation, identification of dominant species, and special-status species associates component of this data request cannot be completed without additional field surveys. Based on current Project models that show that groundwater drawdown influences would not extend to Palen Lake (Worley Parsons 2009) quantitative mapping surveys are not warranted. However, a field survey will be conducted in December 2009 to confirm whether any wetland and groundwater dependant plant species and communities are present at Palen Lake.

The maximum predicted water table drawdown associated with the Project is approximately 0.3 feet in the area of the pumping well. The area where drawdown exceeds 0.25 feet is limited to within approximately 2.5 to 3.5 miles of the Project pumping centroid (Worley Parsons 2009: Figure 18). The nearest potential wetland community is thought to be at Palen Lake, the closest portion of which is more than 12 miles from the Genesis pumping wells. This community, if it is confirmed to exist, would most likely be near the northwest corner of the playa where groundwater is shallowest. This area is 17 miles from the pumping wells, which is too distant to be impacted by Project-related drawdown of the water table at Genesis. Additionally, water table drawdowns of 0.3 feet or less are similar to or less than expected normal climatic, seasonal or diurnal water table fluctuations and would not be expected to adversely affect phreatophytes. Furthermore, the capillary rise, which is the level to which water rises above the water table by wicking, is typically several feet in fine grained playa soils, and would not be measurably affected by this magnitude of drawdown.

Item 65:

Information Required:

Springs and Seeps – Groundwater Dependent Communities. Please provide a vegetation map, description, and acreage table for any shallow groundwater-dependent vegetation potentially associated with McCoy Spring as well as any other seeps and springs within the potential area of influence of groundwater pumping. In determining which seeps and springs to include in this mapping effort please consult the Northern and Eastern Colorado Desert Coordinated Management Plan (Map 3-1, Existing Water Sources), USGS topographic maps, the information data portal of the Mojave Desert Ecosystem Project (MDEP), Joshua Tree National Park biologists, and other local experts that may have knowledge regarding the location of active seeps, springs, and wetlands within the area potentially influenced by groundwater pumping. Please provide an assessment of the potential impact of water table drawdown on vegetation and wildlife dependent on seeps and springs.

Response:

The following sources were checked in determining the presence of seeps and springs in the potential area of influence of Project-related groundwater pumping:

- U.S. Geologic Survey (USGS) topo maps;
- USGS reports;
- USGS and Department of Water Resources (DWR) geologic maps;
- Regional Water Quality Control Board (RWQCB) Basin Plan;
- BLM maps, including NECO map 3-1, Existing Water Sources; and
- Verbal communication with BLM personnel (T. Bernhardt pers. comm. to Allison Schaeffer).

Results from the following sources are pending:

MDEP

Based on a comprehensive review of available records, the only surface water seeps and springs reported in the central and eastern portions of the Chuckwalla Valley Groundwater Basin and surrounding mountains are McCoy Spring and Chuckwalla Spring,. Springs and seeps may be considered surface extensions of the local groundwater system. However, springs and seeps that occur near the interface between a basin and the surrounding bedrock mountains are typically associated with base flow discharge or perched aquifers that are part of a separate groundwater flow system originating in the surrounding mountains. Such a system does not have direct hydraulic connection to the adjacent basin aquifer system. Considerable drawdown (many feet) would have to occur in the adjacent alluvial basin to induce an observable affect in an adjacent bedrock aquifer system.

As a result of this research, McCoy Springs was determined to be the only spring near the projected area of water table drawdown related to the Project. McCoy Spring is located at an elevation of 889 feet amsl at the outlet of a bedrock canyon, near the toe of the western slope of the McCoy Mountains (see photo BIO-DR 65). The spring includes a cistern and seeps and based on the close proximity of bedrock outcrops to the spring and seeps, it likely represents baseflow discharge from the McCoy Mountains. As such, it would not have a direct hydraulic connection to the aquifers in the Chuckwalla Valley Groundwater Basin, which occur in the basin fill materials west of McCoy Spring. A field visit to McCoy spring will be conducted in December 2009.

Figure BIO-DR 65. McCoy Springs

With respect to impacts within the basin aquifer system near McCoy Spring, the drawdown at the water table induced by pumping for the Project is predicted to be approximately 0.2 feet after 33 years. This amount of drawdown is negligible compared to normal seasonal, temporal and even diurnal groundwater fluctuations in the basin. Many feet of drawdown would be required in this aquifer to present a credible mechanism for any measurable affect to baseflow in the adjacent mountains. For this reason, and the lack of a hydrologic connection between the underlying aquifer and the water feeding the spring, impacts to McCoy Spring are judged to be less than significant.

Chuckwalla Spring is not located within the area predicted to be affected by drawdown from Project pumping. Chuckwalla Spring is located approximately 15 miles southwest of the Project site within the Chuckwalla Mountains, outside the basin and the area of predicted Project drawdown.

Item 66:

Information Required:

Ironwood Forest: Please provide an assessment of the potential impact of water table drawdown on the ironwood forest in the Palen-McCoy Wilderness.

Response:

BLM has identified an ironwood woodland community approximately five miles north of the Project site. Predicted water table drawdowns beneath this woodland are in the range of 0.05 to 0.2 foot (Worley Parsons 2009, Figure 18). Water table drawdowns of 0.3 feet or less are similar to or less than expected normal climatic, seasonal or diurnal water table fluctuations and therefore would not be expected to adversely affect the ironwood trees north of the Project site. This forest occupies an area of concentrated drainages where the bases of the McCoy and Palen Mountains are closest. The density of trees is undoubtedly due to the amount of surface water flowing in this inter-mountain constriction, strongly indicating that it is seasonal surface water, rather than groundwater, that supports this community.

Item 67:

Information Required:

Revise Delineation of Drainages. Please revise the delineation of ephemeral drainages to include all the drainage features with a well-defined channel and/or drainages that support dry desert wash woodland as depicted in the 2005 aerial photos (Figures 5.3-7A – J, Data Adequacy Supplement). Smaller features with no surface connection to Ford Dry Lake or to another larger feature may be omitted. Please also include drainages downslope of the project boundary that connect to Ford Dry Lake and/or which have dry desert wash vegetation. Please provide revised delineations on an aerial photo at a scale and level of detail similar to that submitted in the Data Adequacy Supplement, Figure 5.3-6.

Response:

The delineation that was provided with the AFC for the project footprint does, in fact, include all the drainage features with a well-defined channel and/or drainages that support dry desert wash woodland. This delineation was done in accordance with a protocol approved by CDFG and consistent with how delineations have been conducted on other projects approved by CDFG in the past. Nevertheless, we are reviewing a revised delineation provided by CEC Staff and look forward to discussing that further at the workshop scheduled for December 18, 2009.

Item 68:

Information Required:

Temporary and Permanent Impacts to Drainages. Please provide a table with acreage estimates of temporary and permanent impacts to ephemeral drainages based on the revised delineation requested in the above data request.

Response:

See response to DR 67 above.

Item 69:

Information Required:

Revise Width and Area of Drainages. Please revise the width and area columns on Table 5.3-2 to reflect calculations based on a GIS measurement of the drainages width from the aerial photo signature that encompasses the width of the associated wash vegetation and interfluves of compound or braided features. Please add to Table 5.3-2 any new drainages delineated on the data request described above.

Response:

See response to DR 67 above.

Item 70:

Information Required:

Revise Delineations to Include Desert Dry Wash Woodland. Please revise the delineation to include mapping the wash- or stream-associated microphyllous or desert dry wash woodland.

Response:

Figures BIO-DR 70 Sheets 1-3 illustrate the wash-associated microphyllous vegetation observed on-site.

Item 71:

Information Required:

Tree Count Survey Methods. Please provide an explanation of the methodology for establishing tree quantities shown in Table C-1 of the delineation report.

Response:

Tree quantities in Table C-1 of the delineation report were established by counting individuals during field surveys, except for Wash 26 (see Figure 3-1, Survey for Jurisdictional Waters and Wetlands report, Appendix C of the AFC). Each ironwood tree, palo verde, and smoketree associated with delineated drainages was individually counted in the field. Trees associated with Wash 26 were too numerous to count in the field, and were approximated by utilizing high-resolution aerial photographs; post field survey.

Item 72:

Information Required:

Describe Desert Dry Wash Woodland. Please provide a brief narrative description of the desert dry wash woodland on the channels, e.g., dominant and sub-dominant species in each stratum, percent cover (absolute cover), observed or expected wildlife use of the habitat, and other physical and biological characteristics of the habitat that would be useful in establishing its biological values and functions. Please provide a table that summarizes the acreage of desert dry wash woodland in the survey area, and the acreage of this habitat type that could be directly and indirectly impacted by the project.

Response:

No Desert Dry Wash Woodland occurs within the project footprint as defined by Holland (1986), "An open to dense, drought-deciduous, microphyllous riparian thorn scrub woodland to 30-60 feet tall, dominated by any of several fabaceous trees. Sandy or gravelly washes and arroyos of the lower Mojave and Colorado Deserts, largely in frost-free areas. These washes typically have braided channels that substantially rearrange with every surface flow event."

Although no extensive woodlands occur on site, three of the delineated ephemeral drainages found along the Project linear corridor have dense stands of wash-associated trees such as ironwood, mesquite, and palo verde (see figures, DR 70). Other dominant species found in these drainages are creosote bush (*Larrea tridentata)* and big galleta grass (*Pleuraphis rigida*); subdominants include white bursage (*Ambrosia dumosa*) and cheesbush (*Ambrosia salsola*). Invasive species found in these drainages include Saharan mustard (*Brassica tournefortii*) and tamarisk (*Tamarix sp.*). The habitat value is increased in these areas due to the vertical structure and density of vegetation. Although these drainages have little water available during most months, these drainages can provide wildlife dispersal corridors, refuge, nesting habitat, and roosting habitat for numerous desert species (e.g., migrating and resident birds, burro deer, puma, coyote, and kit fox).

The acreage of impact to these areas is yet to be determined. At this time an alternate route for the linear facilities is being considered that would avoid portions of these drainages and associated vegetation.

Item 73:

Information Required:

Functions and Values of Project Area Washes. Please provide a description of the beneficial functions and values provided by the ephemeral washes on the project site, and discuss how the proposed project would affect these functions and values within the project footprint and downslope of the project boundaries.

Response:

Geomorphic Characteristics

The ephemeral drainages identified throughout the project area serve as hydrologic connections during storm events for surface water on McCoy and Palen Mountains which, due to topography, travels towards Dry Ford Lake. This network of braided, shallow drainages serves to buffer the erosional effects such as gullying and/or badland development that would otherwise occur with a more limited number of channels in the desert substrate. The courses of the numerous drainages frequently change as a function of naturally occurring sediment deposition, scouring, and vegetation establishment or removal. This variation helps maintain landscape diversity with respect to the vegetation species composition and age structure, and microtopography.

Biogeochemical Functions

The ephemeral washes in the project area contribute to the biogeochemical functions of the Chuckwalla Valley by storing, cycling, transforming, and transporting elements, compounds, soil organic matter, and woody debris. They also serve to transport and store seeds for a variety of plant species.

Plant Community Support

The majority of the ephemeral drainages in the project area are associated with creosote bush scrub habitat. Species such as white bursage and galleta grass are common in the well-defined drainages. The larger drainages that receive more surface water flow and contain sandy, gravelly substrate and well-defined banks typically support scattered desert wash tree species such as ironwood and palo verde, as well as big galleta grass.

Faunal Support and Habitat

The geomorphology of the area supports the relative abundance and species composition of the vegetative communities that serve as habitat for local wildlife species. Creosote Bush Scrub, Stabilized and Partially Stabilized Sand Dunes, and other vegetation communities that occur within the project area support a variety of mammalian, herpetile, and avian species, some of which are protected under state and/or federal law. A complete list of species observed during the 2009 surveys can be found in the AFC (Section 5.3).

Large mammals such as puma, badger, deer, and bighorn sheep are not likely to use the relatively small ephemeral washes as seasonal migration corridors; however, these species may be attracted to the cover and forage in areas where larger vegetation (i.e. palo verde, cat-claw acacia, and ironwood tree) has become established for. Herpetiles likely traverse and may follow dry ephemeral washes on a daily basis while foraging. Avian species, including loggerhead shrike and short-eared owl that occur within the project area, depend on a matrix of vegetation and open habitat, both of which are supported by the braided network of ephemeral drainages in the Project area. The increased vegetation supported by the larger ephemeral drainages attracts avian species by providing food, cover, water, and/or nesting locations for resident and migratory species.

Project impacts

By diverting water around the Project area, the hydrologic regime would be altered causing a permanent impact to vegetation, wildlife habitat, and microtopography within the Project area and south of the Project area. Because the entire Project facility footprint will be cleared of vegetation and graded, any hydrologic functions would be eliminated within this area. Surface water would be diverted around the Project facility, discharging at three locations south of the facility, resulting in an interruption to the flow of water feeding the ephemeral drainages south of the Project footprint. This would change the microtopography of the area south of the Project by eliminating the seasonal perturbation forces of scouring and sediment deposition.

As a result of surface water diversion around the Project, the vegetation structure, species composition, and wildlife habitat would be altered. There would be areas down slope of the project footprint that would be deprived of surface flow, and areas that would receive additional surface flow. As a result of the re-routing, it would be expected that the areas that receive additional flow would see an increase in biological functions and values, and the areas deprived of surface flow would realize a decrease.

Item 74:

Information Required:

Low Impact Development Approach. Please provide a detailed discussion, with supporting quantitative analysis, of implementation of a low impact development approach to managing stormwater flows. Please include in this assessment the feasibility of reconfiguring the project footprint to retain some or all of the project area ephemeral drainages with setbacks from the banks of the drainages to accommodate a buffer for protection of water quality and to provide a wildlife movement corridor. This assessment needs to be supported by quantitative results of models and analyses describing on-site depths and velocities of stormwater flows and potential impacts to project features if some or all of the natural drainages were left intact, and an analysis of how this flooding might affect project features and operations under 10-, 2-, 1-, and 0.2-percent annual chance flood events within the watershed.

Response:

The project has been conceptually designed, and it is the intent of the storm water management plan to capture off-site flows and channel these around the project site. As outlined in the Drainage Erosion and Sediment Control Plan (DESCP, Appendix A of the AFC), the main purpose of the diversion of flow around the site is to prevent interaction with off-site stormwater and onsite stormwater which will:

- Allow natural groundwater recharge of the off-site stormwater with no contact with the changed flow conditions of the on-site water;
- Protect the Site infrastructure from flash flood events, which have the potential to damage the solar parabolic troughs;
- Control treatment of the on-site flows from the solar collector array (location of heat transfer fluid within the solar parabolic troughs);
- Protect the Site from upstream sediment loading;
- Control on-site flows in detention basin to ensure there is no increase in post developed flow discharging from the site, minimizing the impact on downstream drainage features (lake playas etc), and
- Maximize the developable area within the solar field.

As discussed in the jurisdictional waters and wetlands survey (Appendix C1 of the AFC), two ephemeral lines were identified as potential waters of the state; however, these lines are within the Right of Way for the linear features (i.e. transmission lines, access road), and are therefore not impacted by development of the Project solar site.

In the Data Response workshop on November 23, 2009, Staff identified potential jurisdictional waters crossing the Project solar site (in addition to the ephemeral drainages along the Right of Ways identified above). According to CEC staff, this delineation was sent to the California Department of Fish and Game (CDFG) for review and determination. Discussions are ongoing regarding Staff’s delineation. The Applicant proposes to mitigate for any ephemeral waters classified as “Waters of the State” that are impacted by the design and approach to storm water management that has been outlined in the AFC.

Item 75:

Information Required:

Maintenance District. Please identify and provide evidence of coordination with a suitable public entity that could serve as the Maintenance District. The Maintenance District would maintain the re-routed channels, manage utility crossings of the rerouted new channels, and to undertake all activities needed to preserve the integrity, design, and design discharge capacity of the channels. Please describe a funding mechanism that would serve to support activities of the Maintenance District for the life of the project.

Response:

A Maintenance District is not proposed. Maintenance of the channels will be accomplished as part of the ongoing operations and maintenance of the plant and its facilities. Subcontracted specialists will be engaged as needed to perform specific maintenance activities, and a channel maintenance program will be implemented (See DR 76). The channel maintenance program will be submitted to the CEC for review and approval and it is expected that adherence to the channel maintenance program will be a condition of certification.

Item 76:

Information Required:

Channel Maintenance Program. Please provide a draft Channel Maintenance Program that would eventually be adopted by the Maintenance District as the guidelines for routine maintenance activities, as well as Capital Improvement Projects and emergency repairs. The Channel Maintenance Program should include at least the following elements:

a. Purpose and Objectives. Include a discussion of the main goals of the Channel Maintenance Program (for example, maintenance of the diversion channel to meet its original design to provide flood protection, support mitigation, protect wildlife habitat and provide a wildlife movement corridor, and maintain groundwater recharge).

b. Guidelines for Maintenance. Define standards for acceptable conditions and action triggers for: sediment removal, vegetation/weed management, debris collection, blockage removal, fence repairs, and access road maintenance. Discuss bank protection and grade control structure repairs that might be needed to repair eroding banks, incising toes, scoured channel beds, as well as preventative erosion protection. At a minimum the District would need to implement instream repairs or management actions when the problem (1) causes or could cause significant damage to the project, adjacent property, or the structural elements of the diversion channel, (2) is a public safety concern, (3) negatively affects groundwater recharge, or (4) negatively affects adjacent plant communities or poses a hazard to wildlife. Include a discussion of Routine Channel Maintenance - trash removal and associated debris to maintain channel design capacity; repair and installation of fences, weed management, gates and signs; grading and other repairs to restore the original contour of access roads and levees (if applicable); and removal of flow obstructions at BSEP storm drain outfalls. Describe how capital improvement projects and emergency repairs would be funded and implemented.

c. Reporting. Provide a monitoring and reporting schedule and an outline for annual reports to be submitted to the Compliance Project Manager.

Response:

A channel maintenance program will be developed for submittal to the CEC. As discussed at the November 23, 2009 data request workshop, a draft of this plan will be prepared and submitted by January 29, 2010. Expected elements to this plan will include:

- Scheduled inspections of the channel on a regular basis plus after a storm event which would include assessing the condition of the channel, BMPs and sediment and debris accumulation.
- Purpose and objectives and Guidelines for maintenance as outline above.
- Regular maintenance schedule of the different elements in the diversion channel system which may include BMPs, debris removal, vegetation management, berms, fences and access roads.
- Emergency Response Actions.
- Reporting Requirements.
- Estimated costs of yearly on-going maintenance.
- Identification of this feature being restored to pre-project grades so long term (post project) maintenance is not required.
- Success criteria of on-going maintenance activities.
- Assurances that will be provided to ensure that maintenance is completed.

Item 77:

Information Required:

Revegetation Plan for Re-Routed Channels. If revegetation of the channels is proposed as mitigation for impacts to the project area's vegetated ephemeral drainages, please provide a draft Revegetation Plan for the re-routed channels that include at least the following elements[1]:

Response:

No revegetation plan will be designed for the re-routed drainages because the design of those drainages to meet flood control purposes, plus the required maintenance, preclude revegetating the channels. However, because of the existing presence of invasive weeds on the Project and vicinity (see discussion in Biological Resources Technical Report, AFC Section 5.3), a weed prevention and control program will be implemented for the re-routed drainages (see DR 86).

[1] Refer to the California Department of Conservation's *Rehabilitation of Disturbed Lands in California: A Manual for Decision-Making (Newton & Claasen 2003) @ http://www.consrv.ca.gov/omr/reclamation/Pages/index.aspx for additional guidance on development of a revegetation plan.*

While an active revegetation program will not be implemented, design of the outflow area (south of the solar fields) will be addressed to optimize use of that area by wildlife. This will be part of the design of outlet structures that will be provided to the compliance project manager (CPM), for review and approval, in updated detailed design drawings of the detention basins and associated outlet structures (DR 201).

Item 78:

Information Required:

Overall Goal: Explicitly state the overarching goal of the revegetation plan, which should include at least replicating the hydrological and biological functions and values of the impacted desert washes.

Response:

See Item 77 above.

Item 79:

Information Required:

Existing Functions and Values. Describe the existing functions and values of the drainages that are being replaced by the engineered channels. Include a discussion of the characteristic soils (biological soil crust, permeability), sediment transport and other geomorphic processes, microtopography (microcatchments for moisture, seeds), vegetation (zonation, composition, cover density, dominants in each stratum, rare or uncommon species or communities, non-native component), and wildlife habitat and values (connectivity and corridors, rare species, habitat elements).

Response:

See Item 77 above.

Item 80:

Information Required:

Reference Reach. Select one or several reference reach(es) of the existing channels that would provide a target for mitigation design and success criteria, and provide photos and a hard-copy and GIS [shape files & metadata] map of the reference reach(es). Provide a detailed description of the reference reach and how the features of the reach(es) relate to the success criteria for the mitigation design and goals. Include a rationale for selection for the reference reach(es).

Response:

See Item 77 above.

Item 81:

Information Required:

Proposed Mitigation Design. Describe the mitigation goals and target functions/values (hydrologic, geomorphic, water quality, habitat function/value) of the revegetation plan and a rationale for these goals and targets. Include a discussion of compensation ratios, indicating the ratio(s) of acreage of impacted vegetated wash to the recreated acreage, long-term goal(s) for target habitat to be created at the site 10, 20, and 30 years following implementation.

Response:

See Item 77 above.

Item 82:

Information Required:

Success Criteria. Provide a table of success criteria and quantitative parameters to measure successful achievement of these criteria. The criteria should address each major aspect of the project, including replication of natural hydrological and geomorphological processes and establishment of appropriate vegetation and wildlife habitat values.

Response:

See Item 77 above.

Item 83:

Information Required:

Monitoring Methods. Describe proposed methodology for measuring progress toward success criteria and a rationale as to each method has been chosen to evaluate progress in relation to each success criterion. Describe sampling methods used and include size of sample units and number of samples.

Response:

See Item 77 above.

Item 84:

Information Required:

Monitoring Schedule. Monitoring should be tied to the appropriate spring growing season, with the "first year" of monitoring occurring one full growing season following completion of installation. Given the slow pace of revegetation in desert ecosystems, a monitoring period of 10-years is appropriate. In addition to quantitative methods, ground and/or aerial photos can be used to illustrate year-to-year progress of the overall project.

Response:

See Item 77 above.

Item 85:

Information Required:

Implementation Plan. Describe equipment, procedures, access paths, and any measures used to avoid sensitive areas outside of the grading plan during revegetation. Of particular important is topsoil storage and disposition. The implementation plan should include a description of how the top layer (top 1 inch) of soil will be salvaged from the existing washes, stockpiled and maintained to sustain viability, and how these soils will be applied during revegetation efforts. Indicate storage location of topsoil, area required for storage, duration of intended storage, and ultimate disposition of topsoil material in the engineered channels. Discuss how the area available for revegetation in the channel bottom would integrate with the channel slope protection and erosion control and any opportunities for bioengineering.

Response:

See Item 77 above.

Item 86:

Information Required:

Weed Control. Describe method(s) to be used to remove noxious plants from the mitigation site during the course of revegetation and monitoring, and specific triggers for when weed control is required.

Response:

Weed control will be implemented during construction, operation, and decommissioning according to the Project Weed Management Plan prepared for DR 121. This plan will be prepared by 20 January 2010.

Item 87:

Information Required:

Planting/Seeding. Provide a table of species to be planted and indicate geographic source of plants (of local origin), type of propagules to be used, and season in which seeding/planting/transplanting is to be done. Include size and quantity of propagules and/or intended spacing. For transplant propagules describe method, location of harvest site, and duration of storage, if applicable.

Response:

See Item 77 above.

Item 88:

Information Required:

Irrigation. Revegetation projects should be hydrologically self-sustaining, and may need irrigation only in the early years of a project is to give new vegetation a head start at becoming established. If irrigation is proposed, describe recommended irrigation methods, including estimated frequency, and indicate month(s) in which it is to occur. Also indicate water source(s) for irrigation.

Response:

See Item 77 above.

Item 89:

Information Required:

Implementation Schedule. Provide a schedule showing intended timing (by month) of site preparation, any seed/topsoil storage, seed/topsoil application, and plantings.

Response:

See Item 77 above.

Item 90:

Information Required:

Maintenance and Monitoring. Describe planned maintenance activities (e.g. inspection of irrigation system, inspection of water structure(s), erosion control, weeding, etc.). Identify any pest species (plant and/or animal) that might cause problems on the site, and provide a control plan for these species if appropriate. Indicate the critical threshold of disturbance that will trigger the implementation of control methods. Provide a table showing proposed schedule of frequency of maintenance inspections over the life of the project.

Response:

See Item 77 above.

Item 91:

Information Required:

Monitoring Reports. Monitoring reports to the Compliance Project Manager are typically due January 31st of each year. Describe the overall content and purpose of the annual reports.

Response:

See Item 77 above.

Item 92:

Information Required:

Contingency Measures. If an annual performance goal is not met for all or any portion of the mitigation project in any year, or if the final success criteria are not met, describe how the failure will be remedied. Include a process for analysis of the cause(s) of failure and propose remedial action for CPM and agency approval. Remedial actions might include replanting, weed or herbivore control. Provide a funding mechanism to pay for planning, implementation, and monitoring of any contingency procedures that may be required and present all necessary assurances that the funds will remain available until success criteria have been achieved.

Response:

See Item 77 above.

Item 93:

Information Required:

Long-Term Management. Integrate long-term management (weed/vegetation management, preventing wildlife entrapment hazards) with the Channel Maintenance Program described above so that when revegetation success criteria are fulfilled the responsibility for channel and vegetation maintenance will be transferred to the Maintenance District.

Response:

See above response for the revegetation portion of this data request (above), and DR 76 for a response regarding preparation of a Channel Maintenance Program.

As discussed in the November 23, 2009 data request workshop, an updated Conceptual Drainage Plan will be prepared by January 15, 2010 (DRs 197, 198). A new FLO 2D analysis will accompany the updated Conceptual Drainage Plan and provide channel profiles and updated cross sections (DR 197). This plan will also address unrestricted movement for desert tortoises, and avoidance of hazards for desert tortoises (e.g., entrapment in the channel, without adequate cover) and other wildlife that might enter the channels (e.g., deer).

In summary, erosion control elements, including but not limited to slope protection, channel bottom protection, and drop structures, will be designed to allow for the movement of desert tortoises (DR 191). The channel will be only four feet below grade. The side slopes will be a maximum of 2 horizontal to 1 vertical and the exposed slope protection surface will not be uneven (i.e. no exposed rip rap, gabions, etc). Desert tortoises can traverse substantially steeper slopes, even 1:1, although long, natural grades are not consistently a single slope but, instead, a highly variable mixture of slopes in microsites across a grade. The side slopes of the channels are not long grades and are only approximately nine feet long. The slope percent and distance therefore does not present a hazard to desert tortoises. Suitable slope protection surface includes but is not limited to the use of soil cement, concrete and gunite. Grade control structures are not anticipated to be required because existing grades in the areas where proposed runoff diversion channels are constructed allow for relatively flat channel slopes (<0.5%) (DR 198).

Item 94:

Information Required:

Mitigation and Monitoring Plan for Evaporation Ponds. Please provide a more detailed mitigation and monitoring plan for the evaporation ponds, including a discussion of the frequency and nature of the monitoring, the elements that will be monitored (e.g., sodium, selenium), resident and migratory species that could be at risk, remedial actions that could be taken if the ponds became a hazard for wildlife, and the events that might trigger implementation of those remedial actions.

Response:

The Report of Waste Discharge (ROWD; Appendix H of the AFC) describes the design of the Genesis evaporation ponds that has been selected to optimize performance:

- There are three, eight-acre ponds; at least two will be operational at all times.
- Slopes are 3:1, with a maximum three-foot operating depth and a two-foot minimum freeboard.
- Ponds are lined with primary and secondary high density polyethylene (HDPE) liners; the primary HDPE liner is then overlain with a hard-surface, protective layer, such as roller-compacted concrete (alternate hard-surface media may be considered and submitted for approval). Side slopes have exposed HDPE liner.
- Berms are a minimum of two feet above the surrounding grade to prevent the inflow of storm water.

- Ponds will be cleaned approximately every seven years to remove accumulated sludge in the bottom. Up to three feet of sludge is to accumulate in the base of the ponds.
- Tables 4 and 5 of the ROWD predicts that the combined discharge to the evaporation ponds will have sodium levels of 14,575 ppm. Evaporation of water from the ponds will increase this concentration over time, with salt concentrations exceeding hazardous thresholds for birds (17,000 ppm [see review in Karl 2009]). Selenium has not been identified as detectable in a single, onsite test well, but more testing will provide a more comprehensive picture. Results can vary at a well or between nearby wells. For instance, test wells for Blythe Energy Project had inconsistent selenium results both within and among three wells. In 2004, all results for selenium were non-detectable except: (a) Monitoring Well 3 in March – 0.012 mg/L; and (b) Monitoring Well 1 in December – 0.0054 mg/L. And, even though mostly non-detectable at the wells, selenium had levels of 0.064 to 0.37 during monthly pond monitoring (Karl 2005).

The evaporation ponds will be managed to minimize their attractiveness and access to migratory and resident birds and common ravens. The ROWD provided a preliminary approach for the avian monitoring of the evaporation ponds, based on another solar project. A comprehensive plan now is being developed specifically for the Genesis Project that will provide protection for bird species that might be attracted to the ponds, and a monitoring program to evaluate the effectiveness of the protection measures and alternative approaches. The plan will be submitted no later than 20 January 2010, in order to incorporate both the comprehensive analysis currently underway for the Blythe Energy Project and design modifications to the Genesis evaporation ponds (see DRs 95 and 96). In summary, this program will:

1. Evaluate known bird uses of similar evaporation ponds and hazards
2. Assess expected use of the Genesis evaporation ponds by birds, by taxonomic group
3. Evaluate water quality in the evaporation ponds at Genesis, and potential for hazards to birds
4. Incorporate a series of measures. Minimally, this will consist of making resources provided by the ponds less available (i.e., habitat modification) and/or less attractive (i.e., hazing). Mechanical techniques of habitat modification could include:
    - Raising the water level. This will remove shoreline nesting habitat and will also render the sediment less available to wading species for foraging. In addition, the concentrations of harmful elements may become more diluted
    - Increasing the slope of the upper pond sides so that birds cannot land or perch on the pond sides to gain access to the water
    - Implement an integrated system of negative visual and auditory stimuli to haze birds from the area, especially those that might land on the pond
    - Install common raven deterrents

5. Establish a monitoring program to identify bird usage of the evaporation ponds (type of use, bird groups or species using the ponds, seasonal use, length of stay) and effectiveness of bird deterrents
6. Include evaporation pond water quality monitoring for salinity (daily), water level (daily), and water temperatures (continuous); other elements may be monitored as necessary, depending on the ongoing results of test wells
7. Identify remedial actions that may be necessary based on the results of the monitoring program
8. Identify thresholds from the monitoring that would indicate that remedial actions are necessary

Item 95:

Information Required:

Design of Evaporation Ponds. Please discuss how the evaporation ponds could be designed, built and operated to discourage wildlife use.

Response:

Section 9.5 in the Report of Waste Discharge (AFC Appendix H) outlined the design of the evaporation ponds. These are summarized in DR 94, which also describes the development of the Evaporation Pond Mitigation and Monitoring Plan. This plan will incorporate other pond design features that could further discourage wildlife use, while maintaining the evaporative function.

Item 96:

Information Required:

Alternatives to Evaporation Ponds. Please provide a detailed discussion of all available alternative technologies that could provide power plant cooling without the creation of evaporation ponds, and why these technologies were not included as part of the proposed project.

Response:

In the proposed design, the Genesis Solar Energy Project will utilize wet-cooling technology and evaporation ponds for treating cooling tower blowdown as discussed in the AFC. In the Alternatives section 3.10.7 the following water treatment options were evaluated and discussed in detail. A summary of these alternatives and associated evaporation pond sizes are discussed below per Staff's request during a Data Request workshop on November 23, 2009.

Proposed Design with Wet Cooling: 24 Acres (per unit)

As discussed in the AFC, the proposed design uses reverse osmosis (RO) units for pre and post treatment. The proposed design should be considered a partial Zero Liquid Discharge system since the post treatment RO reduces about 74% of the incoming water for reuse. While this design reduces much of the wastewater volume, 24 acres (per unit) are still required for operation.

Brine Concentrator: 7 Acres (per unit)

This alternative consists of a Brine Concentrator which evaporates between 90-95% of the wastewater. Water that is not evaporated contains concentrated dissolved solids and precipitates, this system would require approximately 7 acres of evaporation ponds to contain the remaining 5-10% of the wastewater.

Full ZLD System: 0 Acres

A full ZLD system consists of a brine concentrator and crystallizer to process wastewater generated by the site. The ZLD requires no evaporation ponds since nearly all of the water is evaporated and condensed for reuse. Wastes from this system are moist solids that are trucked offsite to an appropriate waste treatment facility. A full ZLD system requires continuous operation and is not conducive to supporting a cycling facility that only generates steam during the daylight hours. Therefore, additional fuel or electricity as well as supporting equipment would need to be constructed to support the ZLD's operation.

Clarifier: 19 Acres (per unit)

This alternative consists of a clarifier, and additional components including a multi-media filter, softener, RO unit and filter press. These wastewater treatment components combine into a treatment system to maximize the treated wastewater for reuse. The treated wastewater will be discharged into approximately 19 acres of evaporation ponds (per unit).

Air Cooled Condenser (ACC): 6 Acres (per unit)

An ACC uses dry-cooling technology to condense the process steam. A RO system is still needed for water treatment at the site, with the RO reject discharged to 6 acre evaporation ponds (per unit).

Item 97:

Information Required:

Conceptual Restoration Plan After Decommissioning. Please provide a conceptual decommissioning plan that addresses the fate of the engineered channels. If these channels will be filled, please provide a conceptual plan for filling the re-created channels and restoring drainages on the project site, including a description of a revegetation plan for restoring the function and values of the ephemeral drainages. Please include a cost estimate, adjusted for inflation, for implementing the closure, including the revegetation component of the closure activities for the drainages, and provide a conceptual plan and funding mechanism for monitoring and maintenance of the ephemeral drainages until existing functions are reestablished.

Response:

A channel-decommissioning plan will be a component of the overall site decommissioning plan. The overall decommissioning plan will be completed by February 12, 2010.

Item 98:

Information Required:

Identification of Utah Cynanchum and Ribbed Crytpantha. Please confirm the identification of the reported occurrence of Utah Cynanchum, and describe the characteristics of Utah Cynanchum and Ribbed Cryptantha in the project area.

Response:

Utah cynanchum (*Cynanchum utahensis*) was not observed during 2009 surveys. This was a transcription error of field notes into the comprehensive species list found in the Genesis Biological Resources Technical Report (TTEC and Karl 2009). The correct species was climbing milkweed (*Sarcostemma cyanchoides hartwegii*).

The ribbed cryptantha (*Cryptantha costata*) collected on 22 March 2009 had the following field notes:

> "The collection conforms very well with the descriptive characters below:
>
> - Nutlets 4 per fruit 1.5-2 mm long homomorphic, narrowly winged*, dorsal surface finely tuberculate. Large lanceolate inflorescence bracts.
> - Corolla limb 1-3 mm wide. Calyx in fr 4-6 mm.
> - The collection has nutlets that are slightly tuberculate and shiny with definite edges (wings)*; the inflorescence has conspicuous bracts characteristic of the species."
> - (*Further communication with the collector (T. Thomas) clarified that the nutlets were only very slightly winged by comparison to the winged nutlets of *C. holoptera*.)

The collector also revealed that the plants had a growth habitat (branching from the base) consistent with previously observed *C. costata* (T. Thomas, pers. comm. to A. Karl).

Item 99:

Information Required:

Description and Map of Utah Cynanchum and Ribbed Crytpantha. Please provide a discussion of the location of the reported occurrences of Utah Cynanchum and Ribbed Cryptantha in relation to the range of this species, whether individuals within these occurrences exhibit any unusual morphology, or if they occur in atypical habitats or substrates.

a. Include an estimate of the number of plants observed and describe their location/distribution in the project area.
b. Depict the approximate occurrence boundaries on an aerial photo at a scale and level of detail similar to that submitted in the Data Adequacy Supplement, Figure 5.3-6.

Response:

a. Include an estimate of the number of plants observed and describe their location/distribution in the project area.

   Response:

   Utah Cynanchum: There was no Utah cynanchum at the site.

   Ribbed Cryptantha**:** A single population of a few ribbed cryptantha was observed northwest of Wiley's Well rest area, at elevation 380 ft; coordinates were N33 º 38'30", W114º57'04". Field notes state:

   > "Mixed sand (i.e., sand drifts and hummocks; T. Thomas, clarification to A. Karl) and desert pavement with Patton tank tracks. Widely scattered creosote with *Dicorea canescens*, *Geraea canescens*, *Mentzelia multiflora longiloba*, *Cryptantha maritima*, *Cryptantha angustifoli*a" and *Abronia villosa*; (T. Thomas, pers. comm. to A. Karl).

   Plant morphology (see DR 98), location, and habitat were consistent with the description in *The Jepson Manual* (Baldwin et al. 2002). There is no suggestion that this population is atypical.

b. Depict the approximate occurrence boundaries on an aerial photo at a scale and level of detail similar to that submitted in the Data Adequacy Supplement, Figure 5.3-6.

   Response:

   Figure BIO-DR 99, located at the end of the Biological Resources Data Responses, illustrates the approximate boundaries of suitable habitat for ribbed cryptantha within the survey area and identifies the location of the single observation during surveys.

Item 100:

Information Required:

Characteristics of Mentzelia. Please describe the characteristics of the unidentified *Mentzelia* and its location in the project area, and discuss whether it exhibited any of the morphological features of *M. puberula* or *M. oreophila*.

a. If the unidentified *Mentzelia* does resemble the new rare taxon, discuss the location of these occurrences in relation to the range of this species.

b. Include an assessment of project impacts to this taxon in an eco-geographical context.

(**This information was contained in the background and is necessary for an understanding of the response**- Additionally, the Appendix A species list includes an unidentified *Mentzelia* (*Mentzelia* sp.). Argus blazing star (*Mentzelia puberula*) is a new addition to the CNPS Inventory (as a List 2.2) and to the new *Jepson Manual (ucjeps.berkeley.edu/new_era.html).* The new taxon was split off from *M. oreophila; s*outheastern morphs of *M. oreophila* going to *M. puberula* in the new Jepson Manual. *M. puberula* also extends into western Arizona, and blooms March to May.)

Response:

During the Genesis 2009 surveys, 135 plant species were identified to species or subspecies/variety level, including four species of the genus *Mentzelia* (TTEC and Karl 2009). During the survey, a running list of species observed was maintained, including individuals that obviously belonged to a particular genus, but did not have sufficient key characters to be keyed to the species level. As the survey proceeded, species were keyed and added to the field list. However, not all initial identifications only to genus level were removed, even though one or more species were keyed in a particular genus (e.g., *Mentzelia*). Transcription of these field notes into the comprehensive species list found in the Genesis Biological Resources Technical Report (TTEC and Karl 2009) included this oversight.

It is notable that the Jepson Flora Project (http://ucjeps.berkeley.edu/) does not recognize a distinct species called *Mentzelia puberula*, but instead states that the name is unresolved. It is listed in the current *Jepson Manual* (Baldwin et al. 2002) as a minor variant of *M. oreophila*, not an individual species. A new treatment of the genus, which will appear in the forthcoming, new *Jepson Manual*, will very likely identify *M. puberula* as a separate species (L. Hufford, Director, Marion Ownbey Herbarium, pers. comm. to A. Karl). This new Jepson Manual is not yet available, nor is it on the web site noted above in the background discussion for the data request. The author of the new treatment (L. Hufford) stated that the material is in draft form and neither finalized nor published.

M. puberula is not currently included in any CNPS list of special species (CNPS 2009), despite the data request background. Nick Jensen, CNPS' rare plant botanist, stated that this taxon will likely be proposed for addition to CNPS List 2 in the near future, which will be followed by an analysis to determine if addition to the list is warranted (pers. comm. to A. Karl). *M. puberula* is also not identified by CDFG on the current CNDDB Special Vascular Plants, Bryophytes, and Lichens List (CNDDB 2009).

Munz and Keck (1968) associate *M. puberula* with rocky habitats and mountains/rock outcrops. This is consistent with all *M. puberula* occurrences in the Consortium of California Herbaria (Consortium; http://ucjeps.berkeley.edu/) and Calflora (http://www.calflora.org) databases, except possibly one. This single occurrence is along the Colorado River at Cibola National Wildlife Refuge, along a levee road, an unlikely place for rocky habitat. This is sufficiently anomalous to question the accuracy of the species identification. In the new, draft treatment of the species, this Colorado River occurrence has been eliminated and all reference sites for the species are in rocky habitats (Hufford, pers. comm. to A. Karl).

Target species sought during a rare plant survey are based on special-status rank, known rarity, expected presence based on habitat, range and elevation, and available, existing information about occurrences. Since *M. puberula* has unresolved taxonomic difficulty, is not a state-or federally listed or candidate species, is not on any CNPS lists, and is not associated with habitats found on the Project, then it could not be reasonably expected to be included on the target list. However, there is every reason to believe, given the comprehensive floristic survey for the Project, that if *Mentzelia puberula* were present, it would have been recorded and keyed. There is an identification key available for the taxon (Munz and Keck 1968) and *M. puberula* blooms from March to May, during the period when the surveys were conducted. The taxon is not diminutive (it is 1-3 dm tall), such that it might be overlooked.

Item 101:

Information Required:

Shape Files/Metadata for Special-Status Plant Occurrences. Please provide the GIS shape files and metadata for special-status plants found in the project area.

Response:

The shape files/metadata for all special-status plant occurrences were sent via email to Carolyn Chainey-Davis on November 25, 2009.

Item 102:

Information Required:

CNPS List 2 Species.

a. Please provide a detailed discussion of the potential of these CNPS List 2 species to occur in the project area, based on the presence or absence of general conditions required by these species and provide information on the location and status of the nearest known occurrences from the sources listed above (UC Riverside [UCR], Joshua Tree National Park, and the Sweeney Granite Mountains Desert Research Center), as well as CNPS and the Consortium of California Herbaria.

b. Provide a map showing the location of suitable habitat (if present in the project area) on an aerial photo at a scale similar to that submitted in the Data Adequacy Supplement, Figure 5.3-6.

(**This information was contained in the background and is necessary for an understanding of the response** - Table 2 of the Biological Resources Technical Report, the target list of special-status plants upon which surveys were based, omits some special-status plant species. The following species Staff considers might potentially occur in the project area based on information by regional botanical experts at UC Riverside, Joshua Tree National Park, and the Sweeney Granite Mountains Desert Research Center, and/or CNDDB [including unprocessed reports]):

CNPS List 2 Plants:

angel trumpets (*Acleisanthes longiflora*), extremely rare species in California;

bitter hymenoxys (*Hymenoxys odorata*)

lobed ground cherry (*Physalis lobata*)

small-flowered androstephium (*Androstephium breviflorum*)

Argus blazing star (*Mentzelia puberula*) (new addition to the CNPS Inventory and new *Jepson Manual, split off from M. oreophila*)

CNPS List 4 Plants:

pink velvet mallow (*Horsfordia alata*)

desert portulaca (*Portulaca hamiloides*)

(Condalia globosa var. pubescens)

(Cryptantha holoptera)

Response:

a. Please provide a detailed discussion of the potential of these CNPS List 2 species to occur in the project area, based on the presence or absence of general conditions required by these species and provide information on the location and status of the nearest known occurrences from the sources listed above (UC Riverside [UCR], Joshua Tree National Park, and the Sweeney Granite Mountains Desert Research Center), as well as CNPS and the Consortium of California Herbaria.

Response:

A comprehensive floristic survey approach was employed during the Spring 2009 survey. All plants observed were keyed; 133 of 135 taxa were keyed to species and/or subspecies/variety (TTEC and Karl 2009). Winter rainfall (October 2008 to March 2009) at Blythe Airport totaled 33.5 mm (see DR 109); the long-term average for this period is 53 mm (see AFC Table 5.4-1). Fall/early winter rainfall in 2008, during which most germination occurs, was nearly the same as the long-term average: 21.5 mm as compared to 22.3 mm. Late winter rainfall, which promotes growth as well as some germination, was less in 2009 than the long-term average: 11.3 mm as compared to 31.5mm. Assuming that the precipitation at the Project mirrored that at Blythe Airport, rainfall during the critical germination period was sufficient for average germination and spring surveys. Our observations were that germination of ephemeral species was average. So, it is highly likely that all plants that are either woody or succulent perennials or spring-blooming herbaceous species would have been recorded during the survey.

Every CNPS List 1 or 2 plant that could reasonably be expected at the Project was targeted during the survey. Table DR-102 provides relevant data on the species listed above by CEC Staff. (Note: *Condalia globosa* var. *pubescens* has been excluded from Table DR-102 because it was in Table 2 of the Genesis Biological Resources Technical Report as a target species.) None of the CNPS List 2 plants suggested by CEC Staff would be expected to occur at the Project. (Also see DR 100 for a discussion of *Mentzelia puberula*.) Target species sought during a rare plant survey are based on special status, known rarity, expected presence based on habitat, range and elevation, and existing information about occurrences. During the initial development of the target species list, species are eliminated if they cannot reasonably be expected to occur, based on these factors. A “safety net”, however, is the comprehensive floristic survey approach, which records all species present on the project.

In addition to being eliminated based on the factors listed above, *Portuca halimoides* and *Horsfordia alata* are CNPS List 4 species. CNPS List 4 species generally are not sought for CEQA projects unless they have been otherwise identified as special-status, for example in the NECO Plan (BLM and CDFG 2002), or warrant consideration based on local significance or recent biological information (CNDDB 2009). *Portuca halimoides* and *Horsfordia alata* were not identified in the NECO Plan as List 4 plants that warranted special consideration and are not ranked as unusually rare or threatened (Table DR-102). According to Nicholas Jensen, CNPS’ rare plant botanist, there are no plans to upgrade the status of these two species.

Cryptantha holoptera has suitable habitat throughout the Project footprint (Figure DR-102A-E), although none was observed during the spring surveys. (Table DR-102).

Table DR-102. Information on CNPS List 2 and List 4 Plant Species Identified by CEC Staff for Potential Consideration at the Genesis Project.
For elevation comparisons, note that the elevation at the Project is 110-137 m.

Species		CNPS List (1)	State/Global Rarity and Condition Rank (2)	Habitat (3)	CNPS, Consortium, Jepson Manual, and Calflora Locations and Range (3)	Blooming Period (3)	2009 Spring Surveys Conducted at the Appropriate Time to Identify Plants?	Potential on Project
Latin Name	**Common Name**							
Acleisanthes longiflora	Angel trumpets	2.3	S1.3G5	**CNPS**: 90-95 m, Son.D. scrub (limestone) **Jepson**: 0-2500 m, generally on limestone; mountains or base of mountains	Two occurrences in CA from 1906 and1970 at same location at base of Big Maria Mts, north of Blythe; to TX and northern MX	April (1906 occurrence was 8 April) and May	Yes	None - no limestone or rocky habitat; not observed
Cryptantha holoptera	Winged cryptantha	4.3	S3?G3G4	**CNPS**: 100-1690 m, Moj. and Son. D. scrubs; **Jepson**: 100-1200 m in eastern Moj. and Son. D.; sandy to rocky soils; creosote bush scrub	San Diego to Inyo Cos., including Los Angeles, San Bernardino, Riverside, and Imperial Cos., to AZ, NV, and Sonora, MX; CalFlora has 11 Riverside Co. records, 9 Imperial Co. records, and 7 San Bernardino Co. records, none within miles of the Genesis Project. (Note: The NECO Plan stated that there were no records in the NECO Planning Area and	Mar-Apr	Yes	Possible, but not observed

Species		CNPS List (1)	State/Global Rarity and Condition Rank (2)	Habitat (3)	CNPS, Consortium, Jepson Manual, and Calflora Locations and Range (3)	Blooming Period (3)	2009 Spring Surveys Conducted at the Appropriate Time to Identify Plants?	Potential on Project
Latin Name	Common Name							
					there are no nearby records in the CNDDB data base. However, there is a 1992 location near McCoy Spring.)			
Hymenoxys odorata	Bitter hymenoxys	2.2	S2G5	**CNPS**: 45-150 mm; riparian scrub and Son. D. scrub **Jepson**: <150 m; sandy flats near Colorado R.	10 locations (11 records) in CA along Colorado River from southern San Bernardino Co. to northern Imperial County; to UT, CO AZ to TX, northern Mexico, including Baja California	Feb-Nov	Yes	Highly unlikely - known only from the Colorado River alluvial plain; not observed
Androstephium breviflorum	Small-flowered androstephium	2.2	S1.2G5	**CNPS**:220-640 m; desert dunes, Moj. D. scrub (bajadas) **Jepson**: 700-1600 m; open desert scrub	36 records, all in San Bernardino Co. except one record in Riverside near San Bernardino Co. line; to western CO	Mar-Apr	Yes	Would not be expected - all known locations well to north and generally higher; not observed
Horsfordia alata	Pink velvet-mallow	4.3	S3.3G4	**CNPS**: 100-500 m; rocky Son. D. scrub **Jepson**: 100-500 m; rocky	Imperial and Riverside Cos. to; to southern AZ, northern MX and	Mar-Apr, Nov-Dec	Yes	None - no rocky habitat on Project;

Species		CNPS List (1)	State/Global Rarity and Condition Rank (2)	Habitat (3)	CNPS, Consortium, Jepson Manual, and Calflora Locations and Range (3)	Blooming Period (3)	2009 Spring Surveys Conducted at the Appropriate Time to Identify Plants?	Potential on Project
Latin Name	**Common Name**							
				canyons and washes; Son D. creosote bush scrub	Baja California			not observed
Mentzelia puberula	Argus Blazing Star	none	none	**CNPS and Jepson:** Not recognized **Munz:** Below 2500 ft; Rocky or gravelly sites in creosote bush scrub rom Ord Mts. to Chocolate Mts., to AZ and northern Baja California. All records are from rocky, mountainous locations except one in Imperial Co., along a levee road next to the Colorado River.	13 records, 11 in San Bernardino Co, 1 in Riverside Co. in Big and Little Maria Mts., 1 in Imperial Co. in Cibola NWR	March-May (Munz)	Yes	Highly unlikely based on habitat and range; not observed
Physalis lobata	Lobed ground-cherry	2.3	S1.3G5	**CNPS**: 500-800 m; Moj. D. scrub (decomposed granite); playas **Jepson**: 500-800 (-1311) m; dry lake margins, granitic soils	6 (Consortium) and 15 (Calflora) records, all San Bernardino Co.; to AZ, KS, northern MX	Sep-Jan	No	None - all known locations well to north and at higher elevations than Project
Portulaca halimoides	Desert portulaca	4.2	S3G5	**CNPS**: 1000-1200 m; Joshua tree woodland,	San Bernardino, Riverside and San	September (Munz);	No	None - No habitat and

Species		CNPS List (1)	State/Global Rarity and Condition Rank (2)	Habitat (3)	CNPS, Consortium, Jepson Manual, and Calflora Locations and Range (3)	Blooming Period (3)	2009 Spring Surveys Conducted at the Appropriate Time to Identify Plants?	Potential on Project
Latin Name	Common Name							
				sandy **Jepson**: 1000-1200 m; sandy washes and flats in desert mountains	Diego Cos., to TX and northern MX; Jepson Manual states New York Mts. and Little San Bernardino Mts.	can be common following summer rains.		Project elevations too low

(1) Source: CNPS 2009

(2) Ranking is from CNPS (2009), as follows:
G = Global (a reflection of the overall condition of the taxon throughout its global range

S = State ranking

G1 or S1 - <6 viable occurrences OR <1000 individuals OR <2,000 acres

G2 or S2 – 6-20 occurrences OR 1,000-3,000 individuals OR 2,000-10,000 acres

G3 or S3 – 21-80 occurrences OR 3,000-10,000 individuals OR 10,000-50,000 acres

G4 or S4 – Apparently secure; factors exist to cause some concern

G5 or S5 – Population or stand demonstrably secure to ineradicable due to being commonly found in the world

Threat rank qualifications for all State rankings:

S1.1 – Very threatened

S1.2 – Threatened

S1.3 – No current threats known

(3) Source: Unless noted, information is from *The Jepson Manual* (Baldwin et al. 2002), CNPS Online Inventory (CNPS 2009), and Jepson Flora Project (http://ucjeps.berkeley.edu/)

b. Provide a map showing the location of suitable habitat (if present in the project area) on an aerial photo at a scale similar to that submitted in the Data Adequacy Supplement, Figure 5.3-6.

Response:

BIO DR 102A-E, located at the end of the Biological Resources Data Responses, illustrate the approximate boundaries of suitable habitat within the survey area for winged cryptanta.

Item 103:

Information Required:

Surveys for CNPS List 2 Species.

a. If potentially suitable habitat is present to support the rare plant taxa listed above, please re-survey areas within the project footprint focusing on suitable habitat under appropriate environmental conditions (following a rainfall event of 12- to 18-mm rain or more) or provide an explanation as to why these surveys could not be conducted.

b. These species should also be included on the list of species targeted during surveys of the transmission line spur roads and any other areas not surveyed during the spring 2009 surveys.

c. If found, provide a description of the survey results, including the CNDDB field survey forms and GIS shape files and metadata for any found occurrences.

(**This information was contained in the background and is necessary for an understanding of the response -** A number of summer and fall-flowering rare plants are known to occur in this region, and many more have potential to be present. Rare plant taxa with potential to occur in the project area but may not be detected during a spring survey (according to regional botanical experts consulted) include:

- Adam's spurge (Chamaesyce abramsiana)
- Glandular ditaxis (Ditaxis claryana)
- Angel trumpets (Acleisanthes longiflora): Aug-Oct is the optimum survey time for this extremely rare species in California
- Pink velvet mallow (Horsfordia alata)
- Lobed ground cherry (Physalis lobata)
- Desert portulaca (Portulaca hamiloides)
- Flat-seeded spurge (Chamaesyce platysperma)

Response:

DR Response No. 102 explains that the taxa identified were either not observed during the floristic survey in 2009 and/or could not be reasonably expected to occur at the Project.

During 2010 surveys, a floristic survey will be completed for the areas of the linear facilities that were not completed in spring 2009. All species from Table 2 of the Genesis Biological Resources Technical Report and those in Table DR-102 that can be reasonably expected to occur on the Project will be sought during 2010 spring surveys. Any other species that attain special-species status by that time will also be sought. The results of these surveys will be provided to all resource agencies, along with GIS shape files and metadata for any occurrences of special-status species; CNDDB field forms will be completed.

Item 104:

Information Required:

Assess Habitat Potential for Late Season Rare Plants. Please provide a detailed discussion of the potential of these species to occur in the project area, based on the presence or absence of general and micro-habitat conditions required by these species.

Response:

The following species from CEC Staff's list are excluded due to lack of association with the Project area (see DR 102, above): Angel trumpets, pink velvet mallow, lobed ground cherry, and desert portulaca. Glandular ditaxis blooms from December to March (Baldwin et al. 2002); flat-seeded spurge blooms from February (Mexico) to May (Felger 1980, Baldwin et al. 2002) to September (CNPS 2009). Both species were sought during Spring 2009 surveys (Table 2 of the Biological Resources Technical Report [TTEC and Karl, 2009]).

The only species remaining on Staff's list that is fall-flowering is Abram's spurge (*Chamaesyce abramsiana*). Abram's spurge, a CNPS List 2 species, has a documented occurrence near the Project on the south side of Interstate 10, just west of the Ford Dry Lake exit (see figure for DR 105). In 2008, dried plants were observed growing in a swale and in depressions that collected water in a dirt road (A. Karl, pers. obs.). Habitat for the species includes sandy flats in creosote bush scrub (Munz and Keck 1968), below 200 m (Baldwin et al. 2002) to 915 m (CNPS 2009). Based on 14 Consortium records, habitats in Riverside, San Diego and Imperial Counties are sandy or at dry lake margins, whereas habitats in San Bernardino County are coarser, probably sandy loams. Based on these occurrences, Abram's spurge could occur on any part of the Project; it would be most likely to occur on along the transmission line route and southern portion of the western solar field.

Item 105:

Information Required:

Map of Suitable Habitat. If suitable habitat is present onsite for these late season sensitive plants, please provide a map showing the location of suitable habitat in the project area on an aerial photo at a scale and level of detail similar to that submitted in the Data Adequacy Supplement, Figure 5.3-6.

Response:

Figures BIO-DR 105A-E, located at the end of the Biological Resources Data Responses, illustrate the approximate boundaries of suitable habitat within the survey area for Abram's Spurge.

Item 106:

Information Required:

Assess Significance of Occurrences. Please provide an assessment of the eco-geographical significance of an occurrence (if present) relative to its distribution within California.

Response:

Abram's spurge is found from San Bernardino County to Imperial and eastern San Diego Counties, to Arizona, Nevada, Mexico and Baja California (Baldwin et al. 2002, Calflora 2009). While relatively widespread, both in California and over its entire range, the species has a CNPS ranking of G4S1.2, which means that the plant is globally apparently secure, but in California is both rare and subject to threats (see footnote for Table DR-102).

A population at the Project would be well within the known geographic range and habitats known for the species. There are four records in Riverside County, one of which is just south of Interstate 10 at the Ford Dry Lake exit (see figure for DR 105).

Item 107:

Information Required:

Include a table that itemizes the area of suitable habitat within the project area and provide an analysis of the extent and distribution of suitable general habitat and microhabitat within the cumulative effects study area, taking into account ownership and management of the habitat as well as all reasonably foreseeable projects that could eliminate the plants and/or their habitat.

Response:

The only species with the potential to occur within the Project area is *Chamaesyce abramsiana* (see DR 104). The entire survey area, including the Project footprint, is considered suitable habitat for *C. abramsiana* (see figures BIO-DR105A-E). Table BIO-DR107 itemizes the suitable habitat within the Project footprint.

Table BIO-DR 107. Acreage of Suitable Habitat for Abram's Spurge by Vegetation Community within the Project Footprint

Location	Sonoran Creosote Bush Scrub	Playa and Sand Drifts over Playa	Stabilized and Partially-Stabilized Sand Dunes	Total Acreage
Linear Corridor	1758	18	28	1805
Facility Footprint	41	15	28	83
Total	1799	33	56	**1888**

The cumulative effects study area is being addressed by BLM as has not yet been defined, and as such, the extent and distribution of suitable general habitat and microhabitat for Abram's spurge cannot be analyzed at this time. However, because Abram's spurge is relatively widespread in California (see DR 104), it is likely that several other proposed renewable energy projects with ROW applications in the Palm Springs BLM field office would be within the known geographic range for this species.

Item 108:

Information Required:

Provide a map or discussion of the reported/documented occurrences within the NECO planning area.

Response:

Abram's spurge is the only species that has the potential to occur within the Project area. Figure BIO-DR108, located at the end of the Biological Resources Data Requests, illustrates the CNDDB and Corsortium of California Herbaria (CCH) documented occurrences of Abrams's spurge (*Chamaesyce abramsiana*) (CNDDB 2003b, CCH 2008). CNDDB known observations of glandular ditaxis (*Ditaxis claryana*), angel trumpets (*Acleisanthes longiflora*), and lobed ground cherry (*Physalis lobata*) within the NECO planning area have been included to illustrate the locations of these special-status species in relation to the Project. No occurrences of flat-seeded spurge (*Chamaesyce platysperma*), desert portulaca (*Portulaca hamiloides*), or pink velvet mallow (*Horsfordia alata*) have been recorded in the CNDDB within the NECO area for these species.

In addition to CNDDB and CCH, botanist for the CNDDB, Roxanne Bittman was contacted to inquire about unprocessed botanical records for the above listed species (R. Bittman, pers. comm. to Amy Bensted). There were unprocessed, back-logged records for *Physalis lobata, Androstephium breviflorum,* and *Cryptantha holoptera;* however none of the occurrences occurred within the Project area or vicinity. Additionally, the occurrences for *P. lobata* and *A. breviflorum* were outside of the NECO planning area. Eight occurrences for C. Holoptera were identified within San Bernardino County, but because the data was unprocessed, it cannot be determined whether they are located within the NECO planning area at this time.

Item 109:

Information Required:

Rainfall Data. Please provide any available 2008/2009 rainfall data from a source as close as possible to the project site.

Response:

The following table shows precipitation data from the closest source to the Project site. For additional, long-term climate information, see the AFC, Table 5.4-1.

Table BIO DR-109. 2008 and 2009 Monthly Total Precipitation Data (in inches) for the Blythe, CA Airport (approximately 19 miles east of Project area). WRCC 2009.

YEAR	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Annual
2008	0.77	0.02	0	0	0.18	0	0.27	0.15	0.06	0	0.24	0.65	2.34
2009	0.02	0.43	0	0	0.03	0.01	0.07	0.02	0.03	0	TBD	TBD	0.61

Item 110:

Information Required:

Description of Surveys for Coachella Valley Milkvetch. Please provide information about the level of survey effort directed toward finding Coachella Valley milkvetch and other special-status plant species, including dates and person-hours spent conducting special-status plant surveys.

Response:

Floristic surveys and targeted surveys for all potentially occurring sensitive species on March 17-25 and April 6-13, 2009. Coachella Valley milkvetch is not expected at the Project (see DR 111). The survey effort for the Coachella Valley milkvetch was identical to the survey effort for all other plant species, details of which can be found in the Biological Resources Technical Report for the Genesis Solar Energy Project (Tetra Tech and Karl 2009).

Total person-hours spent conducting floristic and special status plant surveys was approximately 1,265 hours. As the number of field biologists surveying each day varied, as well as actual survey time (due to the amount of time needed to walk to each survey location), total person-hours were approximated. Person-hours were calculated based on an average survey time of 6.2 hours per day, multiplied by the average number of field biologists working each day (12), and multiplied by the number of survey days (17).

Item 111:

Information Required:

Survey Effort/Microhabitat for Coachella Valley Milkvetch. Please address whether suitable microhabitat is present onsite to support Coachella Valley milkvetch.

Response:

The USFWS has concluded that Coachella Milkvetch, a federally listed species, does not occur in the Project vicinity (T. Englehard, USFWS, e-mail to C. Chainey-Smith, CEC).

Item 112:

Information Required:

Provide a map depicting the approximate boundaries of the habitat on an aerial photo at a scale and level of detail similar to that submitted in the Data Adequacy Supplement. Please provide additional information about the level of survey effort (number of person hours for surveys) applied to detecting this species, and describe the results of a reference site visit for Coachella Valley milkvetch.

Response:

Figures BIO-DR 112A-E, located at the end of the Biological Resources Data Responses, illustrate the approximate boundaries of suitable habitat for the Coachella Valley milkvetch. See DR 110 for additional information regarding level of survey effort applied to detecting this species. A reference site visit was not conducted because the closest known occurrence at the time of surveys was greater than 10 miles from the Project. Coachella Valley milkvetch is not expected at the Project (see DR 111).

Item 113:

Information Required:

Wiggins' Cholla Identification.

a. Please provide a vouchered specimen or photographs of the plants mapped in the area as Wiggins' cholla to UC Riverside botanist Andrew Sanders and to the author of the Cactaceae treatment in the new Jepson Manual (or other recognized cactus expert) for determination.

b. Provide documentation of the results of the investigation, including a record of conversations.

Response:

Wiggins' cholla (*Cylindropuntia wigginsii*) is not recognized as a species, but is considered, instead, a hybrid of silver cholla (*C. echinocarpa*) and pencil cholla (*C. ramosissima*) (Jepson Flora Project: Jepson Interchange for California Floristics 2009b). It is not found in *The Jepson Manual* (Baldwin et al 2002) nor in *A California Flora and Supplement* (Munz and Keck 1968). However, it is called out as a special-status taxon by the NECO Plan (BLM and CDFG 2002) and therefore was sought Wiggins' cholla during surveys. Wiggins' cholla is a CNPS List 3 plant.

The following descriptions of Wiggins' cholla and silver cholla are from Benson (1981), who first described Wiggins' cholla as a new species. Only the characters that distinguish the two species or are sufficiently similar such that the distinction is ambiguous, are listed:

Wiggins' cholla:

Habit - 1-2 feet high, about a foot in diameter; trunk 3/4 to 1 1//2 inches in diameter

Joints - 2-4 inches long

3/8 inch in diameter (terminal joints 1/4 to 3/8 inches in diameter)

Spines - Red or pink but with straw-colored sheaths

6-8 per areole

Moderately dense, but not obscuring the joints

Those on the terminal part of the joint much larger, the central one in

the areole far larger than the others, 3/4 to 1 3/4 inches long

Not markedly barbed

Fruit - Green, dry at maturity

5/8 to 3/4 inches long, 1/2 to 3/4 inches in diameter

Spines well developed, weakly barbed

Seeds - Tan

3/16 inches long

Silver cholla:

Habit - Much-branched shrub; trunk distinct, often forming one-third to one-half the height of the plant

Joints - 2-6 (or rarely 10-15) inches long

3/4 to 1 1/2 inches in diameter (terminal joints, at least some, ≥5/8 inches in diameter)

Spines - Straw-colored, silvery or golden (the sheaths of similar color)

About 3-12 per areole

Dense

Central and radial spines indistinguishable, 3/4 to 1 1/2 inches long

Not barbed

Fruit - Green, dry at maturity

3/4 to 1to 1 1/2 inches long, 1/2 to 3/4 inches in diameter

Spines dense on upper half, strongly barbed

Seeds - Light tan

About 1/4 inch in diameter

The morphological differences between the two taxa are subtle. Both parent species also have substantial morphological variation, which could further produce variation in hybrids. During the Genesis Spring 2009 surveys, we observed plants that were obviously silver cholla. However, the plants labeled as Wiggins' cholla were distinctive, being both substantially smaller than the local silver cholla and having narrower joints, 1/2 to 5/8 inch in diameter.

No specimens were collected as vouchers, based on the distinctive morphological characters of the plants that were labeled as Wiggins' cholla. Andrew Sanders (Curator, University of California at Riverside Herbarium, pers. comm. to A. Karl) does not believe that Wiggins' cholla is more than a sporadic hybrid (how sporadic, he cannot guess). While he has not seen the plants in eastern Chuckwalla Valley, he feels that it is possible that Wiggins' cholla could be present, given the diminutive morphology of many of the plants there; dwarf silver cholla is also likely to occur. His opinion is that this taxon does not warrant the attention it is receiving. John Redman (Curator, San Diego Natural History Museum Herbarium, pers. comm. to A. Karl), who is co-writing the treatment for cacti in the forthcoming, revised *Jepson Manual*, states that no plants have been verified as hybrids between silver and pencil chollas, although no genetic analyses have been conducted. Silver cholla is highly variable and he has observed dwarf forms in poorer habitats, including on the broad flats in far western Arizona and near the Salton Sea. Those dwarf forms in Arizona were originally thought to be Wiggins' cholla, but he and his colleagues now believe that they are merely dwarf silver cholla. Based on information to date, they do not feel that Wiggins' cholla is a valid species or hybrid.

Based on this analysis, it is likely that all plants at the Genesis Project are silver cholla. Wiggins' cholla is not considered a valid taxon.

Item 114:

Information Required:

Please identify the number and location of occurrences for each special-status plant species that could be directly and indirectly impacted by the project.

Response:

Table BIO-DR 114. Number and Location of Special-Status Plant Species

Special Status Plant Species Observed During Spring 2009 Field Surveys	# Occurrences Associated with Project Facilities	Location	# Directly Impacted	# Indirectly Impacted*
Harwood's milkvetch *(Astragalus insularis var. harwoodii)*	2	Facility Footprint	**2**	**0**
	10	Linear Corridor North of I-10	**3**	**7**
	0	Linear Corridor South of I-10	**0**	**0**
Desert unicorn plant (*Proboscidea althaefolia*)**	5	Facility Footprint	**4**	**1**
	14	Linear Corridor North of I-10	**8**	**6**
	3	Linear Corridor South of I-10	**1**	**0**
Wiggins' cholla (*Cylindropuntia wigginsii*)	22	Facility Footprint	**21**	**1**
	4	Linear Corridor North of I-10	**1**	**1**
	0	Linear Corridor South of I-10	**0**	**0**
Las Animas colubrina (*Colubrina californica*)	0	Approximately 1.5 miles northwest of the facility footprint	**0**	**0**
Harwood's phlox (*Eriastrum harwoodii*)	0	Approximately 6 miles west of facility footprint	**0**	**0**
Ribbed Cryptantha (Cryptantha costata)	1	Linear Corridor North of I-10	**0**	**1**

* Includes individuals located within approximately 1,320 feet (0.25 mile) of Project facilities

** Note that occurrences refer to seed pods found during surveys and not individual plant; therefore, direct and indirect impact numbers are inexact.

Surveys will be conducted in spring 2010 to identify populations of special-status plants on the new linear alignments. This will provide input on locations of special-status species along portions of the Project that are not scheduled for complete removal of surface vegetation. Survey results are not expected to be material different from the 2009 survey results.

Item 115:

Information Required:

Please provide a discussion of the significance of the project occurrences relative to their distribution within California and address the potential cumulative effects of other past, present, and foreseeable future projects on the species or taxon in the NECO planning area.

Response:

BLM is currently working on identifying a method for analyzing Project cumulative effects, which includes identifying past, present, and foreseeable future projects. This information is not yet available, and therefore an analysis and discussion of potential cumulative effects on the below species cannot be completed at this time. However, below is a discussion of the project occurrences as they relate to distribution of the special-status plants observed during field surveys.

Harwood's milkvetch is found in desert dunes and sandy or gravelly areas throughout the Mojave and Sonoran Deserts in Imperial, Riverside, and San Diego Counties in California (Baldwin et al. 2002, CNPS 2009, CalFlora 2009). Although apparently widespread, as there are documented occurrences in three counties, this species is rare in California and has a CNPS ranking of 2.2, which means that it is fairly endangered in California, but more common elsewhwere: G5S2-2.

Project development will impact a minimum of 90 acres of suitable habitat for the Harwood's milkvetch, based on the number of acres of Stabilized and Partially-Stabilized Sand Dunes (57 acres) and Playa and Sand Drifts over Playa (33 acres) within the Project area (see AFC, Table 5.3-4). Surveys identified 12 individual plants that will be either directly or indirectly impacted by the Project (see DR 114). Because this species is relatively widespread, the elimination of 90 acres would have a relatively small reduction in overall acreage of suitable habitat found within the NECO planning area. However, it is recognized that dune habitat is limited. As such, 90 acres of dunes is somewhat more important.

Desert unicorn plant is found in sandy places in the Sonoran Desert in San Bernardino, Imperial, Riverside, Imperial Counties in California (Baldwin et al. 2002, CNPS 2009). It has a CNPS ranking of 4.3, which means it has limited distribution, but is not very endangered in California.

Project development would impact approximately 1,887 acres of suitable habitat for the desert unicorn plant, assuming the entire Project footprint is habitat for this species (See AFC, Table 5.3-4). Surveys identified 75 seed pods, 20 of which were found in areas that will be directly or indirectly impacted by Project development (see DR 114). Because only seed pods were found, exact locations of plants are unknown; however, their presence indicates that the plants grow in the area. Because this species is not very endangered in California, is relatively widespread, and is found in an abundant vegetation community (there are 3.8 million acres of Sonoran Creosote Bush scrub in the NECO planning area [BLM 2002]), the elimination of 1,887 acres would be a relatively minor reduction in overall acreage of suitable habitat in the NECO planning area.

Wiggin's cholla is not considered a valid taxon (see DR 113). As described in CNPS (2009), the potential taxon is found in sandy spots in Sonoran Creosote Bush Scrub in Imperial, Riverside, San Bernardino, and San Diego Counties. Whereas relatively widespread, both in California and over its entire range, the species has a CNPS ranking of 3.3, which means more information is needed, and it's not very endangered in California. It was targeted as a special-status species during surveys because it is named in BLM's NECO plan as a special-status plant within the NECO planning area.

Project development would impact approximately 1,887 acres of suitable habitat for Wiggin's cholla, assuming the entire Project footprint is habitat for this species (See AFC, Table 5.3-4). Surveys identified 109 possible Wiggin's cholla, only 24 of which will be directly or indirectly impacted by Project development (see DR 114). Because this species is not very endangered in California, is relatively widespread, and is found in an abundant vegetation community (there are 3.8 million acres of Sonoran Creosote Bush scrub in the NECO planning area [BLM 2002]), the elimination of 1,887 acres would be a relatively minor reduction in overall acreage of suitable habitat in the NECO planning area.

Ribbed cryptantha is found in loose-sandy soils of the eastern Mojave and Sonoran Deserts in Imperial, Inyo, Riverside, San Bernardino, and San Diego Counties, to Arizona and Baja California (Baldwin et al. 2009, CNPS 2009). It has a CNPS ranking of 4.3, which means it has limited distribution, but not very endangered in California.

Project development will impact approximately 90 acres of suitable habitat for the Harwood's milkvetch, based on the number of acres of Stabilized and Partially-Stabilized Sand Dunes (57 acres) and Playa and Sand Drifts over Playa (33 acres) within the Project area (see AFC, Table 5.3-4). . Surveys identified one ribbed cryptantha that may be indirectly impacted by Project development (see DR 114), although suitable habitat was present beyond that single individual. Because this species is not very endangered in California, and is relatively widespread, , the elimination of 223 acres would be a relatively minor reduction in overall acreage of suitable habitat in the NECO planning area. However, it is recognized that dune habitat is limited. As such, 90 acres of dunes is somewhat more important.

Item 116:

Information Required:

Please also indicate whether the special-status plants found occur on an atypical substrate or habitat or exhibit any unusual morphology. The sources of information should include records from the California Natural Diversity Database (CNDDB), NatureServe, CNPS, and the Consortium of California Herbaria data.

Response:

DR 113 discusses that Wiggins' cholla is not a valid taxon; all individuals observed are assumed to be the non-sensitive silver cholla and were observed in expected habitat. The morphological description and key from Benson (1981) was utilized to identify the taxon, so individuals conformed to the expected morphology. Ribbed cryptantha is discussed in DR 99 as neither atypical in description nor location.

The individuals observed of Harwood's milkvetch, desert unicorn plant and Las Animas colubrina were typical in morphology, habit, habitat, microhabitat, and geographic range. All were consistent with descriptions in recognized floras (Munz and Keck 1968, Baldwin et al. 2002). The single individual that was potentially Harwood's phlox was observed growing on an aeolian substrate, consistent with the species account (Gowen 2008) and identical to Harwood's phlox observed on 27 March 1009 at a known CNDDB reference population near Soda Dry Lake, San Bernardino County (CNDDB Occurrence No. 10). The individual west of Ford Dry Lake was partly dried and had no flowers, so a definitive identification could not be made. And, based on the geographic range of the known locations in the CNDDB database, it seems unlikely that this individual was Harwood's phlox. (All locations in CNDDB are in San Bernardino County or along the

San Bernardino-Riverside Counties line, except one in western Riverside County and one in San Diego County.) However, the species account (Gowen 2008) places the species in northeastern Riverside County, and because the entire plant was very woolly with habitat/microhabitat consistent with known individuals and the species account, the possibility that this was Harwood's phlox could not be ruled out.

Item 117:

Information Required:

Indirect Impacts to Special-Status Plant Species. Please provide a more detailed and species-specific discussion of potential indirect impacts to special-status plant occurrences, including an analysis of effects from potential project related impacts such as spread of noxious weeds, herbicide or soil-stabilizer drift, changes in vegetation management practices (for example, vegetation clearing for fuel reduction or weed control), sedimentation, fire, and alterations of the site hydrology.

Response:

Harwood's milkvetch, ribbed cryptantha and Harwood's phlox (if present) occupy sandier areas; the latter two species are more associated with aeolian deposits than is Harwood's milkvetch. During and after construction, disturbed sites on sand generally will be prone to wind erosion, which is likely to deposit sand on adjacent, downwind vegetation. Individuals of these three species may be buried, although the population effects are likely to be minor because these species are adapted to aeolian sand deposition and movement. Added to this is that these three species are short-lived, spring-flowering annuals, so if the sand deposition from the Project occurs after seed set, there would arguably be no impacts. Mitigation measures during periods when plants are flowering and producing seeds may include temporary drift fences where populations could be affected, or other measures to minimize downwind sand deposition.

Harwood's milkvetch may actually benefit from construction-associated disturbance. During the 2005 high rainfall year, this species' greatest densities in the Blythe area occurred along road berms and shoulders (A. Karl pers. obs.), where mechanical seed scarification could occur as a result of sand and gravel movement by road equipment.

Vegetation communities adjacent to construction areas also may be affected by fugitive dust from construction activities. (Fugitive dust may inhibit metabolic processes such as photosynthesis and transpiration.) While some of this may occur, air quality measures to minimize fugitive dust (AFC Section 5.2) will minimize this effect.

During the construction of the access road and pipeline, temporary changes to drainages may occur. Special-status plants that could be affected would be desert unicorn plant and trees regulated by the CDNPA. These effects would be temporary, since all original hydrological function would be restored following construction and maintained during construction. Solar field runoff will be contained onsite and will not affect adjacent plant populations (DR74).

All sensitive species in the Project vicinity may be affected by the ingress of off-highway-vehicle (OHV) recreational activity into new areas. Currently, there is no road access to the Project area. With the addition of an access road from the Wiley Well Rest Area, as well as maintenance roads along the facility edges, new access to currently inaccessible areas could result in greater recreational traffic. The increase in traffic may be small. There are a couple dirt roads west and a few miles east of the site and little traffic was seen on them during the Spring surveys.

Fire is always a possibility, but every effort would be made to contain any fires onsite prior to spread. There is no reasonable anticipation that a fire would occur at Genesis. Fires have been found to be associated with dense exotic weed populations, which exacerbate lightning strike fires by providing both a fuel load and connection between shrubs. However, exotic weeds are already common at the site, especially Saharan mustard (*Bromus tournefortii*), Russian thistle (*Salsola tragus*) and split (Mediterranean) grass (*Schismus arabicus*) (AFC Section 5.3). The Genesis Weed Management Plan (DR 121) will inhibit the further spread and enhancement of the resident weed populations.

The Genesis Weed Management Plan (DR 121) also will address the application of herbicides or manual measures that could affect non-target species, such as sensitive plants. Example measures to avoid non-target impacts will include seasonal spraying (e.g., Saharan mustard germinates earlier than many spring-flowering annuals) and avoidance of herbicide applications during breezy conditions. At no time will the management of weeds damage populations of sensitive species.

Item 118:

Information Required:

Special-Status Plant Avoidance/Mitigation Plan. Please prepare a draft Special-Status Plant Avoidance and Mitigation Plan for species potentially impacted by the project that includes a description of impact avoidance and minimization measures. Please provide detailed specifications for avoiding/minimizing construction and operations impacts to preserved plants within 250 feet of project linear facilities and site boundaries. These specifications might include: designating Environmentally Sensitive Areas (ESAs) during construction; management guidelines to prevent the spread of noxious weeds; protecting preserved plants from herbicide or soil-stabilizer drift, construction and operation dust, sedimentation, fire, and alteration of the site hydrology; and ensuring permanence through fencing where necessary to protect from accidental harm and signage. For any potentially significant impacts to special-status plants that cannot be avoided or minimized by the measures described above, please also describe and quantify the remaining impacts and investigate opportunities for off-site mitigation through any of the following, listed in order of priority:

a. Off-site Compensation through Restoration. Provide an assessment of restoring degraded special-status plant populations on or off-site (for example, by controlling unauthorized vehicle use, noxious management).

b. Off-site Compensation through Acquisition/Protection. Provide an assessment of the feasibility of compensating for unavoidable impacts through acquisition and protection of other populations and watershed lands important to the ecological health of populations of these special-status plants. To provide adequate compensatory mitigation the ratio of acquisition to loss would likely need to exceed 1:1 and would also need to include deed restrictions and a management plan to ensure the long-term viability of the population.

c. Off-site Compensation through Transplanting or Propagating and Planting. These measures are choices of last resort if mitigation methods listed above are infeasible or an insufficient to reduce impacts to less-than-significant levels. Transplanting or replacement planting are untested and generally unsuccessful, and thus cannot be used as a substitute for avoidance and minimization measures to reduce the project impacts to a level less than significant. Considerable advance planning is typically required for transplantation or replacement plants; a minimum 9-12 months lead time is often needed for seed collection/salvage before the start of construction. If there is evidence that transplantation or replacement plantings might be a successful mitigation method, please provide a detailed transplantation or replacement planting plan.

Response:

The outlined mitigation measures below will ensure that occurrences of special-status plant species associated with the Genesis Project site will be avoided where feasible. The measures below also address off-site compensation for unavoidable impacts to the special-status plant species onsite. All mitigation measures will be compiled into a Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP), created to comprehensively describe avoidance, minimization and mitigation measures; document their implementation; and monitor their effectiveness.

The BRMIMP will identify the Designated Biologist, Biological Monitors, Construction Compliance Manager, Responsible Agency Contacts, and Compliance Project Manager (CPM). The BRMIMP shall include CEC's conditions of certification and identify the terms and conditions of any permits associated with the Project, including but not limited to, the USFWS Section 7 Biological Opinion (BO), CDFG Section 2081 or Consistency Determination, federal Section 404 permit, and CDFG Streambed Alteration Agreement.

Species Prioritized for Avoidance

The following special-status species were observed onsite and may be affected by Project construction activities:

- Harwood's Milkvetch (Astragalus insularis var. harwoodii)
- Desert Unicorn Plant (Proboscidea althaeifolia)
- Wiggin's Cholla (Cylindropuntia wigginsii)
- Ribbed Cryptantha (Cryptantha costata)

In addition, any other special-status species observed (see Biological Resources Technical Report, AFC Section 5.3) will be avoided, where possible, using the measures described below. Similarly, species protected by the California Native Desert Plants Act (CDNPA) will be avoided, where possible, using these measures.

Avoidance and Minimization Measures

It is acknowledged that vegetation will be uniformly and permanently removed from the solar field footprint, main access road, staging areas, gas pipeline, and transmission pole foundations. The loss of individuals that cannot be avoided will be mitigated through off-site compensation measures (see DR 118a-c below). However, there will be areas outside of the Project footprint, but still within the areas of possible construction disturbance, where avoidance and minimization of impacts to special-status plant species may be practicable using the following measures, which will be augmented, as necessary, in the BRMIMP:

- The construction contractor(s)/crew(s) will be informed about the biological constraints of the project. All construction personnel who work on the Project will attend a worker education program, developed and presented by a project biologist prior to the commencement of construction activity. This Worker Environmental Awareness Program (WEAP) will be included in the BRMIMP.
- Special-status plant populations and any Environmentally Sensitive Areas (ESAs) will be flagged to indicate avoidance. Exclusion fencing may be necessary. This fencing should be bright enough to be highly visible to construction equipment operators so that the population can be avoided. Construction crews and contractors will be responsible for working around all flagged special-status species and ESAs to the extent feasible.
- Spoils will be stockpiled in designated, disturbed areas lacking native vegetation and lacking populations of exotic species.
- All surface disturbing activities, including blading, will be limited to that area essential for Project construction. Equipment laydown sites and staging areas will be sited in areas that are otherwise disturbed. The anticipated impact zones will be delineated with stakes and flagging prior to construction to minimize impacts to natural resources. Construction-related activities outside of the impact zones will be avoided.
- Existing roads will be utilized wherever possible to avoid unnecessary impacts. New and existing roads that are planned for either construction or widening will not extend beyond the planned impact area. All vehicles passing or turning around will do so within the planned impact area or in previously disturbed areas. Where new access is required outside of existing roads or the construction zone, the route will be clearly marked (*i.e.*, flagged and/or staked) prior to the onset of construction.
- Construction vehicle speed limits will be designated for routes used in conjunction with the Project. The speed limit will not exceed 20 mph, but may be lowered in biologically sensitive areas.
- Construction activity will be monitored by a qualified biologist to ensure compliance with avoidance and minimization measures. The monitor will have the authority to halt construction activities if necessary to ensure that impacts to significant biological resources are avoided.
- A detailed Weed Management Plan will be developed by the Applicant and will include measures to control the spread of noxious weeds during construction, operation, and decommissioning. Herbicides, if used, will be used according to the label instructions. No applications should be made when wind speed exceeds 10 miles per hour. Herbicide application should not be made within 100 feet of special-status plants when wind speeds are greater than 5 miles per hour. To minimize herbicide application drift, the contractor shall use low nozzle pressure, applying a coarse spray.

- To control fugitive dust, areas of construction activities will be watered periodically, as necessary by a designated water truck. Water should not be applied in quantities where pooling occurs and persists.
- Service trucks will be provided with fire extinguishers and spill containment equipment, such as adsorbents. Refueling and maintenance of vehicles and equipment will occur only in designated areas that are either bermed or covered with concrete or asphalt to control potential spills. In the event a spill contaminates soil, the soil will be containerized and disposed of as a hazardous waste.
- During construction, impacts to washes will be avoided or minimized. Natural hydrology on the linear facilities will be maintained through the construction period.

Compensation Measures

a. Off-Site Compensation Through Restoration

Off-site habitat acquisition for all Project compensation requirements will include habitat for special-status plant species that are known to occur at the site, if these plants cannot be avoided. Restoration of areas temporarily disturbed during construction will be addressed in the Genesis Revegetation Plan, currently in preparation and due to the CEC on 20 January. This plan will use the following approach:

In order to accommodate the specific features of the desert that make revegetation difficult – namely lack of predictable rainfall, lack of an “A” soil horizon, and the difficulty of re-establishing a soil community of micro-organisms - components of the Revegetation Plan include the following:

- Quantitative identification of the baseline herbaceous perennial and woody perennial species community. These surveys will provide quantitative information on perennial species that will be affected, including density, size and relative health. The quantitative transects used in these surveys will also provide comparative information against which to compare the success of the future revegetation efforts.
- Soil salvage and replacement on areas to be revegetated.
- Final site preparation and grading to ensure maintenance of site hydrology and include features that will enhance germination and growth of native species.
- Vertical mulching and other techniques to promote a hospitable environment for germination and growth.
- Seeding and/or planting of seedlings of locally-occurring colonizing species.
- Development of a soil micro-community by inoculation of mycorrhizal fungi and planting species that develop a mycorrhizal net.
- Weed control.
- Initial irrigation, if necessary.
- A realistic schedule of regrowth of native species, and remedial measures, if needed.

Species to be used for revegetation will include perennial species that occur in the existing mature native communities on the Project, colonizing species, and species that encourage soil building (e.g., mycorrhizal nets, faunal communities). Annual species in the adjacent native community will naturally revegetate the area due to the typical mechanisms of seed transport (e.g., wind, water, rodents, and attachment to fur and/or feathers). As such, they will not be included in the seed mix.

b. Off-Site Compensation Through Acquisition/Protection
To compensate for any permanent impacts to special-status plant species affected by the Project, the Applicant will provide compensation funds to a designated organization (To Be Determined), mostly likely in the form of an escrow account. These funds will be used for purchase, enhancement, administration, maintenance, long-term management, and implementation of management plan objectives for special-status plant habitat. These compensation funds and habitat will most likely coincide with compensation required for desert tortoise, Mojave fringe-toed lizard habitat (sand dunes) and/or streambed alteration. The compensation ratio and acreage that will require habitat compensation have not yet been determined. Approval from the CPM to purchase mitigation lands will be contingent on said lands being suitable to support the above listed species.

c. Off-Site Compensation Through Transplanting Or Propagating And Planting
The Genesis Revegetation Plan, currently in preparation and due to the CEC on 20 January 2010, will include plant salvage and transplantation of species and seedlings that can be reliably transplanted. Species will include special-status species or species protected by the CDNPA. Propagation is not proposed.

Item 119:

Information Required:

Cacti/Tree Avoidance. Please provide a detailed cacti and tree avoidance plan that clarifies the issues described above, including identifying which species are priorities for avoidance, and any areas that could be sustainably avoided during the life of the project.

Response:

All mitigation measures and approaches detailed in DR 118, above, will ensure that occurrences of the identified cacti and tree species associated with the Genesis Project site will be avoided where feasible.

Species Prioritized for Avoidance

- Silver cholla (*Cylindropuntia echinocarpa*)
- Beavertail cactus (*Opuntia basilaris*)
- Palo verde (*Cercidium floridum*)
- Cat-claw acacia (*Acacia greggii*)
- Ironwood (*Olneya tesota*)

The larger and more robust trees will receive the highest priority for avoidance. This is due to the likelihood that these trees have reached reproductive maturity and may assist in natural revegetation in adjacent areas by seed dispersal; further, transplantation is difficult (see DR 118c, above). Seedlings and younger saplings will receive a lower priority for avoidance and may be used for transplantation where possible.

Avoidance and Minimization Measures

It is acknowledged that vegetation will be uniformly and permanently removed from the solar field footprint, main access road, staging areas, and transmission pole foundations. However, there will be areas outside of the Project footprint, but still within the areas of possible construction disturbance, where avoidance and minimization of impacts to special-status plant species may be practicable using the measures outlined in DR 118.

Cacti and trees in these areas will be flagged during pre-construction surveys to indicate priority for avoidance. Construction crews and contractors will be responsible for working outside of these flagged areas.

As part of the Special-Status Plan Avoidance/Mitigation measures (see DR 118), a pre-construction survey will identify locations of these species along portions of the Project that are not scheduled for complete removal of surface vegetation. Individuals that are likely to be lost will be tallied to facilitate a determination of the best method for compensating for the loss of these plants, if necessary. If compensation is required, options will include off-site compensation through restoration, off-site compensation through acquisition/protection, and off-site compensation through transplanting. Such compensation will be incorporated into compensation for all special-status plant species (see DR 118).

Item 120:

Information Required:

Creosote Rings. Please discuss whether surveys were conducted or remote imagery analysis (of high resolution aerials) or review for possible creosote bush rings in the project survey area, and if so, the results of the surveys including a map depicting the locations of creosote rings. If no such analysis was made, please explain why.

(This information was contained in the background and is necessary for an understanding of the response- Certain common California desert plants are protected under the California Desert Native Plants Act and include certain cacti, succulents, and any creosote bush rings ("creosote rings") greater than 10-feet in diameter. Staff understands that the site has a high level of historic disturbance but finds no discussion of creosote rings in the AFC or appendices, and needs to know if surveys were conducted for these features or at least an analysis made from high resolution aerial photography).

Response:

Species regulated by the California Desert Native Plants Act (CDNPA) were sought during surveys and addressed in the Biological Resources Technical Report (AFC Section 5.3). Creosote rings >10 ft in diameter are not regulated by the CDNPA in Riverside County, although they are an unusual variation of creosote bush (*Larrea tridentata*).

Creosote bush is a very widespread, dominant species of the southwestern warm deserts, currently ranging from the northern Mojave Desert to the Chihuahuan Desert in southern Mexico (Hunter et al. 2001). The species experiences increasing polyploidy from south to north. During the postglacial, northern expansion of creosote bush, hexaploid forms became dominant in hotter, more arid areas that opened up in the north (Hunter et al. 2001). Today, distinctions in polyploidy are sharp, with diploid populations in the Chihuahuan Desert and tetraploid plants in the Sonoran Desert, both areas dominated by summer rainfall, and hexaploid in the Mojave Desert and summer-dry areas of Baja California (Barbour 1969, Yang 1970). The Genesis Project lies in an area identified as having diploid populations.

Creosote bush is commonly a clonal species, reproducing asexually (as well as via seed) and forming rings through the production of new stems at the periphery of root crowns, with the death of older stems in the crown center (Vasek and Barbour 1977). Ten-foot diameter clones are common, at least in the Mojave Desert (A. Karl, pers. obs.). For instance, 349 clones >10 feet in diameter were mapped on approximately 400 acres for the Victorville 2 Project, in Victorville, California (AMEC 2008). Unusually large clones, 45-70 feet or more in diameter, are rare and known from Lucerne and Johnson Valleys in the southwestern Mojave Desert (Barbour 1969, Vasek 1980), but similarly large clones are not discussed in other manuscripts on creosote bush or identified in the NECO Plan as unusual assemblages in the NECO planning area (BLM and CDFG 2002). Larger clones are present on older, stable surfaces (Vasek and Barbour 1977) and an age of 9,400 years old has been suggested for the unusually large Lucerne Valley clones (Vasek 1980). Soils on the Genesis Project are only a few hundred years old (AFC Section 5.5, Geologic Resources), excluding the possibility of giant clones and the likelihood of any clones.

In addition, Michael Barbour, an expert on the species, believes that hexaploidy is likely to be responsible for the unusually large clones from the Mojave Desert (pers. comm. to A. Karl). However, edaphic or other abiotic and/or biotic conditions cannot be ruled out, since such large clones are rare throughout the range where hexaploidy occurs. If Barbour is correct, then, the Genesis Project is outside the area where unusually large clones would be expected.

Surveys for special-status species are conducted for species that can be reasonably expected to occur, based largely on habitat and species range. Because unusually large creosote rings have not been reported from the Project region in available literature, they were not expected nor specifically sought; ten-foot clones were not considered unusual. (Note: The ten-foot requirement is from the San Bernardino County Development Code [2008]. We believe that it is an erroneous threshold, given the clonal nature of the species.) However, several of the crew is familiar with the unusually large creosote rings in the Lucerne Valley population, and would naturally record them if the rings were present. None was observed. Although unexpected, high resolution aerial photographs are being examined for creosote rings in the Project survey area. Results will be provided by 14 December 2010.

Item 121:

Information Required:

Weed Management Plan. Please prepare and provide a Weed Management Plan that includes at least the following elements:

a. Plan Goals and Objectives. Define the goals of the Weed Management Plan. At a minimum, the Weed Management Plan should include a goal that the plan will protect the biological resources surrounding the project from the harmful effects of weeds and potential unintended harm from weed management techniques, and will be consistent with all applicable LORS. Identify specific weed management objectives (eradication, suppression, or containment) for each non-native plant species that could potentially threaten the areas affected by the project.

b. Noxious Weed Inventory/Baseline Conditions. Please describe the baseline conditions (weeds found, vectors, population densities, etc.) and provide a map showing concentrations of the noxious weeds and other invasive non-native plants described in the AFC, as well as all project features, areas where soil disturbance will occur, and roads used by the project during construction, operation, and closure. For weeds too widespread to map, depict their approximate distribution and include specifications for a detailed baseline mapping at a future date as part of the Plan implementation.

c. Define and Map the Weed Management Area. Identify the areas that will be included as part of the Weed Management Area, which should include at least project facilities, linear facilities and a buffer area 100 feet out from the boundary of these features; and access roads and a buffer 25 feet out from both sides of the roads. A GIS-based map of the project area should be included to clearly define these buffer zones and facilities as part of the Weed Management Area.

d. Weed Risk Assessment. Consistent with BLM guidelines for weed management, conduct a weed risk assessment for each component of the Project construction, operation, and closure that involves soil disturbing activities or altering vegetation; the stepwise risk assessment is available online at: http://www.blm.gov/ca/st/en/prog/weeds/9015.html.

e. Monitoring and Survey Methods. Describe survey and monitoring methods that will be used during construction and operation to ensure timely detection and prompt eradication of weed infestations. Describe how locations of noxious weed occurrences and other data (detection date, growth stage, infestation extent, treatments implemented, results of treatment, and current status) will be mapped and maintained during the construction and operation phases.

f. Weed Management. Describe measures that will be employed during construction, operations, and site closure to prevent the establishment of new weed species, eliminate small, rapidly-growing infestations, prevent large infestations from expanding, and reduce or eliminate large infestations. Include implementation schedules, monitoring reporting requirements, budgets, and responsible parties. Include the following elements: Prevention & Exclusion; Early Detection & Rapid Response; Eradication & Management; Restoration (of treated sites); Employee Education & Training; Funding & Resources; Enforcement & Compliance. Please refer to BLM's Weed Prevention and Management Guidelines online: http://www.blm.gov/ca/st/en/prog/weeds/weedprevent.html

g. Reporting Requirements. Describe the proposed content of construction-phase monitoring reports and longer term weed control progress reports.

Reporting during construction should include weekly summary reports describing observations and activities relevant to noxious weeds management, and a compilation and analysis of this information into quarterly reports. Upon completion of construction a report should be prepared describing the overall results of noxious weed management and current weed status at the project site. Thereafter annual monitoring reports should be produced for the duration of the monitoring period. The annual reports should include information on noxious weed surveys and management activities for the year, a discussion of whether the weed management goals for the year were met, and recommendations for weed management activities in the upcoming year.

h. Attachments/Other Information. If the following elements were not included in the body of the report they could be included as attachments to the Weed Management Plan: detailed maps (see map guidelines, above); herbicide use protocols and sample record forms; sample monitoring data forms; Cal-IPC and CDFG rankings and ratings and details on management strategy and control methods for each observed and potentially occurring noxious weed on the project site; species -specific goals and objectives (measurable, with time frame); and methods for evaluation of success in achieving weed control goals.

Response:

Per the Data Request Workshop held on November 23, 2009, the Weed Management Plan is not immediately needed by staff to assess impacts to the project, and the due date for this monitoring plan was moved to January 20, 2010. At this time we have provided an outline detailing the minimum components that will be incorporated into the Weed Management Plan for Staff's review.

Weed Management Plan Outline

- **Introduction**
  - Plan Purpose
  - Objectives
- **Applicable Laws, Ordinances, Regulations, and Standards**
  - Federal Laws and Regulations
  - State and Local Laws and Regulations
  - Conservation and Management Plans
- **Noxious Weed Assessment**
  - Noxious Weed Species
  - Noxious Weed Risk Assessment
  - Field Surveys.
  - Known and Potential Weed Occurrences
- **Weed Management Areas**
- **Monitoring and Survey Methods**
  - Weed Identification
  - Surveys and Monitoring
    - Monitoring Methods
    - Database and Mapping

- **Noxious Weed Management**
    - Species Descriptions and Management Strategy
    - Preventative Measures
        - Construction
        - Operations
        - Decommissioning
    - Eradication and Control Methods
        - Unacceptable Weed Removal Methods
        - Physical Removal of Weeds
        - Chemical Methods for Weed Removal
- **Reporting Requirements**
    - Report Content
        - Construction Reports
        - Long-term Monitoring Reports
    - Reporting Periods
        - Construction Period
        - Long-term Monitoring Reports
- **References**
- **Tables, Figures, Appendices (as appropriate)**

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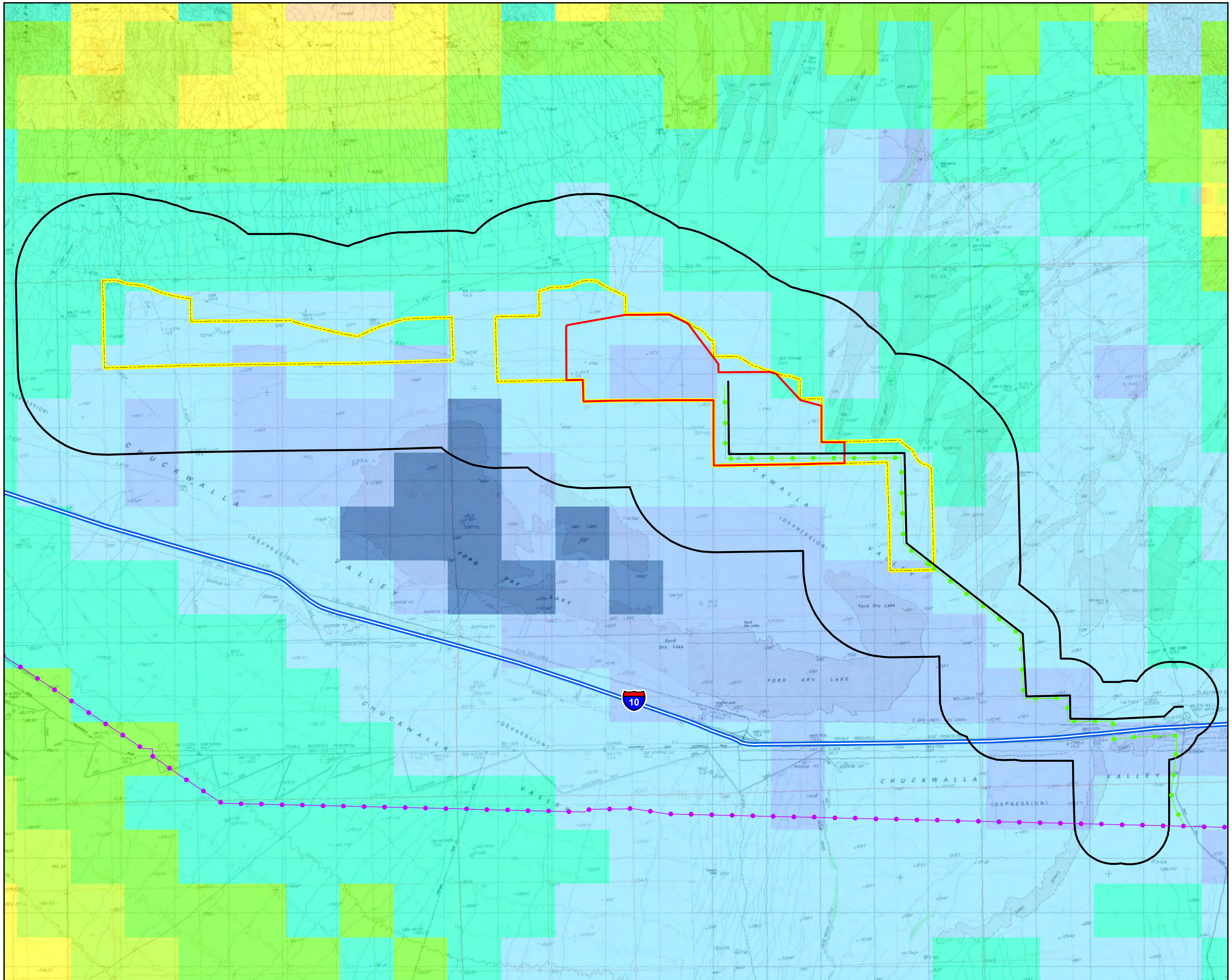
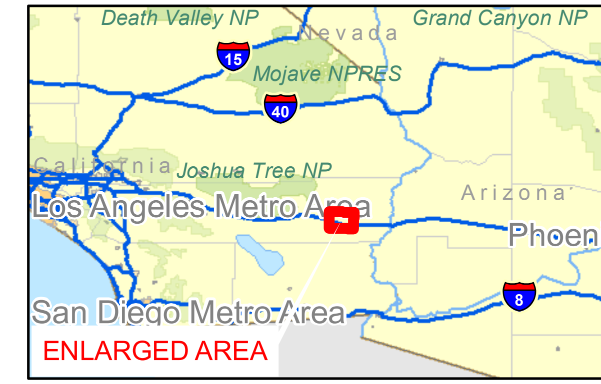


Genesis Solar, LLC

GENESIS SOLAR PROJECT
RIVERSIDE COUNTY, CALIFORNIA



- Proposed Access Road
- Proposed Linear Route (9.63 mi)
- Blythe Energy Project Transmission Line
- Extent of Surveyed Area
- Project Site
- Proposed Facility Footprint

USGS Desert Tortoise Habitat Model Score

- 0
- 0.1
- 0.2
- 0.3
- 0.4
- 0.5
- 0.6
- 0.7
- 0.8
- 0.9
- 1

N

0 0.5 1 1.5 2
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: ESRI, BLM, USGS

Figure BIO-DR53
USGS 2009 Mojave Desert Tortoise Habitat Modeling

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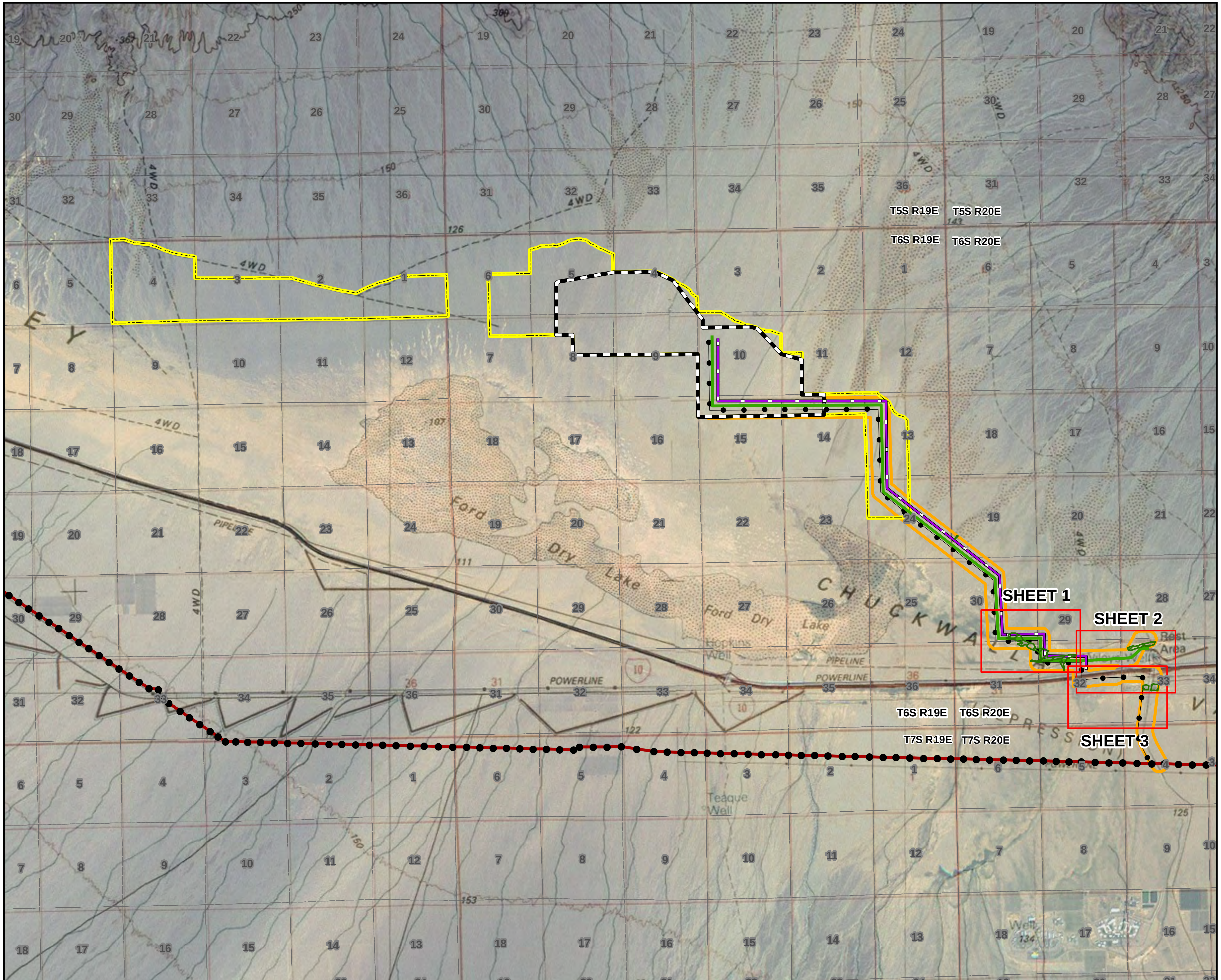
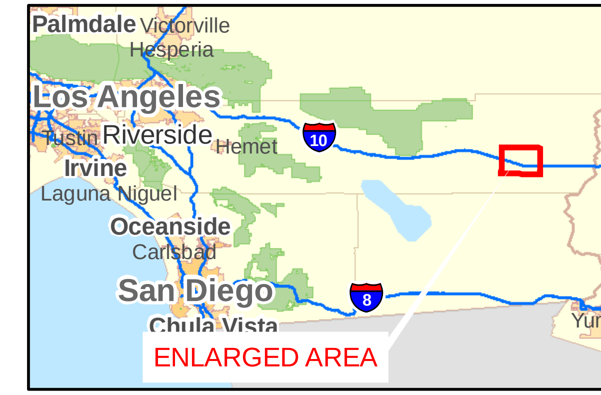


GENESIS SOLAR, LLC

**GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA**



Legend

- Proposed Gas Line
- Proposed Access
- Proposed Transmission Interconnect
- Blythe Transmission Line
- Blythe Transmission Line Structure
- 1:4800 Detail Map Sheet
- 500ft buffer on Linear Route
- Project Site
- Facility Footprint
- Section Line
- Wash-Associated Microphyllous Vegetation

N

0 0.25 0.5 0.75 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: ESRI, BLM, eGIS, TTEC

**BIO-DR 70 INDEX MAP
WASH-ASSOCIATED
MICROPHYLLOUS VEGETATION**

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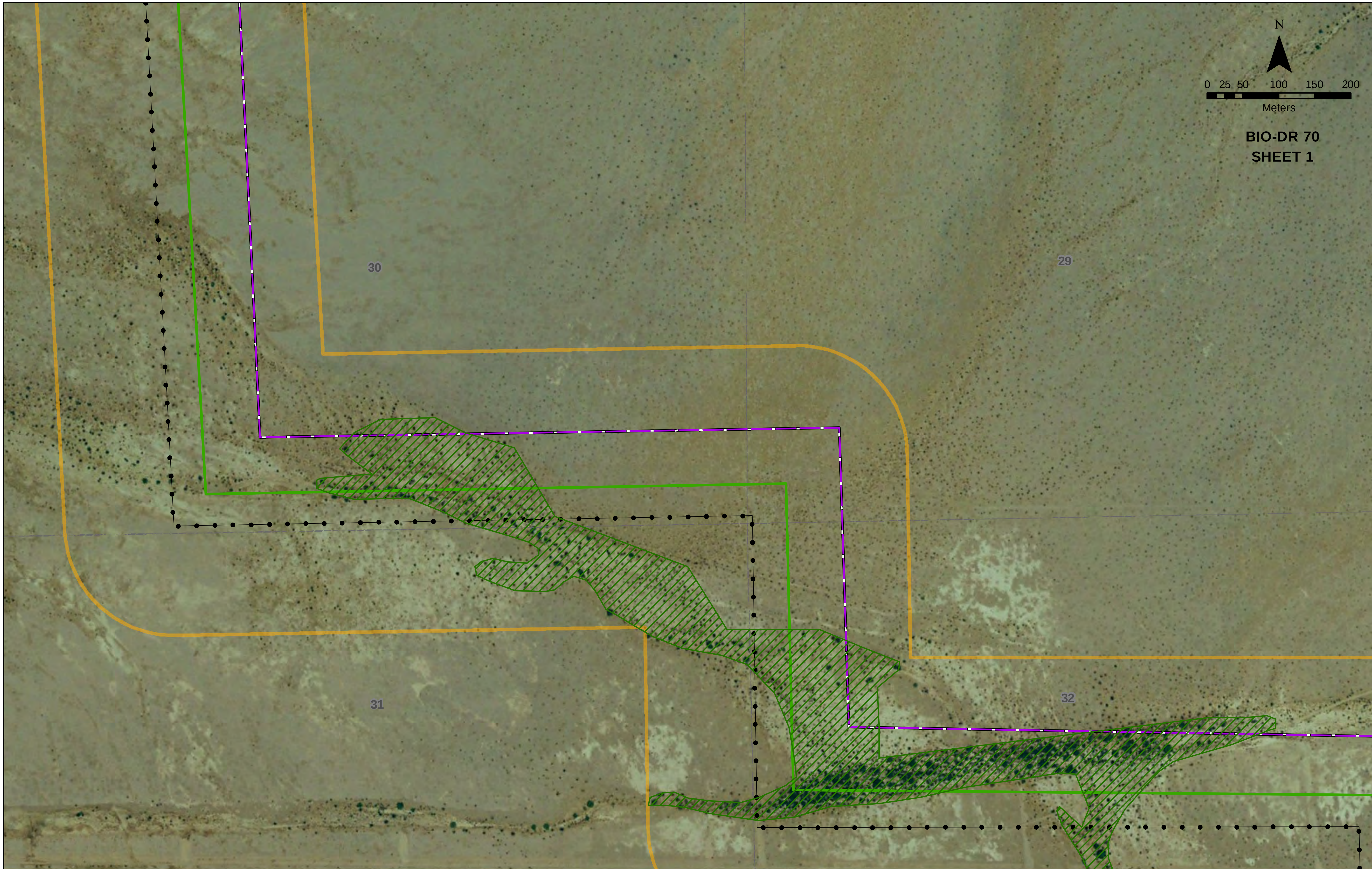

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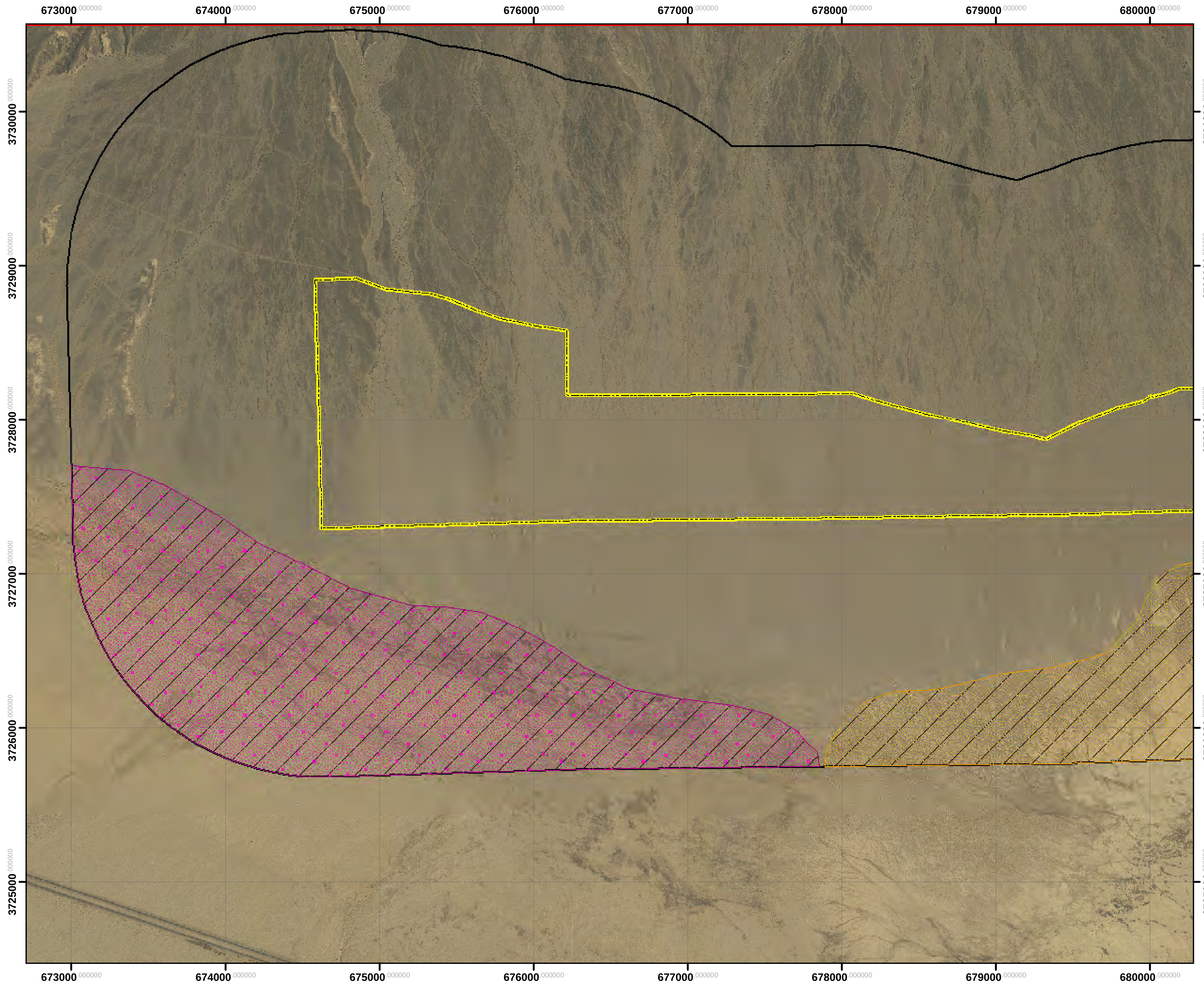
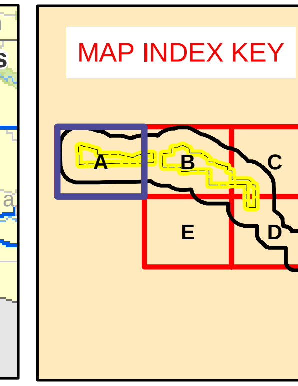
BIO-DR 70
SHEET 3



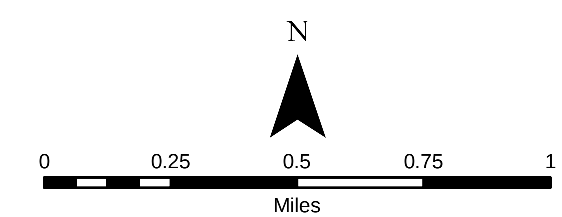
Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA



Legend

- Observed Ribbed Cryptantha *(Cryptantha costata)*
- *Blythe Energy Project Transmission Line*
- *Proposed Transmission Interconnect*
- *Proposed Gas Line*
- *Proposed Access Road*
- *Suitable Habitat*
- Chenopod Scrub
- Sonoran Creosote Bush Scrub
- Dry Desert Wash Woodland
- Playa and Sand Drifts over Playa
- Stabilized and Partly-Stabilized Sand Dune
- *Extent of Surveyed Area*
- *Project Site*
- *Solar Facility*



Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

BIO-DR 99 A
Observed Ribbed Cryptantha and Approximate Boundaries of Suitable Habitat

TETRA TECH EC, INC

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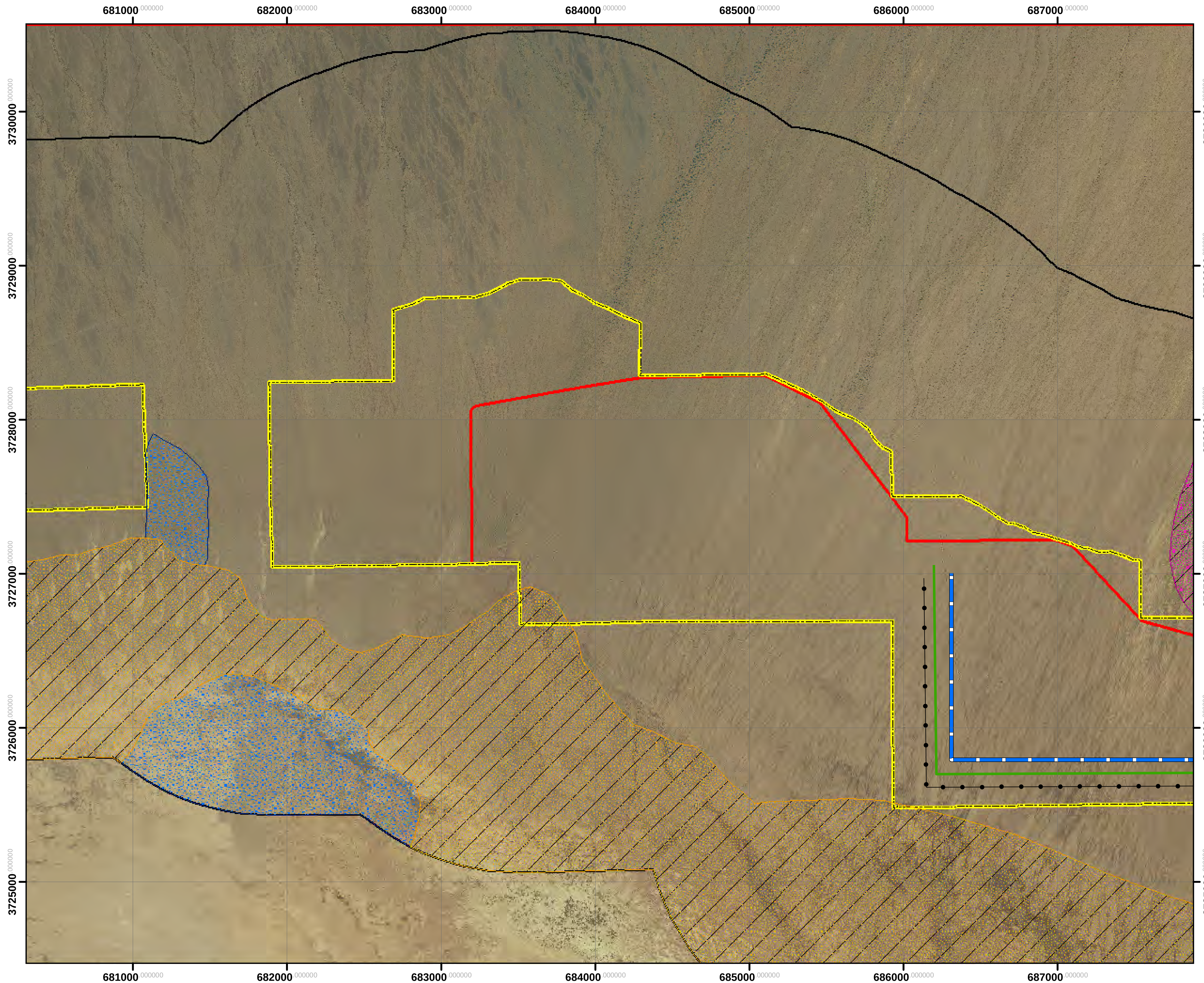
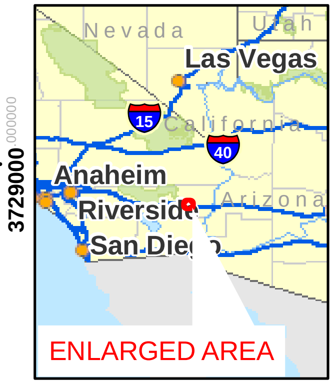
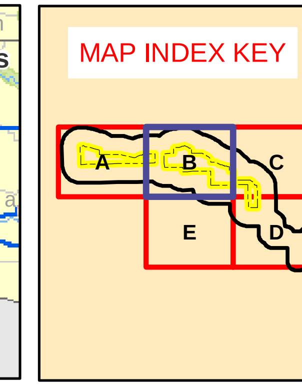


Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY, CALIFORNIA





Legend

- Observed Ribbed Cryptantha *(Cryptantha costata)*
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- *Proposed Transmission Interconnect*
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- *Project Site*
- *Solar Facility*

N

0 0.25 0.5 0.75 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

BIO-DR 99 B
Observed Ribbed Cryptantha and Approximate Boundaries of Suitable Habitat

TETRA TECH EC, INC

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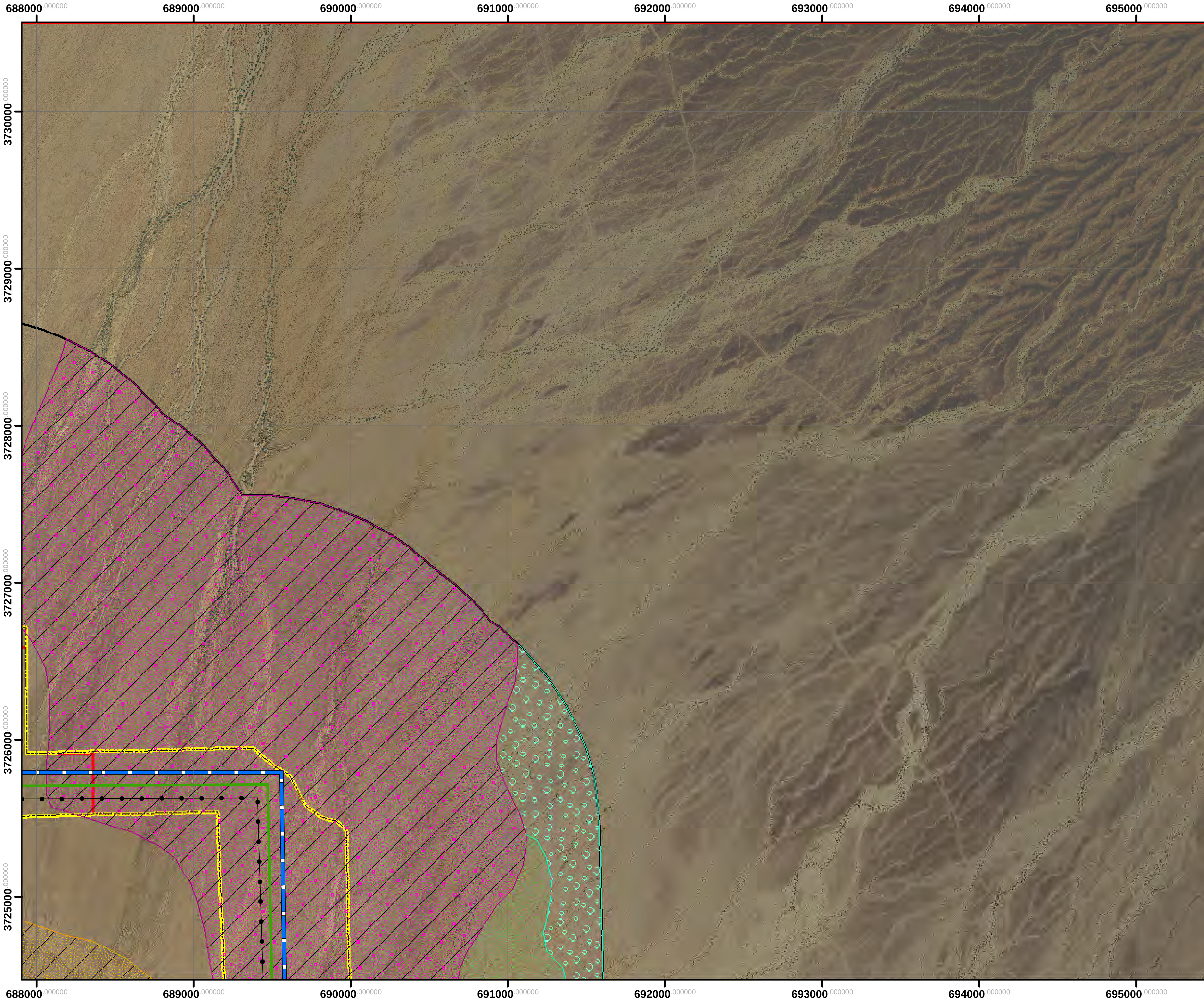
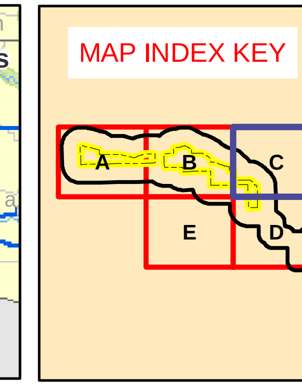


Genesis Solar, LLC

**GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA**



Legend

- Observed Ribbed Cryptantha *(Cryptantha costata)*
- *Blythe Energy Project Transmission Line*
- *Proposed Transmission Interconnect*
- *Proposed Gas Line*
- *Proposed Access Road*
- *Suitable Habitat*
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- *Extent of Surveyed Area*
- *Project Site*
- *Solar Facility*

N

0 0.25 0.5 0.75 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

**BIO-DR 99 C
Observed Ribbed Cryptantha and
Approximate Boundaries of
Suitable Habitat**

TETRA TECH EC, INC

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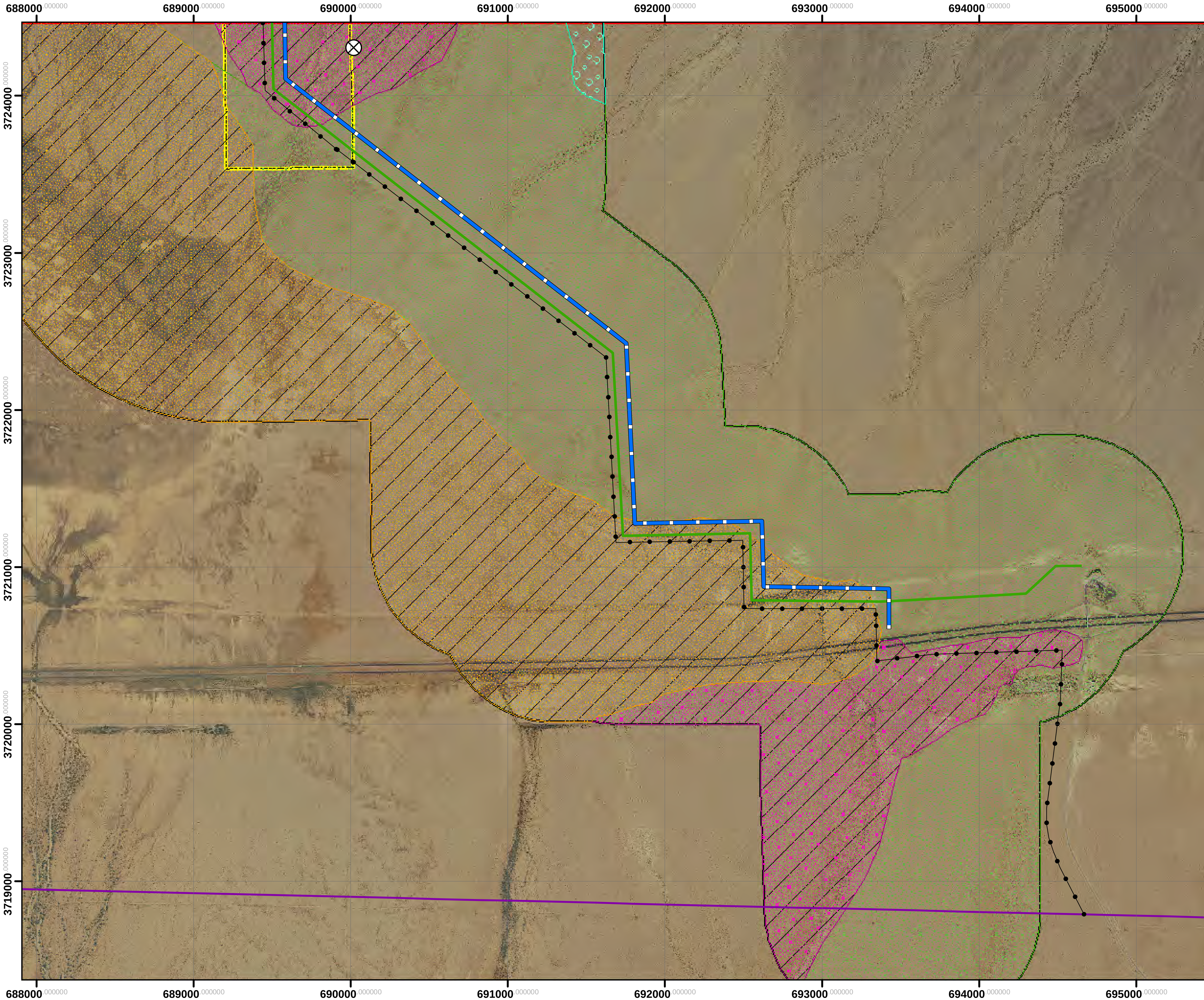
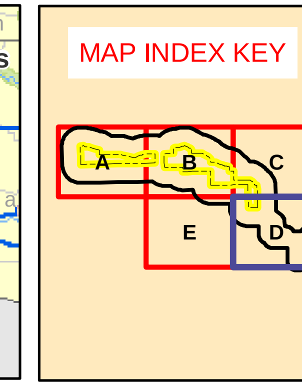


Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY, CALIFORNIA



Legend

- Observed Ribbed Cryptantha (*Cryptantha costata*)
- *Blythe Energy Project Transmission Line*
- *Proposed Transmission Interconnect*
- *Proposed Gas Line*
- *Proposed Access Road*
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- Stabilized and Partly-Stabilized Sand Dune
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- *Project Site*
- *Solar Facility*

N

0 0.25 0.5 0.75 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

BIO-DR 99 D
Observed Ribbed Cryptantha and Approximate Boundaries of Suitable Habitat

TETRA TECH EC, INC

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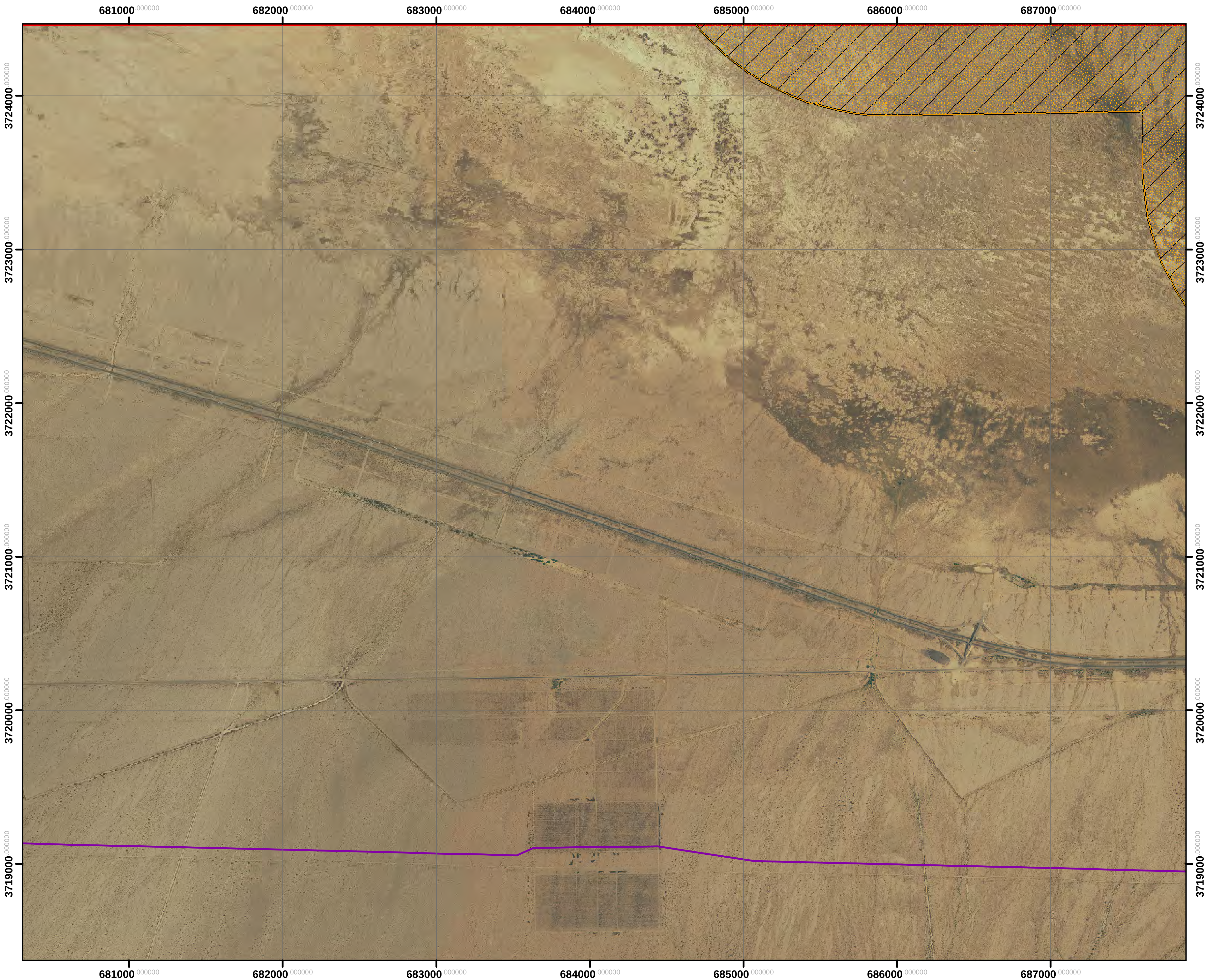
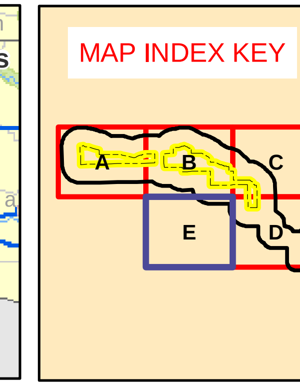


Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY, CALIFORNIA



Legend

- Observed Ribbed Cryptantha (*Cryptantha costata*)
- *Blythe Energy Project Transmission Line*
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- *Proposed Gas Line*
- *Proposed Access Road*
- *Suitable Habitat*
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- *Extent of Surveyed Area*
- *Project Site*
- *Solar Facility*

N

0 0.25 0.5 0.75 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

BIO-DR 99 E
Observed Ribbed Cryptantha and Approximate Boundaries of Suitable Habitat

TETRA TECH EC, INC

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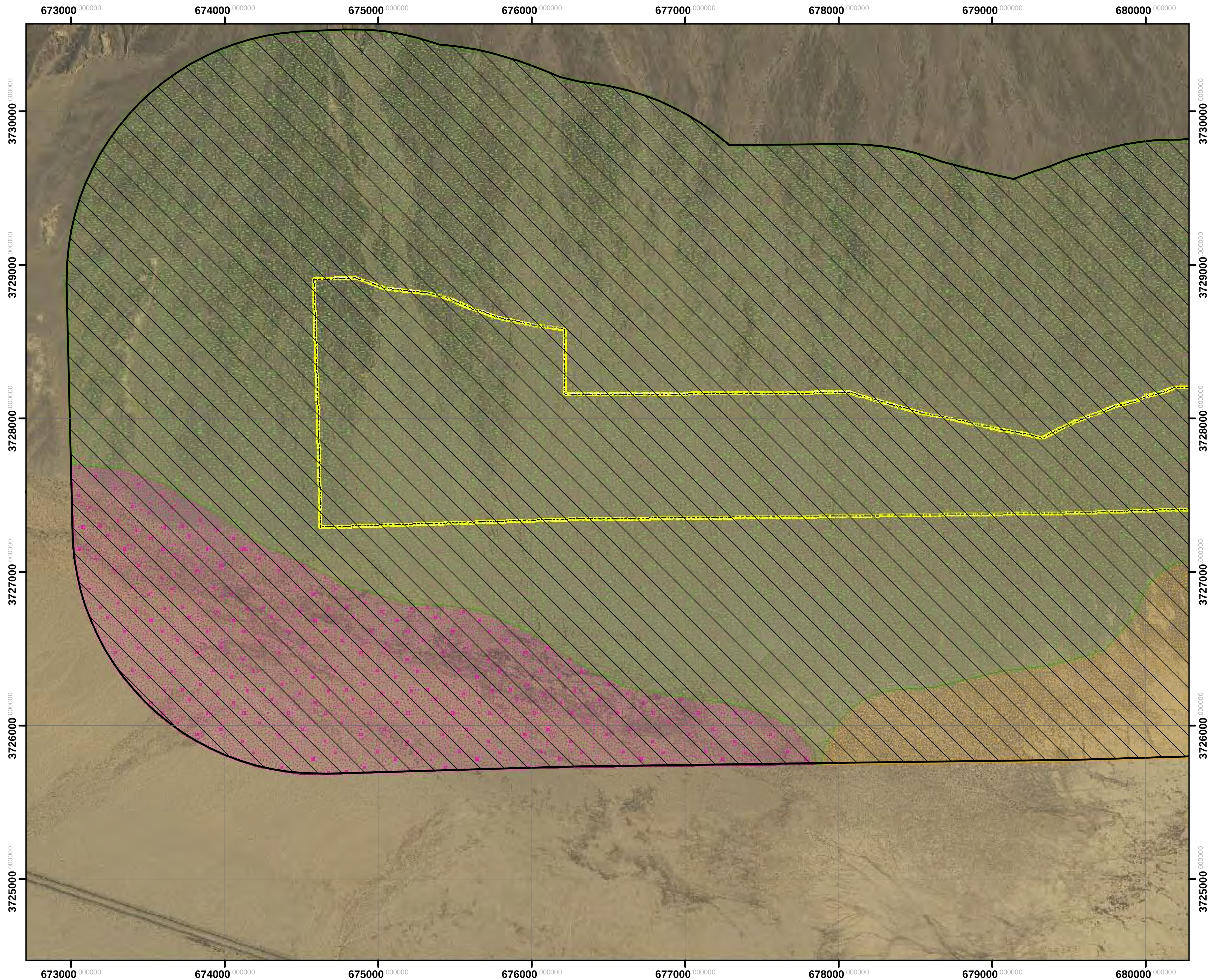
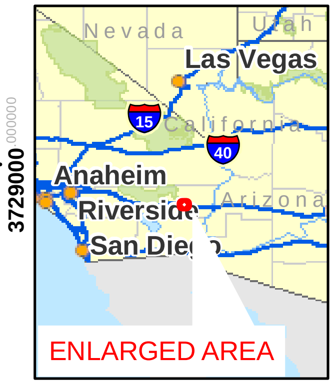
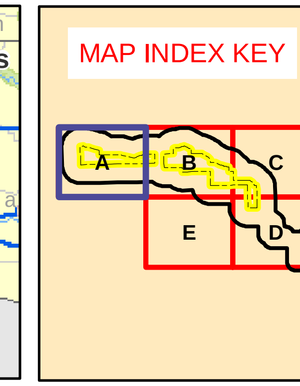


Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY, CALIFORNIA



ENLARGED AREA



MAP INDEX KEY

Legend

- Suitable Habitat
- Chenopod Scrub
- Sonoran Creosote Bush Scrub
- Dry Desert Wash Woodland
- Playa and Sand Drifts over Playa
- Stabilized and Partly-Stabilized Sand Dune
- Blythe Energy Project Transmission Line
- Proposed Transmission Interconnect
- Proposed Gas Line
- Proposed Access Road
- Extent of Surveyed Area
- Project Site
- Solar Facility

N

0 0.25 0.5 0.75 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

BIO-DR 102 A
Approximate Boundaries of Suitable Habitat for *Cryptantha holoptera*

TETRA TECH EC, INC

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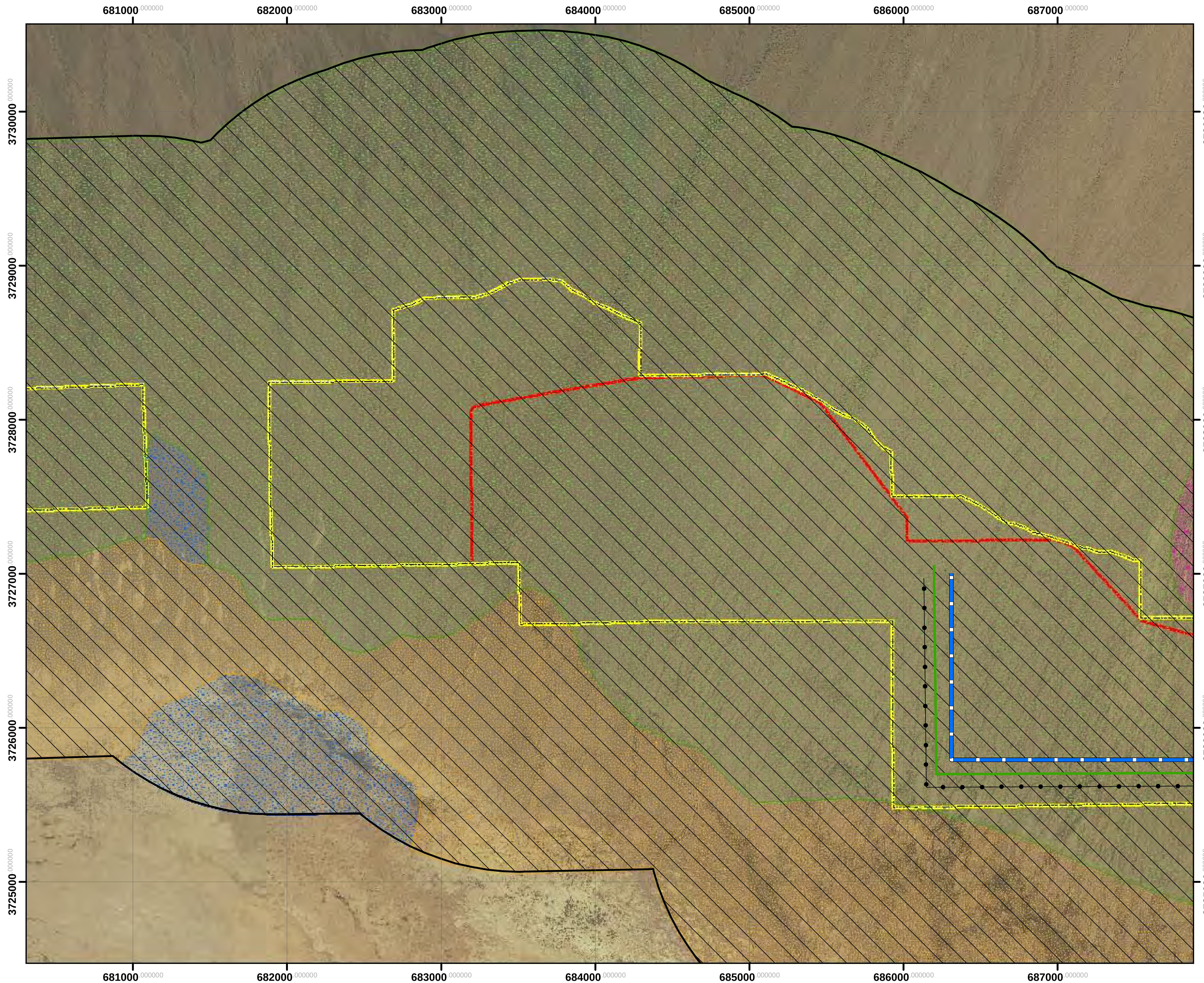
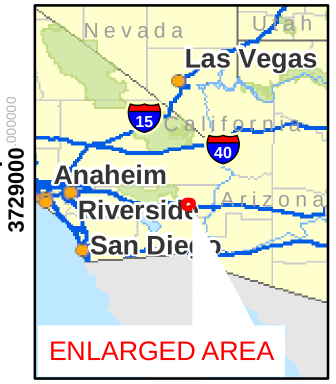
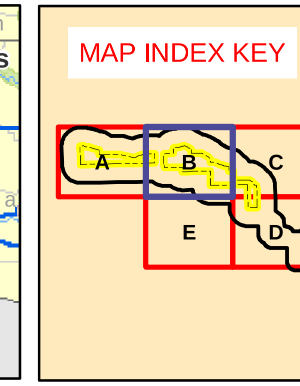


Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY, CALIFORNIA





Legend

- Suitable Habitat
- Chenopod Scrub
- Sonoran Creosote Bush Scrub
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- Proposed Transmission Interconnect
- Proposed Gas Line
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- Project Site
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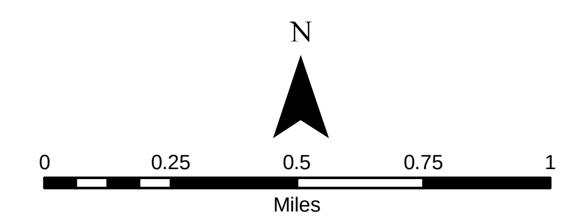

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

BIO-DR 102 B
Approximate Boundaries of Suitable Habitat for *Cryptantha holoptera*

TETRA TECH EC, INC

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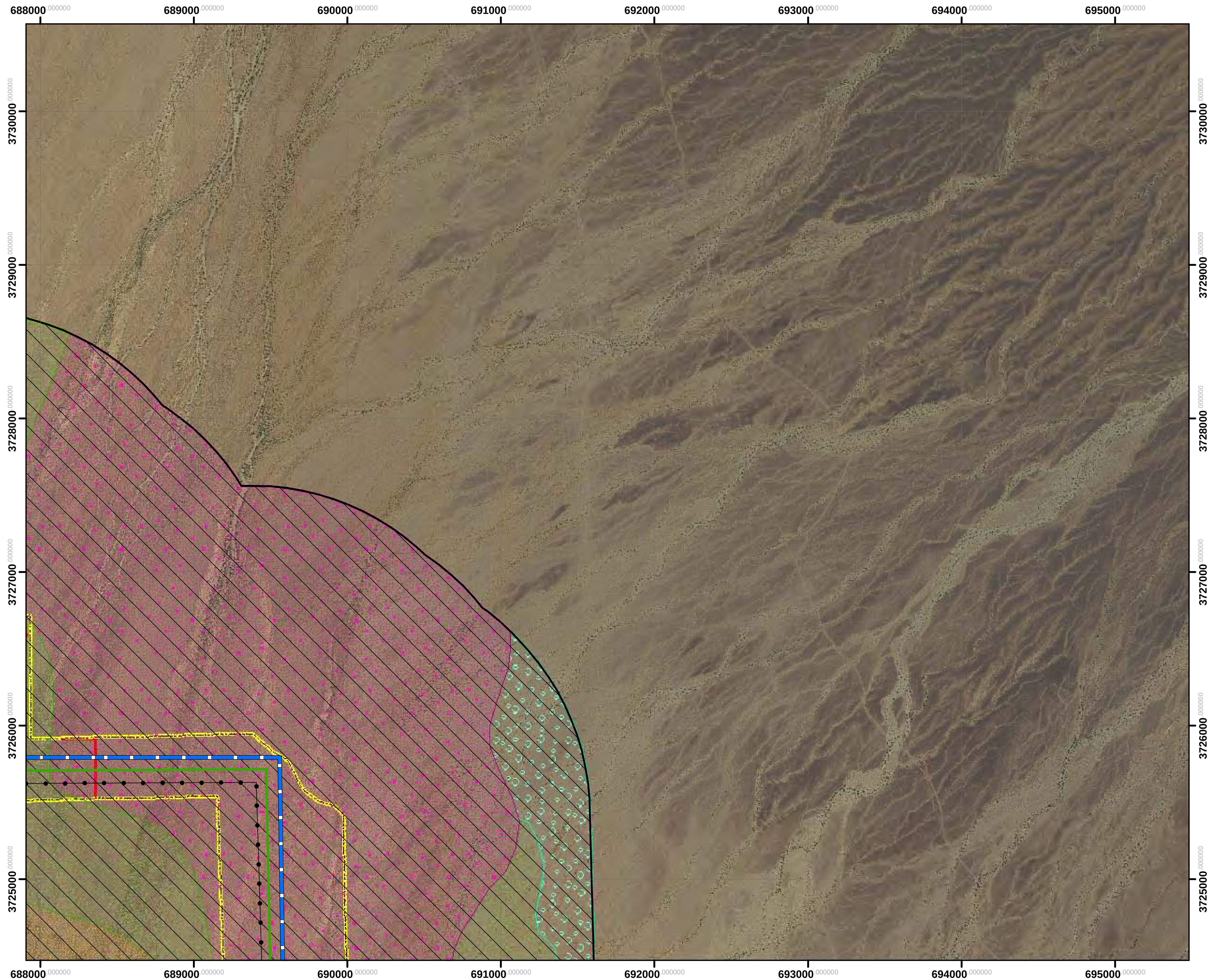
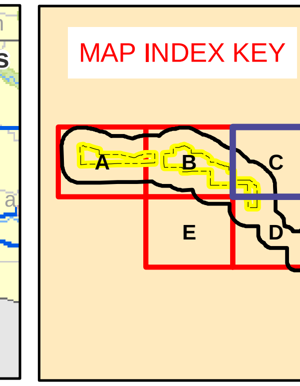


Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT RIVERSIDE COUNTY, CALIFORNIA



Legend

- Suitable Habitat
- Chenopod Scrub
- Sonoran Creosote Bush Scrub
- Dry Desert Wash Woodland
- Playa and Sand Drifts over Playa
- Stabilized and Partly-Stabilized Sand Dune
- Blythe Energy Project Transmission Line
- Proposed Transmission Interconnect
- Proposed Gas Line
- Proposed Access Road
- Extent of Surveyed Area
- Project Site
- Solar Facility

N

0 0.25 0.5 0.75 1

Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

BIO-DR 102 C
Approximate Boundaries of Suitable Habitat for *Cryptantha holoptera*

TETRA TECH EC, INC

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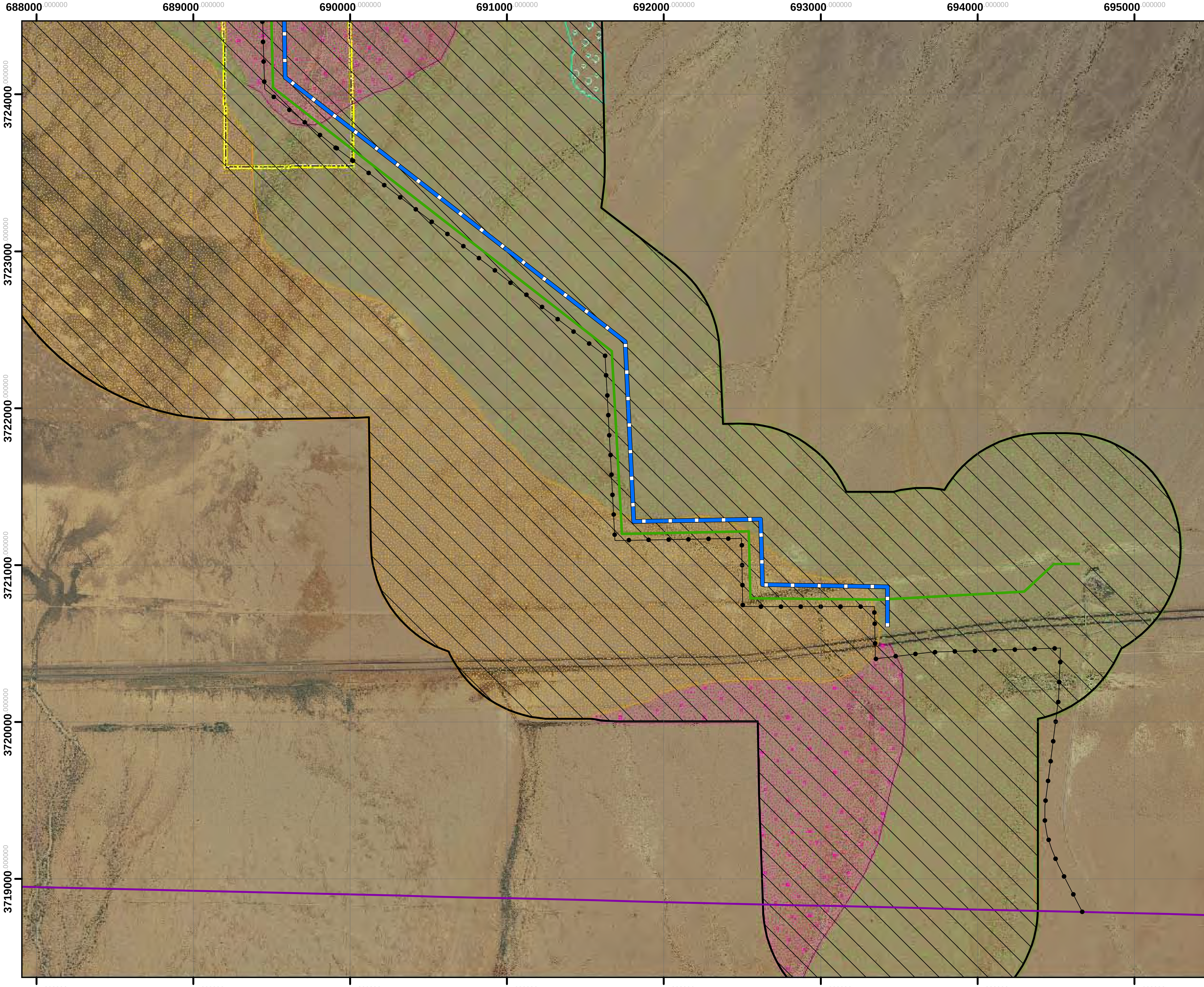
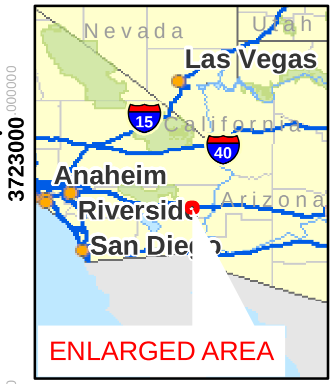
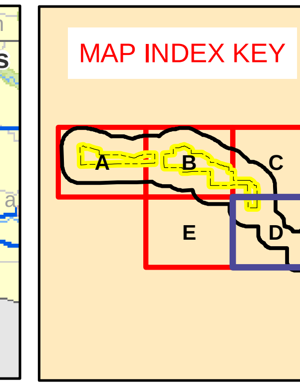
Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY, CALIFORNIA







Legend

- Suitable Habitat
- Chenopod Scrub
- Sonoran Creosote Bush Scrub
- Dry Desert Wash Woodland
- Playa and Sand Drifts over Playa
- Stabilized and Partly-Stabilized Sand Dune
- Blythe Energy Project Transmission Line
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N

0 0.25 0.5 0.75 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

BIO-DR 102 D
Approximate Boundaries of Suitable Habitat for *Cryptantha holoptera*

TETRA TECH EC, INC

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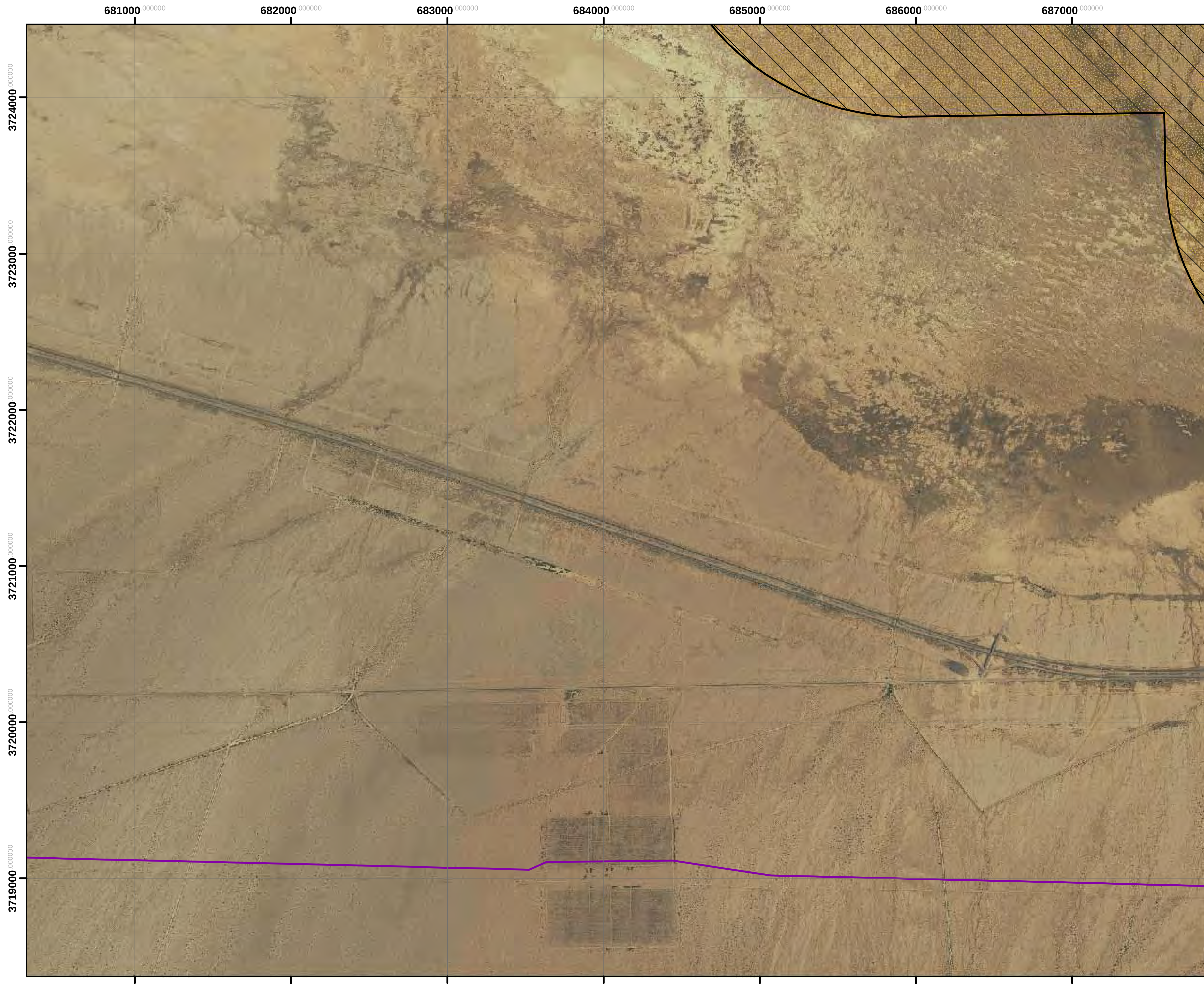
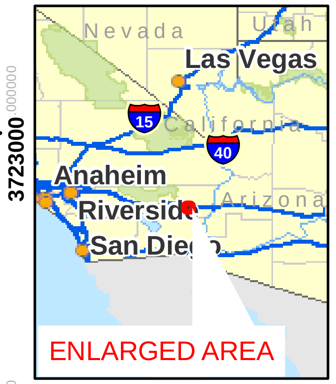
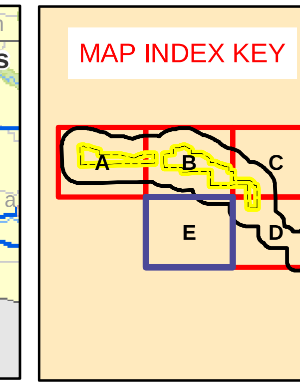


Genesis Solar, LLC

**GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA**





Legend

- Suitable Habitat
- Chenopod Scrub
- Sonoran Creosote Bush Scrub
- Dry Desert Wash Woodland
- Playa and Sand Drifts over Playa
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- Proposed Access Road
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- Solar Facility

N

0 0.25 0.5 0.75 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

**BIO-DR 102 E
Approximate Boundaries of
Suitable Habitat for *Cryptantha holoptera***

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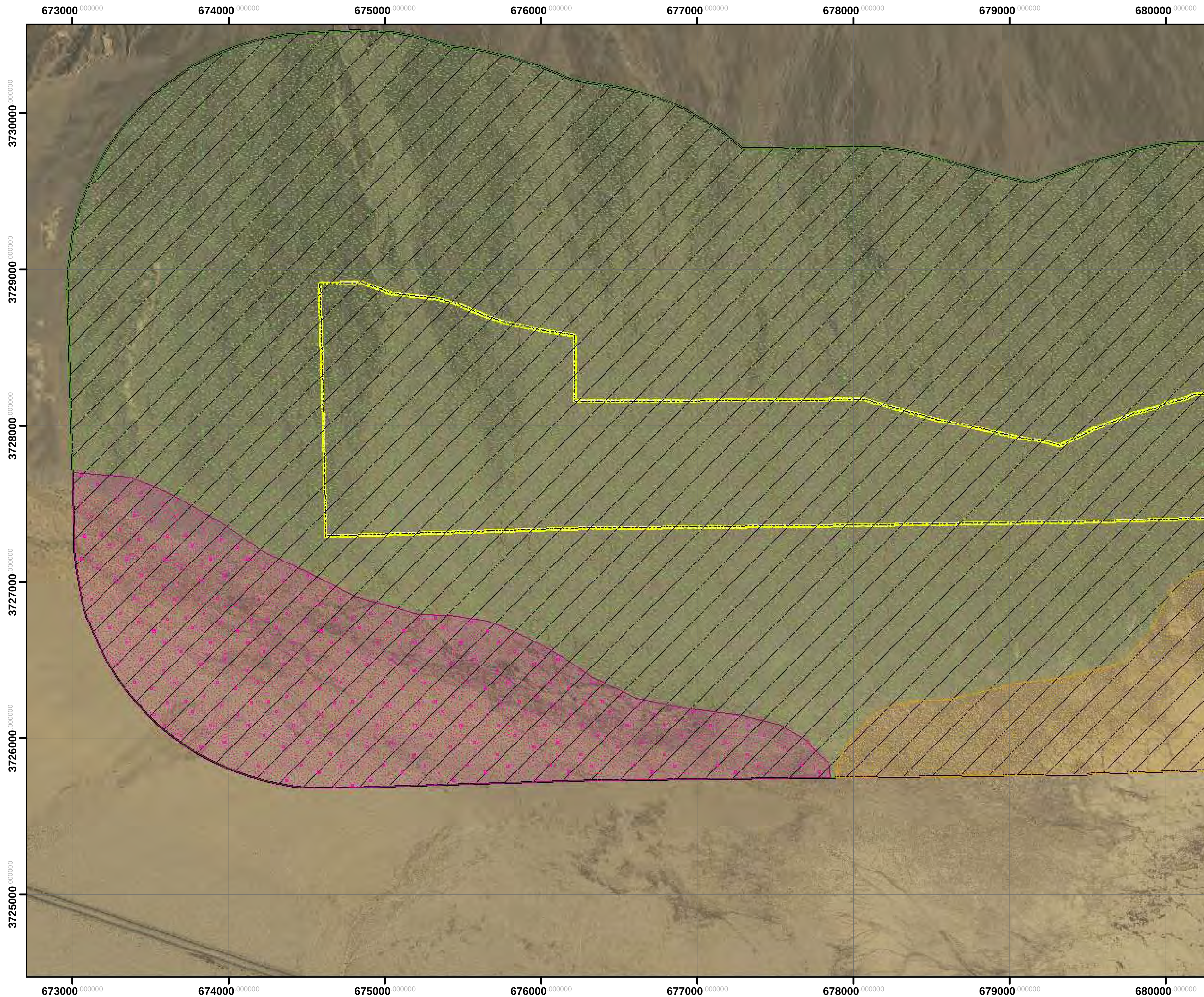
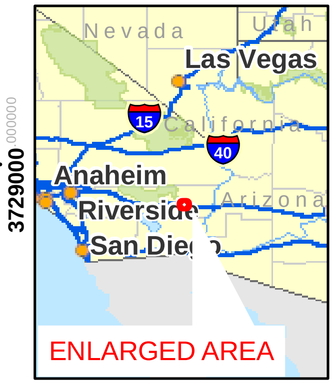
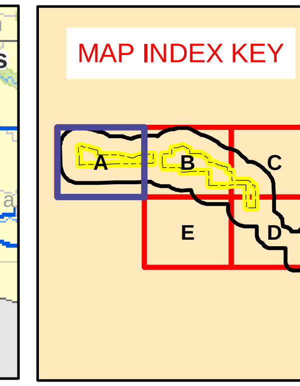
Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA







Legend

- *Blythe Energy Project Transmission Line*
- *Proposed Transmission Interconnect*
- *Proposed Gas Line*
- *Proposed Access Road*
- Most Likely Abram's Spurge (*Chamaesyce abramsiana*) Suitable Habitat (on-site)
- CNDDB Record - Abram's Spurge *(Chamaesyce abramsiana)*
- Suitable Habitat
- Chenopod Scrub
- Sonoran Creosote Bush Scrub
- Dry Desert Wash Woodland
- Playa and Sand Drifts over Playa
- Stabilized and Partly-Stabilized Sand Dune
- *Extent of Surveyed Area*
- *Project Site*
- *Solar Facility*

N

0 0.25 0.5 0.75 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

BIO-DR 105A
Approximate Boundaries of Suitable Habitat for Abram's Spurge

TETRA TECH EC, INC

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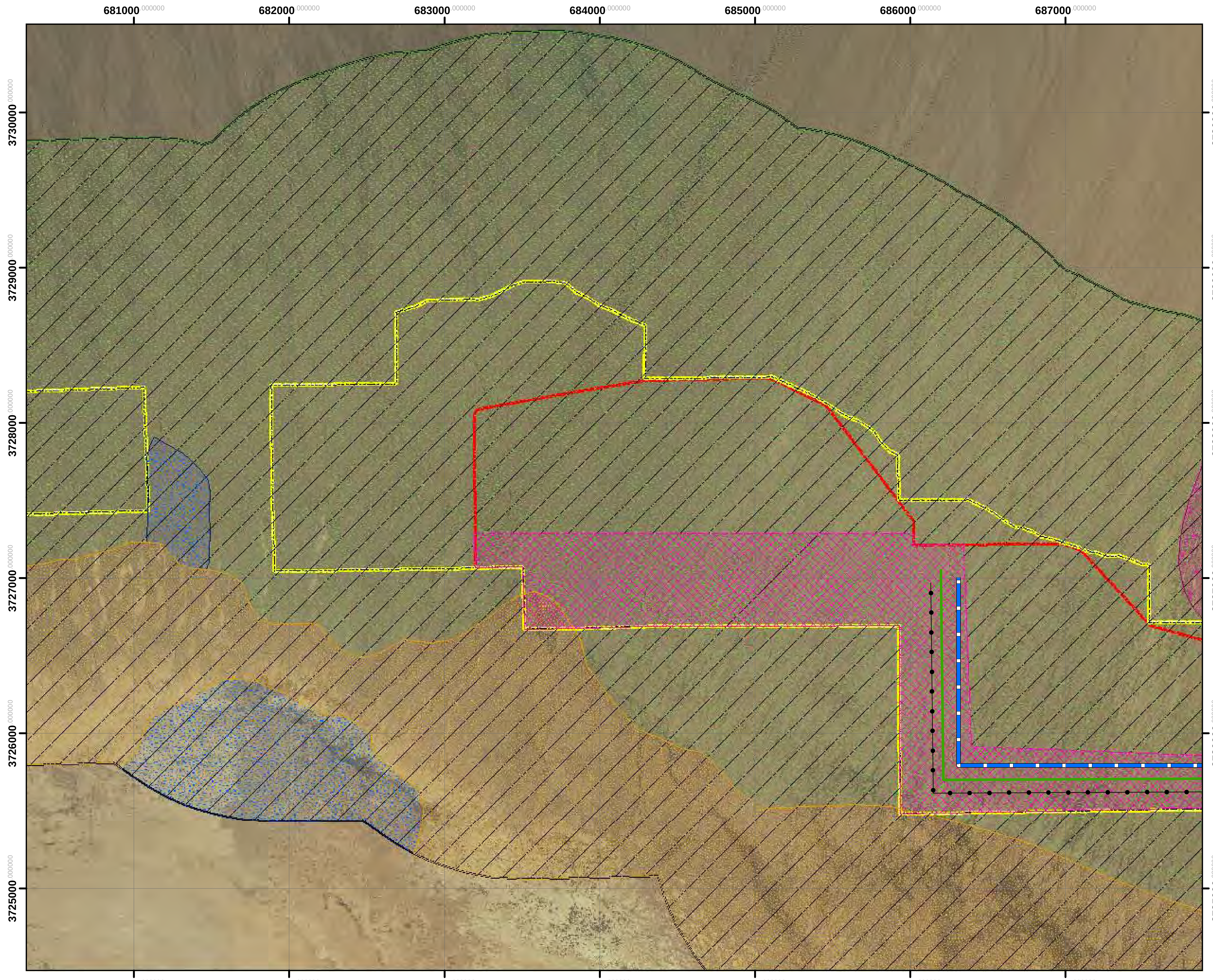
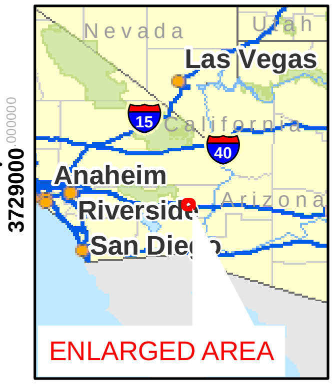
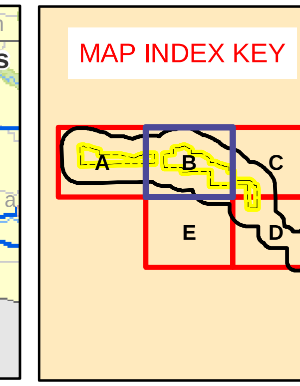


Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY, CALIFORNIA





Legend

- *Blythe Energy Project Transmission Line*
- *Proposed Transmission Interconnect*
- *Proposed Gas Line*
- *Proposed Access Road*
- Most Likely Abram's Spurge (*Chamaesyce abramsiana*) Suitable Habitat (on-site)
- CNDDB Record - Abram's Spurge (*Chamaesyce abramsiana*)
- Suitable Habitat
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- Stabilized and Partly-Stabilized Sand Dune
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N

0 0.25 0.5 0.75 1
Miles

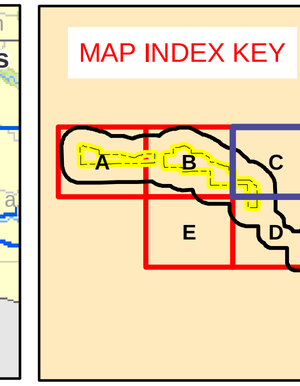
Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

BIO-DR 105B
Approximate Boundaries of Suitable Habitat for Abram's Spurge

TETRA TECH EC, INC

Genesis Solar, LLC

**GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA**



Legend

- *Blythe Energy Project Transmission Line*
- *Proposed Transmission Interconnect*
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- *Proposed Access Road*
- Most Likely Abram's Spurge (*Chamaesyce abramsiana*) Suitable Habitat (on-site)
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- *Solar Facility*

N

0 0.25 0.5 0.75 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

**BIO-DR 105C
Approximate Boundaries of
Suitable Habitat for
Abram's Spurge**

TETRA TECH EC, INC

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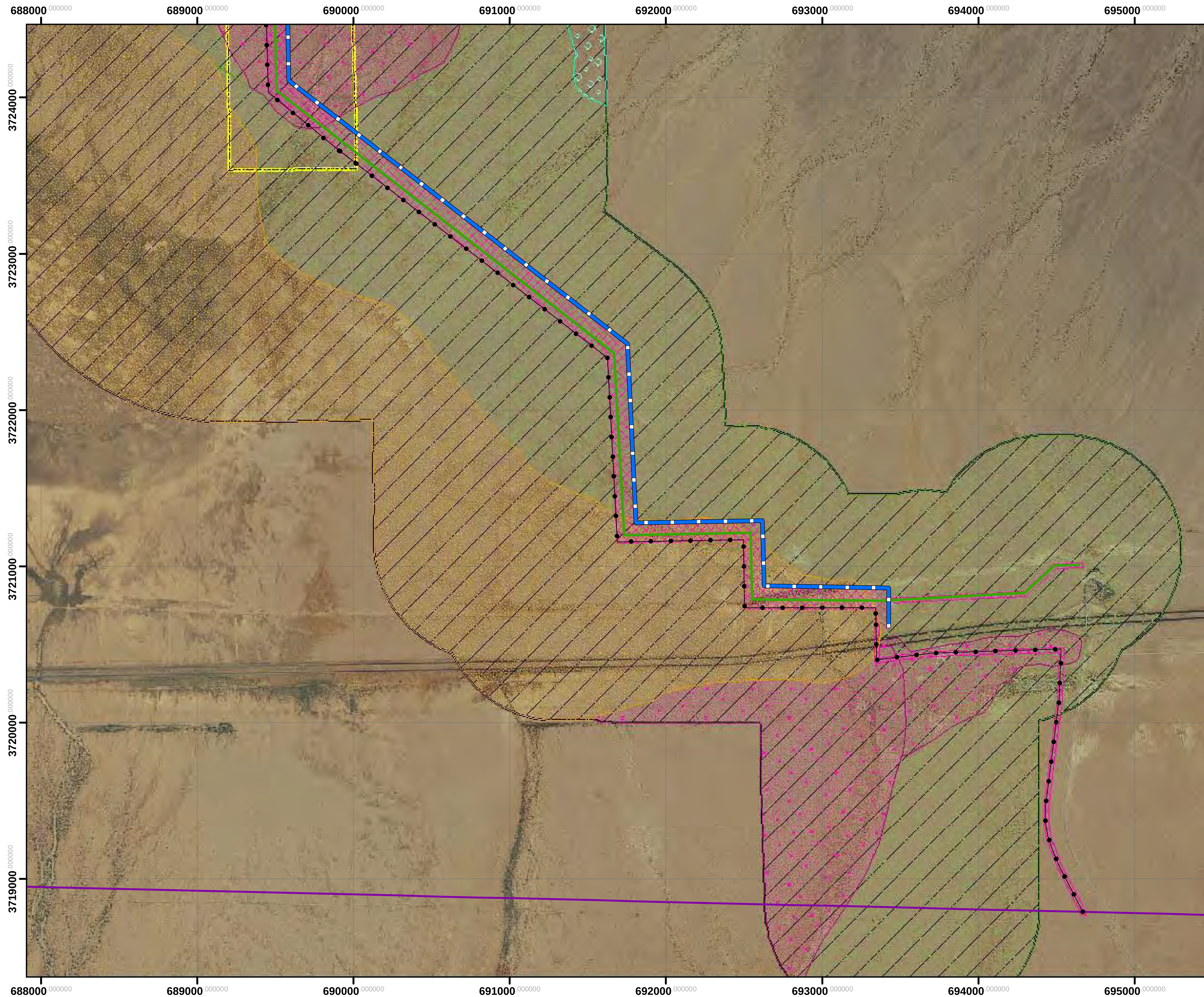
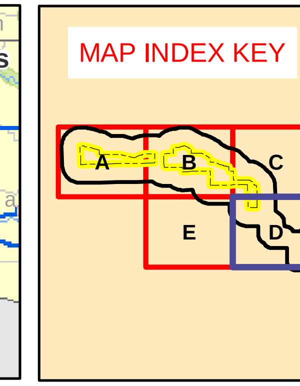


Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY, CALIFORNIA

ENLARGED AREA



Legend

- *Blythe Energy Project Transmission Line*
- *Proposed Transmission Interconnect*
- *Proposed Gas Line*
- *Proposed Access Road*
- Most Likely Abram's Spurge (*Chamaesyce abramsiana*) Suitable Habitat (on-site)
- CNDDB Record - Abram's Spurge (*Chamaesyce abramsiana*)
- Suitable Habitat
- Chenopod Scrub
- Sonoran Creosote Bush Scrub
- Dry Desert Wash Woodland
- Playa and Sand Drifts over Playa
- Stabilized and Partly-Stabilized Sand Dune
- *Extent of Surveyed Area*
- *Project Site*
- *Solar Facility*

N

0 0.25 0.5 0.75 1
Miles

Notes:
(a) UTM Zone 11, NAD 1983 Projection.
(b) Source data: Alice Karl & Assoc. ESRI, USDA, TTEC
(c) Main Map Scale: 1:24,000

BIO-DR 105D
Approximate Boundaries of Suitable Habitat for Abram's Spurge

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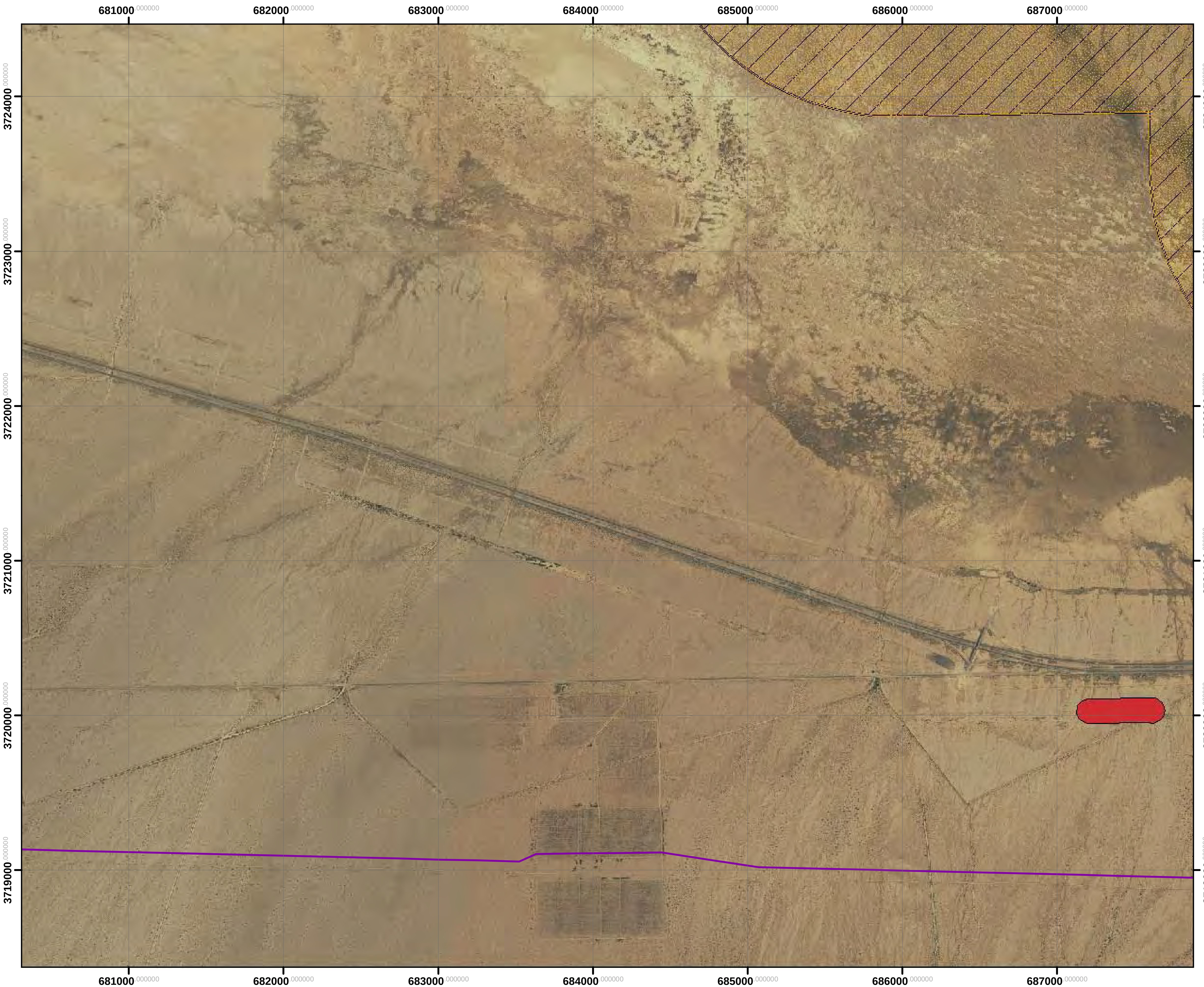
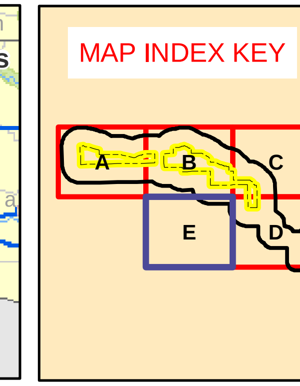
GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY, CALIFORNIA





Legend

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N

0 0.25 0.5 0.75 1
Miles

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(c) Main Map Scale: 1:24,000

BIO-DR 105E
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TETRA TECH EC, INC

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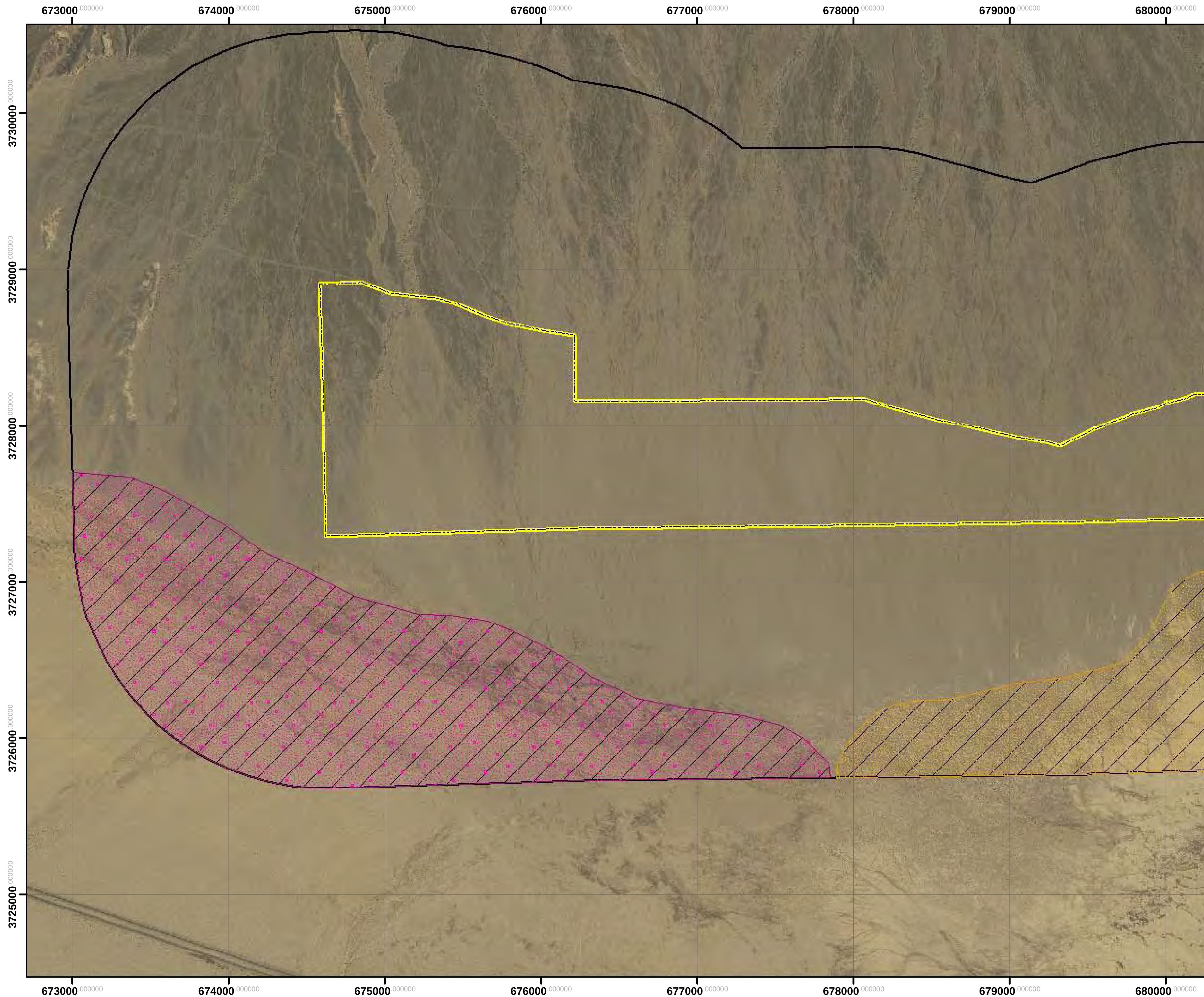
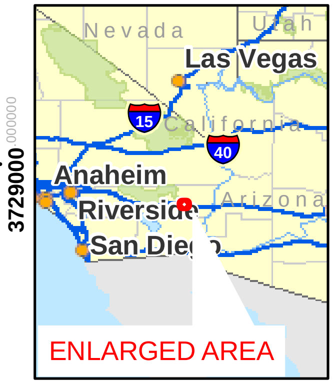
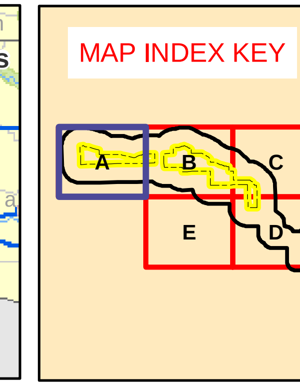
Genesis Solar, LLC

**GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA**







Legend

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**BIO-DR 112 A
Approximate Boundaries of
Suitable Habitat for the
Coachella Valley Milkvetch**

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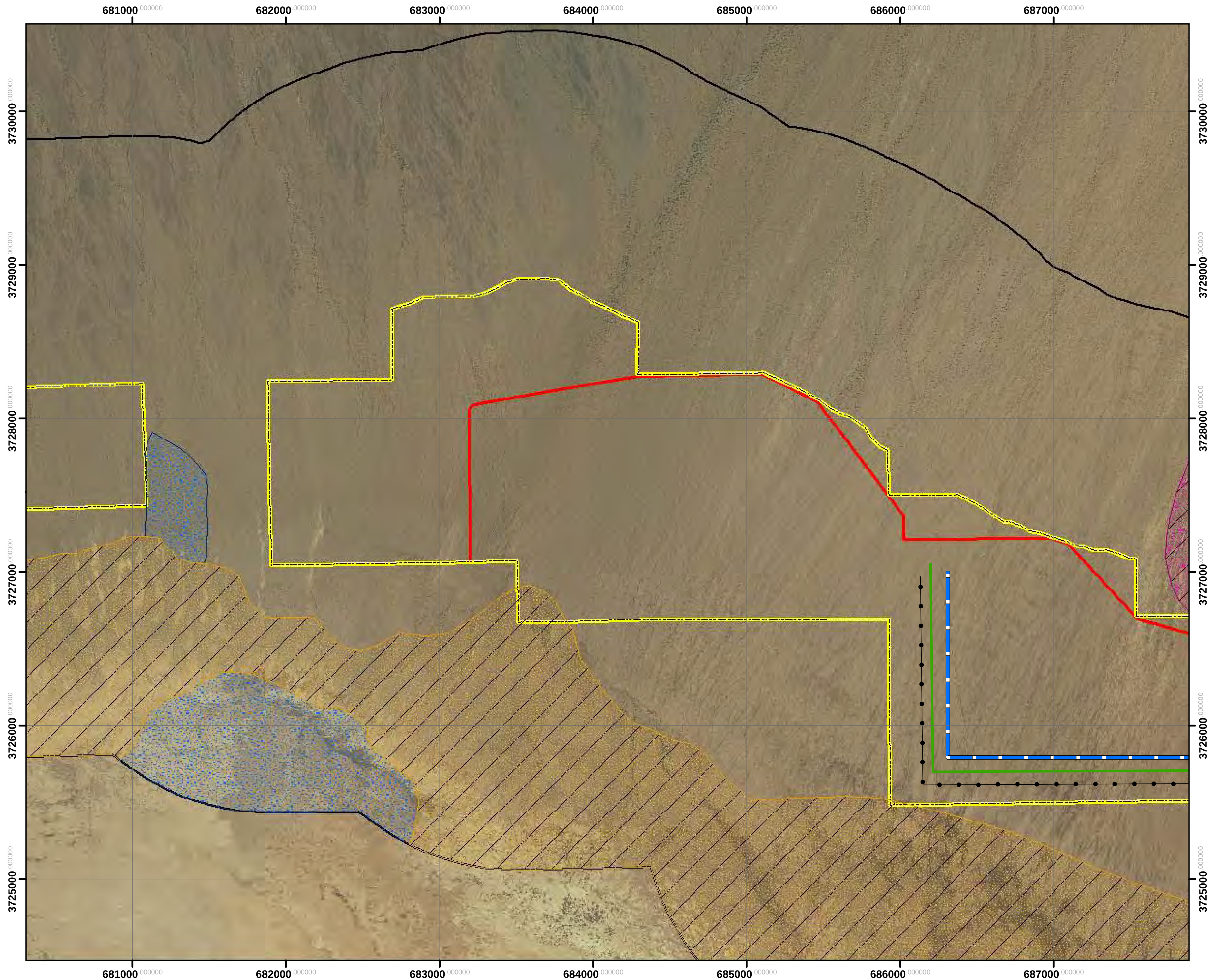
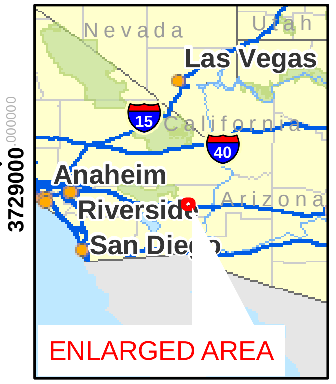
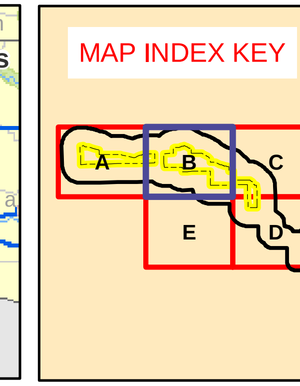
Genesis Solar, LLC

**GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA**







Legend

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**BIO-DR 112 B
Approximate Boundaries of
Suitable Habitat for the
Coachella Valley Milkvetch**

TETRA TECH EC, INC

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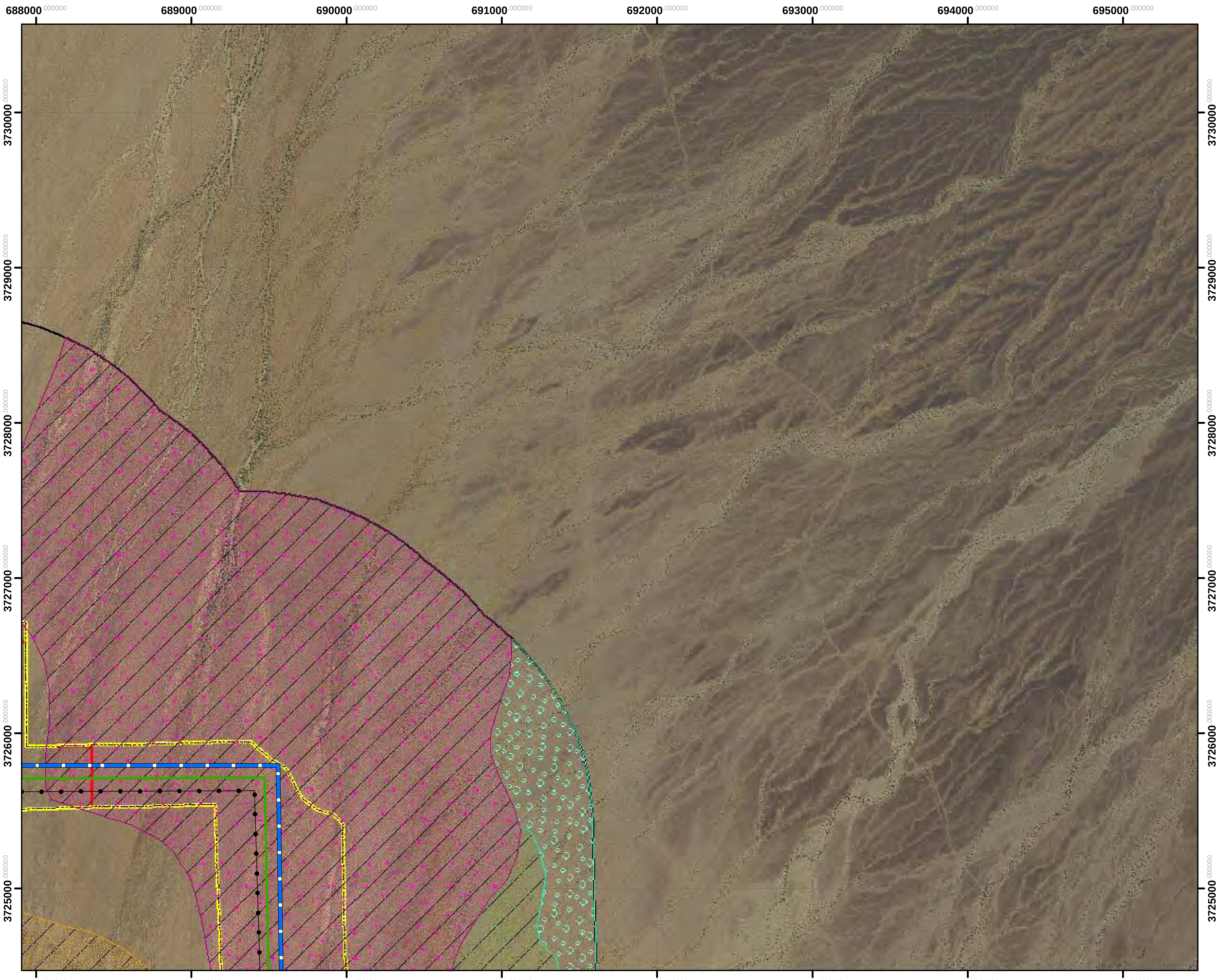
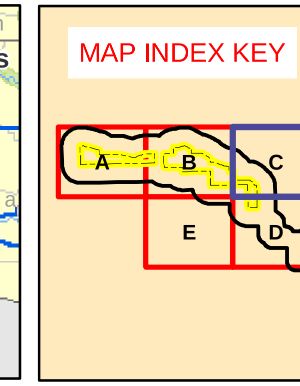


Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY, CALIFORNIA



Legend

- Suitable Habitat
- Blythe Energy Project Transmission Line
- Proposed Transmission Interconnect
- Proposed Gas Line
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- Chenopod Scrub
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BIO-DR 112 C
Approximate Boundaries of Suitable Habitat for the Coachella Valley Milkvetch

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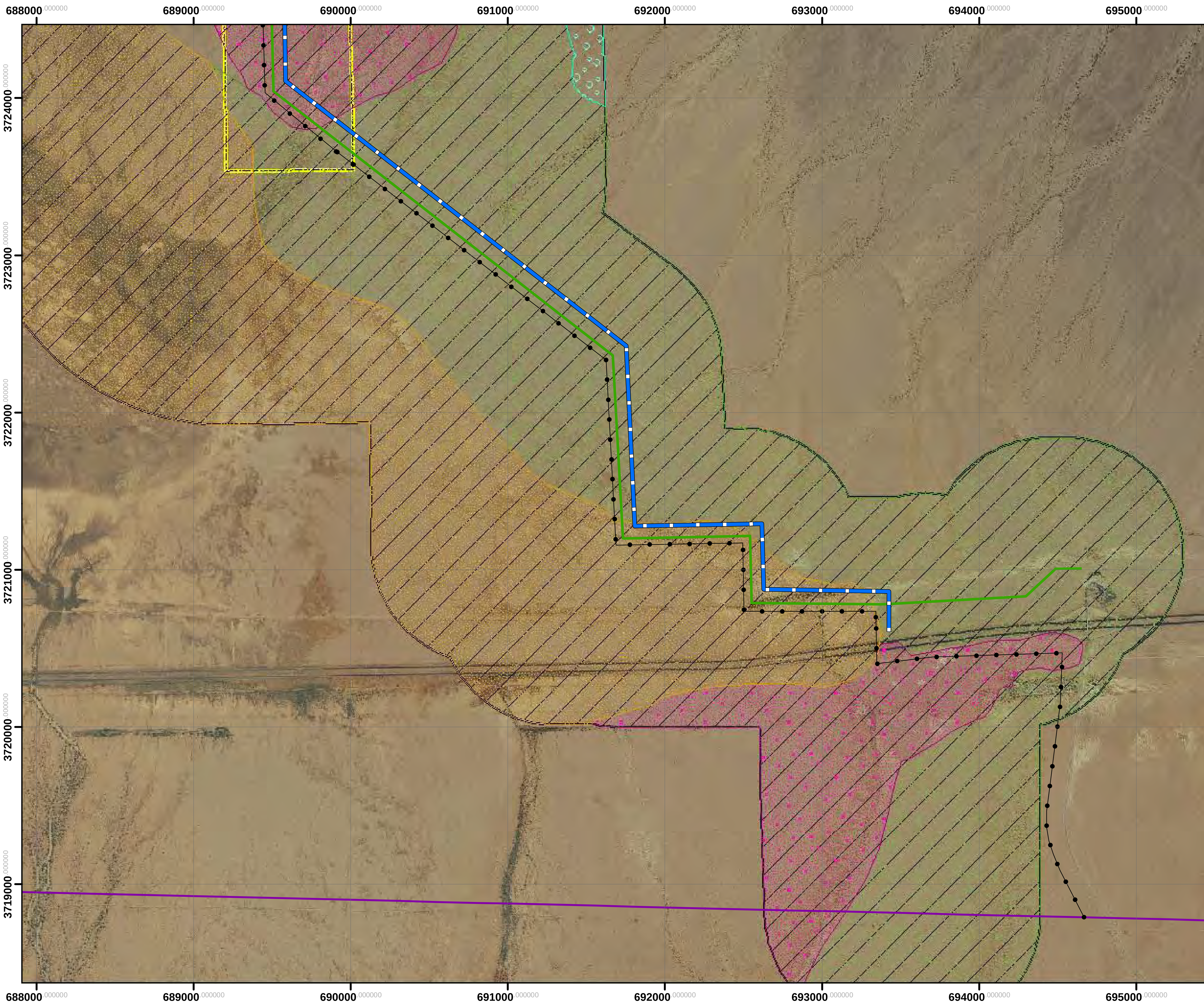

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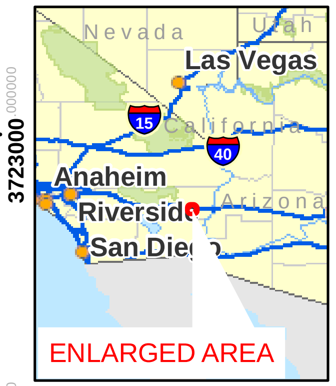
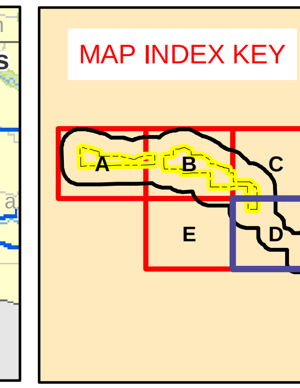
**GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY,
CALIFORNIA**





Legend

- Suitable Habitat
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- Proposed Gas Line
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**BIO-DR 112 D
Approximate Boundaries of
Suitable Habitat for the
Coachella Valley Milkvetch**

TETRA TECH EC, INC

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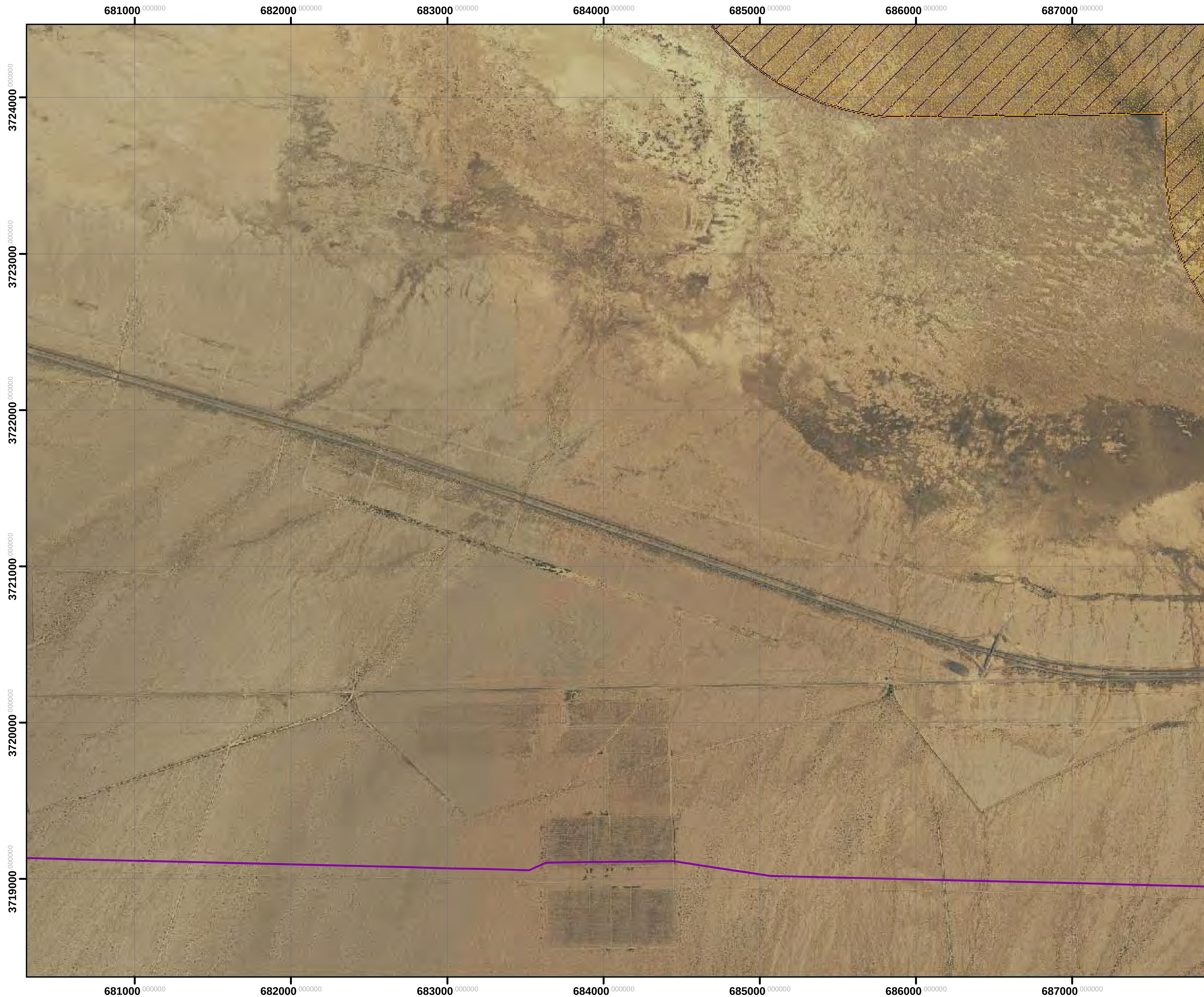
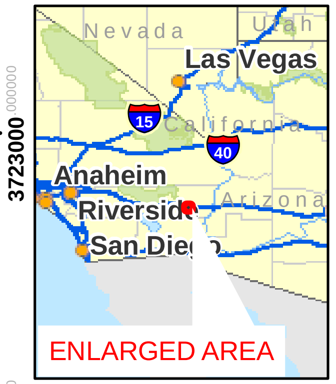
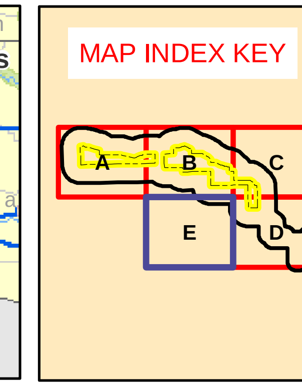


Genesis Solar, LLC

GENESIS SOLAR ENERGY PROJECT
RIVERSIDE COUNTY, CALIFORNIA





Legend

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- Blythe Energy Project Transmission Line
- Proposed Transmission Interconnect
- Proposed Gas Line
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0 0.25 0.5 0.75 1
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BIO-DR 112 E
Approximate Boundaries of Suitable Habitat for the Coachella Valley Milkvetch

TETRA TECH EC, INC

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WorleyParsons
resources & energy

Infrastructure and Environment
2330 E. Bidwell Street, Suite 150
Folsom, CA 95630, USA
Telephone: +1 916 817-3920
Facsimile: +1 916 983-1935
www.worleyparsons.com

December 12, 2009
52004617

Genesis Solar LLC
700 Universe Blvd.
Juno Beach, FL 33408

Attn: Mike Pappalardo, Environmental Manager

Re: AFC Appendix E.4 - Geomorphic Reconnaissance for Genesis Solar Power Project, Riverside County, CA

Dear Mr. Pappalardo:

WorleyParsons conducted a geomorphic and engineering geologic site reconnaissance of the proposed Genesis Solar Energy Project (the Project). Prior to our reconnaissance, a map of surficial geologic deposits was prepared based on review of available maps and literature, and interpretation of aerial photographs obtained from Riverside County. The site was then visited on July 20, 2009 and again on September 23, 2009 to perform a surface reconnaissance to evaluate and confirm surface conditions and excavate and log shallow soil pits at selected locations on a reconnaissance level. The purpose of the reconnaissance was to field verify the geologic mapping that was conducted, and to gather data regarding the nature of the shallow soils, landforms and erosion and sedimentation processes active at the site. This information helps to provide context to analyze the potential for buried cultural resources, design project drainage features, and evaluate the potential impacts of the project on surface drainage, sediment transport and sand dune habitat. A geoarchaeological evaluation and a conceptual drainage study were submitted as appendixes to the Application for Certification submitted for the Project to the California Energy Commission in August 2009. Supplemental drainage studies are currently in progress, including more detailed hydrologic modeling and more detailed design of channel alignment, geometry and flow depth to pass storm flows and sediment and distribute them downstream of the Project site.

During the field reconnaissance, observations were made from the NECO designated roads in and near the site and associated off-site linear alignment, and while traversing on foot to the south of the site and to the designated locations shown on Figure 1. Data gathered from the nine locations shown on Figure 1 is summarized in the attached data sheets. At each of these locations, observations were made regarding the landforms present, vegetation, surface characteristics (e.g., desert pavement development) and the nature of the underlying soils. These data combined with our literature, map and aerial photograph review to refine our understanding of the landforms, deposits, and surficial processes (erosion and sedimentation) at the site and associated off site linears. A summary of our findings is presented below.

Site Physiography

The Project Site lies on a broad, relatively flat, sloping surface underlain by alluvial deposits derived from the Palen Mountains to the north and the McCoy Mountains to the east. These alluvial deposits have created two distinct landform types and several discernable landform ages. The deposits immediately adjacent to the mountains have formed alluvial fans from multiple identifiable sources, and multiple fan surfaces have coalesced into a single bajada surface that wraps around each of these mountain fronts. Between the bajada surfaces from each mountain chain lies a broad valley-axial drainage that extends southward between the mountains and drains to the Ford Dry Lake playa, located about 1 mile south of the Site. The Site itself is relatively flat and generally slopes from north to south with elevations of approximately 400 to 370 feet above mean sea level. It is occupied by a community of low creosote and bursage scrub vegetation.

The off-site linears extend southeastward from the Project site, skirting ½ to 1 mile northeast of Ford Dry Lake, reach the low point of the valley approximately 1 mile east of Ford Dry Lake, and follow the low point of the valley eastward to near the intersection of I-10 and Wiley's Well Road. The proposed transmission line then crosses I-10 and extends southward, up the lower portions of the southern valley flank, to join the Blythe Energy Transmission Line (currently under construction). The topography crossed by the off-site linears is virtually level, and ranges between 360 and 390 feet above mean sea level (amsl). Northeast of Ford Dry Lake, the off-site linears cross an alluvial and aeolian plain that represents the distal portions of the valley axial and bajada surfaces that extend southward from the McCoy Mountains. The ground surface in this area slopes very gently to the southwest, toward Ford Dry Lake, at inclinations of approximately ½ percent. Landforms include alluvial and sand plains, local coppice dunes, and local subdued bar and swale topography associated with sheet flood deposits. East of Ford Dry Lake, the off-site linears cross the distal portions of a valley axial drainage that enters Ford Dry Lake from the east. The ground surface in this area slopes westward at less than ½ percent and the alluvial and the aeolian plain in this area includes similar landforms as described above. A series of poorly defined, broad, shallow washes run eastward near the off-site linear alignment starting about 1 mile west of the Wiley's Well Road exit and extending along the alignment for approximately 1 mile prior to dissipating into sheet flow and alluvial/aeolian plain deposits. South of I-10, the transmission line crosses similar terrain, but the ground surface slopes northward at inclinations of approximately ½ percent and represents the distal portions of the bajada that extends northward into the valley from the Chuckwalla Mountains.

Regional Geology and Geomorphology

General Geomorphology of the Basin and Range Geomorphic Province

The proposed development exists within the Mojave Desert Geomorphic Province which exhibits strikingly similar geologic history and resulting geomorphology as the Basin and Range Geomorphic Province (BRGP) located to the north. For the purposes of this site evaluation, the use of the term BRGP will include the Mojave Desert Geomorphic Province. The geomorphology of the BRGP is dominated by mountains and valleys produced during dramatic tectonic extension in the western and southwestern United States primarily during the mid to late Tertiary (Nelson, 1981; Armstrong, 1982; Rehrig, 1982; Hamilton, 1982; Anderson, 1988; Wernicke, 1992). The lithospheric tectonic extension caused normal faulting in the brittle upper crust allowing for crustal thinning and produced fault bounded mountain ranges (horsts) and valleys (grabens) across the BRGP. The crustal extension led to the development of widespread Tertiary fanglomerates and abundant pressure release volcanism. Many of these deposits associated with the widespread extension were subsequently tilted, folded and faulted post formation during the ongoing extensional tectonism.

The mountains bounding the Chuckwalla Valley near the site are primarily composed of igneous, metamorphic and volcanic rocks. These mountains ranges include the Palen to the north-northwest, the McCoy to the north-northeast, the Mule to the southeast, and the Little Chuckwalla to the south. Numerous basement constrained faults are exposed in the mountain basement rock terranes dominantly associated with Mesozoic compression and Tertiary extensional tectonics. These faults do not displace Quaternary deposits and no active faults are known to exist within the Chuckwalla Valley area (Jennings, 1994). Thus, there is little evidence to suggest Holocene age or even late Pleistocene age tectonic vertical movements have occurred in the region. Typical geomorphic terranes within the BRGP include mountains flanked by an apron of alluvial fans (proximal, middle and distal facies), and playa lakes (valley sinks). Each of these terranes is discussed in more detail below in addition to a general discussion on weathering processes.

General Weathering Processes

Erosion is primarily produced by chemical and mechanical weathering processes. Primary structures and composition such as pressure release jointing, fracturing, faults, foliation, and types of silicate minerals all play a role in the ability of the bedrock in the mountains to erode. Water is an important factor in both the weathering and transport of rocks and sediments. Water assists chemical reactions and is a strong control on the amount and type of vegetation. Flowing water is also the dominant mode of transport of the erosional products which move the sediment (bed load and suspended load) down the drainages to be deposited. Wind also has the ability to mobilize sediment and does play a larger role in desert environments; however it is a distant second to water in terms of total mass mobilized.

Mountain Geomorphic Terranes

Mountains within the BRGP generally have relatively steep slopes, erosional “V”-shaped valleys due to stream erosional processes, and local escarpments along the mountain edges. Within the BRGP erosional processes dominate within the mountainous terranes. Relatively minor deposition does take place in mountain terranes within the drainages as stream terraces. Primary structures and composition of the rocks such as pressure release jointing, fracturing, faults, foliation and chemical composition all play a role in the ability of the mountain rocks to erode. Water is the dominant form of transport of the erosional products which move the sediment (bed load and suspended load) down the drainages to be deposited.

Alluvial Fan Geomorphic Terranes

The flanks of most mountains ranges in the BRGP piedmont geomorphic terranes containing alluvial fan deposits derived from sediments derived from erosion of the local mountains (Dohrenwend et. al., 1991). The fans are derived from flowing water emanating from the mountain valleys. The exit point of the drainage from the mountain front is called the apex. At the apex, the fan drainage is no longer confined to the mountain valley and the channel has the ability to fan out in numerous directions leading to a cumulative “fan” shaped deposit. The fans are dominantly composed of fanglomerates and debris flows in the proximal and mid fan sections, and generally grade to fluvial sands in the distal axial valley fan section. Sediment sizes generally get finer further from the fan apex. Fan deposition rates have varied during the Quaternary. Although the correlation that wetter climates during the Pleistocene glaciations played a role in relatively large aggredational fan events throughout the BRGP is debated, it is likely that the climatic maximums during the ice ages led to periods of increased fan deposition (Bull, 1979; Bull, 1990; Dohrenwend, et. al., 1991; Harvey and Wells, 2003; McFadden et. al. 2003). Streams within the BRGP exhibited discharge an order of magnitude larger than today during pluvial (glaciations) periods (Morrison, 1991; Dohrendwend, et. al., 1991). One effect of wetter climates of the Pleistocene was likely larger storm strength intensity and frequency that generally caused a shift downslope of the proximal, middle and distal fan facies. Thus, it is common to identify distal fan facies deposited during the Holocene overlying late to latest Pleistocene coarser grained middle fan facies.

Valley Sinks – Desert Playas and Ancient Pluvial Lakes

One of the key geomorphic characteristics of the BRGP is that streams terminate in local or regional valley sinks (i.e. Playa lakes) and not the Pacific Ocean or Sea of Cortez (USGS, 1967). The region truly is a “basin”. The Colorado River located east of the site near Blythe terminates in the Sea of Cortez and is thus an exception to the vast majority of streams in the BRGP. Once the extensional tectonics subsided during the late Tertiary, the uplifted mountains continued to erode without further uplift and the local valleys continued to in-fill with sediment. Thus, since the regional tectonic extension ceased, erosional and depositional processes have dominated the area. Over time the aerial extent of mountain ranges and valleys have decreased and increased respectively as mountains erode and adjacent valleys filled with sediment.

Many if not most of the BRGP valley sinks contained pluvial lakes most of which existed during the glacial maximums of the Pleistocene (Morrison, 1991; Reheis, 1999; Reheis, 2005; Castiglia and Fawcett, 2006; Reheis et. al., 2007). During the early and late Holocene some valley sinks developed relatively minor pluvial lake stands within the BRGP (Morrison, 1991; Dohrenwend, 1991)

Eolian Deposits and Source Areas

Within the Mojave Desert, sand dune deposition (aggregation-growth) generally occurred during relatively dry periods following wetter climates that generated considerable sediment supply within regional drainages and dried up pluvial lake basins (Dohrenwend, et. al., 1991; Lancaster and Tchakerian., 2003). The last major regional sand dune aggredational event occurred near the Holocene-Pleistocene boundary (Dohrenwend, et.al. 1991). However, a global dry period during the mid Holocene that followed the relatively wetter climate cycle (Forman, et. al., 2001; Jenny et. al., 2002; Fahu et. al., 2003; Umbanhowar et. al., 2006; An et. al., 2006; Jenny et. al., 2002) also allowed for sand dune growth of within the Mojave Desert region 7 to 4 ka (Dohrenwend, et. al., 1991). Most major sand dune deposits existing today are considered fossil formations as they have likely have not been actively forming during the late Holocene (Dohrenwend, et. al., 1991).

Most of the sand dunes in the Mojave Desert region are produced by sand moving east to southeast due to resultant annual wind directions. However, this migration is also altered by topographic controls on wind when channeled along mountain fronts and within valleys (Laity, 1987). Zombelman et. al. (1995) identified two primary sand corridor systems in the eastern Mojave Desert near the site. These include: The Bristol Trough system which extends over 150 km southeast from the Bristol

Playa to the Colorado River and the Clarks Pass system that extends from Dale Dry Lake to just east of Ford Dry Lake (also see Lancaster and Tchakerian, 2003).

The source for sand dune sediment within most Mojave Desert dune fields likely comes from a combination of regional sand corridors and local active washes along the sand corridors. Recent work suggests that sediment for most dune fields in the Mojave Desert west of the Colorado River is originally derived from active stream washes (both locally and regionally along the sand corridors), migration along sand corridors, and transport from dry playa lakes (Lancaster and Tchakerian, 2003; Muhs et. al., 2003; Ramsey et. al., 1999). A study by Muhs et. al. (2003) found that dune fields on opposite sides of the Colorado River are mineralogically distinct and have different sources. They identified that the Parker Dune field located just east of the Colorado River and northeast of the site is supplied by sediment derived from the Colorado River valley itself and not transport of sand from the Danby dune field located west of the Colorado River valley. This study indicated that large washes can be both a large source of sediment for dune fields, and also a large impediment to sand wind entrainment.

Drainage Systems

The BRGP primarily exhibits braided drainage systems containing abundant coarse grained sediment bed load associated with an arid region. Drainages typically begin in the mountainous regions, then extend over alluvial fans and terminate in valley sinks (often playa lakes). Drainages within the mountains typically exhibit V-shaped stream eroded valleys due to slope erosion and stream bed down cutting. Mountainous areas are thus primarily regions dominated by erosional processes and tributary drainage networks. As the drainages exit the mountain front they enter the region dominated by alluvial fans at the fan apex geomorphically referred to as piedmonts. Piedmonts consist of coalescing alluvial fans exhibiting a mosaic of active channels, abandoned channel segments, and interchannel surfaces or ridges (Dohrenwend, et. al., 1991). Active piedmont drainages form distributary drainage networks in areas of recent active fan deposition (current active washes) with bar and swale topography. Abandoned portions of piedmonts typically exhibit tributary drainage networks on areas of older fan deposition across relict abandoned fan surfaces. The vast majority of coarse grained sand and gravel transported by the local drainages is deposited within the alluvial fans. Near the termination of the alluvial fan system drainages become progressively less constrained within distinct channels which allows for sheet flow type deposition to occur. Eventually the drainages reach a valley terminal sink which generally represents a playa lake of nearly horizontal fine grained strata (silts and clays).

FINDINGS

Site Geology Units

Site Geologic Units

Mapped surficial geologic units and associated landforms and processes are summarized in Table 1, shown on Figures 1 and 2, and discussed below.

Table 1 Mapped Surficial Geologic Units

MAP UNIT	INFERRED AGE	DESCRIPTIVE NAME
Q_{YVA}	POST-LATE HOLOCENE	YOUNGER VALLEY AXIAL ALLUVIAL DEPOSITS
Q_{YMA}	POST-LATE HOLOCENE	YOUNGER MIXED ALLUVIAL AND AEOLIAN DEPOSITS
Q_P	POST-LATE HOLOCENE	PLAYA DEPOSITS
Q_{YAF}	LATE HOLOCENE	YOUNGER ALLUVIAL FAN DEPOSITS
Q_{IAF}	MID-HOLOCENE	INTERMEDIATE ALLUVIAL FAN DEPOSITS
Q_{OAF}	LATE PLEISTOCENE	OLDER ALLUVIAL FAN DEPOSITS

Younger Valley Axial Deposits **(Q_{yva}).** Deposits in the valley axial drainage that underlie the majority of the eastern part of the Site (and entire footprint of the proposed solar power plants) are characterized by a north south trending fabric in aerial photographs and possess a generally subdued bar and swale topography at ground level. These deposits represent distal end member facies of the northeast to southwest-trending valley axial drainage between the Palen and McCoy Mountains (Palen-McCoy valley) that terminates at Ford Dry Lake. Very few small washes are continuous across the eastern part of the Site.

The valley axial surface deposits consist primarily of silty sand with lesser amounts of gravel and display local incipient desert pavement development or aeolian lag deposits associated with saltation. There is no desert pavement development, and no carbonate accumulation in the uppermost 12 to 18 inches soil. Subsurface stratification observed in this interval consists of thinly spaced horizontal silt laminations, which is consistent with the formation of silt crusts after sheet floods. Also observed were cross bedded silty sand beds about 8 to 10 cm thick and massive silty sand with gravel just upslope of the site. The morphology and lack of desert pavement and soil development are consistent with depositional surfaces that are at most a few hundred years old.

The two soil pits excavated to depths greater than 18 inches both encountered dense, buried soils with slight carbonate (Bk) and clay (Bt) horizon development. Based on the degree of soil development, these buried soils appear to represent Intermediate of Older Alluvial deposits (Q_{IAF} or Q_{OAF}, respectively). Thus, these older soils appear to be overlain by a relatively thin veneer of alluvial sheet flood deposits. The surface exhibits a subdued bar and swale morphology generally lacking water erosional features, which is indicative of a surface that is either in equilibrium or undergoing deposition. The fact that the active surficial layer is relatively thin where it was penetrated suggests that it represents equilibrium alluvial deposits that are being transported downslope in a relatively thin sheet. This is supported by the presence of elongated, bar shaped features located south of the area between the eastern and western portions of the site, which appear to be very dense and partially cemented soils exhumed by aeolian transport. However, the data are insufficient to confirm the depth of the shallow valley axial deposits across the site, and depths could significantly exceed 12 to 18 inches in some locations.

Younger Mixed Alluvial and Aeolian Deposits* (**Q_{oaf}).*** Downslope of the Younger Alluvial Fan deposits (described below), between the Valley Axial Deposits (described above) and the Playa Deposits of Ford Dry Lake, and within the valley axial drainage east of Ford Dry Lake, the alluvial fan and valley axial alluvium grade into a mixture of deposits consisting of distal alluvial deposits, sand and silt sheet flood deposits, and interspersed aeolian sand sheets and local small coppice dunes. The factor that distinguishes these deposits from the upslope alluvial deposits is the presence of less gravel and more fine sand and silt, and an increasing prevalence of aeolian deposits and processes. As described above, elongated, lobate bodies of partially cemented soil that appear to represent soils or lacustrine deposits partially exhumed by aeolian erosion are locally present south of the site close to Ford Dry Lake. This suggests that the mapped mixed aeolian and alluvial deposits includes both areas of aeolian deposition and erosion. Several small washes are located within the area of the off-site linears and extend from about 1 mile to 2 miles west of the Wiley's Well Road exit before dissipating into sheet flood deposits. Younger Mixed Alluvial and Aeolian Deposits underlie the alignment of the off-site linears associated with the Project.

Younger Alluvial Fan Deposits* (**Q_{yaf}).*** Similar to the Palen Mountains, the downslope extent of the Pleistocene-age, relict alluvial fan surfaces at the foot of the McCoy Mountains appear to marks the "intersection point" of the alluvial fans in this area. Downslope of these points, the incised (and confined) washes emerge from an erosional setting and transition into a depositional mode with fan lobes, bar and swale topography, and shallow distributary washes, all of which are consistent with a distal fan environment. However, the aerial photographs of this area suggest that the bajada surface downslope of the McCoy Mountains has a more pronounced bar and swale topography, is generally lighter in color, and has more developed (or preserved) distributary channel development extending to the lower reaches of this surface. In addition, the presumed ancient shoreline feature that trends across the Q_{iaf} surfaces downslope of the Palen Mountains (see description below) is not discernible across these fans, and appears to have been covered by deposition during the late Holocene. These Q_{yaf} deposits consist of silty sands and gravelly silty sands, with generally finer grained gravel than the upslope deposits.

Playa Deposits* (**Q_p).*** These deposits are located south of the Project site and west of the off-site linear alignment. Ford Dry Lake is a playa that represents the terminal sink within Chuckwalla Valley. Playa deposits include silt, clay and sand sheet flood and lacustrine deposits, as well as local aeolian sand sheets and coppice dunes.

Intermediate Alluvial Fan Deposits* (**Q_{iaf}).*** These deposits are located upslope of the proposed solar power plant footprint and in the area of the proposed western portion of the right-of-way requested from the Bureau of Land Management (BLM). The downslope extent of the Pleistocene terraces at the foot of the Palen Mountains marks the "intersection point" of the fans in this area.

Downslope of these points, the incised (and confined) washes emerge from an erosional setting and transition into a depositional mode with fan lobes, subdued bar and swale topography, and shallow distributary washes, all of which are consistent with a distal fan environment. These lower fan deposits exhibit a darker color than the adjacent valley axial (Q_{yva}), aeolian (Q_{yma}) or playa deposits. Desert pavement is present, but its development is not as extensive, and the individual clasts that comprise the pavement do not exhibit the same degree of desert varnish development as the upslope, and older alluvial fan surfaces. The intermediate fan deposits consist of silty sands and gravelly silty sands, with generally finer grained gravel than the upslope deposits.

A photo lineament is discernible in Figure 1 based on a change from a rougher, lighter-colored and more dissected surface (on its north side) to a darker, smoother surface (on its south side). This lineament extends across the bajada surface in an east-west direction approximately along the 400 foot amsl elevation contour. The photo lineament disappears in the lighter-colored valley axial deposits that underlie the majority of the eastern portion of the Site. To the west of the site, where the 400 foot contour trends southward across the valley floor, the lineament also disappears. However, similar features can be observed at approximately the same elevation on the south side of Chuckwalla Valley (i.e. south of I-10), and on the south flank of the McCoy Mountains (north of I-10).

A plausible explanation for this feature consistent with the above observations is the preservation of an ancient shoreline developed during a pluvial lake highstand of Ford Dry Lake. Site reconnaissance indicated that near Locations 6 and 7 (Figure 1) this feature is associated with a subtle but observable change in the surface characteristics. However, this change could not be consistently traced along the alignment at ground level, and the nature of this photo lineament therefore remains unconfirmed. Based on the moderate degree of desert pavement and varnish development on these fan surfaces, it is estimated that if a lake highstand is responsible for this feature, it would have occurred sometime during the Holocene. If the presumed ancient shoreline can be verified, this would suggest that the intermediate alluvial fan deposit surfaces at the Site have been in a state of relative equilibrium (undergoing little erosion or sedimentation) since the age of the 400' contour pluvial lake.

Older Alluvial Fan Deposits (Q_{oaf}). These deposits are located upslope of the proposed solar power plant footprint and in the area of the proposed western portion of the right-of-way requested from the Bureau of Land Management (BLM). The upper and middle alluvial fan surfaces, located north of, and upslope from the western portion of the Site, consist of coarse to medium grained sandy gravels and gravelly sands and are extensively dissected by deep washes that are up to 1/4 mile wide and over 50 feet deep in the proximal fan areas. Between these incised washes, the remnant alluvial fan surfaces are covered by well developed desert pavement with nearly 100 percent stone cover, dark brown to nearly black desert varnish, and carbonate deposition on the lower sides of the clasts. The desert pavement development is consistent with a Pleistocene surface age and these remnant fan surfaces were mapped as late Pleistocene by Stone (2006). These remnant fan surfaces extend largely unbroken (between the incised washes) into the upslope portions of the western parcel of the site and northwestern most corner of the eastern parcel.

Site Geomorphology and Geology

The Project site exists within the distal fan portion of a series of fans and bajadas flanking the east side of the Palen Mountains to the north and northwest of the site, and the southwestern side of the McCoy Mountains to the northeast. The piedmont bajadas merge within an approximately northwest trending axial valley between the Palen and McCoy Mountains (Palen-McCoy valley) that flows approximately southward terminating in Ford Dry Lake. Topographically, the site is relatively flat with a 0.3 degree southwest slope and exhibits surficial sediments composed of fluvial silty sands with lesser amounts of fine grained gravel. During times of storm runoff, sheet flow appears to be the primary mechanisms during moderate to large storm events (possibly 20 to 50 year events), but may be more localized during relatively smaller flow events (i.e. 10 year events). The linears extend over areas containing distal alluvial fans similar to the solar power plant, but also areas containing a mixture of surficial aeolian sand and alluvial fan deposits.

Near surface sediments at the site contain a relatively thin member of fine grained distal fan facies underlain by late Pleistocene coarser grained mid-fan facies (see Romig Engineers, 2009). Preserved late to latest Pleistocene age fan surfaces with well developed desert surfaces (desert pavement, soil profiles) are still preserved at the surface near the site. They occur in the proximal and upper mid-fan areas along the flanks of the local mountains to the northwest and northeast. These preserved fan surfaces which have been eroding since the latest Pleistocene represent the termination of sediment aggredational events during wetter climates of the Pleistocene ice ages (Weldon, 1986; McFadden and Weldon, 1987; Bull, 1990; Harvey and Wells, 2003; McDonald et. al., 2003). The latest Pleistocene alluvial fan deposits exposed along the flanks of the Palen and McCoy mountains may very well represent the same coarse grained deposits as those observed within 1 to 2 feet of the surface within the Project (morphostratigraphic relationship).

Based on limited investigation, subsurface geology at the site is likely dominated by nearly horizontal strata composed of interbedded lacustrine and mid- to distal-fan facies, and possibly sand dune facies. Based on depositional age studies conducted throughout the Mojave Desert, each of these facies generally has depositional maximums that are at least partially climatically controlled (Dohrenwend et. al, 1991). For example, thick lacustrine deposits developed during glacial maximums when valley sinks contained widespread pluvial lakes, sand dune growth occurred during interstitial glacial periods (dryer climate), and maximum alluvial fan aggradation occurred during glacial and interglacial transitions (Morrison, 1991; Dohrenwend et. al., 1991). However, there are typically local exceptions to these general regional climatic controlled depositional cycles.

Chuckwalla Valley Sinks

The site is located within the Chuckwalla Valley which contains two primary valley sinks. The first is Palen Dry Lake located about 12 miles west of the site and the second is Ford Dry Lake located about 1 mile due south of the Project site (Jenkins, 1967). Thus, the drainages emanating from the local mountain ranges and across local fans terminate within these local sinks. The vast majority of streams in the BRGP and all of the streams in the project area are ephemeral (the drainage is usually dry and fills with water only during brief episodes of intense rainfall). The western portion of Chuckwalla Valley containing Palen Dry Lake trends northwest-southeast and then turns to approximately due east-west in the region of Ford Dry Lake. A tributary valley extends northward from the Project site between the Palen and McCoy Mountains.

Ford Dry Lake represents the local drainage sink and contains surficial sand dune deposits underlain by either perennial pluvial lake deposits or more ephemeral playa lake deposits (Dohrenwend et. al., 1991). Thick accumulation of lacustrine (lake) deposits generally occurred during the wetter climates of the Pleistocene glacial maximums. Pleistocene lakebed deposits similar to those described northwest of Palen Lake are located north of Ford Dry Lake between the Project site and the playa (DWR, 1963). The age of the most recent major pluvial lakes throughout the Mojave Desert valley sinks is latest Pleistocene (13 to 11 ka; Rehis, 1999; Briggs, 2003; Jayko et. al, 2005; Knott, 2005; Miller, 2005; Beacon et. al., 2005; Reheis, et. al., 2007). Relatively smaller Holocene lakes also occurred within many BRGP valley sinks during the early and early late Holocene (Morrison, 1991; Dohrenwend et. al., 1991).

The elevation of the playa lake is approximately 350 feet above mean sea level, and the maximum upper elevation of the sink (sill) is approximately 460 above mean sea level located approximately 10 miles east of the site in a pass between the southern McCoy Mountains and northern Mule Mountains. Pluvial lakes, which represent lakes formed during a period of exceptionally heavy rainfall; specifically, a Pleistocene lake formed during a period of glacial advance and now either extinct or only a remnant, likely existed within Ford Dry Lake during the Pleistocene glacial maximums. Exposed pluvial lake deposits (lacustrine deposits) exist in the valley northwest of the current dry lake area at an upper elevation of approximately 377 feet msl; however the upper limits of these outcrops appear to be covered with younger fan deposits and geomorphic indicators of an ancient shoreline could not be identified. Thus, the 377’ ancient lake elevation should be considered a minimum.

A DWR geologic map (1963) indicates lacustrine deposits at upper elevations of 520 feet above mean sea level west of the site and south of the Palen Mountains. A pluvial lake with surface elevation of ~520 feet msl suggests that the sill to the east has been eroded more than 60 feet (520 – 460 feet) since the time of the high standing lacustrine deposits. This is assuming no local tectonic movements, which is reasonable based on previous discussions regarding local fault activity. These DWR mapped lacustrine deposits are overlain with late Pleistocene alluvial fan deposits exhibiting very dark desert varnish.

Eolian Deposits of the Chuckwalla Valley

A preliminary aerial image analysis was performed on the Palen Dry Lake to Ford Dry Lake sand corridor utilizing Google Earth imagery. The Palen Dry Lake dune field is one of a few BRGP dune field considered to be active and thus continuing to grow (Dohrenwend, et. al., 1991). The Palen Dune field exists within and adjacent to Palen Dry Lake and exhibits abundant active northeast to southwest trending transverse dunes in the northeastern portion of the field, and active southeast trending longitudinal dunes in the southwestern portion of the field. Dominant wind directions based on the orientation of the Palen Dry Lake dunes is from the northwest and roughly parallel to the valley axis. Active barchan dunes in the Palen Dry Lake dune field migrate toward the southeast (Dohrenwend, et. al., 1991). Areas containing minor vegetated coppice dunes were identified primarily within regions on the outer fringes of the dune field. The central portion of the dune field exhibited much less vegetation and distinct, active dunes. Pleistocene lake bed deposits with abundant bentonitic clay and caliche caps are exposed in low dissected, mesa-like promontories approximately 5 to 10 feet above the northwest end of the playa (DWR, 1963). Quaternary lacustrine deposits exist directly beneath the existing dunes and between dune mounds.

The Palen Dry Lake dune field may contain separate sources from both the Dale Lake-Clarks Pass corridor between the Coxcomb and Eagle Mountains to the northwest and the pass between the Coxcomb and Palen-Granite Mountains to the north. This hypothesis is based on color contrasts and dominant wind directions for the sand dunes in the western verses eastern portions of the Palen Dry Lake dune field. These two separate sources possibly mix within the eastern portion of the Palen Dry Lake dune field as it narrows and begins to turn more easterly at the south end of the Palen Mountains. The two source hypothesis for the Palen Dry Lake dune field would need to be investigated with field mapping and sample analysis. Mixing of these two sources may be complete within a couple of smaller dune fields identified southeast of the main Palen Dry Lake dune field at the southern end of the Palen Mountains alluvial fan complex. These smaller dune fields exhibit primarily active transverse dunes.

Sand dunes deposits identified during our preliminary Google Earth imagery review of the Ford Dry Lake dunes suggest that these dunes are of smaller scale and lower activity level than those identified at Palen Dry Lake. It is likely that these dunes are no longer active and that the dune field is not aggrading (Dohrenwend, et. al., 1991). Coppice “vegetated” dunes with relatively low topographic relief cover large portions of the Ford Dry Lake dune field, primarily east and southeast of the Ford Dry Lake playa. Areas exhibiting low relief sheet dunes may cover large regions of the area of Ford Dry Lake playa, and contain surficial wind blown sand-derived sediments. Few distinct active dunes were identified with the Google Earth non-stereographic imagery; however, their potential presence cannot be discounted until more detailed mapping and imagery analysis can be conducted.

Drainage Systems of the Palen-McCoy Valley

The drainage system within the Palen-McCoy wash is likely in a state of equilibrium as described by Bull (1979). In addition, the drainages have likely been in equilibrium throughout most of the Holocene. As proposed by Bull (1979) a state of stream equilibrium indicates that the available stream power is sufficient but does not exceed the ability to move the available sediment load. During a state of equilibrium most of the stream energy will be utilized to move the available sediment and thus, nearly no net aggredation or erosion will take place along most of the stream profile. This appears to be the case at the Project site because late Pleistocence soil profiles exist within just 1 foot of the surface in the central portion of the site as discussed earlier. The identification of buried late Pleistocene soil horizons during the field reconnaissance is critical because it rules out the possibility of deep incision by the local drainages since the late Pleistocene. Recent work in the Coachella Fan located in the eastern Coachella Valley found remarkably similar equilibrium conditions of the fan drainages during the Holocene (Petra, 2007).

Potential Flooding Behavior of the Palen-McCoy Valley

The recurrence interval of floods leaving the valley axial deposits is not known. Floods reaching Ford Dry Lake and filling the lakebed are reported to occur about once every 20 years. If each of these beds represents 20 years of accumulation, they would be indicative of deposition rates of 0.5m/1,000 years in the downslope portions of the site. Deposition rates may be up to 10 times that in the upslope portions of the site; however, these areas are closer to the fan intersection points and the locus of deposition would be more likely to change from one flood event to the next, so the deposition rates are probably less. It is important to note that while these deposits appear to be relatively young, their thickness may be very limited across the site, and the existing data suggest that the valley axis alluvium is being actively transported and reworked rather than aggrading.

Evidence of competing wind erosion, including lag deposits and small mounds next to bushes were also noted; however, the dominant processes appear to be alluvial. The prevalence of aeolian processes increases in the area of younger mixed alluvial and aeolian deposits south the site and underlying most of the off-site linear alignment.

CONCLUSIONS AND SUMMARY OF RESULTS

The general geomorphology of the Chuckwalla Valley is reasonably well understood in terms of Quaternary erosion and depositional processes of the alluvial fans, drainages, and playa basins. The area exhibits typical Mojave Desert (BRGP) landforms and geomorphic processes. Sheet flow is the dominant active geomorphic process in the relatively low relief area of the proposed solar power plant. Channel designs for the sheet flow could allow for current drainage bed load to be transported past the proposed solar power plant facility to at least natural distances down slope if not further down slope than occurs in the current natural system. This type of design would not decrease the potential sand source from the Palen-McCoy outwash sediments deposited south of the proposed solar power plant. The amount of sand source material contributed by flow through the Palen-McCoy valley axial drainage is not yet evaluated. Additional site specific work will be conducted to evaluate activity level, sand sources and general geomorphology of the Ford Dry Lake dune field near the Project linears design footprint and will be presented in a report to be issued mid to late January 2010. Regional and local evidence suggest that the Ford Dry Lake sand dune field is no longer growing and is dominated by non-active coppice and dune sheet deposits. In addition, regional evidence for non-active dune systems in the Mojave Desert indicate that in-active dune fields (not acquiring additional sediments to allow for dune growth) can appear active due to variable winds shifting existing sand within the dune fields.

Yours truly,

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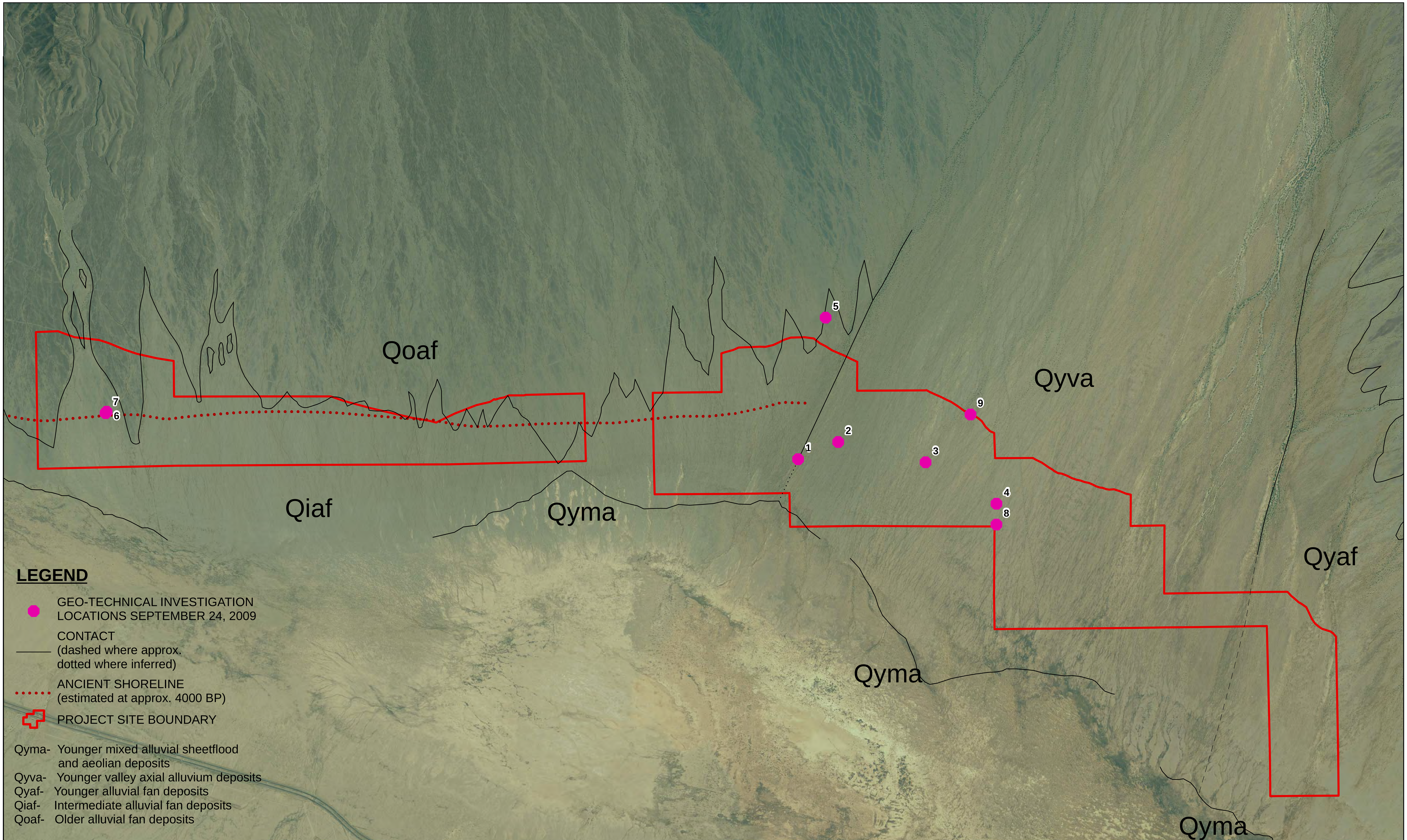

CASIL USDA NAIP DOQQ Imagery
Geographic Information System Website
Scale 1:24,000 at original print size 28" x 22"
All locations approximate

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1" = 2,000 Feet

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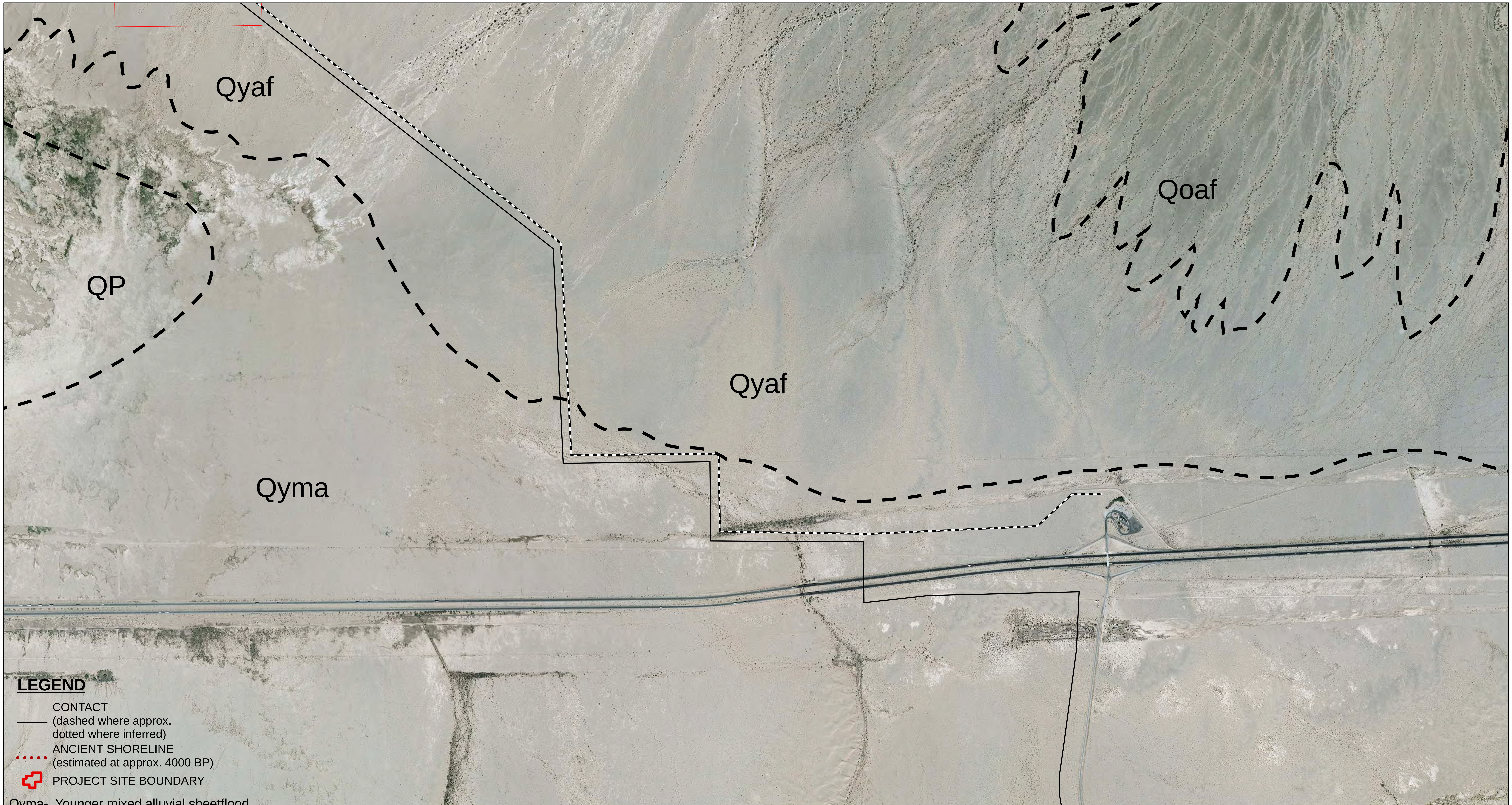
SWL	MT	9/2009

SITE GEOLOGIC MAP AND GEO-
MORPHIC RECONAISSANCE LOCATIONS

52004617	1



LEGEND

CONTACT (dashed where approx. dotted where inferred)

ANCIENT SHORELINE (estimated at approx. 4000 BP)

PROJECT SITE BOUNDARY

Qyma- Younger mixed alluvial sheetflood and aeolian deposits
Qyva- Younger valley axial alluvium deposits
Qyaf- Younger alluvial fan deposits
Qiaf- Intermediate alluvial fan deposits
Qoaf- Older alluvial fan deposits
Qp- Holocene playa lake deposits

SOURCE:
RIVERSIDE COUNTY TLMA
Scale 1:12,000 at original print size 28" x 22"
All locations approximate

N W E S

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1" = 1,000 Feet

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SITE GEOLOGIC MAP FOR OFF-SITE LINEARS

SWL	MT	10/2009
52004617	2	

Reconnaissance Locations			
Site #			
1	2190113.69 N	6935999.68 E	NAD 1983
2	2190782.08 N	6937553.76 E	NAD 1983
3	2189994.67 N	6940944.04 E	NAD 1983
4	2188383.95 N	6943688.73 E	NAD 1983
5	2195599.38 N	6937067.81 E	NAD 1983
6	2191951.5 N	6909190.86 E	NAD 1983
7	2191901.5 N	6909154.5 E	NAD 1983
8	2187580.6 N	6943684.8 E	NAD 1983
9	2191848.8 N	6942679.7 E	NAD 1983

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2330 E. Bidwell Street, Suite 150

Folsom, CA 95630

PROJECT NAME:	**Genesis**
PROJECT NO.:	**52004617**
DATE:	**7/30/2009**

WORLEYPARSONS KOMEX PERSONNEL ON-SITE:	CONTRACTOR(S) ON-SITE:	
Mike Tietze	**Mark Carper**	Tetra Tech
Andie Gehlhausen	**Christina Sichley**	Roming Engineers
	Derrick Coleman	Tetra Tech

GENERAL WORK DESCRIPTION: **Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**

Time	10:43 AM				
Location	**Site #1**				
	at 0' on transect	2190113.69 N	6935999.68 E	NAD 1983	
	at 100' on transect	2190063.25 N	6936082.16 E	NAD 1983	
	Orientation	307°			
	Approximate Elevation	366' MSL			
Vegetation:	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**	
	0	S	S	1	
	0	N	L	4	
	10	N	L	5	
	14		L	0	
	18		S	0	
	18	S	S	2	
	18	S	S	2	
	31	N	L	4	
	37	S	S	4	
	57		S	0	
	100	S	S	1	
	Total Bushes:		**11**		
	Note: Vegetation was counted within 5' of either side of the transect.Small = 1-2' diameter, Medium= 2-4' diameter, Large >4' diameter				
	Summary: Creosote and bursage. Slight mounding under some bushes less than 1 foot.				
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**	
	100'	0		0%	
	50'	1	angular flat granule-size	4%	
	0	0		0%	
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.				
	Summary: No desert pavement development. Young surface. No lag.				
Landforms	occasional sheet floods. Six small washes, 1-6' wide, less than 6" deep, with no bank formation. Slight mounding under some bushes (< 1 foot), suggesting aeolian deflation.				
Soil Description	Soil pit was excavated to approximately 1 foot. Laminated fine to coarse grained, well graded, silty sand with no evidence of carbonate or soil development				

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2330 E. Bidwell Street, Suite 150
Folsom, CA 95630

PROJECT NAME:	**Genesis**
PROJECT NO.:	**52004617**
DATE:	**7/30/2009**

WORLEYPARSONS KOMEX PERSONNEL ON-SITE:	CONTRACTOR(S) ON-SITE:	
Mike Tietze	**Mark Carper**	Tetra Tech
Andie Gehlhausen	**Christina Sichley**	Roming Engineers
	Derrick Coleman	Tetra Tech

GENERAL WORK DESCRIPTION: **Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**

Time				
Location	**Site #2**			
	at 0' on transect	2190782.08 N	6937553.76 E	NAD 1983
	at 100' on transect	2190838.18 N	6937472.28 E	NAD 1983
	Orientation			
	Approximate Elevation	372' MSL		
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	44	N	S	1
	50	S	L	5
	50	S	S	3
	70	N	L	1
	81	N	S	1
	97	N	M	1
	Total Bushes:		**6**	
	Note: Vegetation was counted within 5' of either side of the transect.Small = 1-2' diameter, Medium= 2-4' diameter, Large >4' diameter			
	Summary: Creosote and bursage			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	0	Abundant granule size lag	0%
	50'	1	Granule to small gravel, flat, subrounded lag deposits	4%
	0	0		0%
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.			
	Summary: No desert pavement development. Young surface, slightly deflated with some aeolian lag deposits.			
Landforms	Subdued bar and swale topography with no washes observed. Some mounding up to 6 inches around bushes suggesting aeolian deflation.			
Soil Description	Soil pit excavated to approximately 1 foot. Laminated fine to coarse grained, well graded, silty sand with no evidence of carbonate or soil development. Silt laminations approximately 1 cm apart and appear to represent silt crusts from individual sheet floods. No evidence of carbonate accumulation or soil development.			
Notes	More gravel lag at this location than Site 1.			

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2330 E. Bidwell Street, Suite 150			PROJECT NAME:	**Genesis**
Folsom, CA 95630			PROJECT NO.:	**52004617**
			DATE:	**7/30/2009**
WORLEYPARSONS KOMEX PERSONNEL ON-SITE:			CONTRACTOR(S) ON-SITE:	
Mike Tietze			**Mark Carper**	Tetra Tech
Andie Gehlhausen			**Christina Sichley**	Roming Engineers
			Derrick Coleman	Tetra Tech
GENERAL WORK DESCRIPTION:		**Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**		
Time				
Location	**Site #3**			
	at 0' on transect	2189994.67 N	6940944.04 E	NAD 1983
	at 100' on transect	2190053.38 N	6940862.63 E	NAD 1983
	Orientation			
	Approximate Elevation	374' MSL		
Vegetation:	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	17		L	0
	25	N	L	1
	26	S	M	1
	36	S	S	4
	36	N	M	1
	83	S	M	1
	84	N	L	1
	96		S	0
	Total Bushes:		**8**	
	Note: Vegetation was counted within 5' of either side of the transect.Small = 1-2' diameter, Medium= 2-4' diameter, Large >4' diameter			
	Summary: Creosote and bursage			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	0	Estimated 50% coarse sand to fine gravel lag	0%
	50'	2		8%
	0	0		0%
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.			
	Summary: No desert pavement development. Young surface, slightly deflated with local aeolian lag deposits.			
Landforms	Subdued bar and swale topography with one faint wash approximately 5 feet wide and 3 inches deep with no bank development. Some mounding around 6 inches around bushes, suggesting aeolian deflation.			
Soil Description	Soil pits to approxiamtely 1 foot. Laminated fine to coarse grained, well graded, silty sand with no evidence of carbonate or soil development. Silt laminations approximately 1 cm apart separating fining upward sequences or ripple cross laminated sets.			
Notes				

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PROJECT NAME:	**Genesis**
PROJECT NO.:	**52004617**
DATE:	**7/30/2009**

WORLEYPARSONS KOMEX PERSONNEL ON-SITE:		CONTRACTOR(S) ON-SITE:	
Mike Tietze		**Mark Carper**	Tetra Tech
Andie Gehlhausen		**Christina Sichley**	Roming Engineers
		Derrick Coleman	Tetra Tech
GENERAL WORK DESCRIPTION:	**Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**		

Time	1:32 PM			
Location				
	at 0' on transect	2188383.95 N	6943688.73 E	NAD 1983
	at 100' on transect	2188346.69 N	6943774.65 E	NAD 1983
	Orientation			
	Approximate Elevation	374' MSL		
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	5	N	M	1
	39	S	S	5
	65	N	L	1
	73		L	0
	Total Bushes:		**4**	
	Note: Vegetation was counted within 5' of either side of the transect.Small = 1-2' diameter, Medium= 2-4' diameter, Large >4' diameter			
	Summary: Creosote and bursage.			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	4	Fine to medium gravel	16%
	50'	1	Fine gravel, subrounded to angular	4%
	0	0		0%
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.			
	Summary: No desert pavement development. Young surface, slightly deflated with local aeolian lag deposits.			
Landforms	Subdued bar and swale topography with no washes observed. Some mounding around 6 inches around bushes, suggesting aeolian deflation.			
Soil Description	Soil pits to approxiamtely 1 foot. Laminated fine to coarse grained, well graded, silty sand with no evidence of carbonate or soil development. Silt laminations approximately 1 to 2 cm apart separating fining upward sequences or ripple cross laminated sets.			
Notes				

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Folsom, CA 95630

PROJECT NAME:	**Genesis**
PROJECT NO.:	**52004617**
DATE:	**7/30/2009**

WORLEYPARSONS KOMEX PERSONNEL ON-SITE:	CONTRACTOR(S) ON-SITE:	
Mike Tietze	**Mark Carper**	Tetra Tech
Andie Gehlhausen	**Christina Sichley**	Roming Engineers
	Derrick Coleman	Tetra Tech

GENERAL WORK DESCRIPTION: **Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**

Time	3:50 PM			
Location	**Site #5**			
	at 0' on transect	2195599.38 N	6937067.81 E	NAD 1983
	at 100' on transect	2195577.13 N	6937166.39 E	NAD 1983
	Orientation	295°		
	Approximate Elevation			
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	6	N	S	1
	18	N	L	1
	47	S	S	2
	55	N	S	1
	60	S	S	3
	62	S	S	3
	69	N	S	3
	71		S	0
	73	S	M	5
	81	N	S	3
	87		S	0
	92	S	S	5
	Total Bushes:		**12**	
	Note: Vegetation was counted within 5' of either side of the transect.Small = 1-2' diameter, Medium= 2-4' diameter, Large >4' diameter			
	Summary: Creosote and bursage.			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	12	Fine to coarse gravel	48%
	50'	3	Fine to coarse gravel	12%
	0	6	Fine gravel, soft matrix	24%
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.			
	Summary: Possible incipient desert pavement development consisting of granule to medium, subangular gravel with no desert varnish development.			
Landforms	Generally level, very subdued bar and swale topography, two washes 2-3' wide, 2 to 4" deep. Mounds about 4 " to 6" around some bushes, suggesting evidence of deflation.			
Soil Description	Soil pits to approxiamtely 1 foot. Gravelly silty sand and silty sand with gravel, fine to medium grained subangular to subrounded gravel. Clast supported, faint stratification, two strata approximately 4" thick. Upper stratum has faint cross bedding inclined at approximately 15 degrees. Lower stratum is massive. No evidence of carbonate accumulation or soil development.			
Notes				

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PROJECT NAME:	**Genesis**
PROJECT NO.:	**52004617**
DATE:	**9/23/2009**

WORLEYPARSONS KOMEX PERSONNEL ON-SITE:			CONTRACTOR(S) ON-SITE:	
Mike Tietze			**Kurt Lambert**	Tetra Tech
Andie Gehlhausen				
GENERAL WORK DESCRIPTION:		**Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**		

Time	8:30 AM			
Location	**Site #2**			
	at 0' on transect	2191951.5 N	6909190.86 E	NAD 1983
	at 100' on transect	2191876.34 N	6909261.42 E	NAD 1983
	Orientation			
	Approximate Elevation	392' MSL		
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	No brush within 5 feet of transect line.			
	Summary: Vegetation very sparse on this surface..			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	21	Fine to medium grained, angular, with well developed desert varnish.	84%
	50'	25		100%
	0	24		96%
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.			
	Summary: Well developed desert pavement with 85 to 100 percent stone cover, underlying soft, silty vessicular horizon, and well developed desert varnish on clasts.			
Landforms	Level surface with subdued bar and swale topography, contiguous with surfaces extending downslope from mid and upper fan. Surfaces are separated by washes that are moderately developed, up to 10 feet wide and 1 foot deep.			
Soil Description	One soil pit excavated to approximately 1 foot depth.			
	0-0.2'= sandy silt, light brown, blocky, soft, vesicular texture, few off white carbonate films			
	0.2-0.5' = silty sand with 30%- fine gravel. Possible cross bedding			
	0.5-1.0 silty sand with gravel 30%+, fine to medium gravel. Vague stratification.			
Notes	Transect upslope of a linear change heading 125-140°. North side coarser grained desert pavement with more desert varnish, south side finer grained desert pavement, lighter color, somewhat smoother topography. Carbonate films and vessicular horizon indicative of soil development. Linear change is not traceable for more than a few hundred feet along trend.			

2330 E. Bidwell Street, Suite 150			PROJECT NAME:	**Genesis**
Folsom, CA 95630			PROJECT NO.:	**52004617**
			DATE:	**9/23/2009**
WORLEYPARSONS KOMEX PERSONNEL ON-SITE:			CONTRACTOR(S) ON-SITE:	
Mike Tietze			**Kurt Lambert**	Tetra Tech
Andie Gehlhausen				
GENERAL WORK DESCRIPTION:		**Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**		
Time	appx 9:30 AM			
Location	**Site #2**			
	at 0' on transect	2191901.5 N	6909154.5E	NAD 1983
	at 100' on transect	2191826.7 N	6909222.94E	NAD 1983
	Orientation	147°		
	Approximate Elevation	392' MSL		
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	No brush within 5 feet of transect line.			
	Summary: Vegetation very sparse on this surface, limited to patches of grassy, dry material near transect.			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	25	Small to medium grained subangular to angualar clasts.	100%
	50'	20	More abundant medium grained clasts.	80%
	0	25	More abundant fine grained clasts.	100%
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.			
	Summary: Well developed desert pavement with 80 to 100 percent stone cover, underlying soft, silty vessicular horizon, and well developed desert varnish on clasts.			
Landforms	Level surface with faint bar and swale topography, contiguous with surfaces extending downslope from mid and upper fan. Surfaces are separated by washes that are slightly to moderately developed, up to 5 to 10 feet wide and 0.5 to 1 foot deep.			
Soil Description	One soil pit at 0' at the west end transect.			
	Depth (feet BGS)	**Description**		
	0-0.1 '	Desert pavement, silt with sand, vesicular, light brown		
	0.1-0.4'	gravelly sand, fine to coarse sand + gravel w/silt, loose light gray brown		
	0.4-0.6'	light reddish brown, fine to coarse as above but with more silt, some carbonate film		
	0.6-1.1	light grey brown, sandygravel with silt, fine to coarse		
Notes	Transect downslope of a linear change heading 125-140°. North side coarser grained desert pavement with more desert varnish, south side finer grained desert pavement, lighter color, somewhat smoother topography. Carbonate films, color change and vessicular horizon indicative of soil development. Linear change is not traceable for more than a few hundred feet along trend.			

2330 E. Bidwell Street, Suite 150			PROJECT NAME:	**Genesis**
Folsom, CA 95630			PROJECT NO.:	**52004617**
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WORLEYPARSONS KOMEX PERSONNEL ON-SITE:			CONTRACTOR(S) ON-SITE:	
Mike Tietze			**Kurt Lambert**	Tetra Tech
Andie Gehlhausen				
GENERAL WORK DESCRIPTION:		**Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**		
Time	12:50 PM			
Location	**Site #2**			
	at 0' on transect	2187580.6 N	6943684.8 E	NAD 1983
	at 100' on transect	no transect- just a	single pit location.	NAD 1983
	Orientation			
	Approximate Elevation	369' MSL		
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	No vegetation counts taken.			
	Summary: Small to large creosote and bursage bushes present, also patches of dry grassy vegetation			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	
	No pebble counts taken this location			
	Summary: No desert pavement development. Young surface, slightly deflated with local aeolian lag deposits.			
Landforms	Subdued bar and swale topography with no washes observed. Some mounding around 6 inches around bushes, suggesting aeolian deflation.			
Soil Description	One soil pit excavated.			
	Depth (feet BGS)	**Description**		
	0-1.4 '	Fine to medium grained silty sand, trace gravel, 7.5 YR 7/2, loose,		
		vague laminations at 2 to 4 mm spacing, possible low angle cross-bedded		
		sets 1 to 2" thick.		
	1.4-3'	Fine grained silty sand, 10 YR 6/3, trace to few carbonate films, dense		
Notes	Appears to be a buried soil with eatrly stage carbonate (Bk) horizon development, covered by recent			
	alluvial sand deposits that are being transported across this surface.			

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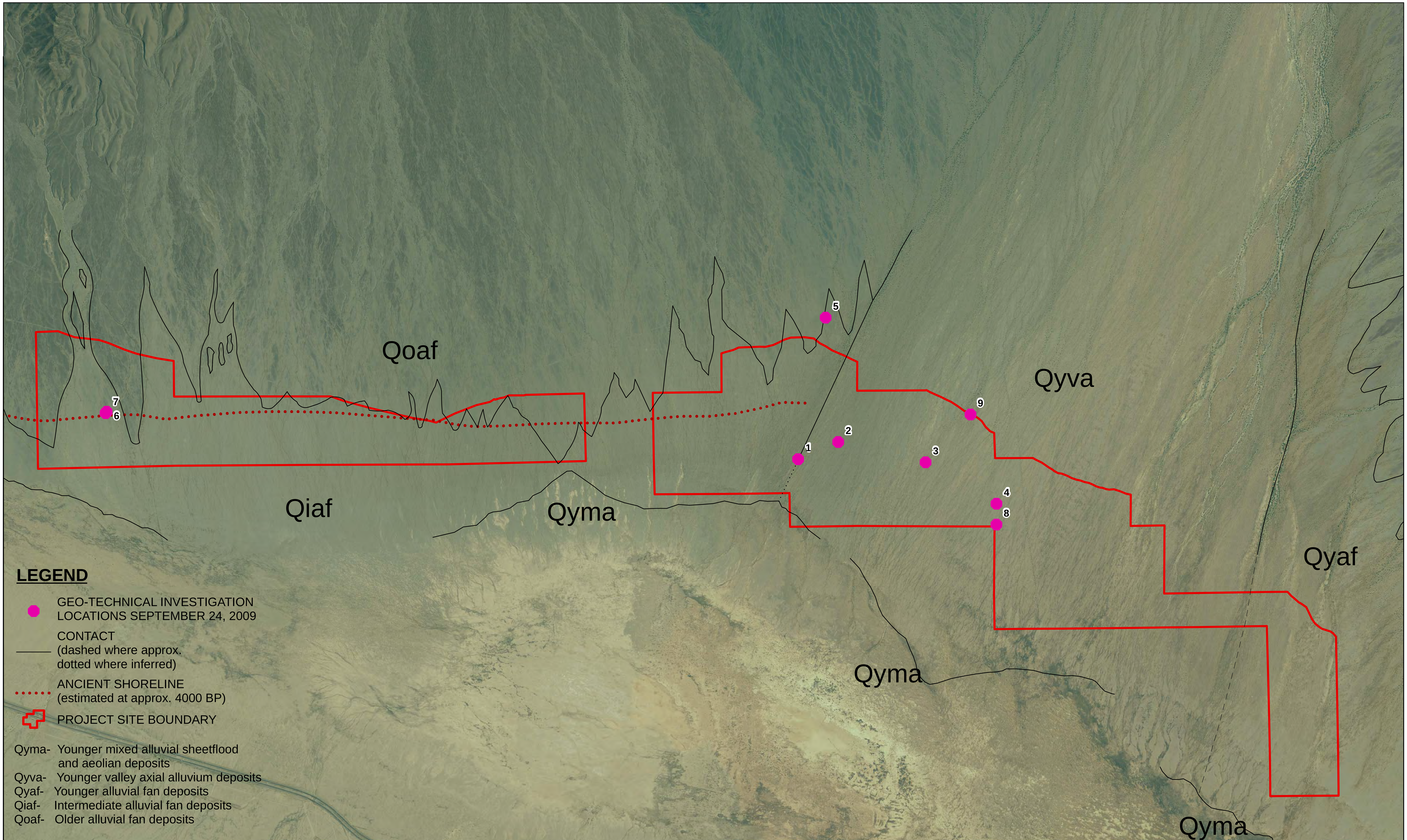
WORLEYPARSONS KOMEX PERSONNEL ON-SITE:			CONTRACTOR(S) ON-SITE:	
Mike Tietze			**Kurt Lambert**	Tetra Tech
Andie Gehlhausen				
GENERAL WORK DESCRIPTION:		**Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**		
Time				
Location	**Site #2**			
	at 0' on transect	2191848.8 N	6942679.7 E	NAD 1983
	at 100' on transect	no transect- just a	single pit location.	NAD 1983
	Orientation			
	Approximate Elevation	382' MSL		
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	No vegetation counts taken.			
	Summary: Small to large creosote and bursage bushes present. Pit located near isolated Palo Verde tree			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	
	No pebble counts taken this location			
	Summary: No desert pavement development. Young surface, slightly deflated with local aeolian lag deposits.			
Landforms	Subdued bar and swale topography but better developed than Location #8. Pit located next wash approximately 10 feet wide and 0.5 to 1 foot deep. No bank development.			
Soil Description	**Depth (feet BGS)**	**Description**		
	0-0.3'	silty sand, fine to coarse grained, trace fine gravel, 2.5YR 7/3, loose;		
		horizontal silt laminations 1-10mm apart interspresed with cross bedded sands.		
	0.3-0.5'	as above, but with 30% granules, med dense. Cross bedded		
	0.5-0.9'	Sandy gravel with silt, fine to medium grained subangular gravel, 2.5YR 7/2		
		med dense		
	0.9-1.4'	silty sand with gravel, fine to coarse sand, subangular fine gravel, 10YR 6/3		
		very dense, trace carbonate films		
	1.4-1.8'	as above, but granular soil structrure, few carbonate films, 10YR 6/4		
	1.8'	as above, but 40% fine to med gravel, 5% clay		
Notes	Appears to be a buried soil with eatrly stage carbonate (Bk) and clay (Bt) horizon development			
	covered alluvial sand and gravel deposits that are being transported across this surface.			



CASIL USDA NAIP DOQQ Imagery
Geographic Information System Website
Scale 1:24,000 at original print size 28" x 22"
All locations approximate

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1" = 2,000 Feet

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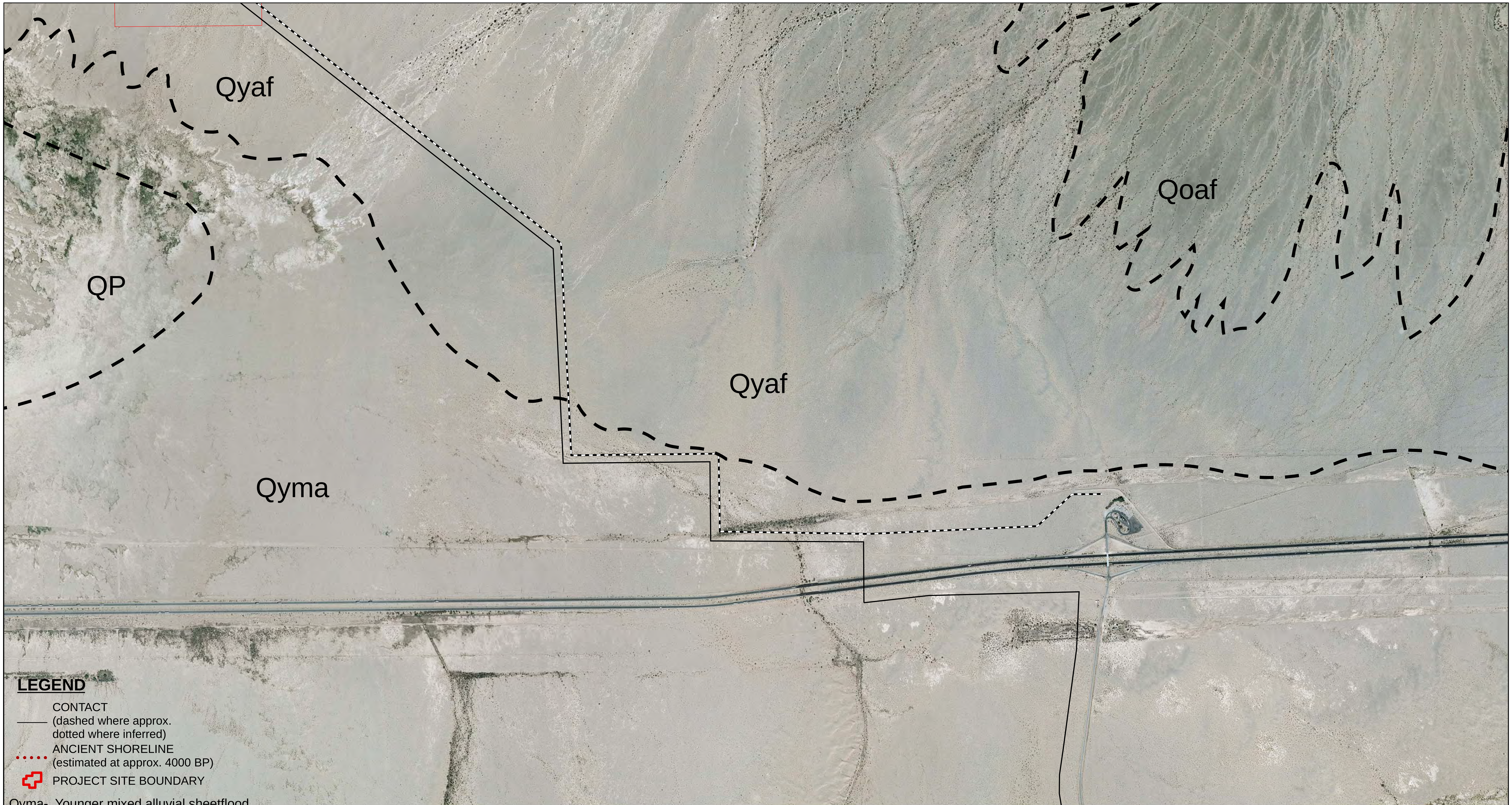
resources & energy

SITE GEOLOGIC MAP AND GEO-MORPHIC RECONAISSANCE LOCATIONS

SWL	MT	9/2009
52004617	1	



LEGEND

CONTACT (dashed where approx. dotted where inferred)

ANCIENT SHORELINE (estimated at approx. 4000 BP)

PROJECT SITE BOUNDARY

Qyma- Younger mixed alluvial sheetflood and aeolian deposits
Qyva- Younger valley axial alluvium deposits
Qyaf- Younger alluvial fan deposits
Qiaf- Intermediate alluvial fan deposits
Qoaf- Older alluvial fan deposits
Qp- Holocene playa lake deposits

SOURCE:
RIVERSIDE COUNTY TLMA
Scale 1:12,000 at original print size 28" x 22"
All locations approximate

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SITE GEOLOGIC MAP FOR OFF-SITE LINEARS

SWL	MT	10/2009
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PROJECT NAME:	**Genesis**
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WORLEYPARSONS KOMEX PERSONNEL ON-SITE:	CONTRACTOR(S) ON-SITE:		
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	Derrick Coleman	Tetra Tech	
GENERAL WORK DESCRIPTION:	**Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**		

Time	10:43 AM			
Location	**Site #1**			
	at 0' on transect	2190113.69 N	6935999.68 E	NAD 1983
	at 100' on transect	2190063.25 N	6936082.16 E	NAD 1983
	Orientation	307°		
	Approximate Elevation	366' MSL		

Vegetation:	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	0	S	S	1
	0	N	L	4
	10	N	L	5
	14		L	0
	18		S	0
	18	S	S	2
	18	S	S	2
	31	N	L	4
	37	S	S	4
	57		S	0
	100	S	S	1
	Total Bushes:		**11**	

Note: Vegetation was counted within 5' of either side of the transect.Small = 1-2' diameter, Medium= 2-4' diameter, Large >4' diameter

Summary: Creosote and bursage. Slight mounding under some bushes less than 1 foot.

Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	0		0%
	50'	1	angular flat granule-size	4%
	0	0		0%

Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.

Summary: No desert pavement development. Young surface. No lag.

Landforms

occasional sheet floods. Six small washes, 1-6' wide, less than 6" deep, with no bank formation. Slight mounding under some bushes (< 1 foot), suggesting aeolian deflation.

Soil Description

Soil pit was excavated to approximately 1 foot. Laminated fine to coarse grained, well graded, silty sand with no evidence of carbonate or soil development

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2330 E. Bidwell Street, Suite 150
Folsom, CA 95630

PROJECT NAME:	Genesis		
PROJECT NO.:	52004617		
DATE:	7/30/2009		

WORLEYPARSONS KOMEX PERSONNEL ON-SITE:	CONTRACTOR(S) ON-SITE:	
Mike Tietze	**Mark Carper**	Tetra Tech
Andie Gehlhausen	**Christina Sichley**	Roming Engineers
	Derrick Coleman	Tetra Tech

GENERAL WORK DESCRIPTION: **Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**

Time				
Location	**Site #2**			
	at 0' on transect	2190782.08 N	6937553.76 E	NAD 1983
	at 100' on transect	2190838.18 N	6937472.28 E	NAD 1983
	Orientation			
	Approximate Elevation	372' MSL		
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	44	N	S	1
	50	S	L	5
	50	S	S	3
	70	N	L	1
	81	N	S	1
	97	N	M	1
	Total Bushes:		**6**	
	Note: Vegetation was counted within 5' of either side of the transect.Small = 1-2' diameter, Medium= 2-4' diameter, Large >4' diameter			
	Summary: Creosote and bursage			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	0	Abundant granule size lag	0%
	50'	1	Granule to small gravel, flat, subrounded lag deposits	4%
	0	0		0%
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.			
	Summary: No desert pavement development. Young surface, slightly deflated with some aeolian lag deposits.			
Landforms	Subdued bar and swale topography with no washes observed. Some mounding up to 6 inches around bushes suggesting aeolian deflation.			
Soil Description	Soil pit excavated to approximately 1 foot. Laminated fine to coarse grained, well graded, silty sand with no evidence of carbonate or soil development. Silt laminations approximately 1 cm apart and appear to represent silt crusts from individual sheet floods. No evidence of carbonate accumulation or soil development.			
Notes	More gravel lag at this location than Site 1.			

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2330 E. Bidwell Street, Suite 150			PROJECT NAME:	**Genesis**
Folsom, CA 95630			PROJECT NO.:	**52004617**
			DATE:	**7/30/2009**
WORLEYPARSONS KOMEX PERSONNEL ON-SITE:			CONTRACTOR(S) ON-SITE:	
Mike Tietze			**Mark Carper**	Tetra Tech
Andie Gehlhausen			**Christina Sichley**	Roming Engineers
			Derrick Coleman	Tetra Tech
GENERAL WORK DESCRIPTION:		**Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**		
Time				
Location	**Site #3**			
	at 0' on transect	2189994.67 N	6940944.04 E	NAD 1983
	at 100' on transect	2190053.38 N	6940862.63 E	NAD 1983
	Orientation			
	Approximate Elevation	374' MSL		
Vegetation:	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	17		L	0
	25	N	L	1
	26	S	M	1
	36	S	S	4
	36	N	M	1
	83	S	M	1
	84	N	L	1
	96		S	0
	Total Bushes:		**8**	
	Note: Vegetation was counted within 5' of either side of the transect.Small = 1-2' diameter, Medium= 2-4' diameter, Large >4' diameter			
	Summary: Creosote and bursage			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	0	Estimated 50% coarse sand to fine gravel lag	0%
	50'	2		8%
	0	0		0%
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.			
	Summary: No desert pavement development. Young surface, slightly deflated with local aeolian lag deposits.			
Landforms	Subdued bar and swale topography with one faint wash approximately 5 feet wide and 3 inches deep with no bank development. Some mounding around 6 inches around bushes, suggesting aeolian deflation.			
Soil Description	Soil pits to approxiamtely 1 foot. Laminated fine to coarse grained, well graded, silty sand with no evidence of carbonate or soil development. Silt laminations approximately 1 cm apart separating fining upward sequences or ripple cross laminated sets.			
Notes				

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Folsom, CA 95630

PROJECT NAME:	**Genesis**
PROJECT NO.:	**52004617**
DATE:	**7/30/2009**

WORLEYPARSONS KOMEX PERSONNEL ON-SITE:			CONTRACTOR(S) ON-SITE:	
Mike Tietze			**Mark Carper**	Tetra Tech
Andie Gehlhausen			**Christina Sichley**	Roming Engineers
			Derrick Coleman	Tetra Tech
GENERAL WORK DESCRIPTION:		**Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**		

Time	1:32 PM			
Location				
	at 0' on transect	2188383.95 N	6943688.73 E	NAD 1983
	at 100' on transect	2188346.69 N	6943774.65 E	NAD 1983
	Orientation			
	Approximate Elevation	374' MSL		
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	5	N	M	1
	39	S	S	5
	65	N	L	1
	73		L	0
	Total Bushes:		**4**	
	Note: Vegetation was counted within 5' of either side of the transect.Small = 1-2' diameter, Medium= 2-4' diameter, Large >4' diameter			
	Summary: Creosote and bursage.			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	4	Fine to medium gravel	16%
	50'	1	Fine gravel, subrounded to angular	4%
	0	0		0%
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.			
	Summary: No desert pavement development. Young surface, slightly deflated with local aeolian lag deposits.			
Landforms	Subdued bar and swale topography with no washes observed. Some mounding around 6 inches around bushes, suggesting aeolian deflation.			
Soil Description	Soil pits to approxiamtely 1 foot. Laminated fine to coarse grained, well graded, silty sand with no evidence of carbonate or soil development. Silt laminations approximately 1 to 2 cm apart separating fining upward sequences or ripple cross laminated sets.			
Notes				

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Folsom, CA 95630

PROJECT NAME:	**Genesis**
PROJECT NO.:	**52004617**
DATE:	**7/30/2009**

WORLEYPARSONS KOMEX PERSONNEL ON-SITE:	CONTRACTOR(S) ON-SITE:	
Mike Tietze	**Mark Carper**	Tetra Tech
Andie Gehlhausen	**Christina Sichley**	Roming Engineers
	Derrick Coleman	Tetra Tech

GENERAL WORK DESCRIPTION: **Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**

Time	3:50 PM			
Location	**Site #5**			
	at 0' on transect	2195599.38 N	6937067.81 E	NAD 1983
	at 100' on transect	2195577.13 N	6937166.39 E	NAD 1983
	Orientation	295°		
	Approximate Elevation			
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	6	N	S	1
	18	N	L	1
	47	S	S	2
	55	N	S	1
	60	S	S	3
	62	S	S	3
	69	N	S	3
	71		S	0
	73	S	M	5
	81	N	S	3
	87		S	0
	92	S	S	5
	Total Bushes:		**12**	
	Note: Vegetation was counted within 5' of either side of the transect.Small = 1-2' diameter, Medium= 2-4' diameter, Large >4' diameter			
	Summary: Creosote and bursage.			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	12	Fine to coarse gravel	48%
	50'	3	Fine to coarse gravel	12%
	0	6	Fine gravel, soft matrix	24%
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.			
	Summary: Possible incipient desert pavement development consisting of granule to medium, subangular gravel with no desert varnish development.			
Landforms	Generally level, very subdued bar and swale topography, two washes 2-3' wide, 2 to 4" deep. Mounds about 4 " to 6" around some bushes, suggesting evidence of deflation.			
Soil Description	Soil pits to approxiamtely 1 foot. Gravelly silty sand and silty sand with gravel, fine to medium grained subangular to subrounded gravel. Clast supported, faint stratification, two strata approximately 4" thick. Upper stratum has faint cross bedding inclined at approximately 15 degrees. Lower stratum is massive. No evidence of carbonate accumulation or soil development.			
Notes				

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2330 E. Bidwell Street, Suite 150			PROJECT NAME:	**Genesis**
Folsom, CA 95630			PROJECT NO.:	**52004617**
			DATE:	**9/23/2009**
WORLEYPARSONS KOMEX PERSONNEL ON-SITE:			CONTRACTOR(S) ON-SITE:	
Mike Tietze			**Kurt Lambert**	Tetra Tech
Andie Gehlhausen				
GENERAL WORK DESCRIPTION:		**Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**		
Time	8:30 AM			
Location	**Site #2**			
	at 0' on transect	2191951.5 N	6909190.86 E	NAD 1983
	at 100' on transect	2191876.34 N	6909261.42 E	NAD 1983
	Orientation			
	Approximate Elevation	392' MSL		
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	No brush within 5 feet of transect line.			
	Summary: Vegetation very sparse on this surface..			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	21	Fine to medium grained, angular, with well developed desert varnish.	84%
	50'	25		100%
	0	24		96%
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.			
	Summary: Well developed desert pavement with 85 to 100 percent stone cover, underlying soft, silty vessicular horizon, and well developed desert varnish on clasts.			
Landforms	Level surface with subdued bar and swale topography, contiguous with surfaces extending downslope from mid and upper fan. Surfaces are separated by washes that are moderately developed, up to 10 feet wide and 1 foot deep.			
Soil Description	One soil pit excavated to approximately 1 foot depth.			
	0-0.2'= sandy silt, light brown, blocky, soft, vesicular texture, few off white carbonate films			
	0.2-0.5' = silty sand with 30%- fine gravel. Possible cross bedding			
	0.5-1.0 silty sand with gravel 30%+, fine to medium gravel. Vague stratification.			
Notes	Transect upslope of a linear change heading 125-140°. North side coarser grained desert pavement with more desert varnish, south side finer grained desert pavement, lighter color, somewhat smoother topography. Carbonate films and vessicular horizon indicative of soil development. Linear change is not traceable for more than a few hundred feet along trend.			

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Folsom, CA 95630

PROJECT NAME:	**Genesis**
PROJECT NO.:	**52004617**
DATE:	**9/23/2009**

WORLEYPARSONS KOMEX PERSONNEL ON-SITE:	CONTRACTOR(S) ON-SITE:	
Mike Tietze	**Kurt Lambert**	Tetra Tech
Andie Gehlhausen		

GENERAL WORK DESCRIPTION: **Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**

Time	appx 9:30 AM			
Location	**Site #2**			
	at 0' on transect	2191901.5 N	6909154.5E	NAD 1983
	at 100' on transect	2191826.7 N	6909222.94E	NAD 1983
	Orientation	147°		
	Approximate Elevation	392' MSL		
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	No brush within 5 feet of transect line.			
	Summary: Vegetation very sparse on this surface, limited to patches of grassy, dry material near transect.			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	**Percent Pebble Cover:**
	100'	25	Small to medium grained subangular to angualar clasts.	100%
	50'	20	More abundant medium grained clasts.	80%
	0	25	More abundant fine grained clasts.	100%
	Note: Counting grid is 3' by 3' with 25 nodes. Pebbles counted are fine gravel and greater size.			
	Summary: Well developed desert pavement with 80 to 100 percent stone cover, underlying soft, silty vessicular horizon, and well developed desert varnish on clasts.			
Landforms	Level surface with faint bar and swale topography, contiguous with surfaces extending downslope from mid and upper fan. Surfaces are separated by washes that are slightly to moderately developed, up to 5 to 10 feet wide and 0.5 to 1 foot deep.			
Soil Description	One soil pit at 0' at the west end transect.			
	Depth (feet BGS)	**Description**		
	0-0.1 '	Desert pavement, silt with sand, vesicular, light brown		
	0.1-0.4'	gravelly sand, fine to coarse sand + gravel w/silt, loose light gray brown		
	0.4-0.6'	light reddish brown, fine to coarse as above but with more silt, some carbonate film		
	0.6-1.1	light grey brown, sandygravel with silt, fine to coarse		
Notes	Transect downslope of a linear change heading 125-140°. North side coarser grained desert pavement with more desert varnish, south side finer grained desert pavement, lighter color, somewhat smoother topography. Carbonate films, color change and vessicular horizon indicative of soil development. Linear change is not traceable for more than a few hundred feet along trend.			

2330 E. Bidwell Street, Suite 150			PROJECT NAME:	**Genesis**
Folsom, CA 95630			PROJECT NO.:	**52004617**
			DATE:	**9/23/2009**
WORLEYPARSONS KOMEX PERSONNEL ON-SITE:			CONTRACTOR(S) ON-SITE:	
Mike Tietze			**Kurt Lambert**	Tetra Tech
Andie Gehlhausen				
GENERAL WORK DESCRIPTION:		**Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**		
Time	12:50 PM			
Location	**Site #2**			
	at 0' on transect	2187580.6 N	6943684.8 E	NAD 1983
	at 100' on transect	no transect- just a	single pit location.	NAD 1983
	Orientation			
	Approximate Elevation	369' MSL		
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	No vegetation counts taken.			
	Summary: Small to large creosote and bursage bushes present, also patches of dry grassy vegetation			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	
	No pebble counts taken this location			
	Summary: No desert pavement development. Young surface, slightly deflated with local aeolian lag deposits.			
Landforms	Subdued bar and swale topography with no washes observed. Some mounding around 6 inches around bushes, suggesting aeolian deflation.			
Soil Description	One soil pit excavated.			
	Depth (feet BGS)	**Description**		
	0-1.4 '	Fine to medium grained silty sand, trace gravel, 7.5 YR 7/2, loose,		
		vague laminations at 2 to 4 mm spacing, possible low angle cross-bedded		
		sets 1 to 2" thick.		
	1.4-3'	Fine grained silty sand, 10 YR 6/3, trace to few carbonate films, dense		
Notes	Appears to be a buried soil with eatrly stage carbonate (Bk) horizon development, covered by recent			
	alluvial sand deposits that are being transported across this surface.			

2330 E. Bidwell Street, Suite 150			PROJECT NAME:	**Genesis**
Folsom, CA 95630			PROJECT NO.:	**52004617**
			DATE:	**9/23/2009**
WORLEYPARSONS KOMEX PERSONNEL ON-SITE:			CONTRACTOR(S) ON-SITE:	
Mike Tietze			**Kurt Lambert**	Tetra Tech
Andie Gehlhausen				
GENERAL WORK DESCRIPTION:		**Geomorphic/Engineering Geologic Field Study at Ford Dry Lake**		
Time				
Location	**Site #2**			
	at 0' on transect	2191848.8 N	6942679.7 E	NAD 1983
	at 100' on transect	no transect- just a	single pit location.	NAD 1983
	Orientation			
	Approximate Elevation	382' MSL		
Vegetation	**Transect Tape Distance**	**North/ South**	**Small/ Medium/ Large**	**Feet off the Transect**
	No vegetation counts taken.			
	Summary: Small to large creosote and bursage bushes present. Pit located near isolated Palo Verde tree			
Surface Characteristics	**Location Along Transect**	**# of Pebbles**	**Description:**	
	No pebble counts taken this location			
	Summary: No desert pavement development. Young surface, slightly deflated with local aeolian lag deposits.			
Landforms	Subdued bar and swale topography but better developed than Location #8. Pit located next wash approximately 10 feet wide and 0.5 to 1 foot deep.			
Soil Description	**Depth (feet BGS)**	**Description**		
	0-0.3'	silty sand, fine to coarse grained, trace fine gravel, 2.5YR 7/3, loose;		
		horizontal silt laminations 1-10mm apart interspresed with cross bedded sands.		
	0.3-0.5'	as above, but with 30% granules, med dense. Cross bedded		
	0.5-0.9'	Sandy gravel with silt, fine to medium grained subangular gravel, 2.5YR 7/2		
		med dense		
	0.9-1.4'	silty sand with gravel, fine to coarse sand, subangular fine gravel, 10YR 6/3		
		very dense, trace carbonate films		
	1.4-1.8'	as above, but granular soil structrure, few carbonate films, 10YR 6/4		
	1.8'	as above, but 40% fine to med gravel, 5% clay		
Notes	Appears to be a buried soil with eatrly stage carbonate (Bk) and clay (Bt) horizon development			
	covered alluvial sand and gravel deposits that are being transported across this surface.			

Geology and Paleontology

Item 122:

Information Required:

Please provide a copy of the stratigraphic and paleontological resource inventory report that is referenced in Section 5.17, Paleontological Resources, of the AFC.

Response:

Field work by Paleontology Associates for the paleontology survey of the Genesis project site was done during the week of July 20, 2009. In the week prior to that, literature searches and museum surveys were conducted to identify published or recorded fossil bearing localities on and around the proposed site. Library and literature searches were conducted online and at the University of Oregon library at Eugene, OR. The state museum of Paleontology at Eugene maintains its own library of publications and those records as well as the museum files were reviewed.

During that week of July 13th, telephone calls were attempted to several museums in California. In addition the websites, if available, were visited. Museums where contact was attempted included: those in San Bernardino County, Los Angeles County Museum, Anza Borrego Museum, University of California at Riverside and the University of California Museum of Paleontology at Berkeley (UCMP). Of these museums and repositories, only UCMP responded formally with a finding of no known fossil localities in the Genesis project site vicinity. Other museums either did not have the records necessary or were not able to reply.

The director/curator of the University of California Riverside museum collection, Dr. Marilyn Kooser/Sadler happened to be visiting in Oregon during that week and was able to relate verbally that UCR did not maintain those kinds of comprehensive records.

The only hard-copy records of these search efforts is an email from Dr. Holroyd of UCMP to Dr. Orr of Paleontology Associates stating that their records showed no fossil sites in the Genesis vicinity. Because the UCMP data bank of fossil sites in California and the west coast is considered by the community to be the most comprehensive and accurate, along with the negative results of four days of field work on the site, Paleontology Associates has concluded no significant impact on fossil resources at the construction site. A separate paleontological inventory report was not prepared due to the lack of data.

Item 123:

Information Required:

Please provide a copy of the archival records search reports prepared by the San Bernardino County Museum, the Los Angeles County Natural History Museum, the University of California Museum of Paleontology (at Berkeley), the Geology Museum at the University of California at Riverside, and the Anza Borego Museum.

Response:

The following were contacted in the museum search. Copies of any records are shown at the end of this section.

Anza Borrego Museum, web site http://wwwanzaborregopaleo.org/home was visited on about July 14, 2009, phone number at that site (760) 767-4974, and was told the museum did not provide fossil sites for construction.

University of California Riverside Museum, the director/curator of the museum, Dr. Marilyn Kooser was contacted on about July 14, 2009 at kooser@ucr.edu regarding salvage paleontology and the Genesis project site, and was told they didn't maintain or provide those kinds or records.

Los Angeles County Museum of Natural History, on about July 16, 2009 visited the museum website http://wwwnhm.org/site/, telephone number listed there (214) 763-3466 and was directed to collections manager Dr. Sam McLeod at (213) 763-3325. Dr. McLeod was unavailable and other personnel at the 3466 number were unable to provide information on obtaining locality data. Reconnected with Dr. Sam McLeod to reconstruct the request and he said there is a fossil locality but it is off-site from the Genesis footprint. His site is a vertebrate locality that is situated between the southern margin of Ford dry lake and Interstate 10, so it is well over a mile from the southern edge of Genesis.

San Bernadino County Museum, web site http://www.co.san-bernadino.ca.us/museum was visited on about July 14, 2009, telephone number (909) 307-2669, and received the number of Kathleen Springer at (909) 307-2669. Ms. Springer was contacted but a connection was unable to be made.

University of California Museum of Paleontology at Berkeley. Dr. Pat Holroyd at UCPM was contacted with a request for locality data for the Genesis project site and vicinity. The request was successful for a fee and was informed that UCMP had no known fossil sites in the area of interest. On September 15, 2009 a request was made for the same information and received the results on e-mail. pholroyd@berkeley.edu

Natural History

900 Exposition Boulevard Los Angeles, CA 90007

Vertebrate Paleontology Section
Telephone: (213) 763-3325
FAX: (213) 746-7431
e-mail: smcleod@nhm.org

14 October 2009

University of Oregon
Department of Geology
Eugene, OR 97403-1272

Attn: Dr. William Orr

re: Paleontological resources for the proposed Genesis Solar Site Project, in Chuckwalla Valley, Riverside County, project area

Dear Dr. Orr:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for the proposed Genesis Solar Site Project, in Chuckwalla Valley, Riverside County, project area as outlined on the portions of the Ford Dry Lake and McCoy Spring USGS topographic quadrangle maps that you sent to me via e-mail on 7 October 2009. We do not have any vertebrate fossil localities that lie directly within the proposed project area, but we do have vertebrate fossil localities nearby from the same or similar sedimentary deposits to those that occur in the proposed project area.

Most of the proposed project area has surficial deposits composed of younger Quaternary Alluvium, primarily derived as coarse fan deposits from the surrounding mountains. The southwestern portion of the eastern parcel of the proposed project area, though, may have surficial aeolian deposits of dunes sands, presumably underlain by older lacustrine deposits of the expanded ancient Palen Lake. The coarse fan deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but the aeolian and lacustrine deposits may well contain significant vertebrate fossils. Our closest vertebrate fossil locality from similar deposits is LACM 5977, directly south of the western portion of the eastern parcel of the proposed project area north of Interstate 10 and on the southwest side of Ford Dry Lake, that produced a fossil specimen of pocket mouse, *Perognathus*. From older Quaternary deposits, the Pinto Formation in this case, our next closest vertebrate fossil localities are LACM (CIT) 208 and LACM 3414, north-northwest of the proposed project area between the Eagle Mountains and the Coxcomb Mountains, that produced fossil specimens of tortoise, *Gopherus*, horse, *Equus*, and camel, *Camelops* and *Tanupolama stevensi*.

Surface grading or very shallow excavations in the younger Quaternary fan deposits exposed in most of the proposed project area are unlikely to encounter significant vertebrate fossil remains. Deeper excavations in those portions of the proposed project area that extend down into older Quaternary deposits, or any excavations in the aeolian and lacustrine deposits that may occur in the southwestern portion of the eastern parcel of the proposed project area, however, may well uncover significant vertebrate fossils. Any substantial excavations in the proposed project area, therefore, should be monitored closely to quickly and professionally recover any fossil remains discovered while not impeding development. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

This records search covers only the vertebrate paleontology records of the Natural History Museum of Los Angeles County. It is not intended to be a thorough paleontological survey of the proposed project area covering other institutional records, a literature survey, or any potential on-site survey.

Sincerely,

Samuel A. McLeod

Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosure: draft invoice

From: pholroyd@berkeley.edu ()
To: Bill Orr
Date: Tuesday, September 15, 2009 1:28:38 PM
Cc: mark@berkeley.edu
Subject: Re. Survey of fossil vertebrates in vicinity of Ford Dry Lake, Riverside Co.

Dear Bill,

I have done a review of our vertebrate locality records, and we have no records of previous finds in that area

Best wishes, Pat

> Hi Pat The area I am interested in is in eastern Riverside Co. CA.
> 15 miles west of Blythe, CA on Hwy. 10 on the north side of the highway is
> Ford Dry Lake. The subject property is one mile north of the lake surface
> on the alluvial fan of the Palen Mountains. None of the subject
> property is on the lakebed surface and there is a ~one mile separation
> between the dry lake surface and the subject property. The subject
> property covers approximately 7 sq. miles and is approximately 8 miles in
> length. Ford Dry Lake is also roughly 8 miles long in a east/west strip so
> the two areas (the dry lake and the subject property) are parallel to each
> other in east west strips with a one mile separation. Anything you can
> tell me about published or recorded vertebrate localities on the subject
> property or in the vicinity (within one mile) is appreciated. Specifics as
> to the exact localities are not necessary but information as to the taxa
> and age if known are helpful.
> The project being considered is a solar power plant.......The Genesis
> Solar Energy Project, Riverside County California.
>
> The billing for the search of your records should go to me at:
>
> Dr. William Orr
> c/o Paleontology Associates
> Dept of Geology
> University of Oregon
> Eugene , Oregon 97403-1272
>
> Thanks, Bill
>
>
>

--
Pat Holroyd, Ph.D.
Museum of Paleontology
University of California
Berkeley, CA 94720
pholroyd@berkeley.edu

San Bernardino County Museum

Search Museum Collections

Note: Use nonplural search terms. Partial terms are okay. Separate multiple terms with a space.

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Go

4678 result(s) found for Riverside County

First Page | Previous Page | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Next Page | Last Page

For more information, please contact Eric Scott: escott@sbcm.sbcounty.gov

Object No	Taxon Name	Higher Taxa	Stratigraphy	Geography	Locality Number
A2232-111	?Scapanus sp.	Mammalia; Eulipotyphla; Talpidae	Pleistocene; Irvingtonian	Riverside County, California	
A2232-135A	cf. Paraneotoma fossilis	Mammalia; Rodentia; Cricetidae	Pleistocene; Irvingtonian	Riverside County, California	
A2232-135B	cf. Paraneotoma fossilis	Mammalia; Rodentia; Cricetidae	Pleistocene; Irvingtonian	Riverside County, California	
A2232-136A	cf. Paraneotoma fossilis	Mammalia; Rodentia; Cricetidae	Pleistocene; Irvingtonian	Riverside County, California	
A2232-136B	Paraneotoma fossilis	Mammalia; Rodentia; Cricetidae	Pleistocene; Irvingtonian	Riverside County, California	
A2232-136C	Paraneotoma fossilis	Mammalia; Rodentia; Cricetidae	Pleistocene; Irvingtonian	Riverside County, California	
A2232-136D	Paraneotoma fossilis	Mammalia; Rodentia; Cricetidae	Pleistocene; Irvingtonian	Riverside County, California	
A2232-136E	Paraneotoma fossilis	Mammalia; Rodentia; Cricetidae	Pleistocene; Irvingtonian	Riverside County, California	
A2232-140	cf. Paraneotoma fossilis	Mammalia; Rodentia; Cricetidae	Pleistocene; Irvingtonian	Riverside County, California	

Search Menu
- Search the Collections
- Notice & Disclaimer
- Access & Use Policy
- Loan Policy
- Contact Curators

Anthropology Help
- Archaeology
- Ethnography

Biology Help
- Birds, Herps, Mammals

Geology Help
- Paleontology

History Help
- Agua Mansa Cemetery
- Archives Photo Index

Land Use

Item 124:

Information Required:

If the Project would only occupy 1,890 acres (once constructed), please describe in detail the reasons why the applicant needs the BLM ROW Grant to include 4,460 acres.

Response:

Since 2007, the size of the ROW request with BLM has been reduced twice to the current size of 4,460 acres. This acreage represents the remaining land that Genesis Solar, LLC and BLM found to be the least environmentally sensitive, particularly regarding cultural resources and biological resources.

All of the acreage will not be needed for the final project, and the 1,890 acres represents the acreage that will ultimately be used in the preferred engineered design.

The western portion of the ROW is not planned to be used for the project. It was used during the summer of 2009 for the installation of a test well, since an access road existed to the western portion of the ROW, but not to the eastern portion. Using the western portion to install the test well was the easiest and most efficient manner to gain information about groundwater in the area.

It is unlikely that the western portion of the ROW will be used at any time. However, Genesis Solar, LLC would like to retain the full ROW until such time that all plans are confirmed for the location of the ROW and the linear corridor. Once it is confirmed that the project is permitted and approved as described in the AFC, Genesis Solar, LLC will consider reducing the ROW size to just the actual area needed for the immediate project as shown. Until that time, Genesis Solar, LLC needs to maintain control over the remaining area within the 4,460-acre ROW grant area in case unforeseen environmental/permitting constraints arise within the 1,890 acres that cause the project to need additional/alternative acreage.

Item 125:

Information Required:

Please discuss the future activities, if any, that are intended or anticipated for the western portion of the ROW grant area?

Response:

Please read response to Item 124. No activities are planned for the western portion of the ROW grant area.

Item 126:

Information Required:

Please clarify the name and location of the road being referred to in the statement above.

Response:

To the best of our knowledge, there is no name for the “road”. This is just a two track path, which is frequently blown over by sand. The road being referred to runs directly perpendicular to I-10, straight north to the western edge of the Genesis Solar Energy Project ROW, the very western portion.

Item 127:

Information Required:

Please cite the *“BLM land use policy”* referred to in the statement above and the BLM planning document or policy directive document that contains this policy.

Response:

The prohibition of grazing at the project area was found in the following document: ENVIRONMENTAL ASSESSMENT, CA-660-06-54, Converting Ford Dry Lake Allotment To A Purpose Which Precludes Livestock Grazing, U.S. Department of the Interior, Bureau of Land Management, Palm Springs-South Coast Field Office, January 2007. Accessed online at http://www.blm.gov/pgdata/etc/medialib/blm/ca/pdf/pdfs/palmsprings_pdfs/grazing06.Par.75507.File.dat/06-54_FORDDRYLAKE_EA.pdf

A sign posted at the project area describes the trails available to OHV users in the area. OHV recreational use in the project area is restricted to these trails.

The email from Greg Hill, BLM Planning and Environmental Coordinator, Palm Springs Office, attached below, describes how the CDCA designates BLM land in the project area as either limited or closed.

Slusser, Andrea

From: Greg_Hill@ca.blm.gov

Sent: Tuesday, August 04, 2009 3:18 PM

To: Slusser, Andrea

Subject: RE: Genesis Solar -- Ford Dry Lake OHV question

Since our CDCA plan covers such a large area, there are no OHV limited use area boundaries. Our portion of the CDCA plan area is either limited use, or closed. The closed areas have boundaries, generally wilderness, or portions of ACECs, everything else is limited use. Your description is OK.

Greg Hill
Acting Associate Field Manager
Planning & Environmental Coordinator
BLM Palm Springs-South Coast Field Office
1201 Bird Center Drive
Palm Springs, CA 92262
(760) 833-7100

From: Greg_Hill@ca.blm.gov [mailto:Greg_Hill@ca.blm.gov]

Sent: Wednesday, July 29, 2009 9:28 AM

To: Slusser, Andrea

Subject: Re: Genesis Solar -- Ford Dry Lake OHV question

Andrea,

The Ford Dry Lake OHV area is an old designation. When we did the Northern and Eastern Colorado Desert Plan Amendment to the CDCA Plan (2002) all OHV Open areas were eliminated. All areas are either closed or limited to designated routes. No cross-country travel is permitted. Ford Dry Lake is limited to designated routes. If you have a map or GIS layer with the NECO routes, or the route inventory as of 2002 (shown in the NECO plan Vol. 2, Map 2-29), that should show the open routes.

Greg Hill
Acting Associate Field Manager
Planning & Environmental Coordinator
BLM Palm Springs-South Coast Field Office
1201 Bird Center Drive
Palm Springs, CA 92262
(760) 833-7100

Item 128:

Information Required:

Please provide the exact ROW width needed for transmission line construction activities.

Response:

The linear corridor will consist of the transmission line, the access road and the gas line. A 300-foot ROW for the linear corridor has been requested through BLM to allow for slight variations in the corridor location.

The construction area needed is estimated to be approximately 80 feet in width. This includes approximately 30 feet of a permanent corridor for the access road. The remaining 50 feet is the temporary construction width.

Item 129:

Information Required:

Please provide the exact ROW width needed for maintenance of the 230 kV *"gen-tie"* proposed as part of the Project.

Response:

Maintenance of the transmission line will be done by using the access road; the two will parallel each other. The exact width is related to the access road. It is assumed that 30 feet will be the permanent linear corridor width.

Item 130:

Information Required:

Please discuss whether the constructed ROW needed for maintenance of the proposed Project transmission line (i.e., during Project operation) would be located wholly within federally owned lands administered by the BLM and outside of privately-owned parcels.

Response:

The entire linear corridor will be within BLM administered land. There is no intention or need to use private parcels in the area for the linear corridor or the main facility.

Item 131:

Information Required:

Please provide the current status of Parcel 818111008 (HOOD).

Response:

This is a private parcel of land.

Item 132:

Information Required:

Discuss whether this parcel is currently privately owned? If so, discuss whether the applicant intends to acquire this privately-owned parcel for purposes of the proposed Access Road.

Response:

The Hood parcel is privately owned. There is no need, and no intention to use any portion of the Hood parcel for the access road or any other purposes. There is no intention to purchase the Hood property. The linear corridor will be located on BLM administered land. Final design drawings will be at a more refined scale.

Item 133:

Information Required:

Describe why the Access Road would need to be located on this parcel.

Response:

Please see response to Item 132. The access road will not be located on a private parcel.

Item 134:

Information Required:

If the parcel is currently privately-owned, discuss the Riverside County General Plan Land Use and Zoning designations for the lands within the parcel and affected by the proposed Access Road.

Response:

Please reference the response to Item 132. Since we do not intend to use privately owned parcels, this data request is not applicable.

Item 135:

Information Required:

Discuss the current on-site land use at this parcel.

Response:

Please reference the response to Item 132. The existing land use of the parcel is undeveloped desert. There are no homesteads on this parcel or any adjacent parcel. Similarly, there are no fences, no grazing or any other activity taking place on the parcel.

Item 136:

Information Required:

Discuss the total ROW width of the Access Road proposed to be located on this parcel, once the project is constructed.

Response:

Please reference the response to Item 132. Since we do not intend to use privately owned parcels, this data request is not applicable.

Public Health

Item 137:

Information Required:

Please provide DPM emission factors from construction activities and a health risk assessment for diesel construction equipment emissions.

Response:

The emissions factors for DPM from construction activities are clearly presented in Table K.5-5 (original and updated versions). Exhaust DPM data for the majority of the construction related equipment is presented on the Construction Equipment Exhaust Emissions pages (titled 2010 Equipment Emissions Factors). In addition, DPM emissions factors are clearly presented in Table K.5-5 at the following sheet locations: Truck Delivery and Site Support Vehicle Emissions.

The construction screening HRA requested by CEC staff was performed using the following assumptions as follows:

- The three highest construction offsite MIR receptors were chosen based upon the construction modeling as revised per the data requests in the Air Quality.
- Cancer risk and chronic hazard indices were computed using the screening methodology as outlined in the South Coast AQMD (Health Risk Assessment Guidance for Analyzing Cancer Risks from Mobile Source Diesel Emissions, December 2002, and HRA guidance for Analyzing Cancer Risks from Mobile Source Diesel Idling Emissions for CEQA Air Quality Analysis, August 2003).
- A cancer inhalation unit risk value of 0.0003 (ug/m3)-1 was used.
- A cancer chronic inhalation REL of 5.0 (ug/m3)-1 was used.
- No acute inhalation REL exists for diesel PM.
- The adjustment factor applied to the final risk and hazard index values was based upon a construction work schedule of 10 hrs/day, 5 days/week, 50 weeks/year, for 37 months (3.08 yrs), i.e., lifetime exposure adjustment (LEA) factor value of 0.0126.

With respect to emissions from diesel fueled engines, use of the diesel PM exposure factors noted above are approved by CARB for the characterization of diesel engine exhaust and subsequent risk exposures. The diesel PM factor includes the range of fuel bound, and potentially emitted metals, PAHs, and a wide variety of other semi-volatile substances. CARB notes the following in Appendix K of the current HARP Users Manual:

- The surrogate for whole diesel exhaust is diesel PM. PM10 is the basis for the potential risk calculations.

- When conducting an HRA, the potential cancer risk from inhalation exposure to diesel PM will outweigh the potential non-cancer health effects.
- When comparing whole diesel exhaust to speciated diesel exhaust, potential cancer risk from inhalation exposure to whole diesel exhaust will outweigh the multi-pathway cancer risk from the speciated compounds. For this reason, there will be few situations where an analysis of multi-pathway risk is necessary.

With respect to diesel particulate related risk values, the following should be noted:

- The U.S. Department of Energy (DOE) as well as the U.S. Environmental Protection Agency (EPA) have disagreed with the CARB/OEHHA (and South Coast AQMD) positions on the relative threat and relative contribution of diesel exhaust to “toxic” air pollution, and neither of the agencies, including the EPA’s prestigious Health Effects Institute identify diesel exhaust as a “known” carcinogen, since the scientific studies show only “weak” cancer links. EPA and DOE believe that the studies relied upon by CARB and SCAQMD are flawed in that they use a problematic elemental carbon surrogate for ambient diesel particulate matter and ignored a significant portion of PM2.5 captured at the SCAQMD’s own monitoring stations. In view of these conflicting studies, we suggest that caution be used in the decision making process regarding diesel PM and its associated risks, i.e., the actual risks may be much lower than those calculated by screening method herein. For these reasons, the risk table below reports the construction risk values using DPM only, and the inhalation pathway.

The following table (Table 1) presents the results of the screening level assessment of health risks from the construction phase.

Table 1. Construction Screening HRA Summary

MIR #	Year	UTM E	UTM N	Cancer Risk	Chronic HI
1	2004/1st High	687243.7	3726872.0	9.55E-8	0.000064
2	2004/2nd High	687275.6	3726837.0	9.47 E-8	0.000063
3	2005/1st High	687339.3	3726767.0	9.68 E-8	0.000065

<u>Item 138:</u>

Information Required:

Please provide DPM emission factors for on-site solar field and equipment maintenance activities in pounds per day and tons per year. This value can be submitted as a single number estimate of total emissions from all vehicular sources used on-site.

Response:

Table K.1-7 (original and updated version) is attached on a CD. This table clearly indicates the DPM emissions and emissions factors used to estimate on-site facility operations and maintenance emissions. DPM emissions values presented in the original table, as well as the revised table, are given in terms of lbs/VMT, lbs/hp-hr, lbs/avg day, lbs/year, and tons/yr. DPM emissions in terms of lbs/day, although given, are not used in the HRA since an acute REL has not been established for DPM.

Item 139:

Information Required:

Please conduct a health risk assessment for diesel emissions from vehicles involved in on-site solar field and equipment maintenance activities during plant operations.

Response:

Revised emissions values and operational scenarios for the entire facility were re-evaluated using HARP (including onsite mobile diesel vehicle emissions). The revised HRA values for the facility (including operational vehicle DPM emissions) are as follows:

Table 2. Boilers, Stationary Engines, Cooling Towers, HTF System, Mobile Ops Vehicles

Risk Category	MIR Project Values	Applicable Significance Threshold
Cancer Risk	3.27 E-6	See Table 5.10-4 in Section 5.1 (Air Quality)
Chronic Hazard Index	0.00119	
Acute Hazard Index*	0.00668	
Cancer Burden	0.0[1]	
MIR Receptor : #1, at location 686079mE, 3726978mN.		

*No acute REL has been established for diesel PM.

[1] The 1.0 E-6 cancer risk radius lies approximately 2.48 miles from the site center. There are no known populations within this radius; therefore the cancer burden is 0.0. (Receptor #3685, 688350mE, 3726700mN)

The enclosed CD contains copies of all of the HRA modeling inputs, outputs, and support files.

Item 140:

Information Required:

Please provide a cumulative PM2.5 emissions estimate on a daily and yearly basis when fugitive dust emissions are added to the DPM emissions from the above stationary and mobile sources, assuming that all DPM from diesel engines are PM2.5. As this type of emission information was also requested for Air Quality, a cross-reference response is acceptable.

Response:

Total estimated daily and annual PM2.5 emissions, i.e., fugitive dust plus combustion related emissions (boilers, stationary IC engines, mobile vehicles), and cooling tower PM2.5 for the operational phase of the project are 72.95 lbs/day and 9.89 tons/year respectively (values from summary table in response Item 27 in Air Quality).

Item 141:

Information Required:

Please provide information specific to thermal degradation of HTF, biphenyl and diphenyl ether, and the source of that information.

Response:

According to the MSDS for both Therminol-VP1 and Dowtherm-A as provided in Appendix K.1, note the following:

- Both fluids are stable under normal conditions of handling and storage.
- Neither fluid has the potential to undergo hazardous polymerization.
- Both fluids have compound characteristics similar to the RCRA class of chemicals identified as category D018 (benzene).
- Both fluids can decompose at elevated temperatures.
- Decomposition products may include “trace” amounts of benzene and phenol.

According to data provided by the HTF manufacturer and HTF system designer, as analyzed by the project engineering staff (using the Aspen Plus Model, version 2006.5), the amounts of benzene and phenol in the ullage system decomposition off-gas would be approximately as follows:

- Benzene %wt of total VOC = 89.9%
- Phenol %wt to total VOC = 9.8%
- Other VOCs = 0.3%

For the breakdown of HAPs in the solar field components, the MSDS sheet states that the decomposition products of benzene and phenol occur in “trace amounts”. For purposes of calculating the HAPs emissions from the component fugitives in the solar field, a value of 5% by wt of total VOCs of each compound was used as an upper limit representative of a “trace amount”.

The following table presents the estimates of emissions for the identified degradation products from the various HTF subsystems.

Table 3. Summary of HTF Subsystem Degradation Product Emissions

HTF Subsystem	Units	Benzene	Phenol
Tank/Ullage Venting	Lbs/hr	0.303	0.033
	Lbs/day	2.66	0.289
	Tons/Yr	0.485	0.053
Component Fugitives	Lbs/hr	0.167	0.167
	Lbs/day	1.89	1.89
	Tons/Yr	0.345	0.345
Waste Load Fugitives	Lbs/hr	0.001	0.0003
	Lbs/day	0.001	0.0003
	Tons/Yr	5.94E-6	1.90E-6

The enclosed CD contains copies of the HTF system emissions calculations (pdf format).

Item 142:

Information Required:

Please provide emission factors and a health risk assessment on the emissions of toxic thermal degradation products of HTF.

Response:

See responses Item 32, Item 139, and Item 141.

Soil and Water Resources

NOTE: Figures that illustrate the text in a DR are included at the end of this section and are identified by a figure number that is the same as the DR number.

Additional technical information such as calculations, spreadsheets, data files and some design drawings have been provided on a separate CD. These include files associated with DRs 174, 179, 186, 190, 197, 202 and 211. A separate CD with geologic information has also been submitted for DR 145.

Item 143:

Information Required:

Please present a figure that indicates the position of the stations where the climate data was collected in relation to the project site.

Response:

Please refer to the Figure WR-DR143 which shows the Project site and the two meteorological stations that were used for the climate data: Blythe CAA Airport (climate and precipitation) and Indio Fire Station (Evaporation).

Item 144:

Information Required:

The California Irrigation Management Information System (CIMIS) has stations in Ripley and near Palos Verde that are significantly closer to the site. Please provide a comparison between the Indio station and more localized stations to see if the Ripley, Palos Verde stations and or any other stations may be more representative of site conditions.

Response:

The data from Indio Fire Station (Table 5.4.1 in the AFC) was used to size the evaporation ponds only and is published Pan A Evaporation Data. The most commonly used approach of designing evaporation ponds involves the use of reported evaporation rates from a Class/Pan A Evaporation Pan and correcting the rates for lake and salinity effects (Bureau of Reclamation, 2006). The actual adjusted evaporation rate used to size the evaporation ponds was 50.12 inches per year (refer to the calculations provided with DR 174).

The CIMIS Stations (Ripley Station Item 151 and Palo Verde Station Item 72) provide daily and monthly evapo-transpiration data (ETo) however this can not be used to size evaporation ponds as it does not allow for lake or salinity effects. In the last year (November 2008 to October 2009), the ETo at Ripley was 71.29 inches (CIMIS 2009). This is higher than the adjusted evaporation rates used to size the evaporation ponds, therefore there is a more conservative (larger) evaporation pond design.

Reference: Mickley & Associates (2006), Membrane Concentrate Disposal: Practices and Regulation, US Department of the Interior, Bureau of Reclamation, April 2006.

CIMIS 2009, (http://wwwcimis.water.ca.gov/cimis/sampMonthlyReport.do?src=samp)

Item 145:

Information Required:

Please include a detailed discussion of the geology including structure, faults, and other features that may have an influence on the occurrence and movement of groundwater. Include geologic map, structural contour map and cross-sections.

Response:

A detailed discussion of geology is provided in the draft Groundwater Resources Investigation Report (GRI Report) dated November 30, 2009. Additional information is included in Appendix BR-DR58. A compilation of geologic maps of the site and vicinity is includes as Appendix WR-DR145. The region surrounding the project site has undergone a complex geologic history that includes sedimentation, volcanic activity, folding, faulting, uplift and erosion. The mountains bounding the Chuckwalla Valley near the site are primarily composed of igneous, metamorphic and volcanic rocks and exhibit numerous basement constrained faults dominantly associated with Mesozoic compression and Tertiary extensional tectonics. These faults do not displace Quaternary deposits and no active faults are known to exist within the Chuckwalla Valley area (Jennings, 1994). Thus, there is little evidence to suggest Holocene age or even late Pleistocene age tectonic vertical movements have occurred in the region. The mountains ranges in the area of the site include the Palen to the north-northwest, the McCoy to the north-northeast, the Mule to the southeast, and the Little Chuckwalla to the south.

Bedrock beneath the Project site consists of metamorphic and igneous intrusive rocks of pre-Tertiary age that form the basement complex (DWR, 1963), including Proterozoic schist and gneiss, Paleozoic sedimentary rocks and Mesozoic sedimentary and metavolcanic rock sequences (Stone, 2006). In some areas in the upper (western) Chuckwalla Valley, volcanic rocks of Tertiary age overlie the basement complex (DWR, 1963). The bedrock topography in the study area as interpreted by modeling of Bouger gravity data obtained from USGS was illustrated in Figure 4 and Figure 5 of the draft GRI Report and were incorporated into the numerical groundwater flow model prepared for the project.

The project area is underlain by Holocene to Miocene basin fill deposits (Stone, 2006). These deposits include younger alluvium, older (Pleistocene) alluvium, the Pliocene Bouse Formation and the Miocene fanglomerate. The uppermost alluvium in the basin consists of Holocene to Pleistocene alluvial fan, valley axial (fluvial), playa (dry lake), and aeolian (wind blown) deposits. Geologic maps of the site, off-site linears, the site vicinity, regional Quaternary faulting and earthquakes, and regional geology are included in a separately submitted CD containing geological information.

The Mojave Desert comprises an area bounded by the seismically active Salton Trough to the west and southwest, and the Garlock Fault to the north. The project site lies within the eastern part of Riverside County in a part of California considered not being very seismically active. Although there are several bedrock faults off-site in the mountains surrounding Chuckwalla Valley, these do no exhibit recent activity and are presumed to be Tertiary or pre-Tertiary in age (Stone, 2006). Gravity anomalies suggest the presence of several subsurface bedrock faults beneath Chuckwalla Valley in the vicinity of the project area (Stone, 2006; Rotstein, et al., 1976). The gravity anomalies reflect abrupt changes in basement elevation strongly suggestive of dip-slip movements and possibly transform movement. These changes in basement elevation are shown in the bedrock contour map attached as Figure 4 to the draft GRI Report. USGS has indicated that these faults are presumed Tertiary (Stone, 2006). Thus, these faults are not expected to extend upwards into the basin fill and therefore are unlikely to act as barriers to groundwater flow. This conclusion is also supported by DWR reports that there are no known barriers to groundwater flow within the Chuckwalla Valley Groundwater Basin (DWR, 1963, 1979 and 2004). The bedrock surface topography created by these faults was incorporated as the base of the numerical groundwater flow model constructed for this investigation.

REFERENCES

California Department of Water Resources (DWR), 1963; Data on water wells and springs in the Chuckwalla Valley area, riverside County, California: California Department of Water Resources Bulletin 91-7, 78 p.

California Department of Water Resources (DWR). 1979. Sources of Powerplant Cooling Water in the Desert Area of Southern California – Reconnaissance Study. Bulletin 91-24. 55 pages.

California Department of Water Resources (DWR). 2004. Chuckwalla Valley Groundwater Basin Description. California's Groundwater Bulletin 118 - Supplemental Information.

Jennings, C.W., 1994; Fault Activity Map of California and Adjacent Areas with Locations and Ages of Recent Volcanic Eruptions, scale 1:750,000, Divisions of Mines and Geology, Geologic Data Map No. 6.

Rotstein, Yair, Combs, Jim, and Biehler, Shawn, 1976, Gravity investigation in the southeastern Mojave Desert, California: Geological Society of America Bulletin, v. 87, p. 981–993.

Stone, P., 2006, Geologic map of the west half of the Blythe 30' by 60' quadrangle, Riverside County, California and La Paz County, Arizona: U.S. Geol. Survey Pamphlet to accompany Scientific Investigations Map 2922.

Item 146:

Information Required:

Please provide a comprehensive assessment of springs, seeps, surface discharges, and playas in the area that may be affected by groundwater extraction at the site. The assessment should include:

a. identification and location of known springs, seeps, surface discharges and playas;

b. spring type (if known) and discharge quantity (gpm) and whether perennial or ephemeral; and

c. general water quality.

Response:

A comprehensive inventory of known springs, seeps surface discharges and playas in the area that may be affected by project pumping has been performed and was discussed in the draft GRI Report dated November 30, 2009. Sources reviewed included review of published reports and maps by the United States Geological Survey and California Department of Water Resources, maps published by the Bureau of Land Management, and contact with BLM personnel. The only springs, seeps or surface discharges identified are McCoy Spring and Chuckwalla Spring, which are perennial springs. There is no information available regarding the discharge quantity for these springs. Published water quality data for McCoy Spring is included as Appendix WR-DR146. In addition, Palen Lake has been identified as a potential groundwater discharge location as discussed further in our response to Data Request 151.

REFERENCES:

Bureau of Land Management, 2002, Northern and Eastern Colorado Desert Coordinated Management Plan, Map 3-1, Existing Water Sources.

Bureau of Land Management, 2009, Personal communication with Allison Shaefer, December 9.

California Regional Water Quality Control Board, Colorado River Region (RWQCB), 2006, Water Quality Control Plan, Colorado River Basin – Region 7, June.

California Department of Water Resources, 1963, Data on water wells and springs in the Chuckwalla Valley area, Riverside County, California: California Dept. Water Resources Bull. 91-7, 78p.

United States Geological Survey (USGS), 1983a, Ford Dry Lake Quadrangle, California-Riverside County, 7.5 Minute Series.

United States Geological Survey (USGS), 1983b, Mc Coy Spring Quadrangle, California-Riverside County, 7.5 Minute Series.

Item 147:

Information Required:

Provide groundwater contour maps (scale 1 inch=5 miles) indicating the groundwater surface elevation for all identified groundwater units identified in the area of the project, including the proposed production zone.

Response:

A groundwater contour map based on data published in 1979 (Steinemann, 1979) is included as Figure WR-DR-147. We are currently evaluating whether sufficient synoptic water level data exist in the eastern Chuckwalla Valley Groundwater basin to prepare an additional groundwater contour map for that area using more recent data. If sufficient data are available, a map will be included with the Groundwater Resources Investigation Report that will be issued on or before December 31, 2009. There are insufficient data to contour groundwater levels for separate groundwater-bearing units; therefore, the map included with this response contours groundwater level data from all available sources as a single unit, and a similar approach will need to be taken if an additional map can be prepared.

REFERENCES:

Steinemann, A.C., 1989, Evaluation of Nonpotable Ground Water in the Desert Area of Southeastern California for Powerplant Cooling. U.S. Geological Survey Water-Supply Paper 2343. 44 pages.

Item 148:

Information Required:

Please identify if production had increased or decreased within the basin and whether that could account for changes in water levels. The text should be clarified.

Response:

Historical pumpage is presented below in Table WR-DR148, below.

Table WR-DR148. Historical Groundwater Pumping

	Western Chuckwalla Groundwater Basin (AFY)						Eastern Chuckwalla Groundwater Basin (AFY)		
Year	Agricultural Pumping	Aquaculture Pumping [3]	Tamarisk Lake Pumping [3]	Eagle Mountain Mine Pumping [3]	Southern California Gas Company [3]	Desert Center Pumping	Prison Pumping	Agricultural Pumping (including Prison)	Wiley's Well Rest Stop
1965	--	--	0	2454	--	--	0	0	--
1966	--	--	0	3864	--	--	0	0	--
1967	--	--	0	3951	--	--	0	0	--
1968	--	--	0	4019	--	--	0	0	--
1969	--	--	0	4097	--	--	0	0	--
1970	--	--	0	3507	--	--	0	0	--
1971	--	--	0	3211	--	--	0	0	--
1972	--	--	0	2344	--	--	0	0	--
1973	--	--	0	3724	--	--	0	0	--
1974	--	--	0	3555	--	--	0	0	--
1975	--	--	0	3574	--	--	0	0	--
1976	--	--	0	3750	--	--	0	0	--
1977	--	--	0	3896	--	--	0	0	--
1978	--	--	0	4177	--	--	0	0	--
1979	--	--	0	4166	--	--	0	0	--
1980	--	--	0	3245	--	--	0	0	--
1981	11,331 [3]	302	900 [4]	3005	--	20 [4]	0	4,400 [10]	--
1982	13,220 [3]	302	900 [4]	1574	--	20 [4]	0	4,400 [10]	--
1983	15,108 [3]	302	900 [4]	47	--	20 [4]	0	4,400 [10]	--
1984	16,997 [3]	302	900 [4]	790	--	20 [4]	0	4,400 [10]	--
1985	18,885 [3]	302	900 [4]	484	--	20 [4]	0	4,400 [10]	--
1986	20,778 [3]	302	900 [4]	450	--	20 [4]	0	4,400 [10]	--
1987	--	--	--	0	--	--	0	4,400 [10]	--
1988	--	--	--	0	--	--	492 [5]	3,900 [10]	--
1989	--	--	--	0	--	--	492 [5]	3,900 [10]	--
1990	--	--	--	0	--	--	690 [5]	3,900 [10]	--
1991	--	--	--	0	--	--	690 [5]	3,900 [10]	--
1992	5,587 [3]	302	1,200 [6]	0	1	50	690 [5]	500	--
1993	--	--	1,200 [6]	0	1	50	690 [5]	500	--
1994	--	--	1,200 [6]	0	1	50	690 [5]	500	--
1995	--	--	1,200 [6]	0	1	50	2,100 [5]	500	--
1996	2,235 [3]	302	1,200 [6]	0	1	50	2,100 [5]	500	--

Table WR-DR148. Historical Groundwater Pumping

	Western Chuckwalla Groundwater Basin (AFY)						Eastern Chuckwalla Groundwater Basin (AFY)		
Year	Agricultural Pumping	Aquaculture Pumping [3]	Tamarisk Lake Pumping [3]	Eagle Mountain Mine Pumping [3]	Southern California Gas Company [3]	Desert Center Pumping	Prison Pumping	Agricultural Pumping (including Prison)	Wiley's Well Rest Stop
1997	--	--	1,200 [6]	0	1	50	2,100 [5]	500	--
1998	4,400 [7]	--	1,200 [6]	0	1	50	2,100 [5]	500	--
1999	--	--	1,200 [6]	0	1	50	2,100 [5]	500	--
2000	2,700 [7]	--	1,200 [6]	0	1	50	2,100 [5]	500	--
2001	2,600 [7]	--	1,200 [6]	0	1	50	2,100 [5]	500	--
2002	3,000 [8]	--	1,200 [6]	0	1	50	2,100 [5]	500	--
2003	2,900 [8]	--	1,200 [6]	0	1	50	2,100 [5]	500	--
2004	2,700 [8]	--	1,200 [6]	0	1	50	2,100 [5]	500	--
2005	3,433 [3,9]	215	1,200 [6]	0	1	50	2,100 [5]	500	--
2006	--	--	1,200 [6]	0	1	50	2,100 [5]	500	--
2007	6,389 [3]	215	1,200 [6]	0	1	50	2,100 [5]	500	--
2008		--	1,200 [6]	0	1	50	2,100 [5]	500	--
2009	6,400	215	1,200	0	1	50	2,100	500	5 [11]
2009	7,866						2,605		

Notes:

1. Western Chuckwalla Valley Groundwater Basin. Boundaries assumed to coincide with DWR's Palen Detailed Analysis Unit
2. Eastern Chuckwalla Valley Groundwater Basin. Boundaries assumed to coincide with DWR's Ford Detailed Analysis Unit
3. Eagle Crest, 2009
4. Derived from total combined pumpage for Tamarisk Lake, Desert Center and Southern CA Gas Co. in Eagle Crest, 2009
5. Lanahan, 2009 and ES, 1990. Calculated water demand based on prison population capacity multiplied by a daily water demand of 220 gallons per inmate per day.
6. Pumping includes golf course irrigation and a small amount of domestic use, assumed to be 100 AFY based on DWR-DPLA, 2007.
7. DWR-DPLA, 2007
8. DWR, 2009
9. DWR,2009 reported 2,400 AFY
10. Water demand based on an estimated additional 2,000 acres of jojoba in production in western Chuckwalla Valley (see text for explanation) and a water duty of 2.2 feet per acre (Mann, 1986). Water demand assumed to decrease by 700 AFY with construction of Chuckwalla Valley Prison (ES, 1990). Jojoba production in western Chuckwalla Valley assumed to have ceased by 1992, because a survey of agricultural production in the valley in Eagle Crest, 2009 did not identify and agricultural production in this area.
11. Assumed water duty based on 2,000 visits/day x 2 gallons per visit.

Pumpage for agricultural irrigation is the main contributor to groundwater demand and has varied significantly over time. Irrigation reached a maximum in the early to mid-1980s when significant acreage was devoted to cultivation of jojoba and to a lesser extent to asparagus (Eagle Crest, 2009). Agricultural pumpage reportedly reached a maximum in 1986, when a total of 20,774 AFY was withdrawn to irrigate 5,662 acres, mostly in the area around Desert Center. Agricultural pumpage from 1981 to 1986 in this area was calculated to have removed 39,000 acre feet from storage and caused a water level decline of approximately 130 feet in one well near Desert Center. Most of the agricultural ventures that contributed to this pumping were found to be uneconomical and ceased operating by the mid to late 1980s. Between 1986 and 1992, acreage in jojoba production decreased from 4,005 to 1,351 acres, and asparagus production decreased from 1,157 to 200 acres. By 1996, jojoba and asparagus production had decreased to 200 and 120 acres, respectively. As a result, groundwater demand significantly decreased and water levels recovered within a few years (Eagle Crest, 2009). As discussed further under the response to Data Request 149, during the time of peak agricultural pumping in the western basin, water levels did not decline in Well 49 (located in the western basin) or in Well 39 (located in the eastern basin). Several wells in the eastern basin showed a water level recovery in the late 1980s; however, the data suggest these wells are more likely to have been affected by local pumping in the eastern portion of the basin than by pumping in the western portion of the basin.

Although the above estimates of agricultural pumping are reported to apply to the entire basin, Woodward Clyde (1985) reported that 9,600 acres were under cultivation in the basin as of 1985, mostly in jojoba, with a total groundwater demand of 48,000 AFY. A current source indicates that up to 6,000 acres were in jojoba production in Chuckwalla Valley at one time (La Ronna Jojoba Company, 2009). This may be a more reliable number based on available information regarding historical agricultural water use in the eastern Chuckwalla Valley, and is adopted in the historical water use estimates listed above. The area where Chuckwalla State Prison was constructed was reportedly in agricultural production prior to the time the prison was constructed, and construction of the prison reduced agricultural groundwater consumption at the prison site from 1,200 AFY to approximately 500 AFY (ES, 1990). In addition, jojoba fields or growing operations are reported to have been associated with Wells 2 (installed in 1981), Wells 3, 13, 26 and 43 (installed in 1982), Well 29 (installed in 1983), and Well 44 (installed in 1989). This information suggests that significant agricultural demand existed in the eastern Chuckwalla Valley Groundwater Basin through the 1980s. Presently, none of these wells is being used for irrigation purposes.

Groundwater levels in some wells in the eastern Chuckwalla Valley Groundwater Basin appear to have responded to increased agricultural pumping in the 1980s or pumping for Chuckwalla Valley and Ironwood State Prisons in the late 1980s and early 1990s. Other wells in the area do not appear to respond to this pumping, suggesting that groundwater drawdown was relatively localized and did not extend basin-wide.

Our assumptions regarding the historical agricultural water demand in the eastern Chuckwalla Valley Groundwater Basin are currently being confirmed and if there are any changes in those assumptions they will be reported in an update to the GRI report that will be issued by December 31, 2009.

REFERENCES:

California Department of Water Resources – Department of Planning and Local Assistance (DWR-DPLA), 2007, California Water Plan, 2005 Update, Bulletin 160-05: Colorado River Hydrologic Region – Chuckwalla Planning Area (PA 1003), Water Use and Distribution of Dedicated Supplies: http://www.waterplan.water.ca.gov/docs/regions/CR_PA_1003_Balances.pdf

California Department of Water Resources – Department of Planning and Local Assistance (DWR-DPLA), 2009, Estimated Annual Agricultural Water Demands for Detailed Analysis Unit 335 (Palen - Riverside County) for 2002 through 2005: Data provided by David Inouy, December 7.

Eagle Crest Energy Company (Eagle Crest), 2009, Eagle Mountain Pumped Storage Project, No. 13123, Exhibit E: Applicant Prepared Environmental Impact Statement: Submitted to Federal Energy Regulatory Commission, June 22.

Engineering Science (ES), 1990, Water and Wastewater Facilities Engineering Study, California State Prison – Chuckawalla Valley. September.

Irrigated Crop Acres and Water Use by Detailed Analysis Unit, 1998, 1999, 2000 and 2001: http://www.water.ca.gov/landwateruse/anaglwu.cfm.

Lanahan, 2009, Personal communication with Mr. Lee Lanahan, Plant Manager, Chuckwalla Valley and Ironwood State Prison.

La Ronna Jojoba Company, 2009, Wild Jojoba: http://www.laronnajojoba.com/wildjojoba.html.

Mann, 1986, Ground Water Conditions in the Eagle Mountain Area

Woodward Clyde Consultants (WCC), 1985, Draft Phase I Groundwater Investigation Wiley Well Area. August 14.

Woodward Clyde Consultants (WCC), 1986, Phase II Groundwater Investigation Wiley Well Area. September 24.

<u>Item 149:</u>

Information Required:

Please provide an estimate of the expected groundwater production in the area and correlate that along with precipitation to provide a better description of the ground water level trends for specific wells. The recharge analysis should follow techniques described in Hely & Peck. The computation of change in storage should be done by estimating the volume of water withdrawn from the basin, the anticipated water level decline and the actually observed water level decline during the same period.

Response:

Based on the background context of this Data Request, we assume the desired information is regarding historical pumping. An assessment of anticipated future pumping will be presented in the cumulative impacts analysis in the Groundwater Resources Investigation that will be issued on or before December 31, 2009.

An estimate of historical groundwater production in the Chuckwalla Valley Groundwater Basin is presented above in Table WR-DR148. Hydrographs of key wells compared to cumulative departure from average precipitation and nearby pumpage are included as Figures WR-DR-149 a, b and c. The locations of these wells is shown on Figure WR-DR-149d. Historical water level data for wells in the basin are sparse and insufficient to prepare an estimate of change in storage to a reasonable degree of accuracy. In addition, the hydrographs do not show a response to drier or wetter climatic conditions (as evidenced by upward or downward trends in the cumulative departure curve, which is fairly typical of arid basins that undergo limited recharge primarily in mountain front areas and where groundwater is the sole water supply. Comparison of hydrographs to calculated recharge estimates would not show a different pattern; therefore, historical recharge was not calculated. An estimate of long term average annual recharge is included in our response to Data Request 151.

Figure WR-DR149a shows water level measurements available for five wells in the western Chuckwalla Valley Groundwater Basin. The hydrographs indicate that water levels are generally stable north of Palen Lake (Well 49); however, water levels west of Palen Lake, near the town of Desert Center, declined by up to approximately 130 feet between 1980 and 1985 (Wells 48, 52 and 53). As shown in the figure and indicated in Table WR-DR149, this decline was apparently related to a short term increase in groundwater pumping associated with agricultural ventures primarily to grow jojoba and asparagus in the Desert Center area that exceeded the perennial yield of the basin (Eagle Crest, 2009). These ventures proved to be financially non-viable and were discontinued in 1986. Within several years after pumping was decreased, groundwater levels almost completely recovered.

The hydrographs for three wells located in the eastern Chuckwalla Valley Groundwater Basin near the Project site include limited water level measurements in this area (Figure WR-DR149b). At Well 15, water levels increased by approximately 5 feet between 1992 and 2000 and at Well 54 water levels increased by approximately 20 feet between 1987 and 1992, then dropped approximately 10 feet between 1992 and 2000. This trend does not appear to be climatically related and may be related to a recovery of water levels after a decrease in agricultural pumping since the mid 1980s, either locally or in the western portion of the basin. However, the available data for this well do not allow assessment of whether there was any drawdown in this area during the period of peak agricultural pumping in the western Chuckwalla Valley Groundwater Basin. There are insufficient data available for Well 9 to assess groundwater level trends.

The hydrographs for five wells located in the eastern Chuckwalla Valley Groundwater Basin reflect variable trends (Figure WR-DR149c). The water levels in Well 32 remained relatively stable over the period of record from 1961 to 1970 and the water levels in Well 39, located in the well field constructed to serve the Chuckwalla and Ironwood State Prisons, remained relatively stable between 1961 and 1985 (within a band of approximately 5 feet), then declined approximately 10 feet between 1985 and 1992. Water levels in Well 43, located approximately 1.5 miles southeast of the prison complex, increased approximately 15 feet between 1982 and 1992 (based on two data points), then remained relatively stable between 1992 and 2009. Water levels in Well 33 declined approximately 4 feet between 1987 and 1992, and water levels in Well 36 declined approximately 13 feet between 1992 and 2000. Both of these wells are located near the prison well field. These declines appear to be independent of climatic trends and are likely to be at least partially related to groundwater pumping for Chuckwalla Valley State Prison which began pumping groundwater in 1988 and increased groundwater production in the early 1990's when Ironwood Prison was constructed and the prisons became more populated. Significantly, the hydrograph for the only well with a continuous record spanning the early 1980s (Well 39), does not appear to exhibit a groundwater level decline associated with the peak agricultural groundwater pumping in the western Chuckwalla Valley Groundwater Basin from 1980 to 1986. Two wells show groundwater level increases between the 1980s and early 1990s that could be associated with water level recovery after the cessation of local or regional agricultural pumping (Wells 36 and 43); however, in our opinion, the lack of a drawdown response in Well 39 suggests that any pumping-induced drawdown in these wells is more likely attributable to more local pumping and not to pumping in the western Chuckwalla Valley.

Item 150:

Information Required:

Please provide calculations of the change in storage associated with the water level changes to see if the changes correlate with the expected production in the basin.

Response:

As discussed above, historical water level data for wells in the basin are sparse and insufficient to prepare an estimate of change in storage to a reasonable degree of accuracy.

Item 151:

Information Required:

Provide a comprehensive evaluation of the groundwater budget for the Chuckwalla Basin. The evaluation should include an estimate of average annual precipitation over the entire basin using isohyetal maps developed for the area, recharge from creeks and washes, recharge from return flows, inflow from adjacent basins, approximation of groundwater withdrawal for agricultural, industrial and domestic use, approximation of water loss due to springs, seeps, and playa lakes, evapotranspiration losses, basin underflow, and any other gains and losses that would affect the overall basin budget.

Response:

Groundwater Inflow/Recharge

Natural groundwater recharge to the Chuckwalla Valley Groundwater Basin includes recharge from precipitation and subsurface inflow from the Pinto Valley Groundwater Basin to the northwest and the Orocopia Valley Groundwater Basin to the Southwest (DWR, 2004; Eagle Crest, 2009). Underflow from the Cadiz Valley Groundwater Basin has also been hypothesized by DWR (2004); however, recent work has reportedly confirmed that the Cadiz Valley Groundwater Basin does not contribute inflow to the Chuckwalla Valley Groundwater Basin (BV and WCC, 1998). Chuckwalla Valley Groundwater Basin also shares a boundary with the Ward Valley Groundwater Basin, but groundwater is not reported to flow across this boundary (Bedinger, et al., 1989). Other sources of recharge to the basin include agricultural return flow and return flow from treated wastewater disposal.

Recharge from Precipitation. In this part of California, almost all moisture from rain is lost through evaporation or evapotranspiration and runoff occurs principally during intense thunderstorms (RWQCB, 2006). Most recharge from precipitation occurs when runoff from the surrounding mountains exits bedrock canyons and flows across the coarse sediments deposited in the proximal portions of the alluvial fans that ring Chuckwalla Valley. To a lesser extent, recharge occurs from infrequent precipitation or runoff on the valley floor (DWR, 2004). The area of the Chuckwalla Valley watershed encompasses Chuckwalla Valley (601,543 acres) and the surrounding bedrock mountains (258,825 acres), for a total area of approximately 860,368 acres (Figures WR-DR151a and b).

Available estimates of recharge in Chuckwalla Valley Groundwater Basin are variable and in some cases based on incomplete or incorrect data. DWR has not published an estimated recharge rate for the basin (DWR, 2004). In 1986, Woodward Clyde calculated recharge from precipitation for the Chuckwalla Valley watershed to be 29,530 AFY (Woodward Clyde, 1986). This equates to an average recharge rate of approximately 0.036 feet per year (0.4 inches). Woodward Clyde reported this number as approximately 12.8 percent of an average annual precipitation of 3.39 inches per year across the watershed; however, this was the average annual precipitation in Blythe at the time, and does not consider that the orographic effect of the surrounding mountains results in precipitation rates up to over 6 inches per year in those portions of the watershed (Hely and Peck, 1964). In 1992, the average recharge to Chuckwalla Valley Groundwater Basin was reportedly estimated by BLM and the County of Riverside to be 5,540 to 5,600 AFY based upon an assumed 10 percent infiltration of precipitation (Eagle Crest, 2009); however, this number evidently considered only a portion of the watershed as it would equate to an average annual precipitation depth of only about 1 inch per year across the watershed, which is incorrect. We conclude that this estimate, which was derived in 1992 as part of the EIS for the proposed Eagle Mountain Landfill north of Desert Center, applied to a portion of the western watershed only.

Recent studies have demonstrated recharge rates for nearby desert basins ranging from approximately 3 to 5 percent or 2 to 5 percent to total incident precipitation on the basin catchment area (Whitt and Jonker, 1998). A review of recharge studies in the arid southwest performed by USGS (2007) cited a wide range of recharge rates, but rates in similar basins ranged from about 3 to 7 percent.

As evidenced by the above data, estimates of recharge are typically variable and dependant on the approach used and the extent and quality of available data. Recharge estimates from precipitation can be derived using approaches such as water balance calculation, groundwater water flow modeling, chloride mass balance calculation, isotope mixing cell flow models, empirical water balance methods (e.g., Maxey-Eakin), and methods based on, or adjusted using, site-specific measurements, such as infiltration studies. The Maxey-Eakin method and various derivations have been widely used for estimation of recharge in arid basins. This empirical method consists of the determination of precipitation zones considering orographic effects, and application of recharge rate coefficients to each zone based on empirical factors that may be regionally derived or adjusted to reflect local conditions. This method has been criticized as being unreliable because of the uncertainty in the derived recharge rate coefficients (Lerner, et al., 1990); however, a review of over 60 recharge estimates in Nevada by Avon and Durbin (1994) indicated the method compared favorably with independent recharge estimates derived using other methods. Specifically, they found the standard deviation Maxey-Eakin recharge from values derived using independent estimates was not more than 4,800 AFY, and the standard deviation from values derived using modeling studies was not more than 4,100 AFY. Maurer and Berger (2006) observed that application of the Maxey-Eakin method involves many uncertainties and has limitations, principally because it does not consider the location and mechanism of recharge within a basin. Davisson and Rose (2000) indicated that Maxey-Eakin estimates should be calibrated using the correct regional climatic data and local topographic conditions. They noted that areas in the Mojave Desert west of 116 degrees longitude generally have significantly less precipitation at higher elevations than areas that are located further to the east (such as the proposed project site).

Hely and Peck (1964), present data regarding precipitation (including orographic adjustments), evapotranspiration, and runoff for portions of the lower Colorado River watershed and the Imperial Valley. Data compiled by Hely and Peck have been used to derive recharge estimates using a water balance approach. The use of this data requires consideration of local conditions and understanding of the mechanism of recharge, because runoff estimates presented in Hely and Peck’s report do not include consideration of ephemeral stream flow losses due to infiltration at the mountain front, which is the primary recharge mechanism in the basin. In addition, evapotranspiration is presented as potential evapotranspiration, which is significantly higher than actual evapotranspiration in desert basins. As such, calibration or adaptation of the data are important to achieving a meaningful recharge estimate in a particular basin. In addition, of the three water budget inputs provided by Hely and Peck, maps showing precipitation cover most of the basin, but mapped evapotranspiration and runoff do not cover the basin, and would need to be estimated using other methods. Because the information to derive meaningful recharge estimates using the data of Hely and Peck is not readily available, considerable study would be required to use a water balance approach to estimate recharge from precipitation, and even when complete, significant uncertainty would remain given the current state of knowledge of the basin. We have therefore used an empirical approach to estimate recharge, as described further below.

For this study, recharge from precipitation was estimated by overlaying isohyetal maps prepared by Hely and Peck on the Chuckwalla watershed boundaries and calculating the volume of average annual precipitation for each of four precipitation zones for the valley and bedrock portions of the watershed. Recharge was then estimated as 2, 3, 5 and 10 percent of total incident precipitation and a reasonable lower bound recharge estimate was adopted. Overlays were performed separately for the western watershed, which encompasses the Palen Detailed Analysis Unit (DAU) designated by DWR, and the eastern watershed, which encompasses the Ford DAU designated by DWR. These sub-watersheds drain to Palen and Ford Dry Lakes, respectively. The calculated average annual precipitation volume for the Palen sub-watershed is 156,000 acre feet based on an area-weighted average precipitation of 4.462” and an area of 419,659 acres. The calculated average annual precipitation volume for the Ford sub-watershed is 159,000 acre feet based on an area-weighted average precipitation of 4.316 and an area of 440,709 acres. Recharge for the Chuckwalla Valley Groundwater Basin is estimated as a fraction of 2, 3, 5 and 10 percent of total incident precipitation is therefore calculated to be 6,300, 9,440, 15,750 and 31,500 AFY, respectively, which is very close to the 1986 Woodward Clyde calculation.

Based on the above analysis, approximately 36 percent of precipitation in the watershed falls on the bedrock areas that ring the watershed. This is significant because precipitation that falls on the valley floor is not expected to contribute consistently to recharge. Studies published by USGS report approximately 7 to 8 percent of precipitation falling on bedrock mountains in other arid basins goes to mountain front recharge (USGS, 2007). This would amount to approximately 3 percent of the total precipitation that falls on the Chuckwalla Valley watershed. We therefore recommend that in the absence of more detailed study, 3 percent of total precipitation falling on the Chuckwalla Valley watershed (9,450 AFY) should be as a reasonable lower bound estimate of recharge to the groundwater basin.

Subsurface Inflow. Underflow from the Pinto Valley Groundwater Basin has been calculated to be 3,173 AFY (GeoPentech, 2003, Eagle Crest Energy Company, 2009). Inflow from the Orocopia Valley Groundwater Basin has been estimated to be 1,700 AFY (LCA, 1981). CH2M Hill (1996) estimated the combined subsurface inflow from both basins to be 6,700 AFY. However, recent studies by GeoPentech reportedly indicate that subsurface inflow from Orocopia Valley Groundwater Basin may be as low as several hundred AFY. We therefore recommend that a combined subsurface inflow rate of 3,500 AFY be assumed for both basins for water budget purposes.

Wastewater Return Flow. Chuckwalla State Prison was constructed approximately 6 miles southwest of the project site in 1988, and Ironwood State Prison became operational in 1994. The prisons use an unlined pond to dispose of treated wastewater, and a large percentage of this discharge is reported to infiltrate into the subsurface and recharge the Chuckwalla Valley Groundwater Basin. For the years 1998 through 2001, DWR-DPLA reported that deep percolation of applied urban water in the Chuckwalla Planning Area (assumed to be wastewater return flow) was 500 to 800 AFY (DWR-DPLA, 2007). Information provided verbally by authorities at the State prison complex (Lanahan, 2009), indicate that approximately 600 AFY of treated effluent recharges the basin. Recently published water budget information for the Eagle Crest Pumped Storage Project (Eagle Crest, 2009), indicates 795 AFY of treated effluent are recharged by the prison.

An additional source of wastewater return flow in the basin is approximately 36 AFY from the Lake Tamarisk development near Desert Center (Eagle Crest, 2009).

Irrigation Return Flow. The amount of applied irrigation water that returns to recharge a groundwater basin depends on the soil, crop type, amount and method of irrigation, and climatic factors. Woodward Clyde (1986) reported an irrigation efficiency of 60 percent (return flow of 40 percent) for jojoba crops in Chuckwalla Valley. DWR-DPLA reported an irrigation efficiency of 72 percent (return flow of 28 percent) for subtropical crops in the Palen Detailed Analysis Unit (DAU) of the Chuckwalla Planning Area (DWR-DPLA, 2007). In its water budget calculations for the Chuckwalla Planning Area in support of California Water Plan updates, DWR-DPLA calculated an irrigation return flow of approximately 9 to 11 percent for 1998, 2000 and 2001, respectively. In our opinion, a 10 percent return flow is a reasonable to conservative factor for deep percolation from irrigation in the basin, and may be applied to the assumed agricultural and landscape water demand in the basin for the purposes of a water budget. Return flows are calculated using this factor below.

Groundwater Demand/Outflow

Groundwater provides the only available water resource in Chuckwalla Valley. Designated and potential beneficial uses of groundwater in the basin include domestic, municipal, agricultural and industrial use (RWQCB, 2006). As such, groundwater demand is a significant contributor to basin outflow. Other sources of basin outflow include subsurface discharge to the Palo Verde Mesa Groundwater Basin, and possibly evapotranspiration at Palen Lake.

Groundwater Demand. As summarized below in Table WR-DR148, below, current and historical groundwater pumpage in Chuckwalla Valley Groundwater Basin includes agricultural water demand, pumping for Chuckwalla and Ironwood State Prisons, pumping for the Tamarisk Lake development and golf course, domestic pumping and a minor amount of pumping by Southern California Gas Company. In addition, historical pumpage included water supply for the Kaiser Corporation Eagle Mountain Mine. With the exception of pumping for Chuckwalla Valley and Ironwood State Prisons, most of the current groundwater pumping in the basin occurs in the western portion of the basin, near the town of Desert Center.

Current pumpage is estimated to be approximately 7,900 AFY in the western Chuckwalla Valley Groundwater Basin and 2,605 AFY in the eastern basin. Agricultural production is limited to the western portion of the basin (Eagle Crest, 2009; DWR-DPLA, 2007 and 2009), with the exception of a relatively limited amount of acreage that is associated with the state prisons. It should be noted that as presented in Table WR-DR148, the agricultural pumpage for the western basin in 2005 was estimated to be approximately 30 percent lower by DWR than by Eagle Crest. DWR reportedly field checks 95 percent of agricultural land use determinations; whereas, more limited field verification was performed for the Eagle Crest estimate. It may be that the discrepancy between the estimates is related to land assumed by Eagle Crest to be in production actually not being irrigated. This suggests that Eagle Crest’s 2007 estimate, and the agricultural water demand they projected for the current water budget, may be biased high.

Subsurface Outflow. Subsurface outflow to Palo Verde Mesa Groundwater Basin was estimated by Metzger (1973) to be 400 AFY. This calculation was based on a cross sectional profile of the boundary between the two basins derived using geophysical methods and regional date regarding groundwater gradients and hydraulic conductivity. Woodward Clyde (1986) revised this estimate based on the results of pump testing at Chuckwalla State Prison and calculated the basin outflow to be 870 AFY. Engineering Science (1990) updated this estimate to 1,162 AFY, presumably as a result of return flow from prison wastewater disposal; however, the rationale for this adjustment was not provided. Using more recent gravity data, Wilson and Owens-Joyce (1994) found that the area through which discharge occurs is significantly more limited than previously thought due to the presence of a buried bedrock ridge. As a result, the most recent available water budget for the basin has adopted an outflow rate of 400 AFY (Eagle Crest, 2009).

Palen Lake Evapotranspiration. Regional groundwater flow and discharge mapping performed by USGS (Bedinger, et al., 1989) did not identify Palen Lake as an area where groundwater discharges at the ground surface. Nevertheless, groundwater elevation contour mapping suggests that groundwater may occur near the ground surface beneath approximately the northwestern 25 percent of Palen Lake, so it is possible that a portion of Palen Lake is operating as a wet playa. Groundwater levels beneath the southeastern portions of Palen Lake, and a small ancillary playa located approximately 1 mile southeast of Palen Lake, are 20 to 30 feet below ground level (Steinemann, 1979), indicating these are dry playa areas.

Review of aerial photography indicates what appears to be a relatively small area of dissected salt pan near the northern and western sides of the playa. Because the salt pan is dissected, it is not clear whether salt deposition is actively occurring or whether this material is residual deposition from surface water evaporation. Immediately northwest of Palen Lake, between Palen Lake and Desert Center-Rice Road, Pleistocene lake bed deposits crop out at the ground surface in the form of disected, mesa-like prominences that are 5 to 10 feet high (DWR, 1963). These deposits are capped with a layer of caliche and locally support scattered mesquite trees. There does not appear to be any other evidence of shallow groundwater or evapotranspiration visible in aerial photography. A surface reconnaissance will be conducted to investigate the northern portion of Palen Lake for evidence of groundwater discharge at the ground surface. If evidence of such discharge is observed, the area of discharge will be mapped. The results of this reconnaissance will be reported in the final GRI Report, which will be issued to CEC by December 31, 2009, and will be included in the groundwater budget at that time.

If areas of active groundwater discharge at the ground surface, such as halophyte wetland, puffy soil, or salt pan associated with underlying moist soil are observed, the area of discharge will be mapped. Groundwater discharge rates will be estimated based on reported groundwater discharge rates at other playas. As a preliminary example, Franklin Lake Playa is a well developed and extensively characterized wet playa in the Death Valley area (USGS, 2007b). Evapotranspiration rates at Franklin Lake Playa are calculated to be 38 to 41 cm/year (1.3 to 1.4 feet/year) based on the Energy-Balance Eddy-Correlation method, which is reported to be the most reliable method by the USGS. These rates would be a conservative measure of evapotranspiration for active wet playa areas at Palen Lake for the following reasons:

- Franklin Lake Playa is a terminal playa, which is the terminal discharge point of the local groundwater flow system; whereas, Palen Lake is a bypass playa, with most groundwater flowing laterally past the playa.
- Franklin Lake Playa includes extensive groundwater discharge features (e.g., saltpan, puffy ground and halophyte wetlands) that are generally less developed or lacking at Palen Lake, indicating less groundwater discharge would be expected at Palen Lake.
- Evapotranspiration rates at wet playas are temperature dependant, with maximum rates occurring during the summer months. Franklin Lake Playa occurs in Death Valley, where mean annual and summer high temperatures typically exceed those at Palen Lake.

Groundwater Budget

The perennial yield of Chuckwalla Valley Groundwater Basin was estimated to be between 10,000 and 20,000 AFY (Hanson, 1992). A perennial yield of 12,200 AFY was adopted in the EIS for the Eagle Crest Landfill project in 1992 (BLM and County of Riverside, 1992); however, as discussed in Section 3.7.4.3, the amount of recharge from precipitation used to derive this number appears to be based on recharge to only a portion of the basin, so the perennial yield may be underestimated.

A comprehensive water budget was compiled based on published literature, water budget information collected by the DWR for updates to the California Water Plan, information obtained from the California State Prison Authority, and the analysis of basin inflow and outflow discussed in the previous two sections. This information is summarized in Table WR-DR151, below.

Table WR-DR1512.

Budget Components	Western Chuckwalla Valley Groundwater Basin	Eastern Chuckwalla Valley Groundwater Basin	Totals
Inflow			
Recharge from Precipitation	4,680	4760	9,440
Underflow from Pinto Valley and Orocopia Valley Groundwater Basins	3,500	--	3,500
Irrigation Return Flow	750	50	800
Wastewater Return Flow	36	795	831
Total Inflow	8,381	4,940	13,321
Outflow			
Groundwater Pumpage	7,866	2,605	10,471
Underflow to Palo Verde Mesa Groundwater Basin		400	400
Evapotranspiration at Palen Lake	TBD	--	0
Total Outflow	7,866	3,005	10,871

REFERENCES:

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Item 152:

Information Required:

Please conduct a more thorough analysis of the groundwater recharge that is likely occurring in the Chuckwalla Valley Groundwater basin based on existing studies that have been conducted (see Whitt and Jonker [1998]). Anticipated runoff can be calculated using a procedure described in Hely & Peck (1964). The analysis should use isohyetal maps of average annual precipitation overlaid on the basin boundaries. Several factors (2, 5, & 10%) should be applied to the calculated volume to give a range of anticipated recharge.

Response:

An analysis of groundwater recharge from precipitation is included in the water budget analysis presented in response to Item 151.

Item 153:

Information Required:

For the calibrated numerical model in a steady state condition, please report the basin inflows separated by:

a. Subsurface Inflow from Pinto Basin
b. Subsurface Inflow from Cadiz Basin
c. Treated Prison Effluent Return Flow
d. Agricultural Irrigation Return Flow
e. Infiltration of Precipitation

Response:

As discussed in the AFC, and in accordance with protocols approved by CEC Staff, the numerical model constructed for analysis of impacts potentially resulting from project pumping is an “impact only” or “superposition” model that does not allow for incorporation or calibration of subsurface inflow, effluent or irrigation return flows, or infiltration from precipitation. These components of recharge are discussed in our response to Data Request 151, but are not part of the numerical model.

Item 154:

Information Required:

Please develop a comprehensive evaluation of groundwater outflow/discharge in the basin including calculation of the water lost as a result of evapotranspiration from all sources including Palen Lake. The comprehensive evaluation must include details of the analysis that each of the references used to calculate the outflow/discharge. If a particular component of a model or study is not available (as listed in Table 5.4-4) then the authors need to develop an estimate based upon similar studies/methods used in the area. In the absence of studies, then estimates for outflow from Palen Lake should be based on pan evaporation rates from a free-water surface.

Response:

A comprehensive evaluation of groundwater outflow/discharge for the Chuckwalla Valley Groundwater Basin is presented in our response to Data Request 151. As discussed in that response, further evaluation of evapotranspiration at Palen Lake is in progress and will be submitted as part of the final GRI Report that will be submitted on or prior to December 31, 2009.

Item 155:

Information Required:

For the calibrated numerical model in a steady state condition, please report the basin outflows separated by:

a. Pumpage for Agricultural Irrigation Use
b. Pumpage for Domestic Use
c. Prison Water Demand
d. Subsurface Outflow to Palo Verde Mesa
e. Evapotranspiration from All sources including (Palen Lake)

Please update the estimate of Pumpage for Agricultural Irrigation Use reported by the SWRCB in 2005. Please note that the reference for this report was not included in the list of references for section 5.4.

Response:

As discussed in the AFC and draft GRI report, and in accordance with protocols approved by CEC Staff, the numerical model constructed for analysis of impacts potentially resulting from project pumping is an “impact only” or “superposition” model that does not allow for incorporation or calibration of subsurface inflow, effluent or irrigation return flows, or infiltration from precipitation. These components of recharge are discussed in our response to Data Request 151, but are not part of the numerical model.

Item 156:

Information Required:

For the second footnote in Table 5.4-7 Aquifer Parameters (un-numbered on table), please indicate the correct calculation factor and the source of the factor.

Response:

Table 5.4-7 showed the correct conversion factors and references; however, the column showing transmissivity in gallons per day per foot, which was present in the calculation spreadsheet, was hidden in the printed table. An updated version of the table that includes transmissivity in the correct units was included in the draft GRI Report submitted November 30, 2009. The table is reproduced below as Table WR-DR156 for convenience.

Table WR-DR156. Aquifer Properties

Geologic Unit	Well ID	Well Depth (feet bgs)	Specific Capacity (gpm/ft)	Transmissivity (gpd/ft)	Hydraulic Conductivity (ft/day)	Storativity	Basis
Alluvium (Western Basin)	OW-2	--		224,400	100	0.05	Aquifer test near Desert Center (Eagle Crest Energy Company, 2009)
	CW-1 to CW-4	--		56,000	50	0.05	Aquifer test of Eagle Mountain Iron Mine Wells (Eagle Crest Energy Company, 2009)
				140,200	75	0.05	
Bouse Formation (Eastern Basin)	TW-1	550		21,542	3 to 16		Aquifer Test and Lab Analysis Conducted for the Project
	3	957	5	10,000	4	- -	Specific Capacity Test
	26	1,000	1.5	3,000	1	- -	Specific Capacity Test
	29	985	1.6	3,200	1	- -	Specific Capacity Test
	43	830	35.0	70,000	49	- -	Specific Capacity Test
				21,550	12 to 14	- -	
Bouse Formation/ Fanglomerate (Eastern Basin)	33	1,200	14.8	29,600	8	- -	Specific Capacity Test
	34	1,200	26.7	53,400	14	- -	Specific Capacity Test
	35	1,200	51.6	103,200	28	- -	Specific Capacity Test
	36	1,200	15.6	31,200	8	- -	Specific Capacity Test
	37	1,050	12.9	25,806	11	0.0002	Aquifer test conducted at State prisons
	39	1,139	11.1	22,222	13	- -	Specific Capacity Test
	40	1,200	10.3	20,600	5	- -	Specific Capacity Test
	42	1,100	19.7	39,444	15	- -	Specific Capacity Test
				40,684	13	0.0002	
Fanglomerate	14	982	2.6	5,200	14		Specific Capacity Test

Notes:

Sources include WCC, 1986; Eagle Crest, 2009; DWR Well Completion Records; and Site Specific Investigation (Appendix E.2 and E.3 of the AFC).

Transmissivity from Specific Capacity Tests calculation by multiplying value by 2,000. for confined aquifers and by 1,500 for unconfined aquifers (Driscoll, 1986).

Item 157:

Information Required:

Please provide a conservative estimation of aquifer parameters for the Bouse Formation based on site specific conditions. The site specific conditions from the aquifer test study should be the value used. According to Driscoll (1986), the “empirical equation can be used in the field to calculate the approximate value for the transmissivity of a confined aquifer.” The conservative approach would be that site specific data would be used to define aquifer parameters. In the absence of site specific data, regional data can be used to approximate aquifer parameters. If aquifer parameters vary spatially by more than an order of magnitude, then aquifer parameters need to be characterized spatially.

Response:

Table WR-DR156 summarizes the reported and estimated aquifer properties for the Bouse Formation and Fanglomerate based on data from specific capacity tests and aquifer pumping tests performed on 14 wells in the eastern Chuckwalla Valley Groundwater Basin, including an aquifer pumping test performed at the site. Because the pumping test performed at the site was conducted on a well completed stratigraphically several hundred feet above the proposed production interval for the project, it is appropriate to use data from this test to characterize the properties of the upper Bouse Formation that overlies the pumping interval and then consider the results of the pumping test together with other data from the basin (and possibly other locations) to derive average aquifer properties for the production interval to be used in the model. The hydraulic conductivity data for the Bouse Formation and Fanglomerate are relatively consistent across the eastern portion of the basin, and average approximately 12 to 14 feet per day. Therefore, we consider a hydraulic conductivity of 14 feet/day to be a reasonable generalized value for the lower portion of the Bouse Formation and the Fanglomerate for use in modeling. However, both higher and lower hydraulic conductivities have been derived from some of the specific capacity tests in the basin and the calibrated hydraulic conductivity of the upper Bouse Formation derived from he pumping test conducted at the site was approximately 3 to 6 feet/day. The effect of uncertainty and variability in potential hydraulic conductivities will be evaluated in the uncertainty analysis that will be included in the final GRI report that will be submitted to the CEC on or before December 31, 2009.

Item 158:

Information Required:

Please include an evaluation of the interconnectivity of the shallower water-bearing zone with the deeper Bouse Formation including what, if any, impedance in the vertical groundwater flow occurs at the site.

Response:

As indicated in Appendix E.2 of the AFC, clay strata were logged at the top of the Bouse Formation as well as between approximately 550 and 750 feet during implementation of a test well program at the site. Detailed logging of wells at the Chuckwalla Valley State Prison also detected a competent clay stratum at the top of the Bouse Formation and encountered low permeability strata at various depths in the middle Bouse Formation.

The composite thickness of fine grained strata that were penetrated at the site is over 200 feet. Appendix E.3 of the AFC indicates that the laboratory-measured vertical hydraulic conductivities of soil samples collected from these materials was in the range of 10 E-07 centimeters/second. Analysis of the drawdown and recovery curves for a pumping test performed on well TW-1 indicate that significant vertical leakance did not occur during a 7-day constant discharge test. These data together suggest the existence of a relatively competent aquitard at the top of the Bouse Formation, and relatively abundant fine grained deposits in the middle Bouse Formation that will act as a significant impedance to vertical groundwater flow both locally and regionally. An further evaluation of the interconnectivity of the shallower (water table) water-bearing zone with the underlying Bouse Formation based on groundwater modeling and sensitivity analysis is included in our draft GRI Report that was submitted in draft form November 30, 2009 and will be submitted in final form on or before December 31, 2009.

Item 159:

Information Required:

Please provide the detailed analysis associated with the numerical modeling that was performed including: the type of models (both flow and solute transport) used, assumptions used in the model including model boundary conditions, layers, storativity, transmissivity, input and outputs, calibration results, and various groundwater extraction scenarios. In addition, the modeling should include a sensitivity analysis to assess what parameters had the greatest influence on the results of the modeling effort and the uncertainty associated with various key parameters.

Response:

A detailed discussion of the numerical modeling was submitted in draft form November 30, 2009 and will be submitted in final form on or before December 31, 2009.

Item 160:

Information Required:

Please provide an analysis demonstrating the numerical modeling was completed consistent with the techniques/requirements set forth in:

a. ASTM D5447 - Application of a Ground-Water Flow Model to a Site-Specific Problem
b. ASTM D5490 - Comparing Ground-Water Flow Model Simulations to Site-Specific Information
c. ASTM D5609 - Defining Boundary Conditions in Ground-Water Flow Modeling
d. ASTM D5610 - Defining Initial Conditions in Ground-Water Flow Modeling
e. ASTM D5611 - Conducting a Sensitivity Analysis for a Ground-Water Flow Model Application
f. ASTM D5981 - Calibrating a Ground-Water Flow Model Application

Response:

There are many references and guidelines available for the construction and application of groundwater models. The numerical groundwater model for the project was constructed using industry-standard methods which comply with some of the above standards, but not with others. Several of the above standards do not apply to superposition modeling. The final GRI report will include a detailed summary of the methods used, and the extent to which the follow the above-referenced standards.

Item 161:

Information Required:

Please provide transient groundwater model runs (including analysis) of the proposed project from construction through operations for the life of the project. The model should use average annual recharge from precipitation (developed earlier) along with expected production in the basin from expected growth. Output should include water level changes within the basin (at end of construction, mid project and project shutdown) and total inflow and outflow volumes in acre-feet by year (at end of construction, mid project and project shutdown).

Response:

A detailed discussion of the numerical modeling was submitted in draft form November 30, 2009, comments were received, and the report will be submitted in final form on or before December 31, 2009. The model provides the above-requested outputs; however, it does not consider recharge from precipitation on the valley floor or mountain -front recharge, which is a generally conservative assumption. The affects of pumping associated with future demand from cumulative projects will be evaluated in the Groundwater Resources Investigation report, which will be issued on or before December 31, 2009. Most future pumping is anticipated to occur in the western Chuckwalla Valley Groundwater Basin (Eagle Crest, 2009), and the cumulative affect of the Genesis Solar Energy Project on the western part of the basin will be evaluated based on the project's contribution to water demand in that part of the basin via underflow, and the additional anticipated drawdown across the basin that is predicted to result from implementation of the project. The influence of pumping associated with other projects in the western part of the basin on water levels in the eastern part of the basin near the Genesis Solar Energy Project will be simulated by adjusting the general head boundary conductance term on the western boundary of the model, and by evaluation of predicted drawdowns from modeling conducted for the Eagle Crest Pumped Storage Project and other projects when these data become available.

Item 162:

Information Required:

Please provide transient groundwater model runs (including analysis) of the proposed project during the life of the project. The model should use average annual recharge from precipitation (developed earlier) along with expected domestic, industrial and agricultural production in the basin from expected growth. Output should include water level changes within the basin (at end of construction, mid project and project shutdown) and total inflow and outflow volumes in acre-feet by year (at end of construction, mid project and project shutdown).

Response:

Duplicate request.

<u>Item 163:</u>

Information Required:

Please provide an electronic copy of the computer files for the numerical model.

Response:

An electronic copy of the model will be provided with the final GRI report on or before December 31, 2009.

<u>Item 164:</u>

Information Required:

Please provide the thresholds of significance that were used to evaluate the potential impacts associated with the significant drawdown at the springs, seeps, and playa lakes and at wells used by other groundwater pumpers in the basin.

Response:

Based on calculations presented in the draft GRI report submitted November 30, 2009, a well user that pumps 100 AFY might expect to use an additional 100 KWhr/year of electricity, and a well user that pumps 1,000 AFY might expect to use an additional 1,000 KWhr/year. At a rate of $0.16 per KWhr this amounts to an additional cumulative expense of just $16 and $160, respectively. Although the actual change in electrical consumption may be more or less depending on the characteristics of the affected well and pump, this comparison illustrates that drawdown impacts of less than 5 feet would not be expected to result in significant increases in electrical costs. Consistent with thresholds of significance adopted by the CEC for Blythe Energy Project I and Blythe Energy Project II, we therefore propose to adopt a threshold of significance of 5 feet for well interference drawdown.

McCoy Spring is the only spring located near the area potentially influenced by project pumping; however, it is part of a separate bedrock groundwater flow system that is not directly hydraulically connected to the aquifer that is being pumped. Since there are no measurable affects to the spring anticipated, it is not necessary to set a threshold of significance.

<u>Item 165:</u>

Information Required:

Please indicate how you intend to limit the production of groundwater from the deeper zones where water quality is reported to be of better quality.

Response:

The production wells for operating water supply will be screened in the intervals the yield water consistent with California state water policy for use as a wet cooling water supply. Lateral hydraulic conductivity is many times greater than vertical hydraulic conductivity; therefore, vertical capture beyond the screened interval of the production wells will be self limiting. The water produced from the well will be of a quality that complies with State water policy for use as a source of wet cooling water for the project, and further measures are not warranted.

Item 166:

Information Required:

If other aquifers are likely to contribute to the water supply over the short-term and long-term, please revise Table 5.4-13 Predicted Chemistry of Wastewater Stream accordingly.

Response:

The water quality data that served as the input to wastewater chemistry prediction was from a sample collected from the proposed production interval. It is typical for water quality data to be refined as detailed design progresses and as additional data become available. Refined data, and updated estimates of wastewater chemistry, will be provided to CEC as they become available.

Item 167:

Information Required:

Please provide the results of numerical, modeling for the potential impacts associated water quality degradation from the horizontal and vertical migration of saline water into areas of lower TDS.

Response:

A detailed discussion of the numerical modeling was submitted in draft form November 30, 2009 and will be submitted in final form, including modeling of solute transport, on or before December 31, 2009.

Item 168:

Information Required:

Please provide thresholds of significance that were used to evaluate the potential impacts to groundwater quality such as with vertical migration of saline water from the shallow groundwater system to the lower aquifer systems.

Response:

Slight lateral transport of TDS may occur as a result of the project and may slightly increase TDS concentrations in some limited areas. Under State Water Resources Control Board (SWRCB) Resolution 88-63, the brackish water underlying the Project site that exceeds TDS concentrations of 3,000 mg/L or 250 mg/L chloride would not be considered a potential source of drinking water; and would be suitable only for potential industrial use. As such, the predicted degree of transport will not result in violation of the

Water Quality Objectives for the already brackish groundwater underlying the Project site. We propose that an appropriate standard for evaluating the significance of water quality impacts to brackish waters whose sole beneficial use is industrial would be whether the project increases the concentrations of dissolved constituents to a point where additional treatment would be required prior to use. For evaluating impacts to brackish water-bearing strata that yield water containing less than 3,000 mg/L TDS, which are considered potential sources of drinking water under SWRCB Policy 88-63, we propose that degradation such that the stratum will yield water to supply wells that exceeds the 3,000 mg/L threshold would be considered significant.

Item 169:

Information Required:

Please provide a discussion of potential salt loading as well as impacts associated with pH, boron, metals, radionuclides and any other constituents that may be present in the water and are detrimental to flora and fauna on and adjacent to the project site.

Response:

For construction, Genesis Solar, LLC will develop and utilize a groundwater source similar to that accepted by the CEC and other regulatory agencies for the Blythe Energy Transmission Line project (currently under construction). Available data indicate that water of similar or better quality will be available from supply wells installed within the transmission right-of-way for the project, and may be available at depth beneath the Project site. As such, salt loading will not be an issue of concern.

Item 170:

Information Required:

Please identify whether, except for the exclusive permitting authority of the Energy Commission, the applicant would need a permit from the RWQCB for the discharge of high saline groundwater to land.

Response:

High saline groundwater will not be discharged. The project will use groundwater for dust control that is similar in quality to that customarily used in the area. Since the beneficial use of water for dust control is not a waste discharge, a discharge permit will not be required.

Construction activities will be regulated under the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water discharges associated with Construction Activity. Under this permit, use of water for dust control is undertaken under the wind erosion best management practices (BMP WE-1). In addition, unauthorized non-stormwater discharges are not permitted and as such, the use of groundwater for an unauthorized activity must not result in the runoff of groundwater from the Project site.

Item 171:

Information Required:

If a permit is necessary, please provide a ROWD for discharge of high saline groundwater to land. Please also provide the ROWD to the RWQCB along with the appropriate fee for their review.

Response:

A ROWD for discharge of high saline groundwater to land is not applicable to this Project.

Item 172:

Information Required:

Please evaluate the use of alternative water supply such as recycled water, land fallowing, conversion of other facilities in the Chuckwalla groundwater basin to recycled water use.

Response:

Since the proposed use of the groundwater meets state water policy and would not cause an unmitigable significant impact, evaluation of alternative water supply sources is not needed.

Nevertheless, the use of alternative water supplies was evaluated in the alternatives section of the AFC. Reclaimed water and irrigation return water in the Blythe area are accounted for as Colorado River water and are therefore not available to the project. Wastewater return flow from Desert Center is insufficient in quantity to be considered a viable source or even a supplemental water source for the project. Irrigation water in Chuckwalla Valley is supplied from groundwater, and irrigation water in the Blythe area is derived from groundwater or Colorado River sources. Thus, even if these water supplies could be made available by land fallowing, they would not be viable alternatives for the project.

The applicant is also evaluating the possible use of recycled water from the prison to meet part of its water needs (the prison does not produce sufficient quantities of recycled water to meet all water needs). The prison is currently in the process of re-designing its wastewater treatment facilities and, accordingly, the applicant is working with the prison to ascertain the extent how much recycled water might be available once the re-design is complete.

Item 173:

Information Required:

Please provide an assessment of groundwater basin impacts that would occur from single dry year and multiple dry year (three consecutive dry years) drought scenarios for the life of the project.

Response:

In terms of baseline water level trends, comparison of hydrographs for wells in the basin to precipitation records does not indicate distinct trends indicative of climatic influence during dry or critically dry years (see Figures WP-DR149a, b, c and d and related discussion in the response to Data Request 149. This may be due to the fact that mountain front recharge requires time to migrate from the mountain front to more distal portions of the basin where wells are located and precipitation events are generally short-lived. Under such a scenario, recharge fluctuations would tend to be averaged over time. In addition, groundwater is the only source of water in the basin, so reliance on groundwater pumping is not expected to increase during dry periods, and consequently there would not be an increase in pumping-related drawdown or storage depletion during dry periods. Finally, potential project impacts were modeled without considering the effect of recharge from precipitation or mountain front recharge, which essentially is studying the effects of 33 years of consecutive dry years. (Because climatically-related water level changes have not been observed in the basin, recharge cannot be said to be incorporated in underflow across the model's general head boundaries.) For these reasons, drawdown impacts during dry and critically dry years will be less than significant.

The forecast groundwater budget for the Chuckwalla Valley Groundwater Basin, and the potential affect of dry and critically dry years on the groundwater budget, will be discussed in the final GRI report, which will be issued on or before December 31, 2009, after cumulative projects have been identified to allow forecasting of future water demand. Dry and critically dry years will have short term impacts on the basin water budget; however, as discussed above, these impacts are short term deficits that will tend to average out over time. A water budget deficit for one or more years does not necessarily equate to an overdraft condition or declining water levels. Because changes in groundwater storage may be correlated with changes in groundwater levels, the lack of correlation between well hydrographs and precipitation trends supports the interpretation that dry and critically dry years are not expected to adversely affect water levels in wells in the basin.

<u>Item 174:</u>

Information Required:

Please indicate what the peak summer condition wastewater generation will be and provide calculations demonstrating that the ponds will be able to contain/ evaporate all generated water during all months of the year with containment of the 100-year recurrence interval precipitation event. Include the assumption that at least one pond will be temporarily unavailable for discharge due to maintenance.

Response:

Please refer to Appendix WR-DR174 in the separately submitted CD which is a print out of the evaporation pond sizing calculation.

The document contains:

- Description of the calculation;
- Inputs to the calculation;

- Results from Year 1 and Year 2 when three of the ponds are in operation (24 acres);
- Results from Year 1 when only two of the ponds are in operation (16 acres);
- Results from Year 1 and Year 2 when there is a 100 year storm event in January in Year 1 with only two ponds in operation, and Year 2 when the three ponds are operating; and
- Results from Year 1 and Year 2 when there is a 100 year storm event in June in Year 1 with only two ponds in operation, and Year 2 when the three ponds are operating.

For simplicity, the months of January and June were used for this rain event as January generally has the most precipitation, least evaporation and shorter operating hours; and June generally has the least precipitation, most evaporation and longer operational hours.

The calculations for capacity of the evaporation pond exclude the two foot freeboard, as the two foot freeboard depth must remain free of wastewater under all operating conditions.

Therefore, these sizing calculations assures that the ponds will have sufficient evaporative capacity (surface area) to meet the project objectives presented in the AFC, which are (1) to fully evaporate the discharged wastewater, (2) accumulate up to three feet of evaporation residuals in the ponds before clean out, and (3) allow one pond to be taken out of service for a period of up to one year without having to curtail plant operation.

Item 175:

Information Required:

Please provide expected monthly wastewater discharge to the evaporative ponds along with the average annual evaporation data.

Response:

Please refer to Appendix WR-DR174 (on CD) which contains the expected monthly wastewater discharge into the ponds and the evaporation data.

Item 176:

Information Required:

Please provide an evaluation of the potential impacts to surface and groundwater quality from the operation of a septic system and leachfield that will be operated at the site.

Response:

The septic system is proposed to include septic tanks and a disposal leach field system and will be designed to meet the regulatory requirements of the Riverside County Department of Environmental Health (RCDEH).

RCDEH requirements include that the disposal leach field be located a minimum distance of 100 feet from water supply wells and drainage piping be located a minimum distance of 25 feet from water supply wells. The disposal leach fields will have more than 10 times the minimum of 5 feet of undisturbed soil between the groundwater and the base of the leach lines and will be located in an area that achieves the percolation rate requirements. By complying with the LORS established for septic system design, construction, operation and maintenance, the impacts to surface and groundwater will be mitigated to a level that is less than significant.

Item 177:

Information Required:

Please identify whether, except for the exclusive permitting authority of the Energy Commission, the applicant would need a permit from the RWQCB for the discharge of sanitary wastewater to leachfields.

Response:

The RCDEH regulates the approval and installation of on-site septic system and leach field as outlined in the AFC Section 3.4.8.1 and Table 5.4-16. The AFC incorrectly stated in Section 5.4.2.4 that the septic system would be permitted by the Colorado River Basin Regional Water Quality Control Board (CRBRWQCB) by issuance of Waste Discharge Requirements (WDR). WDR will not be required for this project due to the size of the septic system and distance to groundwater, therefore a permit from the CRBRWQCB will not be required.

Item 178:

Information Required:

If a permit is necessary, please provide a ROWD for discharge of sanitary wastewater to leachfields. Please also provide the ROWD to the RWQCB along with the appropriate fee for their review.

Response:

A ROWD for sanitary wastewater is not required.

Item 179:

Information Required:

Please provide a detailed analysis of the existing and developed floodplain depths and distribution using an industry accepted methodology for shallow floodplain analysis such as FLO2D. The analysis should extend upstream of the project boundaries at least 500' and farther, if needed, to allow any assumed boundary assumptions to establish realistic conditions at the project boundaries. It should extend at least 1000' downstream of the project and farther if needed to allow for a reasonable tie-in to the existing floodplain.

Response:

FLO-2D software analysis was used to provide mapping indicating the pre-development and post-development velocities and flow depths. The analysis extends beyond the boundary conditions indicated above. Please refer to calculation GENI-0-DC-024-C-001 in Appendix WT-DR179 on a separately submitted CD which describes the FLO-2D floodplain analysis and includes all relevant attachments, such as graphical sketches and profiles of depths and velocities. This analysis was conducted for over 93,000 acres on a grid element system of 200 feet using parameters outlined in the calculation.

Item 180:

Information Required:

Please provide the appropriate analysis, mapping and discussion to demonstrate that flows diverted through and around the project reasonably approximate existing downstream conditions and that significant undisturbed areas will not be cutoff from future flows.

Response:

Refer to calculation GENI-0-DC-024-C-001 in Appendix WT-DR179 on a separately submitted CD for the post-development analysis. A model was created in FLO-2D including the proposed diversion channels. The conceptual analysis shows that the diversion channels will need additional modifications so that the velocities at the downstream end of the channels are reduced further and so that the concentrated flows in each channel will spread out and return to existing downstream conditions to the extent possible. The updated FLO-2D model and associated drainage design will be provided on or before January 15, as agreed to in the November 23rd, 2009 DR Workshop. The modifications and improvements to the channels may include (but not be limited to):

- Channel geometry, such as width, depth, and side slopes will be optimized and refined in the FLO-2D model. For example, channels in the current post-development analysis are given a constant average width; however, the actual 'final' design will propose tapered channels along the length of each channel. This will minimize the upstream channel width/depths, maintain a constant slope against the flat terrain, and reduce unnecessary earthwork.
- The diversion channels will be designed with flared or widened end sections for appropriate lengths to reduce potential scouring velocities downstream of the channels to approximate existing downstream conditions. Widening of the channels at the discharge will also serve to spread out the flows to the extent possible to minimize the amount of downstream undisturbed areas that will be cutoff from future flows.
- If necessary, modifications to the drainage within existing general arrangement and site layout can be made so that there is more room to extend diversion channels in the appropriate direction to facilitate the spread of flows to areas that may be potentially cutoff from future flows and also reduce velocities. For the purpose of this discussion, the "drainage within the existing general arrangement and site layout" means the on-site flows that will be diverted to the detention ponds on-site. The updated Conceptual Grading Plan will indicate the on-site flows remaining within the confines of the perimeter loop road. For example, extend the outlet of Channel A (northwest of Solar Module A) further southwest to capture more runoff from the mountains to the north and west of the project site. In the case of Channel B/C, the channel can extend further west along the southern edge of Module A and south along the western edge of Module B to split the total flow and send it towards other downstream areas.

- At the outlet of Channel A, Channel B/C and Channel D, additional engineering and erosion controls will be implemented to distribute the flows to approximate existing conditions.

The updated FLO-2D analysis will use information from the FLO 2D analysis included in response to DR 180 (such as Q's) and more detailed topographic information. This information will be used to further update the Conceptual Drainage Plans. The updated FLO 2d and associated drawings will be provided by January 15, 2010. This analysis will be used to demonstrate that flows diverted through and around the project can reasonably approximate existing downstream conditions and that significant undisturbed areas will not be cutoff from future flows.

Item 181:

Information Required:

Provide a detailed explanation of the data and assumptions used to complete the floodplain analysis and provide all associated data including any model input and output files.

Response:

Refer to calculation GENI-0-DC-024-C-001 (Appendix WR-DR179) on a separately submitted CD which contains the data and assumptions used in the FLO-2D model.

Item 182:

Information Required:

Please provide the reference in the text for the rainfall value stated and show the project location on the isopluvial map in Appendix B of the Concept Drainage Study.

Response:

Please refer to attached Figure WR-DR182 which highlights the project location on the isopluvial map. The rainfall value of 3.51 inches in the text was from this figure.

Item 183:

Information Required:

Please provide a map showing the extent of each soil type within the project watershed as well as a percentage of each type broken down by sub-basin area.

Response:

Please refer to the attached Figure WR-DR183 which further delineates the extents of soil type within the project area.

Item 184:

Information Required:

Please provide additional information on the Soil Taxonomy Map in Appendix C of the Concept Drainage Study including labeled section lines and roadways that allows confirmation the project area is properly located within the map.

Response:

Please refer to the attached Figure WR-DR184 which provides the correct datum and coordinates of the project site, and surrounding landmark features, including Interstate-10 and Wileys Well Rest stop.

Item 185:

Information Required:

Please clarify what data was used to delineate the contributing watersheds and provide a clear and appropriately contoured watershed map to allow independent verification of the watershed boundary.

Response:

GIS topography watershed mapping data was sourced from the *California Spatial Information Library (http://www.atlas.ca.gov/download.html)*, and the watershed boundary and sub catchments delineated using this aforementioned topographic information and verified using USGS maps, aerial photograph and professional judgment. A larger map of the watershed has been provided (Figure WR-DR185) to allow CEC independent verification.

Item 186:

Information Required:

Please provide a summary table that contains all the relevant hydrologic parameters for each sub-basin including area, soils type, slope, flow length, Time of Concentration (Tc), and peak discharge. In addition, provide more detailed input and output data from Pond Pack as well a digital copy of the input files to allow verification of the above parameters.

Response:

Please refer to Appendix WR-DR186 (on a CD) which provides a summary table of the information, the input and output files for PondPack.

Item 187:

Information Required:

Please use the results of the previously discussed floodplain analysis to substantiate the statement "all these three main channels will divert flows downstream of the Site following its existing drainage path, causing no impact to the Site." Please demonstrate the similarity of the flow regimes of the downstream drainages from pre-construction to post-construction with regards to existing flow depths and extents.

Response:

In calculation GENI-0-DC-024-C-001 (Appendix WR-DR179 on a separately submitted CD), from the post-development FLO-2D analysis including the diversion channels, the results show that some portions of the site will be impacted due to the flows in the diversion channels. The impact is that flow migrates into the solar field after discharge from the channel outlets. However, as stated in response to DR180, more analyses will be done, and in addition to the modifications mentioned previously in response to

DR180, the channels will also be designed to cause no impact to the site. This will be accomplished through elevated loop roads that prevent storm water migration into the solar fields after being discharged from the site.

Item 188:

Information Required:

Please provide a detailed discussion, data, and calculations to document the increased potential for onsite runoff volumes due to compaction and possible soil stabilization methods. Provide a justification for the CN values used in the pre- and post-development models.

Response:

As outlined in Section 3.3 of the SWPPP (within the DESCP, Appendix A of the AFC), the drainage study for the project site was based on TR-55 method with curve numbers (CN). The major factors that determine CN are the hydrologic soil type, cover type, hydrologic condition and antecedent runoff conditions (USDA 1986). There is a “desert shrub” category for CN values, which includes major plants salt brush, greasewood, creosote bush, blackbrush, bursage, palo verde, mesquite and cactus. Within this CN category, there are three CN types: poor (<30% ground cover), fair (30 to 70% cover) and good (70% ground cover).

Before construction, the land was considered fair desert shrub with a CN of 86 and for post construction, the land was considered poor desert shrub with a CN of 88, based on Type D soils on the Project site.

The formula to compare fraction impervious to Group D CNs is (Hydrology and Earth System Sciences 2009):

$$CN = 0.188\mathit{Impf} + 80.205$$

Therefore the fraction impervious for a CN of 86 is 30% and the fraction impervious for a CN of 88 is 40%. Therefore the conceptual drainage study estimated a 10% increase in impervious area on the project site. This increase is supported by the estimated increase in impervious areas from roads, buildings, solar foundations as presented in Attachment 4 of the SWPPP.

REFERENCES:

Hydrology and Earth Sciences (2009), Staged cost optimization of urban storm drainage systems based on hydraulic performance in a changing environment, published 9th April 2009, http://www.hydrol-earth-syst-sci.net/13/481/2009/hess-13-481-2009.pdf.

United States Department of Agriculture (USDA) (1986), Urban Hydrology for small watershed – TR-55, Natural Resources Conservative Service, June 1986.

Item 189:

Information Required:

Please provide a detailed justification of why the 100-year, 24-hour design storm is critical for the facility given its projected life span.

Response:

It is a recognized industry standard to design stormwater management elements based on the 100 year 24 hour storm event. In addition, the Riverside County Hydrology Manual states that the District recommends a 100-year flood protection for all dwelling units (page A-2) and using the 24 hour storm for larger watersheds (page E-6). There is a 1% chance that a 100-year storm event could occur in any one year of the facility operating.

<u>Item 190:</u>

Information Required:

Provide estimated flow depths across the site for a 25-year event and discuss why such an occurrence would negatively impact the project.

Response:

The largest section between two drainage channels draining the solar site was used to demonstrate the depth of flow in a 25 year, 24 hour storm event, which is expected to be reasonably close, or higher than other areas of the site. Figure WR-DR190 shows the area that the flows were calculated for and Appendix WR-DR190 on a separately submitted CD contains the results report from pondpack.

In summary, the parameters used for this calculation were:

- Area = 135.71 acres
- Hydraulic length = 5524.59 feet (This is equal to the length along the channel intercepting a perpendicular line to the proposed contours and running straight perpendicular to the southern low point corner of the section between the channels used
- Slope = 0.004063 ft/ft
- Soils = All 135.71 acres is soil type D in poor condition with a CN of 88.

The results obtained from the pond pack analysis:

- Qpeak = 75.34 cfs
- Peak Volume = 16.108 ac-ft
- Average Velocity = 1.03 ft/sec
- Tc = 1.4922 hours

The total depth across this representative section of the site for a 25-year 24-hour storm event was calculated to be approximately one inch of depth. This amount could be further decreased by adding drainage ditches at approximately every 500 feet across the site instead of at on average every 2000 feet which is the current design. The 25-year storm flow is perceived to have no negative effect on the solar site and will continue to be contained within the proposed drainage system under the current grading design.

Item 191:

Information Required:

Please provide documentation demonstrating that the depth to width ratios in the channels will not likely result in the incision of a low-flow thalweg within the channel given the proposed slopes.

Response:

All runoff diversion channels will be lined with a soil/cement mix or similar surface as required to prevent erosion, as requested by the CEC in DR-197. The 100-year storm event channel velocities have been calculated from the FLO-2D software and the channel dimensions, included in the updated Conceptual Drainage Plans, along with the soil/cement lining provides adequate protection against development of an uncontrolled low-flow thalweg.

Suggested Condition of Certification: The diversion channels/berms will be designed and constructed with the following features and requirements:

- Depth to width ratios, slope protection, and channel bottom protection as required to prevent undercutting, headcutting, slope erosion and the development of an uncontrolled low-flow thalweg.
- Implementation of a low flow component, if required, to more efficiently carry the smaller storm events.
- Erosion control elements, including but not limited to, slope protection, channel bottom protection, and drop structures will be designed to allow for the movement of desert tortoises, including juvenile animals. The channel will be only four feet below grade. The side slopes will be a maximum of 2H to 1V and the exposed slope protection surface will not be uneven (i.e. no exposed rip rap, gabions, etc). (Note: Desert tortoises can traverse substantially steeper slopes, even 1:1, although long, natural grades are not consistently a single slope but, instead, a highly variable mixture of slopes in microsites across a grade. The side slopes of the channels are not long grades, however, only approximately 9 ft long. So, the slope percent and distance does not present a hazard to desert tortoises.) Suitable protection includes but is not limited to soil cement, concrete and gunite.
- A vertical wall on the solar plant side of the diversion channels may be implemented if properly designed to not allow desert tortoises to become entrapped or burrow under the vertical section. A typical cross section proposed is included in the updated Conceptual Drainage Plans (Appendix WR-DR197).
- Provide for a smooth transition into the solar plant grades and the off-site natural grades to insure no vertical drops or other detrimental features.
- 10-year flow velocities shall be within acceptable ranges for site specific conditions.

Item 192:

Information Required:

Please evaluate the use of a compound section with a pre-constructed low-flow channel to more efficiently carry flow from the more frequent events.

Response:

All runoff diversion channels have been designed to cater for the 100-year storm event, with a soil/cement mix liner to prevent erosion as requested by the CEC in DR-197. If a low-flow channel is desired for more frequent rainfall events, a compound section with a pre-constructed low-flow channel will be provided as part of final design.

Suggested Condition of Certification: See DR 191.

Item 193:

Information Required:

Please provide hydrologic and hydraulic calculations used to determine the dimensions for all reaches of the diversion channels as well as appropriate typical sections. This effort should utilize the results of the floodplain analysis to determine the extents and distribution of flow being collected by the diversion channels.

Response:

The FLO-2D software is a combined hydrologic and hydraulic model analysis. It was used to calculate the 100-year storm event flows discharging towards the proposed site and into the diversion channels and was also used to analyze the effects at the downstream end of the channels. See response to DR 197 which provides a discussion of the channel dimensions and the information that will also be provided at a later date.

Item 194:

Information Required:

Please provide a detailed explanation of the data and assumptions used to complete the channel hydraulic analysis and all associated data including any electronic copies of model input and output files. The data should include a map showing the estimated distribution of flow entering the channel, as well as flow depths, velocities, channel slopes, Froude number and a comparison against the allowable site specific channel velocities.

Response:

Refer to calculation GENI-0-DC-024-C-001 (Appendix WR-DR179) which contains the input and output data from the FLO-2D analyses and includes all relevant attachments, such as graphical maps, sketches, and profiles of depths and velocities. Also see response to DR 180 and DR 197 for a discussion of the further work that will be provided to support this DR.

Item 195:

Information Required:

Please provide detailed design plans that show the proposed controls to prevent bank erosion and headcutting due to the interception of flows by the proposed diversion channels.

Response:

Channel velocities have been calculated from the FLO-2D software to ensure the appropriate lining material will be provided to adequately protect the channels from erosion for the maximum anticipated velocities. All runoff diversion channels and berms that are susceptible to bank erosion or headcutting will be lined with a soil/cement mix or concrete erosion control revetment, as required under DR-197.

Suggested Condition of Certification: See DR 191.

Item 196:

Information Required:

Provide a detailed grading plan showing the geometry of the proposed channels around the periphery of the site and how they will tie into existing grade.

Response:

The conceptual grading plan was provided within the Drainage, Erosion and Sediment Control Plan (DESCP) (Appendix A of the AFC), and has been updated to provide additional cross sections showing how the channel ties into the existing grades. Please see the attached grading and drainage drawings provided in Appendix WR-DR197 on a separately submitted CD. These drawings provide representative cross sections and a table of channel geometry at approximately 200 foot intervals. The values in the table were derived from the FLO 2D analysis included in DR 180, which is based on a grid spacing of 200 feet over 93,000 acres and other parameters indicted therein. An updated analysis will use information from the FLO 2D analysis included in DR 180 (such as Q's) and more detailed topographic information. This information will be used to further update the Conceptual Drainage Plans. The updated FLO 2d and associated drawings will be provided by January 15, 2010.

Suggested Condition of Certification: See DR 191.

Item 197:

Information Required:

Provide profiles for each channel that include existing and proposed grade along both the finished flowline as well as right and left top of banks. These drawings should be at a scale of no smaller than 1"=50'.All bank protection and erosion control measures, including grade control structures, must be traversable (3:1 slope or flatter) and not present an entrapment hazard to wildlife. More specifically, it has been determined the project site is possible Desert Tortoise habitat, and as such, bank protection measures such as dumped riprap, stacked gabions, or gabion mattresses will not be acceptable. Soil cement has been identified as the most probable alternative as it would prevent headcutting due to flow over the channel banks and would provide a traversable and quasi-natural surface. The use of bio-stabilization measures and/or geotextiles are not considered viable alternatives.

Response:

Additional cross sections have been provided in Appendix WR-DR197 on a separately submitted CD. The information is in tabular form at approximately every 200 feet along the channels and is now shown in the Updated Conceptual Grading Plans. The table includes channel stationing, channel width, ground surface elevation at each channel station, channel design depth and invert elevation, the water surface elevation in the channel (based on FLO 2D – see DR 180), and required berm height. An updated analysis will use information from the FLO 2D analysis included in DR 180 (such as Q's) and more detailed topographic information. This information will be used to further update the Conceptual Drainage Plans and provide the channel profiles and updated cross sections at a more refined scale, although not necessarily at 1" = 50'. The updated FLO 2d and associated drawings will be provided by January 15, 2010.

Suggested Condition of Certification: See DR 191.

<u>Item 198:</u>

Information Required:

If required to reduce channel slope, provide detailed design plans for grade control structures.

Response:

Existing grades in the areas where proposed runoff diversion channels are constructed allow for relatively flat channel slopes (<0.5%). Therefore, grade control structures are not anticipated to be required. However, if needed, these will comply with the requirements established by DR 191. Additionally, a drive through channel crossing with suitable slopes for traffic may be constructed, if required.

Suggested Condition of Certification: See DR 191.

<u>Item 199:</u>

Information Required:

Provide documentation and analysis for establishing project specific non-erosive channel velocities based on site soils, incoming sediment load, and a calculated 10-year flow.

Response:

All runoff diversion channels will be lined with a soil/cement mix as required to prevent erosion within the channel. The 100-yr storm channel velocities have been calculated from the FLO-2D software and the soil/cement lining provides adequate erosion control protection.

Suggested Condition of Certification: See DR 191.

Item 200:

Information Required:

The use of channels without bank protection around the periphery of the project will require it be demonstrated there are neither significant side flows entering the channel, and that 10-year flow velocities are within the acceptable range for site specific conditions. Please clearly delineate all peripheral channel sections where no bank protection is proposed and provide specific and detailed data to demonstrate compliance with the previously stated criteria.

Response:

As the location of incoming flows will be difficult to predict over time the channel will be designed with bank protection along the entire upstream side, where incoming flows may cause erosion. This is shown in the updated Conceptual Drainage Plans (Appendix WR-DR197).

Suggested Condition of Certification: See DR 191.

Item 201:

Information Required:

Please address the issue of potential erosion downstream of the detention basin outlets resulting from the release of potentially sediment deficient water. Provide detailed plans showing the proposed basin outlet structures as well as documentation showing sediment loads out of the basin will approximate existing conditions.

Response:

Designs of outlet structures for the detention basin will be undertaken concurrently with the detailed design of all the elements within project site to ensure all the design elements are integrated (i.e. site grades, diversion channels, evaporation ponds).

The updated Conceptual Grading and Drainage plans have been included as part of these Data Responses (Appendix WR-DR197). These provide the conceptual design of the detention facilities, which pond the water within the solar field, upslope of elevated plant access roads, and allow for release of the water through pipes with specified slope and diameter to limit velocities and erosion. A conceptual outlet of the detention ponds is shown in the updated Conceptual Grading and Drainage Plans. The purpose of the detention basin is to detain the estimated increase in flow due to development of the site, and provide a location for water quality management.

Suggested Condition of Certification: The detention basin outlets are to be designed to dissipate the energy (velocity and volume) of the outflow to prevent downstream erosion and to approximate sediment loading. The project owner will provide updated detailed design drawings and backup calculations of the detention basins and associated outlet structures to the compliance project manager (CPM) for review and approval.

Item 202:

Information Required:

In addition to the 100-year event, please provide existing and developed peak discharges for the 2-, 10-, and 25-year events that include both a “with detention” and “without detention” scenario. Provide detailed plans of the basin outlet structures and their calculated ratings across the spectrum of design flows. Provide a summary table that includes peak flows for all of the scenarios discussed above.

Response:

Please refer to Appendix WR-DR202 on a separately submitted CD which contains a summary of the pre and post developed peak discharges for the 2-, 10-, and 25- year storm events with and without detention. Appendix WR-DR202 also contains hydrographs that provide a visual summary of the peak discharge and volume of stormwater in each storm event. The area underneath the hydrographs between the red and beige line is the amount of detention required to meet the pre-existing flows. Conceptual designs of the detention basin are provided on the revised grading and drainage plans provided with DR-197.

Suggested Condition of Certification: The detention basins and their outlet structures shall be designed to appropriately detain the increase in flow due to development of the site.

Item 203:

Information Required:

Please indicate where the BMPs can be found and update the SWPPP text and site maps to reflect the aspects mentioned in this section including, but not limited to gravel berms, stone filters, check dams, protected vegetation throughout the project site, etc.

Response:

The BMPs applicable for this project are listed in Section 5.8 and Attachment 3 of the SWPPP (Appendix A of the AFC “Drainage Erosion and Sediment Control Plan”). The cut sheets from the California Stormwater BMP Handbook for Construction were not included in Attachment 13 of the BMPs due to the volume of pages that are required. These will be included in the final SWPPP produced by the project owner prior to construction.

The Water Pollution Control diagrams illustrate straw wattle, silt fence and a sand bag line around the perimeter of the property. The other BMPS are to be placed on site by the Contractor as applicable, depending on the construction activity and period of the year (i.e. rainy season).

Suggested Condition of Certification: Final Construction SWPPP to include:

- Site Location drawings that contain all relevant on-site drainage features such as berms, detention basins and culverts.
- Detailed cut sheets of BMP’s from the California Stormwater BMP Handbook for Construction.

- Water Pollution Control Diagrams at a scale where the permanent BMP's during construction can be identified clearly. This includes BMP's and mitigation measures for all areas of disturbance including but not limited to on-site, along the linear corridor, and within the diversion channel and identifying all areas to be preserved.
- Information sheets on the Notice of Intent and Notice of Termination.

Item 204:

Information Required:

Please divide the Water Pollution Control Diagram into multiple maps with a smaller scale to provide greater detail. Please review the minimum requirements and update the Water Pollution Control Diagrams accordingly. Additional features to be shown on the site maps include, but are not limited to, pre and post project topography, drainage patterns across the project, all drainage features (including channels, berms, swales, culverts, basins and outlets), equipment wash out areas, chemical storage areas, material stockpiles, and all BMPs associated with these features.

Response:

The SWPPP is a preliminary document, and will be revised by the project owner when there are approved detailed design plans of the project site.

The SWPPP is part of a larger Drainage Erosion and Sediment Control Plan (DESCP) which contains pre and post topography drainage patterns and all proposed drainage features.

As outlined in Note 3 and 4 on the Water Pollution Control Diagrams (Attachment B of the SWPPP), storage areas are provided within the construction laydown area. The location of material stockpiles will be designated by the SWPPP Construction Contractor, as this will be dependant on the final approved layout of the site and the construction activity occurring.

Suggested Condition of Certification: See DR 203.

Item 205:

Information Required:

Please include the anticipated amount of stormwater run-on. Show additional BMPs to dissipate the velocity of the stormwater in the diversion channels around the perimeter of the site. Drainage patterns within the project site should be shown, as well as all the proposed erosion and sediment control BMPs.

Response:

There will be no stormwater run onto the site as the proposed drainage diversion channels will capture all upstream flows and direct them around the project site. The final design of the drainage diversion channels will include BMP's to ensure the velocities do not cause erosion. As outlined in DR-191 and DR 195, all runoff diversion channels and berms that are susceptible to bank erosion or headcutting will be lined with a soil/cement mix or concrete erosion control revetment, as required under DR-197.

Suggested Condition of Certification: See DR 203 and DR 191.

Item 206:

Information Required:

Please indicate areas to be preserved. The site maps also need to show rough cut/fill areas and the stabilization method used to stabilize these areas (i.e. hydroseed, hydraulic mulch, dust palliatives, etc.).

Response:

The Site shall be graded to create level solar pad elevations with approximate balanced cut and fill, therefore existing vegetation and debris shall be removed. Stabilization will include surface compaction and rolling. Dust Palliatives will be added to areas as required to further stabilize finished areas. Additionally, blown straw/hydraulic mulch may be used on areas with slopes greater than 10% (i.e. berms, etc). Any areas that are not required to be graded will be preserved using a range of BMP's at the SWPPP Contractors discretion which will include EC-2 "Preservation of Existing Vegetation" and TR-2 "Stabilized Construction roadway". Detailed grading plans will be undertaken during detailed design.

Suggested Condition of Certification: See DR 203.

Item 207:

Information Required:

Please include within the SWPPP text the criteria that must be met on-site prior to the Owner/Contractor submitting a NOT.

Response:

Attachment 17 in the SWPPP (within Appendix A of the AFC) contained the Notice of Termination Form which outlined the State Water Resources Control Boards requirements (which includes the "construction project has been completed and the following conditions have been met…"

Suggested Condition of Certification: See DR 203.

Item 208:

Information Required:

Please show proposed interior drainage swales on the Water Pollution Control Diagrams and the proposed BMPs for velocity dissipation within the swale. Please also include all other relevant on-site drainage features such as berms, detention basins, and culverts, and the recommended BMPs. Examples on the current (but incomplete) plans include the emergency spillways on the sediment basins that discharge into the peripheral drainage channel and the BMPs recommended preventing sediment laden waters from leaving the basin.

Response:

The SWPPP is a preliminary document, and will be revised by the project owner when there are approved detailed design plans of the project site. The final SWPPP will contain additional details on the approved on-site drainage features and the recommended BMPs. The preliminary SWPPP contains the location of the detention basin and references BMP requirements SE-2 and the required size of the sediment basins to contain the expected sediment runoff from this project site (Attachment 4).

Suggested Condition of Certification: See DR 203.

Item 209:

Information Required:

The cut and fill quantities are not balanced, please show the calculations or resolve the balance differences.

Response:

The information provided in the AFC indicates that the total cut volume is approximately 1,000,000 and the total fill volume is approximately 700,000. Minor adjustments to the final grade elevations will be made during detailed design to create an earthwork design that balances in both cut and fill. This adjustment is very minor, as a 0.1' adjustment over 1,000 acres represents an increase or decrease in cut/fill of over 160,000 CY. Therefore, grade elevation modification required to achieve a balanced site are insignificant and are proposed to be adjusted during detailed design and construction.

Suggested Condition of Certification: Site grading design shall be adjusted during final design and construction so that import or export of clean fill is not warranted.

Item 210:

Information Required:

Please provide calculations supporting that the size of the stockpile locations are sufficient to support the volume of soil and vegetation expected to be generated.

Response:

It is expected that earthwork will be accomplished by transporting cut directly to an area of fill. In this case stockpiling of soil will not be required. Only nominal vegetation stockpiling will be required. The nominal site vegetation will be disced into the soil or chipped/included in fills in non-structural areas.

Item 211:

Information Required:

Please provide the detailed aerial, topography and ground survey work mentioned above with the refined earthwork quantities and calculations.

Response:

The detailed aerial and topography information is provided electronically on a separately submitted CD. However, as outlined in response to DR-209, earth work quantities have not been refined yet, but will be prior to final design. The aerial is provided, but has not been used for earthwork calculations.

Item 212:

Information Required:

Please provide information on how sheet and channel flow across the project site, over roads, around the mirrors, and off the site would be managed through engineering controls in order to minimize the discharge of sediment into the main drainage channels that ultimately discharge offsite.

Response:

Please refer to the information on the revisions to the Conceptual Grading Plan provided with DR-196 which contains drainage and grading plans that shows the cross sections of the swales and their interaction with the solar field and roadways. Any rainfall in the project site will be directed towards the drainage swales which discharge into the downstream detention basin therefore any mobilized sediment will be detained in the swales or the detention basin. The main diversion drainage channels are routed around the project site and will not have an interaction with the onsite drainage system.

Suggested Condition of Certification: Engineering controls shall be used across the site, over roads, and around plant facilities to minimize the discharge of sediment off-site. Controls may include but not be limited to on-site retention and sediment trap swales or depressed locations, minimizing sheet flow length before water enters a protected channel, reverse slopes (to slow and trap water), etc.

Item 213:

Information Required:

Please provide information on how onsite soils will be maintained to prevent erosion during plant operation.

Response:

Best Management Practices (BMPs) to prevent soil erosion during plant operation were discussed in the AFC in Section 5.6.2.2. These BMPs include use of soil stabilizers within the solar array and placement of gravel berms and detension structures to control sediment loss and manage storm water runoff. Routine vehicle traffic during project operation would be limited to existing roads, most of which will be paved or covered with gravel. Access routes for mirror washing will be graded and covered with gravel to permit mirror washing as needed. It is in the best interest of the project to do all possible to prevent soil erosion, as eroded soil may lead to increased dust on the heliostats and decreased efficiency.

Item 214:

Information Required:

Please describe how the site soils would be returned to their original state upon decommissioning and what the applicant would do to address long-term management of the site soils. (Staff's current understanding is that desert pavement and varnish can take 100s to 1000s of years to form – see USGS Bulletin 1793 - The Response of Vegetation to Disturbance in Death Valley National Monument, California).

Response:

Site restoration plans have been developed for the Land Treatment Unit and Evaporation Ponds as part of the Report of Waste Discharge submitted to the Regional Water Quality Control Board. A Conceptual Restoration Plan after Decommissioning is addressed in response to Data Request 97 and will include soil restoration as well as revegetation efforts. In general, site restoration would involve restoring the original drainage of the site and uncompacting the first six inches of compacted soil and revegetation.

No desert pavement or desert varnish exists on the project site. Section 5.5 of the AFC described the mapped geologic units for the project site and offsite linears as primarily Younger Valley Axial Alluvial Deposits (Qyva) and Younger Alluvial Fan Deposits (Qyaf). The Qyva was described as having locally incipient desert pavement, while the Qyaf was not described as having desert pavement. These geologic descriptions were based upon literature reviews and map analysis. However, a engineering geologic reconnaissance survey conducted on the site after the AFC submittal revealed no desert pavement or desert varnish. The survey described the site as underlain by a thin veneer of recent alluvial material deposited by sheet floods overlying older alluvium with some soil horizon development. (Romig, 2009) The soils present on site are newer deposits, not desert pavement or desert veneer. Therefore, no long-term management of the site soils would be necessary.

REFERENCE:

Romig 2009, Preliminary Geotechnical and Geologic Hazards Investigation for Genesis Solar Energy Project Chuckwalla Valley Riverside County, California. October 2009.

SOURCE:
Confidential - Not for Distribution
Riverside County, SDC Major Roads
ESRI ArcGIS Online and data partners, including imagery from agencies supplied via the Content Sharing Program. All locations approximate

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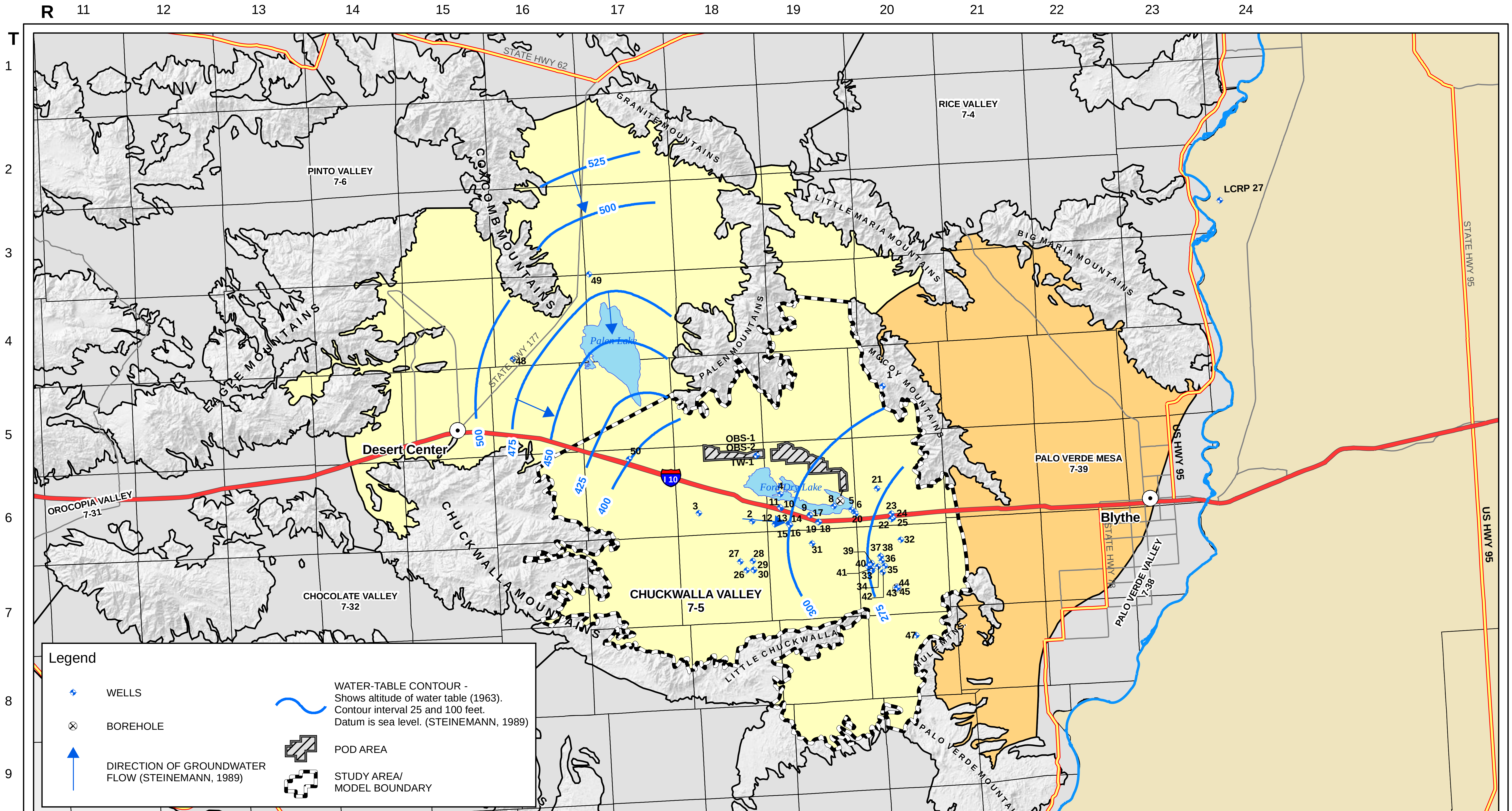
METEOROLOGICAL STATIONS
DATA REQUEST #143

SWL	JF	8/2009
52011206	WR-DR143	



SOURCE:
ESRI, USGS 30 Meter NED (Hillshade)
CASIL CA Groundwater Basins, PLSS
All locations approximate

N
W E
S

0 20
Miles

GENESIS SOLAR, LLC

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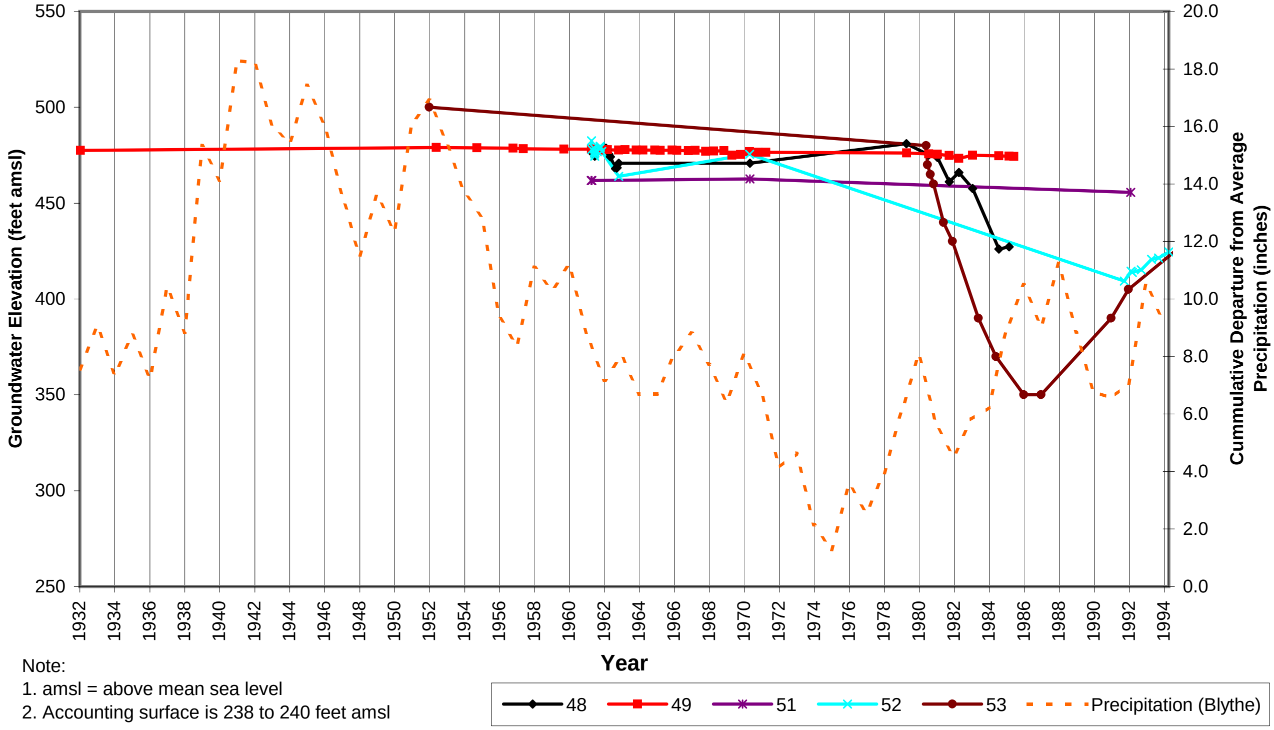
SWL	NB	11/2009
52004617	WR-DR147	

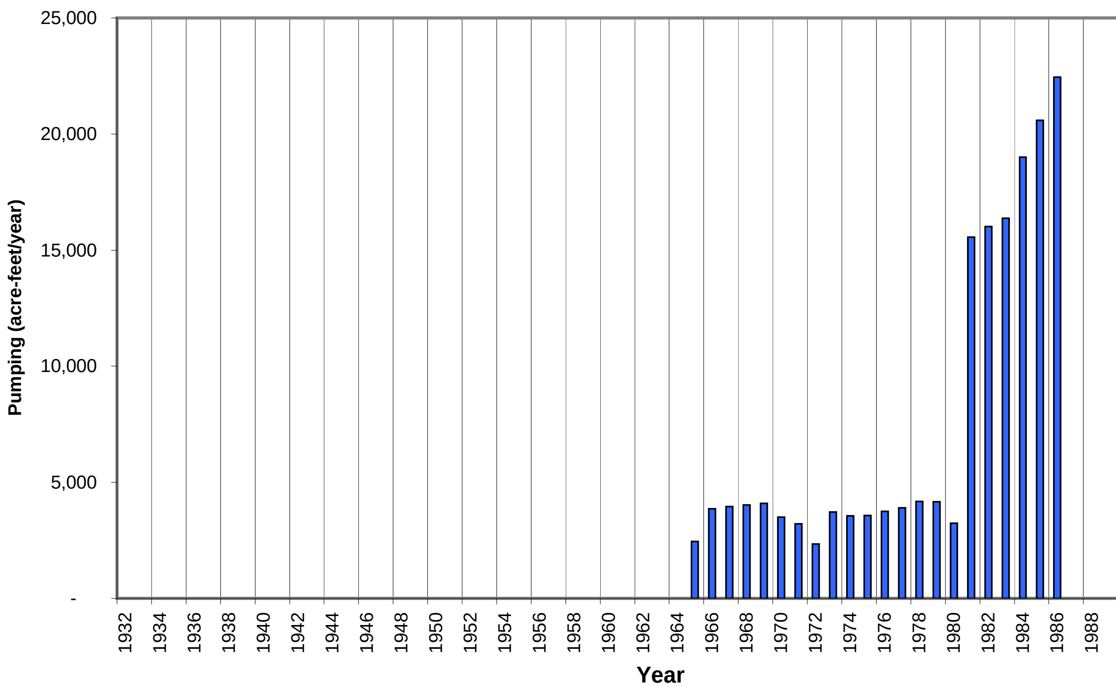
GROUNDWATER CONTOUR MAP

Figure WR-DR149a - Hydrographs of Selected Wells in Western Chuckwalla Valley Groundwater Basin



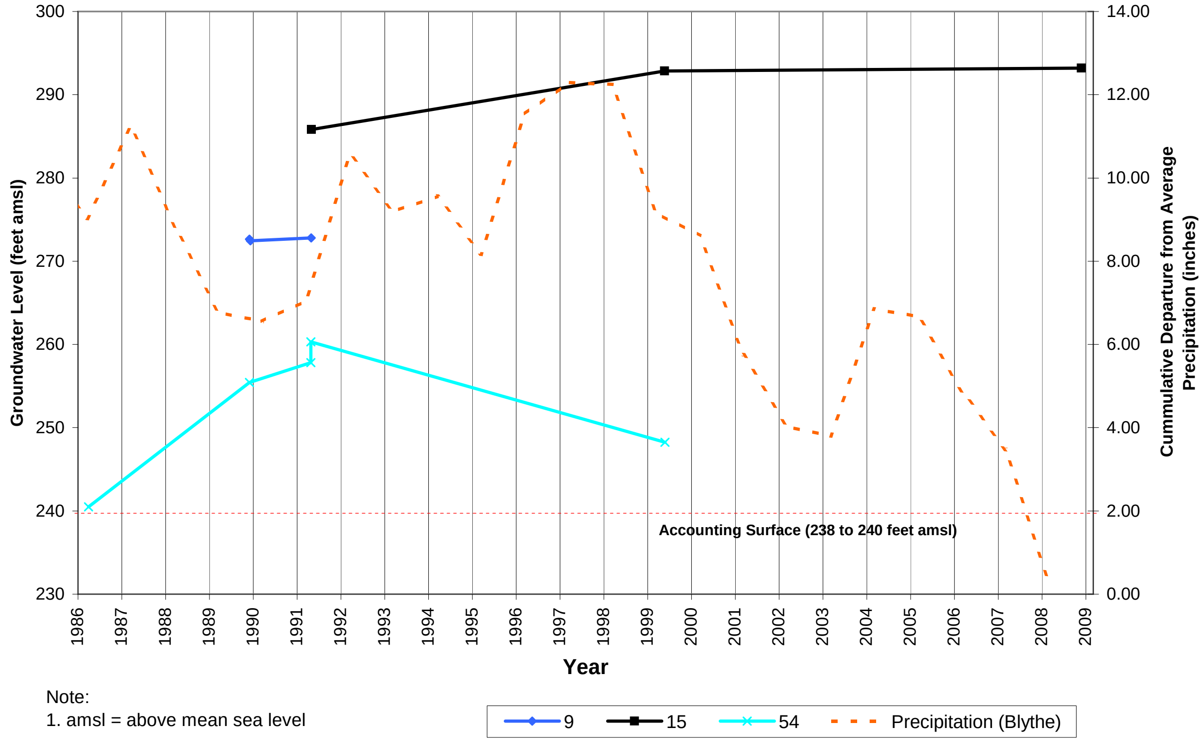
Note:
1. amsl = above mean sea level
2. Accounting surface is 238 to 240 feet amsl

Total Pumping Western Chuckawalla Valley



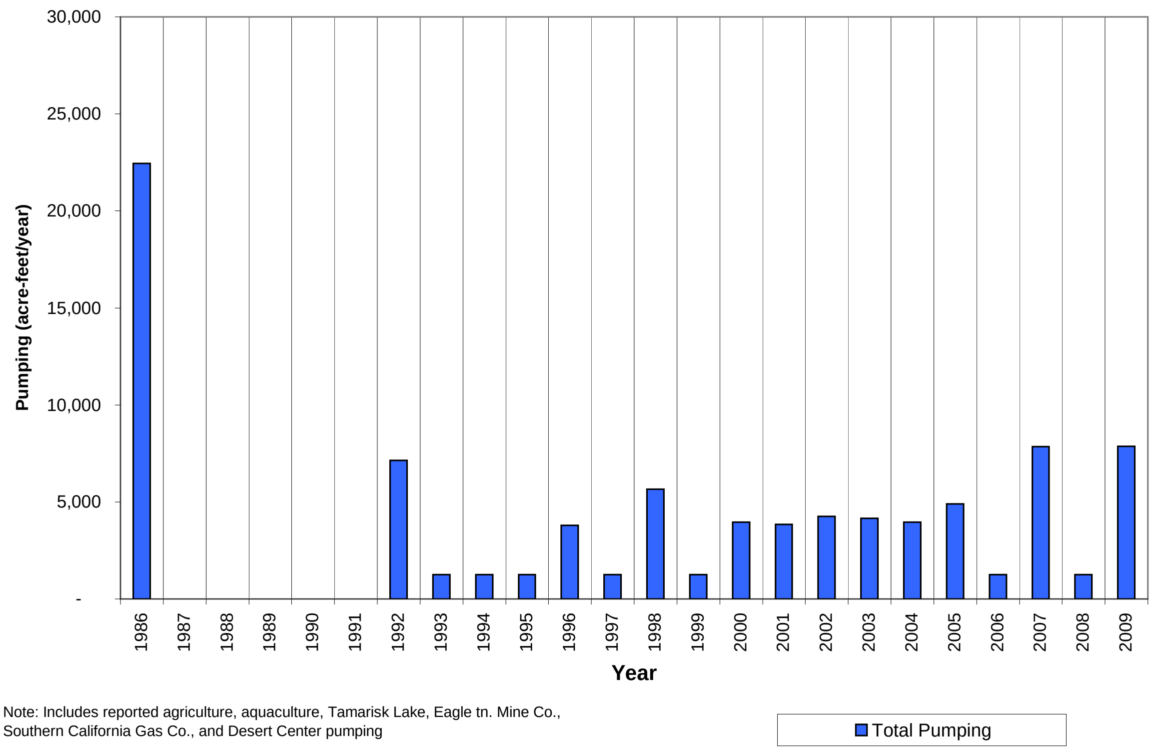
Note: Includes reported griculture, aquaculture, Tamarisk Lake, Eagle Mtn. Mine, Southern California Gas Co., and Desert Center pumping

Figure WR-DR149b - Hydrographs of Selected Wells in Eastern Chuckwalla Valley Groundwater Basin Near the Site



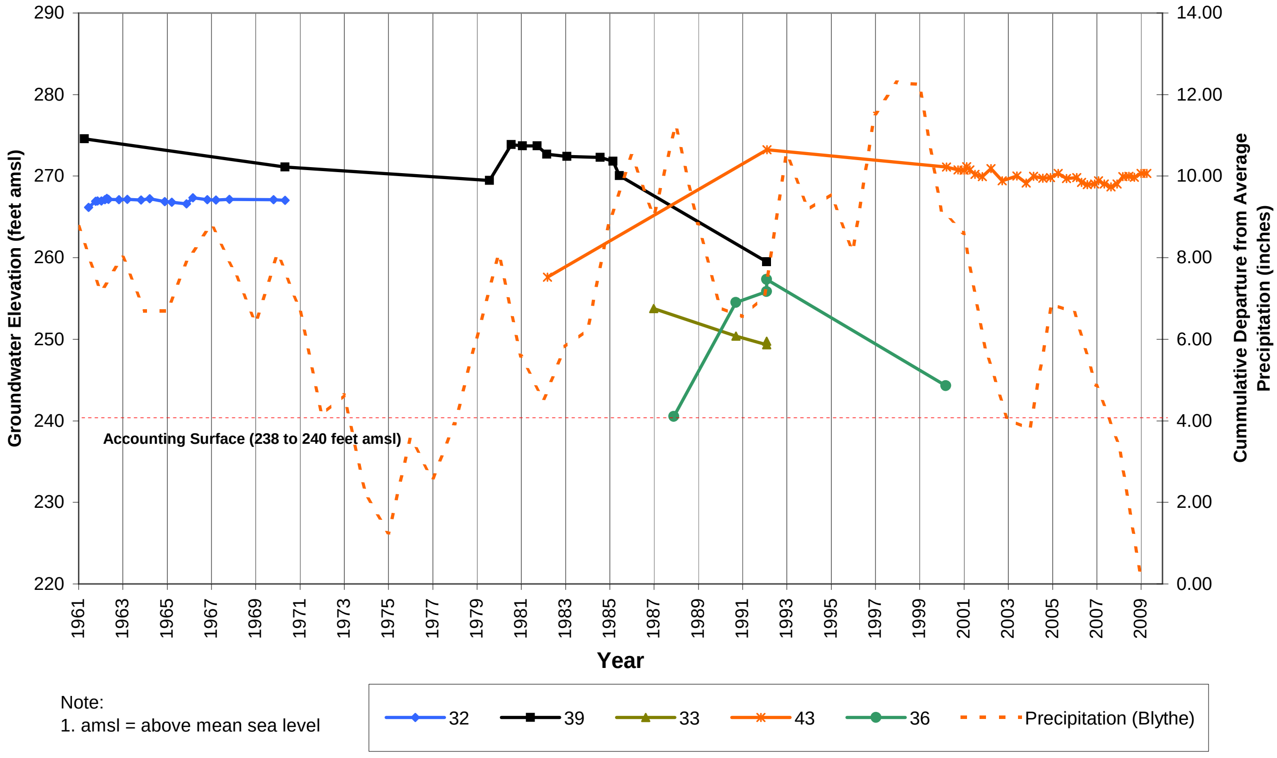
Note:
1. amsl = above mean sea level

Total Pumping Western Chuckawalla Valley



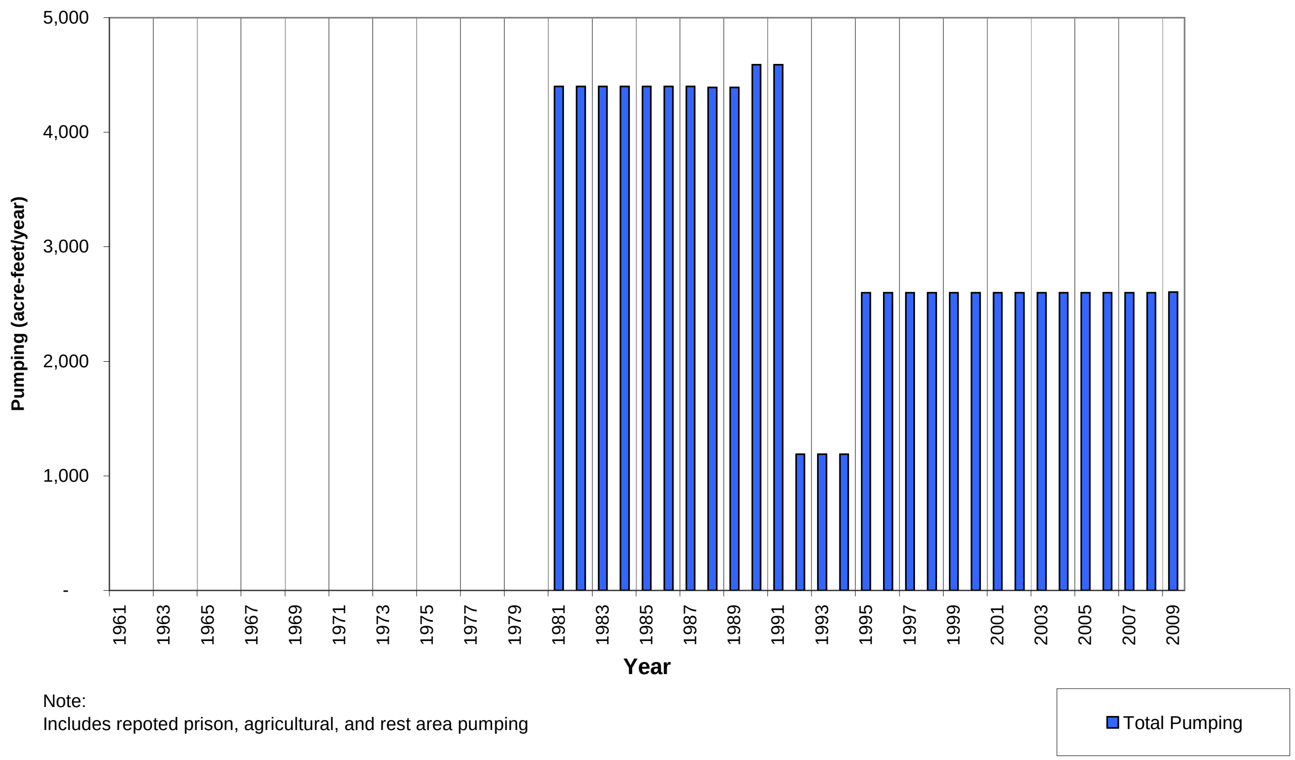
Note: Includes reported agriculture, aquaculture, Tamarisk Lake, Eagle tn. Mine Co., Southern California Gas Co., and Desert Center pumping

Figure WR-DR149c - Hydrographs of Selected Wells in Eastern Chuckwalla Valley Groundwater Basin

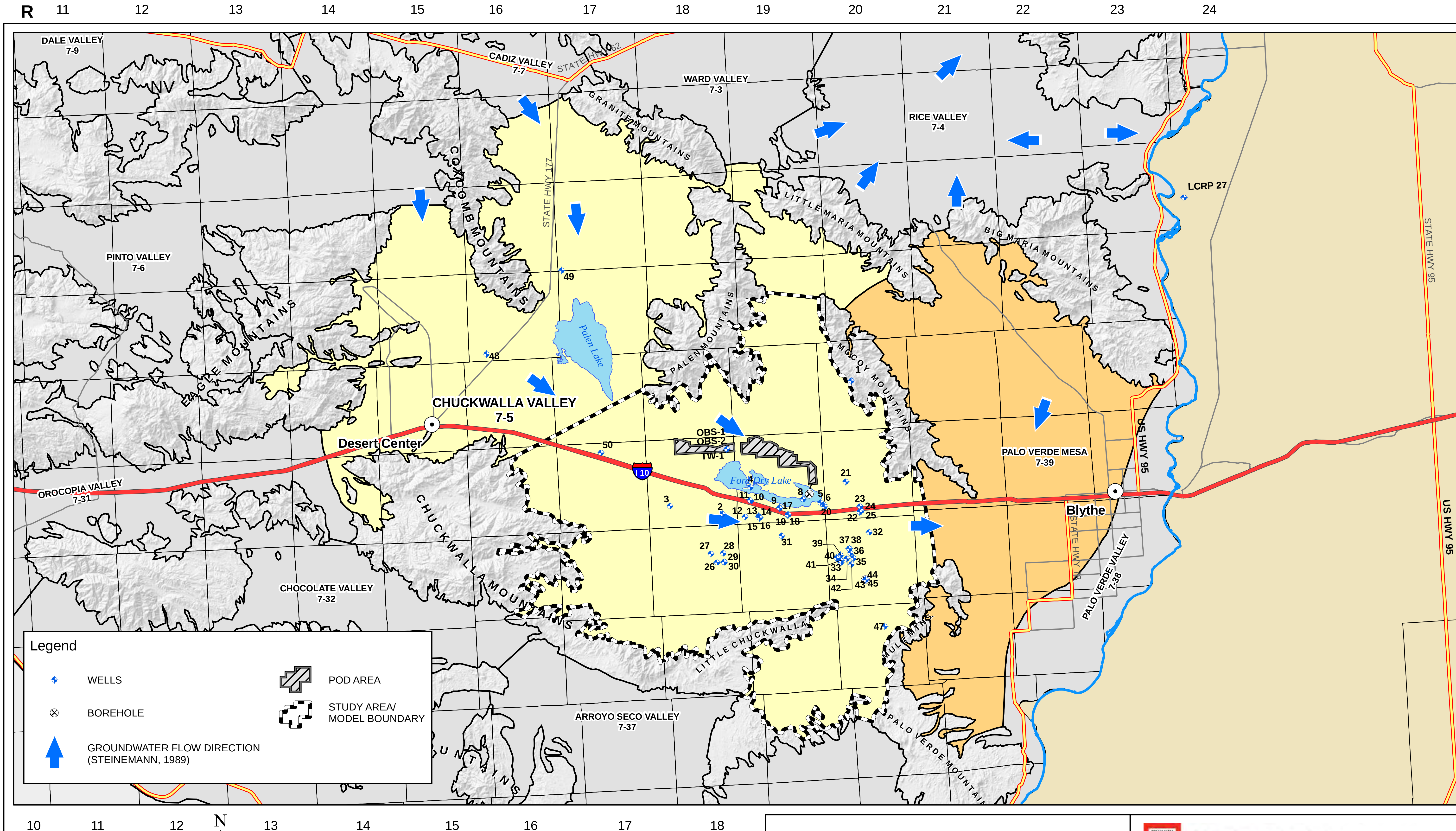


Note:
1. amsl = above mean sea level

Total Pumping from Eastern Chuckawalla Valley



Note:
Includes repoted prison, agricultural, and rest area pumping



SOURCE:
SDC Major Roads
USGS 30 Meter NED (Hillshade)
CASIL Groundwater Basins
All locations approximate

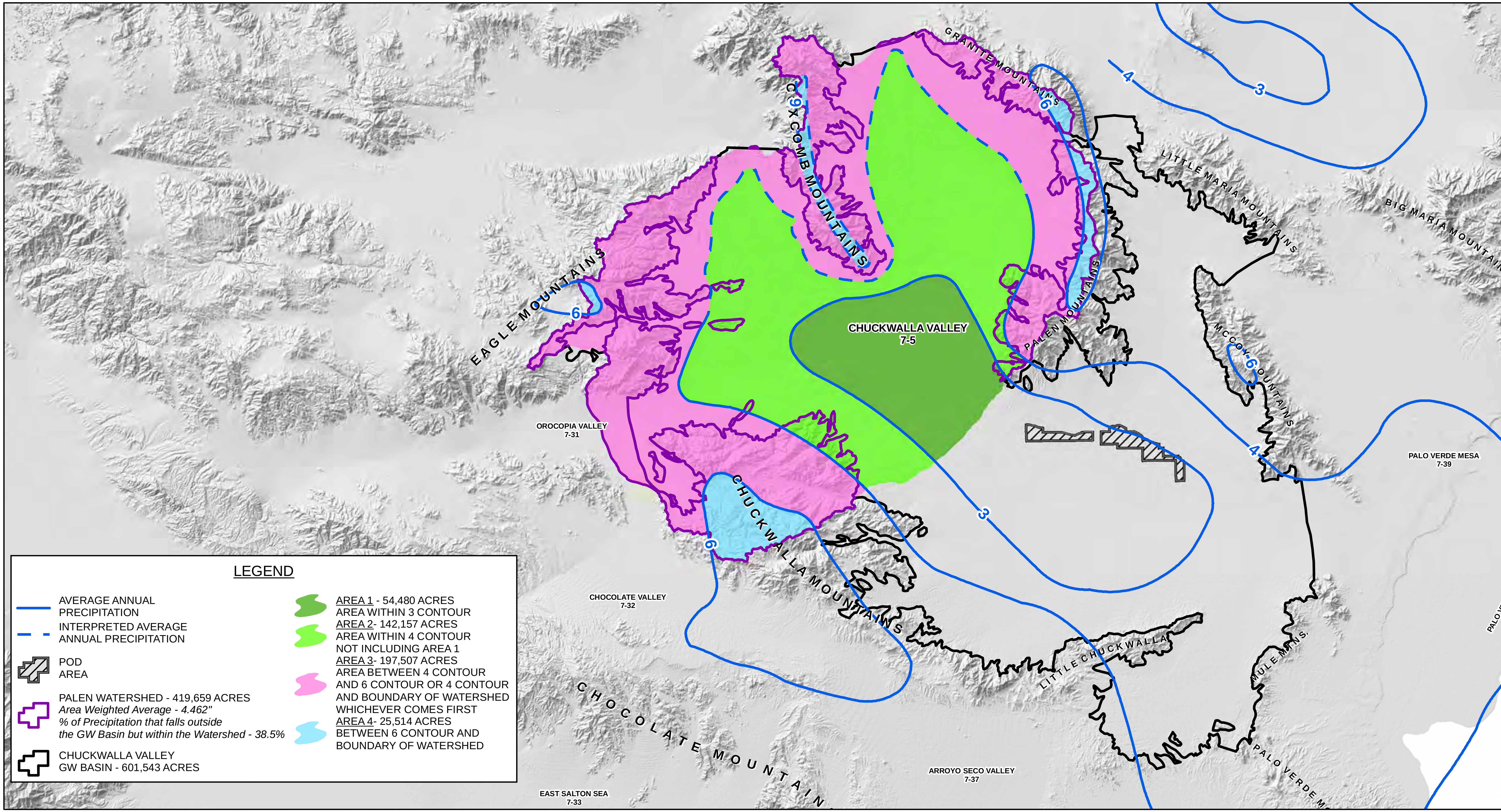
0 — 20 Miles

GENESIS SOLAR, LLC

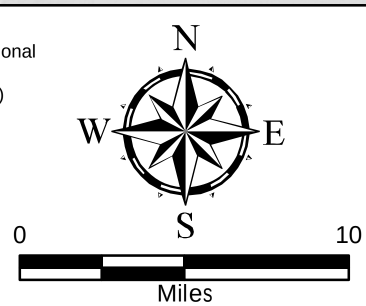
WorleyParsons resources & energy

WELL LOCATIONS

SWL	NB	7/2009
52004617	WR-DR149d	



SOURCE:
US Dept. of the Interior, Professional Paper 486-B Plate 3.
USGS 30 Meter NED (Hillshade)
CA. Spatial Information Library
Groundwater Basins.
All locations approximate



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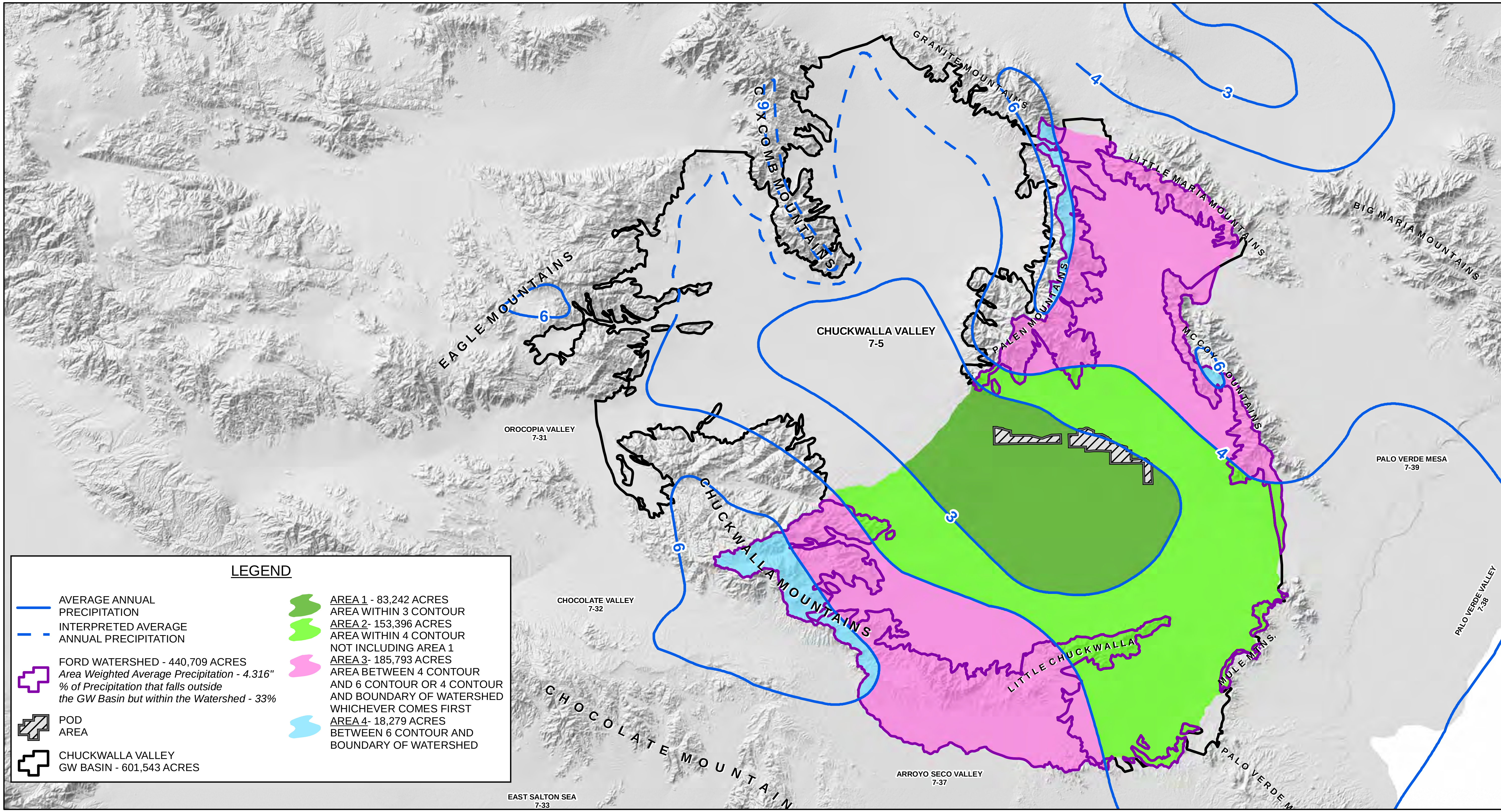
CHUCKWALLA VALLEY PALEN WATERSHED AVERAGE ANNUAL PRECIPITATION IN INCHES 1931 - 1960

SWL	LP/JF	12/2009
52004617		WR-DR151-1



SOURCE:
US Dept. of the Interior, Professional Paper 486-B Plate 3.
USGS 30 Meter NED (Hillshade)
CA. Spatial Information Library Groundwater Basins.
All locations approximate

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CHUCKWALLA VALLEY FORD WATERSHED
AVERAGE ANNUAL PRECIPITATION IN INCHES
1931 - 1960

SWL	LP/JF	12/2009
52004617	WR-DR151-2	

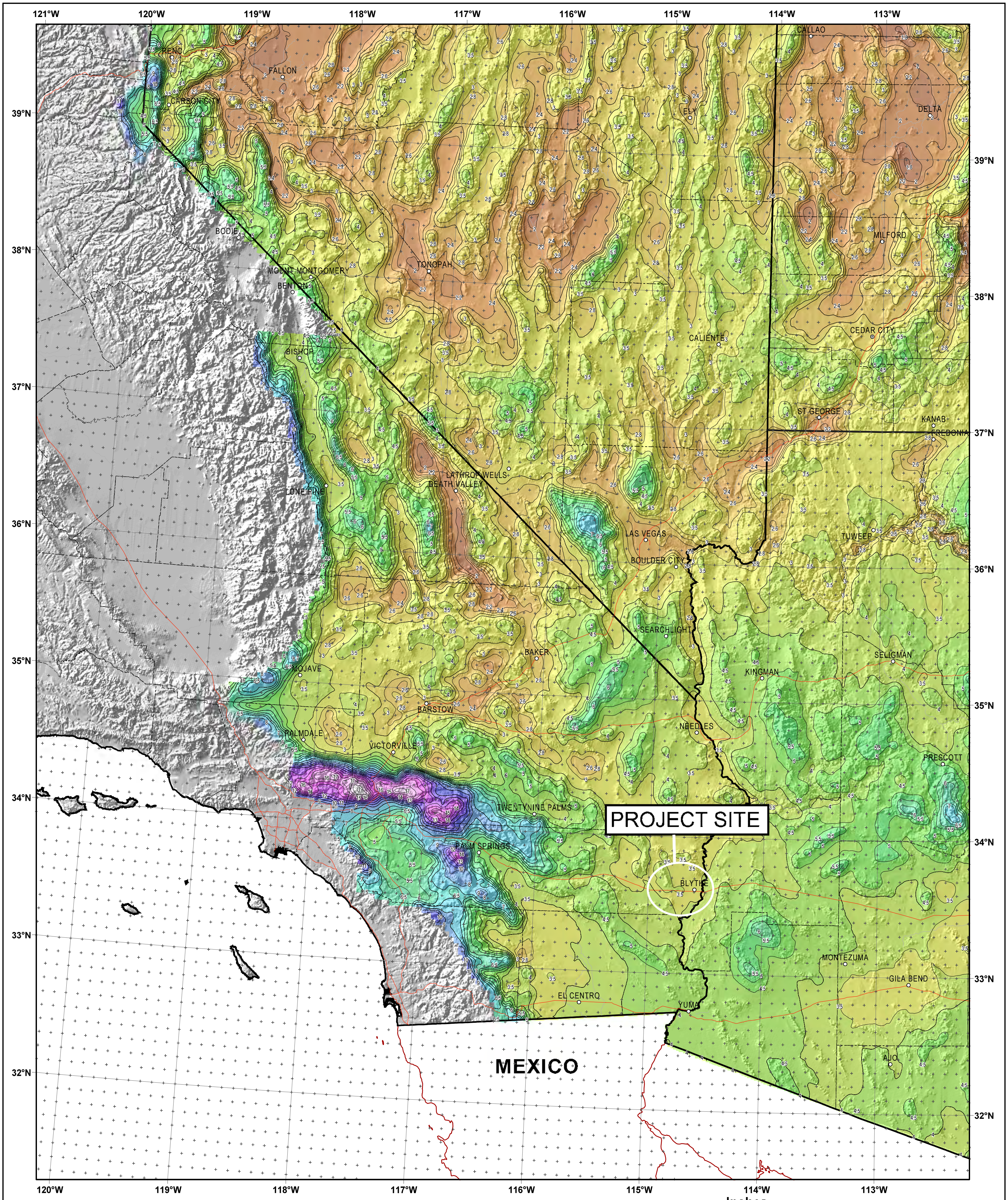


Figure WR-DR182

NOAA Atlas 14, Volume 1, Version 4
Semiarid Southwestern United States

Prepared by U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE
OFFICE OF HYDROLOGIC DEVELOPMENT
HYDROMETEOROLOGICAL DESIGN STUDIES CENTER
June 2006

SOUTHEASTERN CALIFORNIA

SCALE 1:2,000,000
(when printed/viewed at ANSI C size)
0 10 20 30 40 50 Miles
0 5 10 20 30 40 50 60 70 Kilometers

Isopluvials of 24 hour precipitation (inches) with Average Recurrence Interval of 100 years

See NOAA Atlas 14 documentation for factors to convert to Annual Exceedance Probabilities for all estimates below 25 years

N

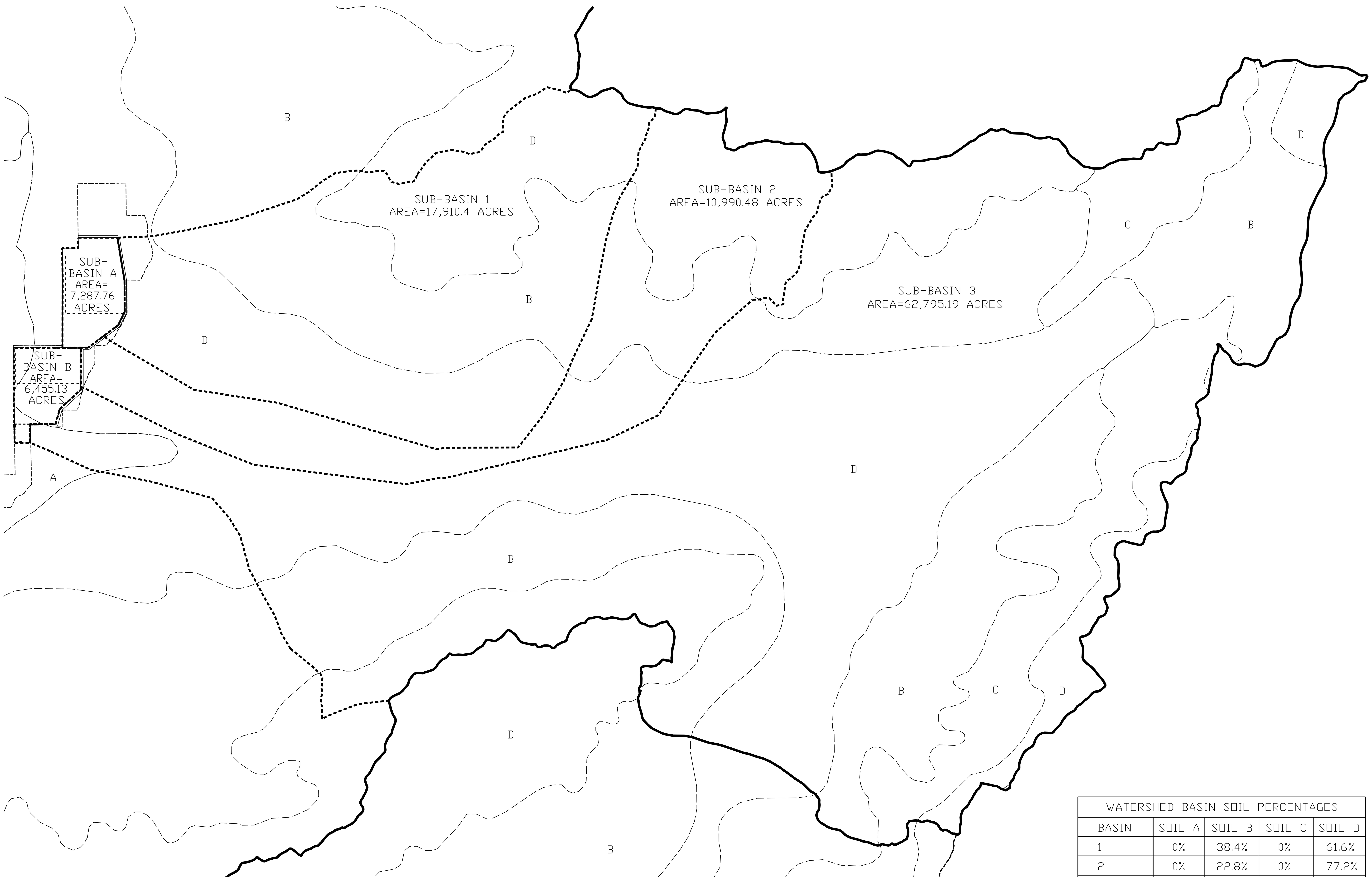
Inches

1.53 - 1.60	2.61 - 2.80	5.01 - 5.50	9.01 - 10.00	15.01 - 16.00
1.61 - 1.80	2.81 - 3.00	5.51 - 6.00	10.01 - 11.00	16.01 - 17.00
1.81 - 2.00	3.01 - 3.50	6.01 - 6.50	11.01 - 12.00	17.01 - 18.00
2.01 - 2.20	3.51 - 4.00	6.51 - 7.00	12.01 - 13.00	18.01 - 19.00
2.21 - 2.40	4.01 - 4.50	7.01 - 8.00	13.01 - 14.00	
2.41 - 2.60	4.51 - 5.00	8.01 - 9.00	14.01 - 15.00	

Projection: Lambert Conformal Conic; Datum NAD83; Standard Parallels: 38° and 45°; Central Meridian 112°.

LEGEND:

- SUB-BASIN WATERSHED BOUNDARY
- NCS SOIL TYPE BOUNDARY
- B — NCS SOIL TYPE
- CALIFORNIA REGIONAL WATERSHED BOUNDARY



WATERSHED BASIN SOIL PERCENTAGES				
BASIN	SOIL A	SOIL B	SOIL C	SOIL D
1	0%	38.4%	0%	61.6%
2	0%	22.8%	0%	77.2%
3	1.2%	36.9%	13.8%	48.1%
A	0%	0%	0%	100%
B	16.8%	0%	0%	83.2%

Zero Harm — Leadership, No Incidents, Safe Behavior

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resources & energy

CLIENT/PROJECT TITLE
GENESIS SOLAR, LLC
GENESIS SOLAR ENERGY PROJECT

SOIL TYPES AND PERCENTAGES
WITHIN WATERSHED
DATA REQUEST #183

SCALE 1"=4000' | DRAWING SIZE 24x36

WORLEYPARSONS DWG. NO. FIGURE WR-DR183 | REV

FILE NAME: $$$$DGNSPEC$$$$ $$$$DATE$$$$ $$$$TIME$$$$

...\working\Soils_Exhibit.dgn 11/30/2009 1:37:29 PM

LEGEND:

SUB-BASIN WATERSHED BOUNDARY

NCS SOIL TYPE BOUNDARY

B NCS SOIL TYPE

SOLAR SITE PROPERTY BOUNDARY

NOTE:

SOILS DATA OBTAINED FROM (SSURGO) "SOIL SURVEY GEOGRAPHIC". DATABASE PROVIDED BY (ISDA NRCS) "UNITED STATES DEPARTMENT OF AGRICULTURE - NATURAL RESOURCES CONSERVATION SERVICE".

Zero Harm Leadership No Incidents Safe Behavior

WorleyParsons resources & energy

CLIENT/PROJECT TITLE

GENESIS SOLAR, LLC
GENESIS SOLAR ENERGY PROJECT

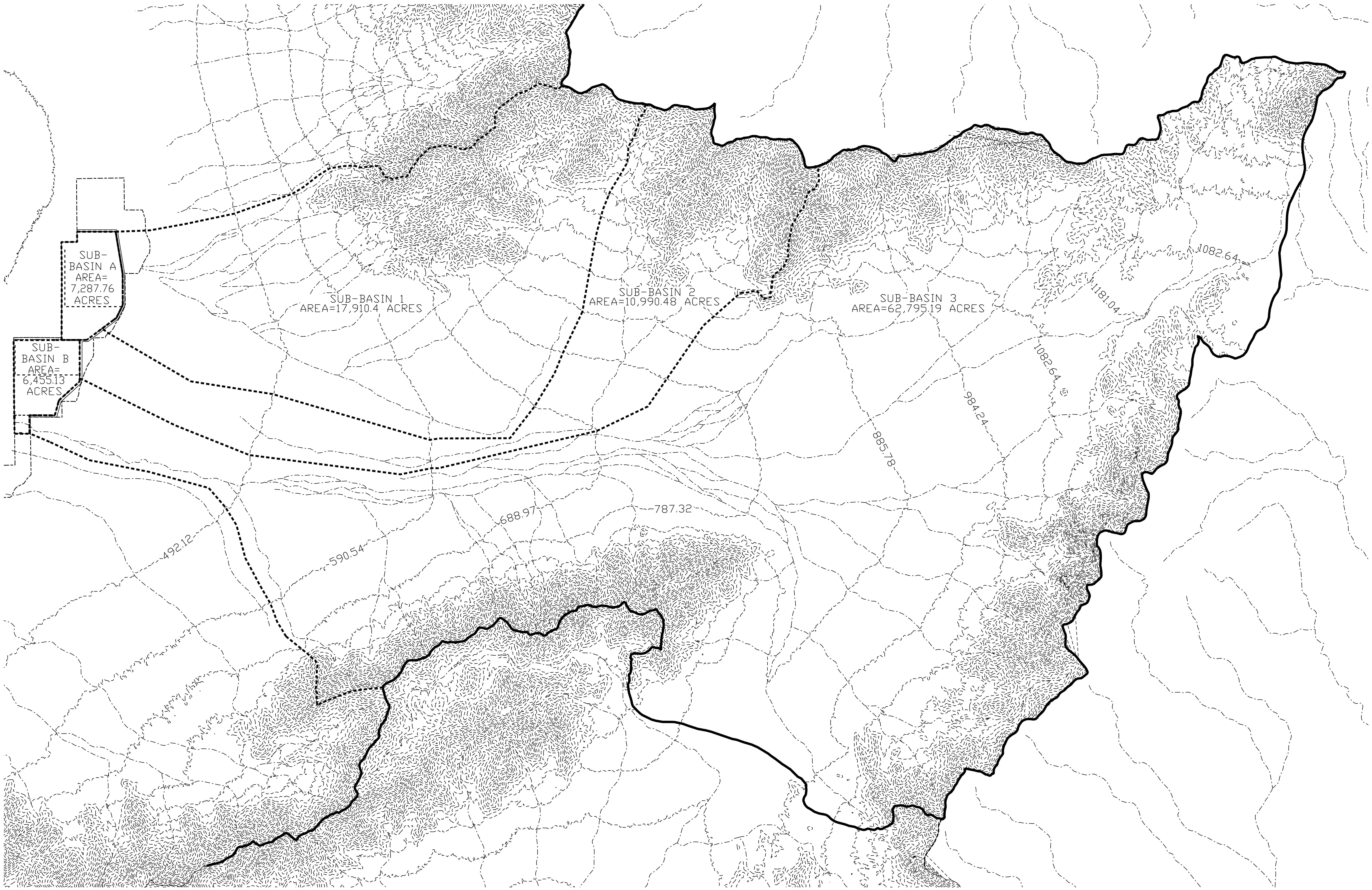
SOIL TYPES AND ROAD LOCATION MAP DATA REQUEST #184

SCALE	DRAWING SIZE
1"=6000'	24x36

WORLEYPARSONS DWG. NO.	REV
FIGURE WR-DR184	

FILE NAME: $$$$DGNSPEC$$$$$$$$$ $$$$DATE$$$$ $$$$TIME$$$$

..\working\localroads_exhibit.dgn 12/2/2009 4:38:19 PM



LEGEND:

SUB-BASIN WATERSHED BOUNDARY
EXISTING SWELLS
30 METER CONTOUR INTERVALS
CALIFORNIA REGIONAL WATERSHED BOUNDARY

Zero Harm Leadership No Incidents Safe Behavior

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CLIENT/PROJECT TITLE
GENESIS SOLAR, LLC
GENESIS SOLAR ENERGY PROJECT

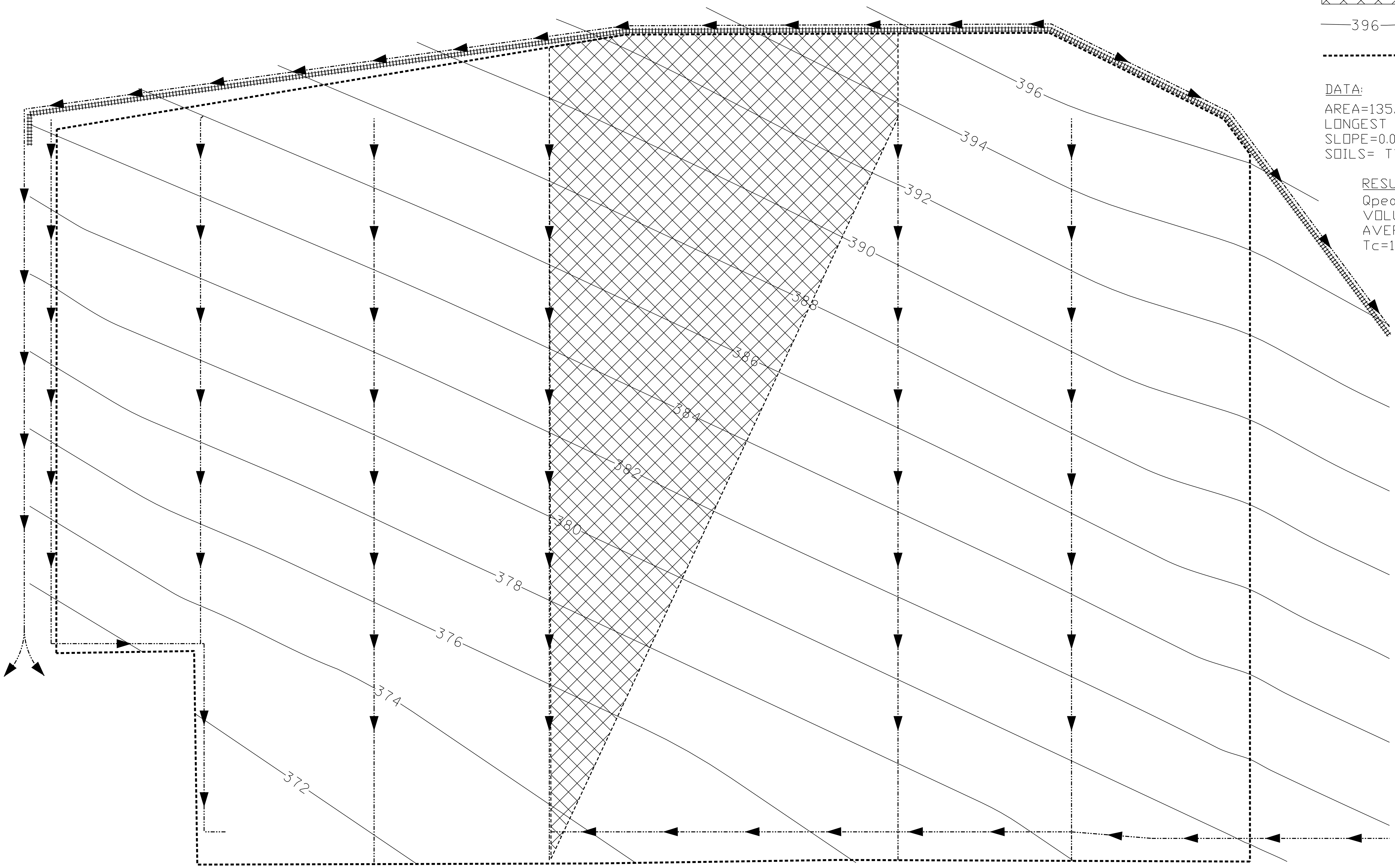
WATERSHED DELINEATION MAP
DATA REQUEST #185

SCALE	DRAWING SIZE
1"=4000'	24x36

WORLEYPARSONS DWG. NO. FIGURE WR-DR185 REV

FILE NAME: $$$$$DGNSPEC$$$$$$$$$$$$ $$$$DATE$$$$ $$$$TIME$$$$

...\working\Watersheds_Exhibit.dgn 12/1/2009 2:18:27 PM



LEGEND:

25 YEAR 24 HOUR BASIN A STORM DEPTH ANALYSIS AREA

396 PROPOSED CONTOUR

SUB-BASIN BOUNDARY

DATA:

AREA=135.71 ACRES
LONGEST RUN=5524.59'
SLOPE=0.004063 FT/FT
SOILS= TYPE 'D' POOR

RESULTS:

Qpeak=75.34 CFS
VOLUME(peak)=16.108 AC-FT
AVERAGE VELOCITY=1.03 FT/SEC
Tc=1.4922 HOURS

N

0 300 600 900 1200
1"=300 FT

Zero Harm
Leadership
No Incidents
Safe Behavior

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CLIENT/PROJECT TITLE

GENESIS SOLAR, LLC
GENESIS SOLAR ENERGY PROJECT

FLOW DEPTH EXHIBIT
FOR 25 YEAR 24 HOUR STORM
DATA REQUEST #190

SCALE	DRAWING SIZE
1"=300'	24x36

WORLEYPARSONS DWG. NO.	REV
FIGURE WR-DR190	

FILE NAME: $$$$DGNSPEC$$$$$$$$$$ $$$$DATE$$$$ $$$$TIME$$$$

DR_190 Exhibit.dgn 12/4/2009 2:39:57 PM

State of California
THE RESOURCES AGENCY OF CALIFORNIA
Department of Water Resources

BULLETIN No. 91-7

DATA ON
WATER WELLS AND SPRINGS IN THE CHUCKWALLA VALLEY AREA

RIVERSIDE COUNTY, CALIFORNIA

Prepared by
UNITED STATES DEPARTMENT OF INTERIOR
GEOLOGICAL SURVEY

FEDERAL-STATE COOPERATIVE GROUND WATER INVESTIGATIONS

MAY 1963

ell number	5/17-33N1	5/20-16Ms		
ate of collection	10-11-61[2]	5-19-61	5-20-52	11-1-17[1]
esults in parts per million		McCoy Spring		
Silica (SiO_2)	8	52		53
Iron (Fe)				.46
Calcium (Ca)	7	98	102	19
Magnesium (Mg)	2	34	23	11
Sodium (Na)	331	515	405	a219
Potassium (K)	31	15		
Bicarbonate (HCO_3)	464	571	296	356
Carbonate (CO_3)	0	0	0	0
Sulfate (SO_4)	45	97	233	77
Chloride (Cl)	216	656	533	137
Fluoride (F)	3.6	1.1		2.2
Nitrate (NO_3)	3.7	9.9	1.2	
Boron (B)	1.3	.96	.9	
Dissolved solids				
Calculated	877	1,760	1,440	694
Residue on evaporation at 180°C	859	1,780	1,560	
Hardness as $CaCO_3$	25	385	348	b93
Noncarbonate hardness as $CaCO_3$	0	0		
ercent sodium	91	73	72	
pecific conductance (micromhos at 25°C)	1,520	3,080	2,610	
I	7.5	7.6	7.5	
emperature (°F)	81	79	82	
pth of well (feet)	758	Spring	Spring	Spring
alyzing laboratory	DWR	DWR	DWR	
boratory number	R4186	R3957	P45	

See footnotes at end of table.

Waste Management

Item 215:

Information Required:

Please provide a plan to conduct further research (Department of Defense, U S Army Corps of Engineers), a thorough field reconnaissance, surveys, and geophysical surveys. The plan should identify agency discussion and permit requirements. The plan should also identify qualification requirements for UXO technicians and timing for surveys and reporting, as well as ordnance removal and disposal, if necessary.

Response:

It is understood that the Genesis Solar Energy Project area is in an area that was used during World War II for training exercises. The cultural resources staff did an extensive records research and did not find anything that indicated there might be UXO on site. One historian found some records that showed that small unit exercises probably occurred on site, and also that larger units may have passed through the site on their way to other areas for training, but no evidence of exercises or weapons used on the actual site.

In the spring of 2009, biological and cultural resource surveys were conducted at the site. Over the course of several weeks, dozens of staff combed the area in methodical transects looking for artifacts and other material on the surface of the ground. During that time period, only one 50 caliber cartridge was found, handled and appropriately disposed of by the Riverside County sheriff's department.

It is unlikely that any other UXO material remains on the surface of the project footprint. Genesis Solar, LLC will make a decision prior to the construction of the project regarding any further UXO investigation. A UXO Detection and Neutralization Plan is not thought to be necessary. However, some UXO identification training and/or reporting procedures during construction) will be implemented. A training program video and posters will be developed, similar to what was done on the Blythe transmission line. In this manner, in the unlikely scenario that any type of UXO be found, there will be procedures in place to deal with the issue appropriately.

Item 216:

Information Required:

Please describe the timing and methodology for completing the geophysical surveys.

Response:

No geophysical surveys for discovery of UXO are thought to be needed at this time.

Item 217:

Information Required:

Please provide the expertise and qualifications of those conducting the geophysical surveys.

Response:

See response to Items 216 and 217.

Item 218:

Information Required:

Please provide results of the geophysical surveys.

Response:

Please see response to Items 216 and 217.

Item 219:

Information Required:

Please identify all water treatment waste streams, waste management methods, and quantity of waste that will be generated.

Response:

Water Treatment Waste Streams

As outlined in Section 5 of the Report of Waste Discharge (RoWD) (Appendix H of the AFC) and Water Balance, Figures 3.4-8 and 3.4-9, there are three primary liquid waste streams that will be discharged into the evaporation ponds. They consist of:

- Wastewater from the multi-media filter upstream of the water pre-treatment system,
- Wastewater from the multi-media filter upstream of the post-treatment system, and
- Reject wastewater from the post-treatment reverse osmosis unit.

In addition, there are several solid waste streams generated from plant operation. The primary solid waste streams include spent media from multimedia filters, spent elements from reverse osmosis membranes, spent elements from reverse osmosis cartridge filters, and the evaporative residue from the evaporation ponds.

Waste Management Methods:

Non-hazardous solid waste generated at the Project site during both construction and operation phases will be taken off-site for recycling or disposal to a permitted Class III landfill. As noted in AFC Section 5.13.1, there are seven Class III landfills located in Riverside County within approximately 145 miles of the Project site: the Badlands, Lamb Canyon, Oasis, Desert Center, Blythe, Mecca, and El Sobrante landfills. The maximum landfill capacity, daily operating capacity, and remaining capacity of each landfill are listed in Table 5.13-1.

Hazardous waste generated at the facility will be taken off-site for recycling or disposal by a licensed and permitted hazardous waste transporter to a permitted treatment, storage, and disposal facility (i.e., Class I landfill). There are two major operating hazardous waste (Class I) landfills in California: (1) Chemical Waste Management Landfill located in

Kettleman Hills (Kings County), and (2) Clean Harbors Buttonwillow Landfill (Kern County). These accept Class I solid wastes and Class II solid and liquid wastes.

Quantity of Waste Generated:

The water and wastewater treatment systems will also generate solid wastes from periodic preventative maintenance that will be taken off-site for recycling or disposal to a permitted non-hazardous landfill. The amount of solid waste generated from periodic maintenance will be small compared to the volume of solid waste to be removed from the evaporation ponds. Since detailed design has not been completed, the amount of wastes generated is only an estimate at this stage of the design. These solid wastes include:

- Spent media from filters, which will consist of sand, gravel, garnet, anthracite, etc. Filter media will be replaced approximately every five years. Multi-media filters typically contain 1 foot of anthracite, 2 feet of sand and 0.5 feet of garnet. For a flow of approximately 6 gpm per square foot and assuming there are three 50% filters, this would require 525 cubic feet of media for each of the three vessels, which equates to 1575 cubic feet of media replacement every 5 years for pre-treatment. Assuming the post-treatment is roughly the same as the pre-filter except at one-third the flow, then approximately 525 cubic feet of media would be needed for the post-treatment system as well.

- Reverse osmosis cartridge pre-filters consist of fiber-wound filter elements and may be used for demineralizer post-filters cartridges. However, demineralizer post-filters may consist of small-pore polymer fibers. Filters are replaced every few months. Each filter element is typically 2” in diameter and 20” in length. Each cartridge is designed for a maximum of 5 gpm per cartridge. Based on the expected flow of 1671 gpm through the water pre-treatment RO system, 335 cartridges would be required and replaced every few months. Based on the expected flow of 528 gpm through the post-treatment RO system, 106 cartridges would be required and replaced every few months. Cartridge waste for the RO treatment system would be approximately 440 cartridges every few months, depending on the amount of TSS present.

- Reverse osmosis membrane elements, which will be recycled or disposed of off-site approximately every 3 to 5 years. Membranes are typically 4” in diameter and 40” long with each element processing roughly 15 gpm. With 6 elements per tube, 20 tubes (or 120 elements) would roughly be able to process the pre-treatment flow. With the post-treatment adding another one-third of the pre-treatment flow, then approximately 160 elements would be disposed of every 3 to 5 years.

- Evaporation pond residue, which will be dewatered and sent offsite to an appropriate landfill for disposal. Temporary dewatering equipment may be leased and located at the evaporation ponds during cleanout cycles.

Item 220:

Information Required:

Please identify all Class II waste disposal sites that will be used for disposal of evaporation pond cleanout waste.

Response:

As referenced in Section 5.13.1.2 of the AFC, the Clean Harbors Buttonwillow Landfill located on Lokern Road is a treatment, storage and disposal facility that accepts Class I and Class II wastes. Class II type waste will be disposed at this facility. Other Class II facilities were reviewed however these facilities are not operational and therefore were not included in the AFC.

Item 221:

Information Required:

Please provide analysis method or criteria used to estimate quantities of contaminated soil and/or estimated volumes of spills and leaks.

Response:

As discussed in the AFC Appendix H-Genesis Solar Report of Waste Discharge (RoWD), contaminated soils and/or spills and leaks are identified, tested and evaluated and determined quantities are established using the Environmental Protection Agency (EPA) publication “Test Methods for Evaluation Solid Waste” (SW-846). This publication will be onsite during all operations concerning the evaporation ponds, waste generation, testing, evaluation or removal.

Item 222:

Information Required:

Please identify volume of HTF contained within pipeline segments separated by isolation valves (max, min, average). Are the isolation valves automatically activated in the event of low pressure (pipeline leak or rupture)?

Response:

A detailed piping layout for the project has not been completed due to the high level of system optimization required for piping networks found in parabolic trough plants. However, estimates have been developed based on preliminary layouts for the project. Each proposed solar field is laid out in quadrants. Two quadrants in the north and south are supplied by a main section header running north-south. These north-south section headers connect to east-west laterals that supply HTF to each quadrant and subsequent collector loops. Each collector loop will contain approximately 630 gallons of HTF that can be isolated. The estimated maximum quantity of HTF between isolation valves is approximately 120,000 gallons. This volume of HTF is located in the east-west laterals that supply each quadrant and represents an unlikely spill risk. Assuming best management practices are in place, responders to the spill can alleviate the problem well before the total volume of fluid is lost. In over 20 years of the operation of the Mojave Desert SEGS (I-IX), there has been no significant HTF spill resulting from a failure or damage to the HTF header piping. History has shown that the most likely location of an HTF spill is for it to occur in the solar collector loop. This represents significantly less HTF volume for a potential spill. The loop can be easily isolated and equipment will be readily available to collect and prevent any additional leaking fluid from contaminating the soil. The loop is designed to be easily and safely drained at which point repairs can be made. In the extreme case where a leak occurs in close proximity to the isolation valves which would limit safe access to them even with use of an extension arm, procedures exist to limit the HTF loss by stopping pumps, closing main and any intermediate isolation valves to that portion of the field and closing off all other individual loops to limit the additional fluid that will be introduced to the failure site. The project will use manual isolation valves at each loop as well as automatic valves located at section headers, the pump header, and laterals. The isolation valves, experienced personnel, and work procedures will limit spills within the facility. As outlined in the Report of Waste Discharge, a Spill Prevention Control and Countermeasure will be prepared for the facility which will include procedures for the unforeseen event of a large HTF spill.

Item 223:

Information Required:

Please clarify how the raw groundwater quality will be limited to the deeper aquifer.

Response:

The production wells for operating water supply will be screened in intervals the yield water consistent with California state water policy for use as a wet cooling water supply. Lateral hydraulic conductivity is many times greater than vertical hydraulic conductivity; therefore, vertical capture beyond the screened interval of the production wells will be self limiting. The water produced from the well will be of a quality that complies with State water policy for use as a source of wet cooling water for the project, and further measures are not warranted.

The project water treatment design, water balance, raw water quality and predicted wastewater quality are based on a groundwater sample collected from the proposed pumping interval. As is typically the case, additional water quality data will be gathered in support of detailed design. This information, and any necessary refinements to the predicted wastewater chemistry and water balance will be provided to CEC as soon as they are available.

Item 224:

Information Required:

If other aquifers are likely to contribute to the water supply, please revise Table 7 Predicted Chemistry of Evaporation Pond Residues accordingly.

Response:

The operational groundwater supply for the Project will be developed below a depth of 800 feet from the Bouse Formation and possibly the underlying Fanglomerate. Many production wells in the area are screened in both of these units and based on the available data they are assumed to act a single aquifer. The chemistry of the groundwater supply has been characterized based on groundwater sampling and chemical analysis as described in the AFC. This information is the basis for the predicted chemistry of the evaporation pond chemistry as described in Table 7. As water supplies are further investigated to support detailed design of the project, it is possible that data regarding the chemistry of the water supply, and as a result the evaporation pond residue, will be updated. Any updates will be provided to the CEC as soon as they are available. Based on available data, a reduction in water quality discharging into the ponds or an increase the volume or toxicity of the evaporated residue is not expected if a different source of local groundwater was used.

Item 225:

Information Required:

Please provide information on how the Genesis Solar Energy Project will meet the requirements of the Riverside County Construction and Demolition Waste Diversion Program.

Response:

Table 5.13-2 in the AFC provided a summary of the construction waste streams and management methods. This table stated that non-hazardous construction waste would be recycled as much as possible. The Integrated Waste Management Act of 1989 (AB 939) established landfill waste diversion goals of 50 percent by the year 2000 for state and local jurisdictions. The Riverside County Construction and Demolition Waste Diversion Program to meet AB 939 is administered by the Riverside County Waste Management Department (RCWMD). The RCWMD's goal is to have each project recycle, reuse, compost, and/or salvage a minimum of 50% of the material and/or waste generated on site. To meet these objectives a Recycling Plan (RCWMD Form B) would be prepared and approved by RCWMD prior to the issuance of Building Permits. The recycling plan identifies construction materials, the waste management method for each material, the estimated weight diverted from landfill, and the estimated weight of material landfilled to determine the total landfill diversion for the Project. The primary construction wastes that will be generated by the Project are wood, concrete, asphalt, and steel. As part of the Recycling Plan, options for reducing, recycling, and reuse of construction materials will be investigated. Collection containers will be available on site for sorting of recyclable materials.

Prior to the issuance of Occupancy Permits, the Construction and Demolition Waste Diversion Program Reporting Form (RCWMD Form C) will be submitted and approved by RCWMD. This form requires letters and/or receipts including certified weights, for all materials and/or waste recycled, reused, composed, salvaged and/or landfilled. This information will be used to calculate the total waste generated and the final diversion weight for the Project. The Project will meet the RCWMD goal of 50 percent waste diversion from landfill.

REFERENCE:

Riverside County Waste Management Department 2009, Construction and Demolition Waste Diversion Program. Available online at http://www.rivcowm.org/recycling/WRP_FINAL.pdf accessed 11/30/09.

Worker Safety/Fire Protection

Item 226:

Information Required:

Please provide a Phase I ESA that addresses the issue of UXO.

Response:

The Phase I ESA completed for the project satisfies the needs of Genesis Solar, LLC. The Phase I ESA recognized the potential for UXO findings in the area, but acknowledges that only one 50 caliper cartridge was found in the entire area.

Please read the response to Item 227 below.

Item 227:

Information Required:

If the Phase I ESA documents the presence of UXO, please provide a UXO Detection and Neutralization/Removal Plan for the site areas where UXO were found.

Response:

It is understood that the Genesis Solar Energy Project area is in an area that was used during World War II for training exercises. The cultural resources staff did an extensive records research and did not find anything that indicated there might be UXO on site. One historian found some records that showed that small unit exercises probably occurred on site, and also that larger units may have passed through the site on their way to other areas for training, but no evidence of exercises or weapons used on the actual site.

In the spring of 2009, biological and cultural resource surveys were conducted at the site. Over the course of several weeks, dozens of staff combed the area in methodical transects looking for artifacts and other material on the surface of the ground. During that time period, only one 50 caliber cartridge was found, handled and appropriately disposed of by the Riverside County sheriff's department.

It is unlikely that any other UXO material remains on the surface of the project footprint. Genesis Solar, LLC will make a decision prior to the construction of the project regarding any further UXO investigation. A UXO Detection and Neutralization Plan is not thought to be necessary. However, some UXO identification training and/or reporting procedures during construction will be implemented. A training program video and posters will be developed, similar to what was done on the Blythe transmission line. In this manner, in the unlikely scenario that any type of UXO be found, there will be procedures in place to deal with the issue appropriately.