Tessera Solar
power from stirling energy systems

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08-AFC-5
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July 13, 2010

To the Committee and Hearing Officer
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512

RE: Imperial Valley Solar Project (formerly SES Solar Two) (08-AFC-05)
Applicant's Submittal of Additional Opening Testimony

Dear Commissioners Jeffrey D. Byron and Anthony Eggert, and Hearing Officer Raoul Renaud:

Attached is the Applicant's opening testimony for the Evidentiary Hearings to be held on July 26 and 27, 2010. The testimony provides additional information regarding the status of the U.S. Army Corps of Engineers identification of the Least Environmentally Damaging Practicable Alternative.

At this time we consider our opening testimony in all other areas to be complete. Pending receipt of the testimony from other parties, we may file additional and/or rebuttal testimony.

Although the SSA was submitted a few days later than expected, we believe the case will nevertheless be ready for hearings at the end of July.

I certify under penalty of perjury that the foregoing is true, correct, and complete to the best of my knowledge.

Sincerely,

Marc Van Patten
Senior Director of Development

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TESTIMONY
OF
MIKE FITZGERALD
Biology – Aquatic Resources

1. Q. Are you the same Mike Fitzgerald that submitted testimony and rebuttal testimony in May, 2010 pertaining to hydrologic analyses and the "least environmental damaging practicable alternative" (LEDPA)?

   A. Yes and my resume submitted at that that time is still valid.

2. Q. What is the purpose of your testimony?

   A. The purpose of my testimony is to describe the status of the U.S. Army Corps of Engineers (ACOE) consideration of alternatives to the proposed Imperial Valley Solar Project to determine what constitutes the least environmentally damaging practicable alternative (LEDPA).

3. Q. What exhibits are you sponsoring in this proceeding?

   A. I am sponsoring Exhibit 119, which is the draft 404(b)(1) Alternatives Analysis prepared by Ecosphere Environmental Services on behalf of Tessera Solar North America and the ACOE.

4. Q. Please describe the status of your submittal of the 404(b)(1) Alternatives Analysis.

   A. The draft 404(b)(1) Alternatives Analysis, attached, was submitted to the ACOE and the U.S. Environmental Protection Agency (EPA) on June 3, 2010. As required by the ACOE and the EPA's Clean Water Act implementing regulations, the draft 404(b)(1) Alternatives Analysis evaluated a range of off-site and on-site alternatives to the proposed project to determine if there are practicable ways in which impacts to aquatic resources could be reduced. Practicability of alternatives was determined based upon consideration of cost, existing technology and logistics in light of the overall project purpose. As is thoroughly discussed in the draft 404(b)(1) Alternatives Analysis, this analysis demonstrated that there was a practicable alternative to the proposed project which would significantly reduce impacts to waters of the United States. This alternative (Alternative 3 in the 404(b)(1) Alternatives Analysis) would allow for the generation of 709 MW and would reduce the permanent impacts to waters of the United States to 39.1 acres. With the submittal of the draft 404(b)(1) Alternatives Analysis the applicant amended its ACOE Individual Permit application to request approval of Alternative 3.

   The draft 404(b)(1) Alternatives Analysis also evaluated the practicability of the alternatives considered in the Staff Assessment/Draft Environmental Impact Statement. These alternatives were all determined to not be practicable. In particular, the Alternative described as Drainage Avoidance # 1 was found to not be practicable in terms of cost considerations. Additionally, as this alternative would result in permanent impacts to 38 acres of waters of the United States, it would not significantly reduce environmental impacts to aquatic resources as compared Alternative 3, the alternative deemed by the applicant to be the LEDPA.

   In addition to identifying the LEDPA, the 404(b)(1) Alternatives Analysis also provides the information necessary for the ACOE to evaluate compliance of the project with other regulatory requirements included in the Clean Water Act and the ACOE's implementing regulations. Per direction from the ACOE, the draft document was submitted with several highlighted placeholders for the ACOE to populate with information from the California Rapid Assessment Method (CRAM) prepared by the Southern California Coastal Water Research Project (SCCWRP). The CRAM data is

expected to characterize the functioning condition of waters of the U.S. that occur on the project site along various metrics. These conditions enable the ACOE to more precisely project the nature of post project impacts and necessary mitigation requirements. The CRAM report from SCCWRP was not complete at the time the draft 404(b)(1) was submitted.

5. Q. Has the CRAM analysis been completed?

A. The CRAM study was completed by SCCWRP and submitted to the ACOE for incorporation into the 404(b)(1) analysis. Since that time Ecosphere and the ACOE have worked together to revise the draft 404(b)(1).

6. Q. What is the status of the revised draft 404(b)(1) analysis?

A. The Corps is revising the draft draft 404(b)(1) in order to adopt the analysis as their own for inclusion in the IVSP FEIS in the coming days.

7. Q. Do you expect the CRAM data to change the overall conclusions reached in the draft 404(b)(1) analysis?

A. No, as previously stated, the CRAM data are not part of the LEDPA analysis. Rather the CRAM only provides additional detail as to the existing condition of waters of the U.S. onsite and helps to describe the consequent impacts resulting from developing the project.

8. Q. Based on the completed CRAM and the draft 404(b)(1) analysis, are there any further modifications the ACOE is expected to make to the project from those discussed in your previous analysis?

A. Having worked with the Corps for last month revising the draft 404(b)(1), I have received no indication from the Corps that further project modifications will be required.

9. Q. Are there any additional Exhibits which you are sponsoring?

A. Yes. I am also sponsoring Exhibits 120 and 121, additional hydrological analyses prepared by Dr. Howard Chang. Exhibit 120 - *Computation of Local Scour on Streambed Induced by SunCatchers (May 28, 2010)* is an analysis quantifying indirect impacts resulting from scour around SunCatcher pedestals. Exhibit 121 - *Evaluation of Engineering Impacts of Revised Plan of Development, Site Plan, and Fencing Design for Solar 2 Site and Recommendations for Impact Mitigation* (May 25, 2010) analyzes sediment transport and changes to river morphology for the applicant's revised 709 MW project.

10. Q. What do these studies conclude?

A. The scour study analyzes the preliminary indirect impact analysis completed by the CEC in the SA/DEIS and concludes that the methodology over estimated the indirect impacts from scour by almost ten times (approximately 13 acres versus 1.6 acres). The difference between approaches has to do with the preliminary analysis failing to take into consideration sediment deposition (backfilling) in the scour area following peak flow as a flood event subsides. Exhibit 121 simply summarized Dr. Chang's rerun of his sediment model against the applicant's revised 709 MW project. This revised project incorporated all of Dr. Chang's project impact reduction recommendations from his originally completed project hydrological analysis (submitted in my previous testimony) and reiterated his live testimony before this commission. This analysis reaffirmed Dr. Chang's

past report and testimony; specifically, that there will be no impacts from downstream sediment transport and that there will be no changes in stream morphology as a result of developing the project.

11. Q. Does that conclude your testimony?

A. Yes.

I swear under penalty of perjury that this testimony is true and correct to the best of my knowledge.

July 13, 2010

_____ _____

Date Mike Fitzgerald

Professional environmental management solutions. Expert regulatory compliance guidance.

404B-1 Alternatives Analysis

For the Imperial Valley Solar Project

Prepared for:

US Army Corps of Engineers
San Diego Field Office
Los Angeles District

Submitted to:

U.S. Army Corps of Engineers, Los Angeles District
Regulatory Branch – San Diego Field Office
6010 Hidden Valley Road, Suite 105
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June 3, 2010

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Full Name	Acronym or Abbreviation
Above Market Funds	AMF
Application for Certification	AFC
Area of Critical Environmental Concern	ACEC
Army Corps of Engineers	ACOE
Best management practices	BMPs
Bureau of Land Management	BLM
California Energy Commission	Energy Commission
California Environmental Quality Act	CEQA
California Independent System Operator	CAISO
California Native Plant Society	CNPS
California Public Utilities Commission	CPUC
California Rapid Assessment Model	CRAM
Colorado River Regional Water Quality Control Board	RWQCB
Cubic feet per day	cfd
Cubic feet per second	cfs
Debt service coverage ratio	DSCR
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Designated Critical Habitat	DCH
Dollar per megawatt-hour	$/MWh
Drainage, Erosion and Sediment Control Plan	DESCP
Gallons Per Day	gpd
Federal Emergency Management Agency	FEMA
Federal Highway Administration	FHWA
Flat-tailed horned lizard	FTHL
Interstate 8	I-8
Kilovolt	kV
Kilowatt	kW
Least Environmentally Damaging Practicable Alternative	LEDPA
Market Price Referent	MPR
Megawatt	MW
Milligram/liter	mg/L
mmhos per centimeter	mmhos/cm

Full Name	Acronym or Abbreviation
National Environmental Policy Act	NEPA
National Renewable Energy Laboratory	NREL
National Wetlands Inventory	NWI
Natural Resources Conservation Service	NRCS
Naval Air Facility	NAF
Peninsular bighorn sheep	PBS
Power conversion unit	PCU
Power Purchase Agreement	PPA
Programmatic Agreement	PA
Renewable Portfolio Standard	RPS
Revised Universal Soil Loss Equation	RUSLE2
Right-of-way	ROW
San Diego Gas & Electric	SDG&E
Seeley Waste Water Treatment Facility	SWWTF
Soil Conservation Service	SCS
Soil erosion factor	KW
Solar Programmatic Environmental Impact Statement	PEIS
Southern California Coastal Water Research Project	SCCWRP
Staff Assessment/Draft Environmental Impact Statement	SA/DEIS
Storm Water Pollution Prevention Plan	SWPPP
Tessera North America	TSNA
Total dissolved solids	TDS
United States Department of Agriculture	USDA
United States Department of Defense	DOD
United States Environmental Protection Agency	EPA
United States Fish and Wildlife Service	USFWS
United States Geological Survey	USGS
Waters of the United States	WUS

1.0 Introduction

On November 4, 2009, Tessera Solar North America (TSNA) also known as the Applicant, submitted an individual Section 404 permit application to the U.S. Army Corps of Engineers for the Imperial Valley Solar Project (Imperial Valley Solar Project) seeking authorization to fill 165 acres of waters of the United States (WUS) on a 6,571 acre site located in Imperial County, California and primarily on federal lands managed by the United Stated Department of the Interior, Bureau of Lands Management (BLM). As originally envisioned, Imperial Valley Solar Project would have included the installation of solar generating facilities capable of generating up to 900 megawatts (MW) of electricity on approximately 7,650 acres of land. Site investigation revealed that development in the eastern portion of the larger site would result in significant and unavoidable impacts to sensitive environmental resources. The project was therefore redesigned to avoid these impacts, resulting in a reduction of the developable area to 6,571 acres with a nominal capacity of generating 750 MW of electricity. Since submittal of the Section 404 Corps permit application, the Applicant has continued to explore avenues for reducing impacts to aquatic and other sensitive resources. As is described in detail below, this effort has resulted in the identification of project revisions that allow for the significant avoidance of impacts to aquatic resources (from 177 acres to 39.1 acres of permanent impacts) while still allowing for a practicable project.

Because the project team has identified a practicable alternative that allows for the avoidance of significant impacts to aquatic resources, TSNA is amending the application to request authorization to permanently impact 39.1 acres of jurisdictional areas, temporarily impact to 10.8 acres of WUS and indirectly impact less than 1.6 acres allowing for the construction of Alternative 3, the alternative found here within to be the Least Environmentally Damaging Practicable Alternative (LEDPA). Attachment A provides the site layouts for the Alternatives.

The following impact analysis is provided in accordance with Section 404(b)(1) of the Clean Water Act. In order to avoid duplication of pertinent sections of the project California Energy Commission (Energy Commission) Staff Assessment/Draft Environmental Impact Statement (SA/DEIS), released on February 12, 2010, there are multiple references to sections of the SA/DEIS where more information may be obtained to support this analysis. This SA/DEIS and additional project details, status, copies of notices, and electronic version of documents filed with the Energy Commission are available under "Documents and Reports" at http://www.energy.ca.gov/sitingcases/solartwo/.

1.1 Regulatory Setting

Any activity requiring an individual permit under Section 404 of the Clean Water Act must undergo an analysis of alternatives in order to identify the LEDPA pursuant to the requirement of the guidelines established by the United States Environmental Protection Agency (EPA), known as the *Section 404(b)(1) Guidelines*. The Guidelines prohibit discharge of dredge or fill material to WUS if there is a "practicable alternative to the proposed discharge that would have less impact on the aquatic ecosystem, provided that the alternative does not have other significant environmental consequences." [40 C.F.R. § 230.10(a).]. An alternative is practicable "if it is available and capable of being done after taking into consideration cost,

existing technology and logistics in light of the overall project purposes." [40 C.F.R. §§ 230.10(a) and 230.3(q).] "If it is otherwise a practicable alternative, an area not presently owned by an Applicant which could reasonably be obtained, utilized, expanded or managed in order to fulfill the basic purpose of the proposed activity may be considered." [40 C.F.R. § 230.10(a)(2).] Thus an alternative must meet the overall project purpose, the purpose for which the Applicant submits the request for fill authorization, and must be consistent with cost, and logistical and availability criteria to be deemed the LEDPA.

If the proposed activity would involve a discharge into a special aquatic site such as a wetland, the *Section 404(b)(1) Guidelines* distinguish between those projects that are water dependent and those that are not. A water dependent project is one that requires access to water to achieve its basic purpose, such as a marina. A non-water dependent project is one that does not require access to water to achieve its basic purpose, such as a housing development. Here, the Proposed Project is not water dependent.

The *Section 404(b)(1) Guidelines* establish two presumptions for non-water dependent projects that propose a discharge into a special aquatic site, such as a wetlands. First, it is presumed that there are practicable alternatives to non-water dependent projects, "unless clearly demonstrated otherwise." [40 C.F.R. § 230.10(a)(3).] Second, "where a discharge is proposed for a special aquatic site, all practicable alternatives to the proposed discharge which do not involve a discharge into a special aquatic site are presumed to have less adverse impact on the aquatic ecosystem, unless clearly demonstrated otherwise." [Id.] The thrust of the Guidelines is that Applicants should design proposed projects to meet the project purpose while avoiding impacts to aquatic environments. This approach is emphasized in a Memorandum of Agreement between the EPA and the Corps Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines (1990) ("MOA"). The MOA articulates the Guidelines "sequencing" protocol as first, avoiding impacts, second, minimizing impacts, and third, providing practicable compensatory mitigation for unavoidable impacts and no overall net loss of functions and values. These presumptions do not apply to the IVSP as no wetlands are directly impacted by the proposed project.

In addition to requiring the identification of the least environmentally damaging practicable alternative, the Guidelines mandate that a project must not violate any applicable toxic effluent standard or prohibition, 40 C.F.R. § 230.10(b)(2), jeopardize the continued existence of any endangered or threatened species (or destroy or adversely modify critical habitat), 40 C.F.R. § 230.10(b)(3), cause or contribute to violations of any applicable state water quality standard, 40 C.F.R. § 230.10(b)(1), or cause or contribute to significant degradation of WUS, 40 C.F.R. § 230.10(c). Prior to completing its review, the Corps also must evaluate the proposed project in light of the public interest. Finally, the Corps must ensure that its environmental review complies with the National Environmental Policy Act (NEPA), codified at 42 U.S.C § 4321 et. seq.

1.2 Purpose and Need

The basic project purpose is to provide a utility grade renewable energy facility in an area of Southern California that can provide power to San Diego Gas & Electric (SDG&E). This purpose is not water dependent. The overall project purpose is to

construct an economically viable solar energy facility utilizing the solar dish Stirling systems technology (referred to as SunCatchers™) in Southern California, which will provide substantial amounts of clean, renewable, solar energy to SDG&E. The overall project purpose includes assisting SDG&E and the State of California in meeting the Renewable Portfolio Standard (RPS), which requires 20% of the electricity sold by regulated California utilities to be generated from renewable energy by 2010 under statute and 33% by 2020 under Governor's Executive Order. The overall project purpose also includes assisting SDG&E, the State of California, and the United States in reducing greenhouse gas emissions to the maximum extent feasible.

SDG&E selected the proposed Imperial Valley Solar Project to help meet its objectives under the legislative requirements of the California Renewable Portfolio Standard (RPS) Program through a least-cost, best-fit competitive solicitation. Because the proposed Imperial Valley Solar Project is one of the three projects that SDG&E selected from the solicitation, the Applicant and SDG&E entered into a 20-year Power Purchase Agreement (PPA) for the provision of renewable electricity. This PPA will help SDG&E meet both its statutory mandate to purchase at least 20% of its electric power from renewable resources by 2010 and its future electricity requirements. The Imperial Valley Solar Project represents approximately 84.1% of SDG&E's RPS goals.

1.3 State and Federal Land Use Authority

The Applicant has submitted an Application for Certification (AFC) to the California Energy Commission (Energy Commission) for the proposed project. The Energy Commission is the lead State agency responsible for evaluating the environmental effects of the project and for complying with the California Environmental Quality Act (CEQA) for project related discretionary actions by the Energy Commission. The project proposes the use of land managed by the United States Department of the Interior, Bureau of Land Management (BLM); therefore the Applicant has submitted a request for a right-of-way grant to the BLM. The BLM is the federal lead agency for the evaluation of project effects and compliance of the proposed project with National Environmental Policy Act (NEPA).

1.4 Location

TSNA Imperial Valley Solar Project, a proposed solar thermal electricity generation facility, would be located in Imperial County, California, primarily on public land managed by the BLM. The project site is approximately 100 miles east of San Diego, 14 miles west of El Centro, and 4 miles east of Ocotillo. The following sections or portions of sections within Township 16 of the San Bernardino Meridian, identify the project site and the planned boundary for development of the Imperial Valley Solar Project. A regional overview map is included in Figure 1 and the proposed project description is included in Figure 2. The project is proposed for location within U.S. Geological Survey (USGS) 7.5-minute map quadrangles; Plaster City, Painted Gorge, and a small portion on Coyote Wells.

- Within Township 16 South, Range 11 East of the San Bernardino Meridian defined by:
    - the portion of Section 7 south of the railroad right-of-way (ROW),
    - the portion of the southwest quarter section and the north half of the southeast quarter section of Section 9 south of the railroad ROW,

- the southeast quarter-quarter section of the northeast quarter section and the east half of the southeast quarter section of Section 14 north of the Interstate 8 (I-8) ROW and east of Dunaway Road,
- the southwest, northwest, and southeast quarter-quarter sections of the southwest quarter section of Section 15, and the southwest quarter-quarter of the southeast quarter section of Section 15,
- the northwest quarter and southeast quarter of Section 16,
- all of Section 17,
- Section 18, excluding the southwest and southeast quarter-quarter sections of the northeast quarter section,
- the northwest quarter and the portion of the west half of the southwest quarter of Section 19 north of the I-8 ROW,
- the portion of Sections 20 and 21 north of the I-8 ROW, and
- the portion of the north half of the northwest quarter section and the northwest quarter-quarter section of the northeast quarter section of Section 22 north of the I-8 ROW.

- Within Township 16 South, Range 10 East of the San Bernardino Meridian defined by:
  - the portions of Sections 12, 13, and 14 south of the railroad ROW,
  - the portions of Section 22 south of the railroad ROW,
  - all of Sections 23 and 24, and
  - the portions of Sections 25, 26, and 27 north of the I-8 ROW.

Generally, the proposed site boundary consists of the Union Pacific Railroad on the north and I-8 on the south. The eastern boundary is approximately 1½ mile west of Dunaway Road; and the western boundary is the westerly section line in Section 22 in Township 16 South, Range 12 East. An additional 125 acre construction area is located east of Dunaway Road. The proposed Imperial Valley Solar Project would also include an electrical transmission line, water supply pipeline, and a site access road. An Off-Site 6-inch-diameter water supply pipeline would be constructed a distance of approximately 11.8 miles from the Seeley Waste Water Treatment Facility (SWWTF) to the project boundary. The water supply pipeline would be routed in the Evan Hewes Highway right-of-way (ROW), or adjacent to this ROW on public and private lands. Approximately 7.56 miles of the 10.3-mile double-circuit generation interconnection transmission line would be constructed Off-Site. The transmission line would connect the proposed Imperial Valley Solar Project substation to the existing SDG&E Imperial Valley Substation. A site access road would be constructed from Evan Hewes Highway to the northern boundary of the project site as shown in Figure 2.

1.5 General Description

On June 30, 2008, TSNA submitted an AFC to the Energy Commission to construct and operate the Imperial Valley Solar Project, a solar dish Stirling systems project in Imperial County, California. The Applicant also applied for a ROW grant for the Project Site from the BLM California Desert District.

Additional project details, status, copies of notices, an electronic version of the AFC filed with the Energy Commission, maps and figures, and other relevant documents are available under Project Proceedings at:

http://www.energy.ca.gov/sitingcases/solartwo/

As described in the AFC, the proposed Imperial Valley Solar Project would be a nominal 750 MW Stirling engine project, with construction planned to begin in the fall of 2010. The primary equipment for the generating facility would include the approximately 30,000, 25-kilowatt (KW) SunCatchers, their associated equipment and systems, and their support infrastructure. The SunCatcher is a 25-KW solar dish that is designed to automatically track the sun and collect and focus solar energy onto a power conversion unit (PCU), which generates electricity. The system consists of a 38 foot high by 40 foot wide solar concentrator in a dish structure that supports an array of curved glass mirror facets. These mirrors collect and concentrate solar energy onto the solar receiver of the PCU. The SunCatcher dish is mounted on a 2 foot diameter, round steel pipe that is hydraulically vibrated into the ground to a depth of approximately 17 feet. No mass site grading is required to install the solar field.

The proposed 6,571 acre project site includes approximately 6,251 acres of federal land managed by the BLM and approximately 320 acres of privately-owned land.

The project would be constructed in two phases. Phase I of the project would consist of up to 12,000 SunCatchers configured in 200 1.5-MW solar groups of 60 SunCatchers per group and have a net nominal generating capacity of 300 MW. The renewable energy from Phase I would be transmitted via the existing 500-kilovolt (kV) SDG&E Southwest Powerlink transmission line. The project would be connected to the grid at the SDG&E Imperial Valley Substation via a 10.3-mile long, 230-kV interconnection transmission line that would be constructed as part of the project in a corridor parallel to the existing Southwest Powerlink transmission line. Phase I would require approximately 2,846 acres.

The 450-MW Phase II would add approximately 18,000 SunCatchers; expanding the project to a total of approximately 30,000 SunCatchers configured in 500 1.5-MW solar groups with a total combined net generating capacity of 750 MW. Phase II would require approximately 3,725 acres of the project site. The additional 450 MW generated in Phase II would require a new transmission capacity within the grid. This is anticipated to be provided by the proposed 500-kV Sunrise Powerlink (or equivalent) transmission line (assumed to be a project independent of the Imperial Valley Solar Project). The construction and operation of Phase II is contingent on the development of either the Sunrise Powerlink transmission line or additional transmission capacity in the SDG&E transmission system.

The proposed Imperial Valley Solar Project would also include office and maintenance buildings, evaporation ponds, an electrical transmission line, water supply pipeline, a site access road, interior arterial and maintenance roads and a perimeter road. A new 230-kV substation would be constructed approximately in the center of the project site. This new substation would be connected to the existing SDG&E Imperial Valley Substation via an approximately 10.3 mile, double-circuit, 230 kV transmission line. Approximately 7.56 miles of the new line would be constructed Off-Site.

The water supply pipeline would be constructed a distance of approximately 11.8 miles from the SWWTF to the project site. The water pipeline would be routed in the Evan Hewes Highway ROW to Plaster City, entering the project site at that location. A

site access road would be constructed from Dunaway Road to the eastern boundary of the project site, generally following an existing road.

Figure 1. Regional Overview

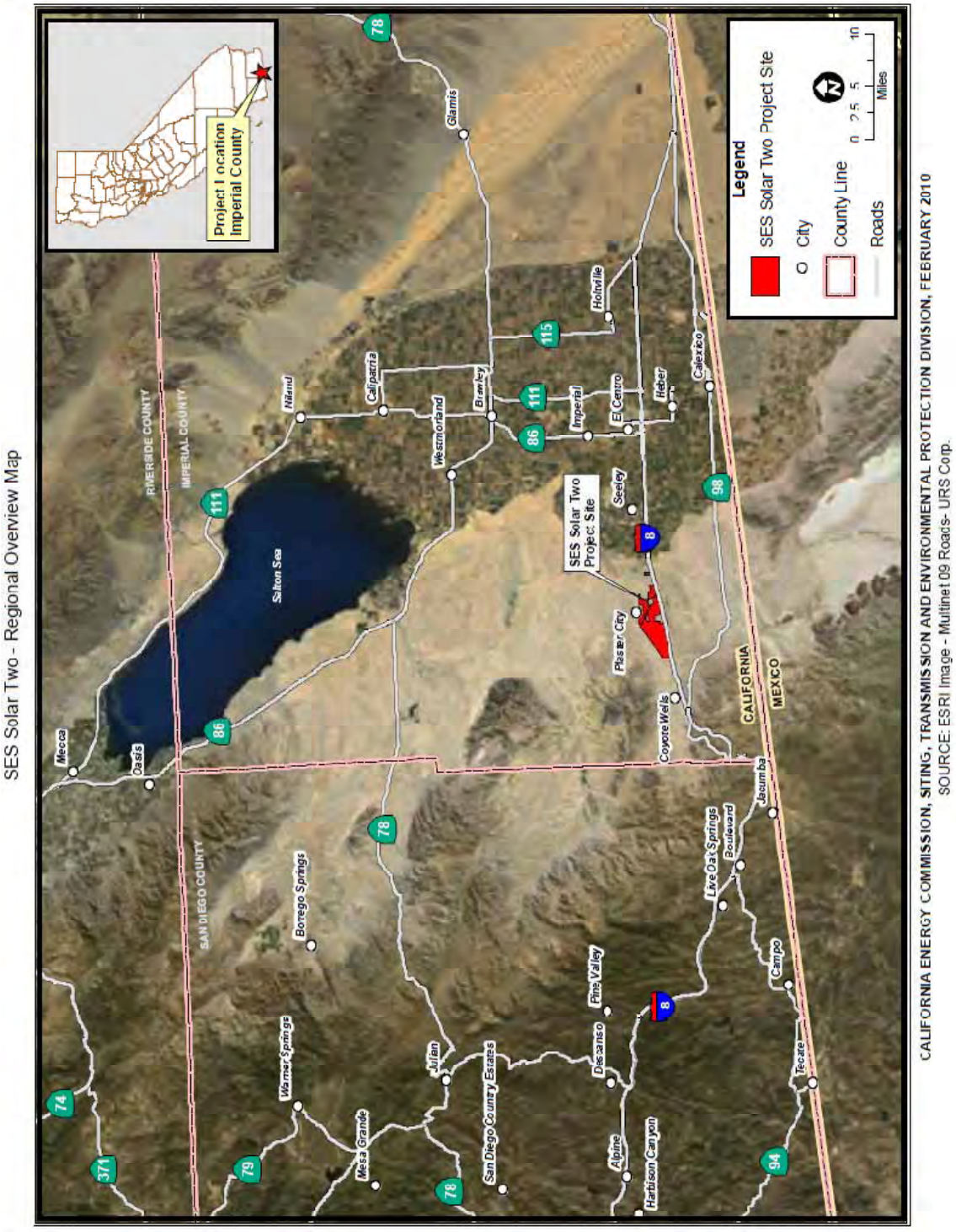
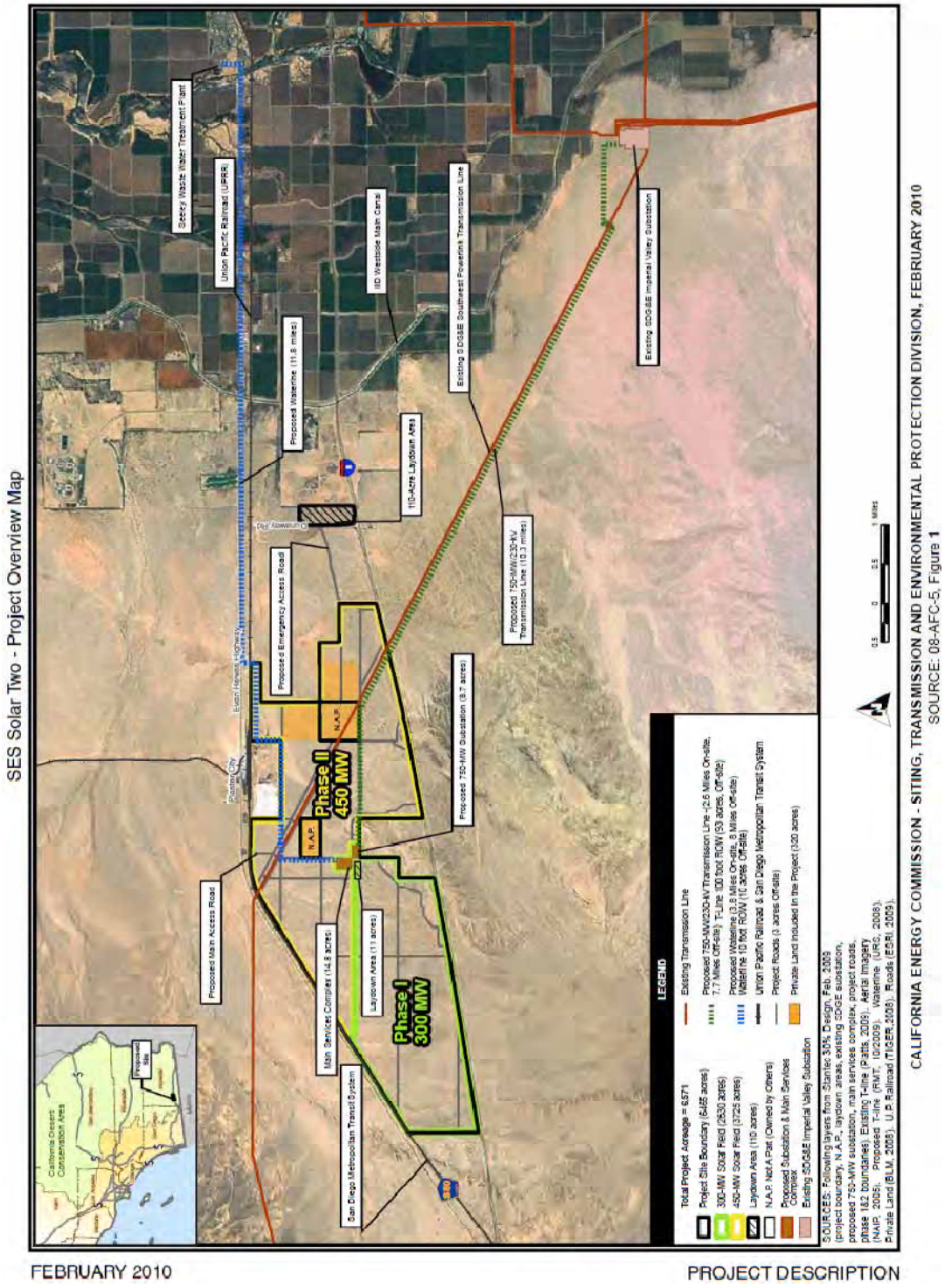


Figure 2. Proposed Project Description



2.0 Alternatives Analysis

2.1 Off-Site Alternatives

As described in the AFC and required by the 404(b)(1) Guidelines, the Applicant evaluated a large range of potential alternative project sites to determine if there is an alternative site available on which the proposed project could be constructed that would involve less impacts to aquatic resources than the proposed project and would not have additional concomitant adverse impacts to other sensitive resources such as listed species. This involved a two tiered review. First, sites were selected for evaluation based on a detailed evaluation of the key criteria required for large-scale, concentrating solar projects. Input was obtained on potential alternative locations through discussions with the Energy Commission, the California Independent Systems Operator, and the BLM. Next, sites that met the initial siting criteria were screened for practicability.

Key siting criteria include:

- The site must include a minimum of 4,000 acres. While 4,000 acres may not be sufficient to meet the overall project purpose, the project team used this acreage to ensure that an adequate range of alternative sites were evaluated.

- The site must be located in an area of long hours of sunlight (low cloudiness), insolation should be at a level of seven KW-hours per square meter per day; the site must be relatively flat with a grade less than 5%; the site must have a wind speed of more than 35 miles per hour less than 2% of the time.

- The site must be located in close proximity to high-voltage CAISO transmission lines with adequate capacity and must have an adequate water supply; the site must have ease of access and close proximity to existing roads.

- The land must be available for sale or use as a utility grade solar facility. Alternative sites must be available for development within a reasonable time frame. Site's for which there is a pending application for use are not available for development of the proposed project.

- The proposed use should be consistent with existing laws, ordinances, regulations and standards. Sites located within a Department of Defense "no fly," "no build" areas as this designation would preclude installation of the proposed project.

Following meetings with the agencies and review of comments received in response to the BLM's scooping meeting, the Applicant identified the following six alternative sites:

1. Alternative Site 1 (AS-1)
2. Alternative Site 2 (AS-2)
3. Alternative Site 2 (AS-3)
4. Mesquite Lake Site

5. Agricultural Lands
6. South of Highway 98

The locations of these Off-Site alternatives are shown in Attachment A. Additional detailed descriptions of these alternatives and a discussion of why they were selected are included in Section 4.1 of the AFC and Section B.2 of the SA/DEIS.

For this application, the project team conducted additional field surveys in December 2009 for these Off-Site alternatives as well as additional analysis to determine site conditions and impacts to water resources and WUS. A summary of these findings and analysis are included in Table 1. The results of this study found that three of the six Off-Site alternatives met all of the siting criteria. A summary of this analysis and how the siting criteria were applied to the Off-Site alternatives follows. The three Off-Site alternatives that met the siting criteria are discussed further in Section 2.4.

2.2 Screening of Off-Site Alternatives

2.2.1 Alternative AS-1

This 7,195 acre site is located primarily on BLM land (80%) with some private in-holdings (18%) and state lands (1%) [MVP1] and [MVP2] along the border between San Diego and Imperial counties approximately 30 miles north of the preferred project location as shown in Figure 1 of Attachment A. It was not pursued as a possible site for the proposed project by the applicant because it is located in a Department of Defense (DOD) "no-fly" and "no build" restricted area. In December 2007, OptiSolar, Inc submitted an application to the BLM for use of a portion of this site for construction and operation of a 500 MW photovoltaic solar facility. This pending application would preclude TSNA using this site for construction of another solar facility at the same location.

Siting Criteria Review: Off-Site Alternative AS-1 was eliminated as an alternative location for the proposed project because it is located within a DOD "no fly" and "no build" restricted area. Additionally, it is not available for development of the proposed project as there is an application pending for development of a photovoltaic solar facility on a portion of the site.

2.2.2 Alternative AS-2

This 8,818 acre site is located primarily on BLM land (62%) with some private in-holdings (38%) east of AS-1 approximately 30 miles north of the preferred project location as shown in Figure 1 of Attachment A. It was not pursued as a possible site for the proposed project by the applicant because it is located in a DOD "no-fly" and "no build" restricted area. In December 2007, OptiSolar, Inc submitted an application to the BLM for use of a portion of this site for construction and operation of a 500 MW photovoltaic solar facility. This pending application would preclude TSNA using this site for construction of another solar facility at the same location.

Siting Criteria Review: Off-Site Alternative AS-2 was eliminated as an alternative location for the proposed project because it is located within a DOD restricted area. Additionally, it is not available for development of the proposed project as there is an application pending for development of a photovoltaic solar facility on a portion of the site.

Table 1. Summary of Off-Site Alternatives

Siting Criteria Measures	AS-1	AS-2	AS-3	Mesquite Lake	Agricultural Lands	South of Hwy 98	Proposed Project
Land Area (acres)	7,195	8,818	5,007	5,112	4,103	5,833	**6,500**
Cost and Availability Criteria							
Number of Landowners	3+	2+	2+	**52**	3+	1	**4**
Number of Land Parcels	1	1	1	1	**7**	1	**1**
Environmental Criteria							
Density of Intermittent Drainages (Miles/Square Mile)	2.2	1.5	1.3	0	0.5	0	**0.8**
Length of Intermittent or Ephemeral Drainages (Miles)	25.2	20.0	9.8	0	3.2	0	**8.1**
Waters of the US (acres)[1]	2,737	2,174	1,069	0	346	0	**885**
National Wetlands Inventory Wetlands	0	0	0	716	0	291	**0**
Meets Siting Criteria?	**No** – located in DOD no-fly, no-build zone.	**No** – located in DOD no-fly, no-build zone.	**Yes**	**No** – number of landowners and transmission line length do meet availability and logistics criteria.	**Yes**	**Yes**	**Yes**

[1] – Waters of the US were estimated for each site based upon the miles of intermittent or ephemeral streams within the alternative site and the acres of waters of the US mapped for the Proposed Project (881 acres)

2.2.3 Off-Site Alternative AS-3

This 5,007 acre site is located primarily on BLM land (96%) with some private in-holdings (4%) approximately 30 miles north of the preferred project location as shown in Figure 1 of Attachment A.

Siting Criteria Review: Alternative AS-3 meets the siting criteria and it was analyzed for practicability, the results of which are described below in Section 2.3. However, given the higher density of drainages within its borders, Alternative AS-3 has the potential to impact a greater area of WUS than the proposed project.

2.2.4 Off-Site Alternative - Mesquite Lake

This site was considered because scoping comments noted it is disturbed land that is zoned for industrial use. Figure 2 of Attachment A shows the location of this site, approximately 15 miles northeast of the preferred location and Figure 3 of Attachment A shows the site boundaries and details. The Mesquite Lake site encompasses approximately 5,100 acres of land. However some of this land is already in use by the Holly Sugar Plant, the Mesquite Lake Recovery Facility, and the Imperial Valley Resource Recovery Plant. The Mesquite Lake Specific Plan Area is made up of approximately 70 parcels with 52 land owners. The large number of owners makes obtaining control of this site not practicable.

Siting Criteria Review: Off-Site Alternative Mesquite Lake is not available for development of the proposed project as the large number of individual land owners makes securing the site impracticable.

2.2.5 Off-Site Alternative – Agricultural Lands.

This site was considered because it would use some of the existing disturbed low-quality agricultural land in Imperial County. This alternative consists of 25 parcels aggregated into seven different parcel groups. The parcel groups range in size from 40 acres to 1,435 acres totaling about 4,100 acres. Figures 2 and 4 of Attachment A show the size and location of the seven disconnected parcel groups.

Siting Criteria Review: The Agricultural Lands Alternative meets the siting criteria and therefore it was analyzed for practicability, the results of which are described below in Section 2.3**.**

2.2.6 Off-Site Alternative – South of Highway 98.

The South of Highway 98 Alternative is located on BLM designated land that is operated by the Bureau of Reclamation. This site was recently identified by the BLM and DOE for in-depth study for solar development in the Solar Programmatic Environmental Impact Statement (PEIS). Figures 2 and 5 of Attachment A show the location of this site approximately four miles southeast of the greater El Centro area and along the US/Mexico international border. This site totals approximately 5,000 acres.

Siting Criteria Review: The South of Highway 98 Alternative meets the siting criteria and it was analyzed for practicability, the results of which are described below in Section 2.4. However, this location is likely to have higher impacts to wetlands than the preferred project location.

2.3 Practicability of Alternatives

2.3.1 Practicability Criteria

The following criteria were used to screen the practicability of Off-Site and on-site alternatives.

2.3.1.1 Project Purpose

To be practicable, an alternative must allow for the construction of a large utility-scale solar facility utilizing SunCatchers. Generation of electricity must be sufficiently large to help SDG&E and the State of California in meeting the RPS, which requires 20% of the electricity sold by regulated California utilities to be generated from renewable energy. A practicable project alternative must also assist SDG&E, the State of California, and the United States in reducing greenhouse gas emissions to the maximum extent feasible.

2.3.1.2 Cost Criteria

In order to be practicable, an alternative must allow for the creation of an economically viable utility scale solar project. This will turn on two major components. First, an alternative must allow for the generation of a sufficient amount of electricity at a low enough cost to allow for the sale of the electricity at a rate that is acceptable to the regulated utilities in California. Second, it must allow for the obtainment of sufficient financing for construction and operation of the proposed project.

Practicability for the Imperial Valley Solar Project depends on TSNA being able to negotiate a PPA with a California electric utility that meets the capital and financing requirements for the project. The final terms of this agreement are determined by the price the utility is willing-to-pay for the power and by the costs to generate that power. Some of the factors that influence price and costs of power from the Imperial Valley Solar Project are discussed below. Fundamentally, the price of the electric power negotiated between a California utility and TSNA must not be higher than regulated price requirements, but the price must be high enough to cover project costs and provide rates-of-return that will attract equity investors.

Price Ceiling

The price that California utilities are willing-to pay for electricity generated by the Imperial Valley Solar Project is set, in part, by the California Public Utilities Commission (CPUC) which regulates power purchases by California's largest utilities. Before a PPA is finalized, the CPUC must find that the prices in the PPA are fair and reasonable to consumers.

The CPUC sets a price ceiling for the purchase of renewable power in the annual Market Price Referent (MPR) [CPUC Resolution E-4298 December 17, 2009]. The MPR values are used in the RPS solicitations issued by electric utilities to purchase the

power that they need to meet the RPS requirements[1]. In other words, the MPR values serve as the price reasonableness benchmark for renewable PPAs. The power provided by the Imperial Valley Solar Project falls into this category of power purchase.

In determining the reasonableness of RPS power purchase contracts, the CPUC compares the levelized all-in costs of each long-term RPS contract on a dollar per megawatt-hour ($/MWh) basis to the MPR, and to the prices in other renewable PPAs and bids by developers for renewable PPAs. The goal is to compare an RPS contract's costs to the costs of the presumptive conventional alternative such as natural gas-fired generation. The MPR is updated annually and driven primarily by natural gas prices. Since natural gas prices have dropped significantly between 2008 and 2009, the MPR is trending downward (see Table 2). In addition, rapidly dropping prices for photovoltaic (PV) panels has placed significant downward price pressure on PPA bids for non-PV solar projects.

Table 2. Comparison of 2008 and 2009 Market Price Referent Prices

PPA Contract Start Date	2008 MPR ($/MWh)	2009 MPR ($/MWH)	Difference between 2008 and 2009 MPR
2010	$ 113.90	$ 96.74	-18%
2011	$ 117.30	$ 100.98	-16%
2012	$ 121.26	$ 105.07	-15%
2013	$ 125.27	$ 108.98	-15%
2014	$ 128.97	$ 112.86	-14%
2015	$ 132.90	$ 116.47	-14%
2016	$ 137.06	$ 120.20	-14%
2017	$ 141.44	$ 124.04	-14%
2018	$ 146.03	$ 128.00	-14%
2019	$ 150.80	$ 132.09	-14%
2020	$ 155.78	$ 136.30	-14%

Utilities have the option to negotiate prices higher than the MPR and risk disapproval by the CPUC or they can tap into the Above Market Funds (AMF), if available. In SDG&E's case, the $69 million AMF allocation had been fully utilized by May 2009; SDG&E's AMF balance is zero. The combination of a decreasing MPR, exhausted AMF balances, and rapidly dropping PV prices is increasing pressure on renewable power generators such as TSNA to keep costs as low as possible and offer power at prices close to the MPR.

Cost of Electricity from Imperial Valley Solar Project

The cost of power from the Imperial Valley Solar Project is related to several factors including the cost to manufacture the Stirling Energy Systems SunCatchers and the capital cost to construct the project facilities. The cost of power from Imperial Valley Solar Project is premised on high volume production of SunCatchers. Each SunCatcher is assembled from component parts that are manufactured in former automobile

[1] The RPS program administered by the CPUC requires each utility to increase its total procurement of eligible renewable energy resources by at least one percent of retail sales per year so that 20 percent of the utility's retail sales are procured from eligible renewable energy resources no later than December 31, 2010.

manufacturing facilities in the United States. The cost to manufacture a single part is reduced with each additional part that is manufactured. The cost for a SunCatcher is reduced by as much as 50% if there is a high volume of SunCatchers manufactured compared to a low volume scenario. The higher cost for low volume manufacturing is due to the difficulty and cost premium required to get suppliers to dedicate manufacturing capacity to manufacture specialty parts for the SunCatcher, as well as higher materials costs because the materials that are purchased in lower quantities. Additionally, setup and tooling costs are spread across fewer parts. Therefore, for every MW that the Imperial Valley Solar Project is reduced by, the cost of each individual SunCatcher increases.

Similarly, the capital cost to construct a reduced MW Imperial Valley Solar Project would be higher on a $/MW basis because the cost of common facilities would be spread across fewer installed generators. Some of the common facilities that have to be constructed and sized the same, no matter what the size of the final Imperial Valley Solar Project include:

- Necessary transmission lines (10.3 miles of 230kV transmission lines on the proposed project site)
- Necessary water supply lines (11.8 miles of water supply line from the SWWTF for the proposed project site)
- Wastewater treatment facilities
- Hydrogen production facility
- Maintenance building
- Administration building
- Access roads

Financing the Imperial Valley Solar Project

In order to construct a large scale solar project, TSNA must be able to obtain debt and equity financing. The ability to obtain adequate financing will depend on the project's ability to show a sufficient rate of return to attract equity investors, as well as a debt service coverage ratio (DSCR) high enough to establish creditworthiness to lenders.

A recent study by the National Renewable Energy Laboratory (NREL) on renewable energy project financing found that equity market conditions have been changing rapidly since the credit crisis of 2008 (NREL 2009). The NREL study found upward pressure on equity investment returns. The NREL report finds that renewable energy projects are relatively risky investments compared to other possible investments such as affordable housing. Since the NREL report which surveyed equity investors in early 2009, equity markets have contracted further and the demand for these relatively limited funds has stayed the same. This means that renewable energy projects, as a relatively risky investment, must offer even higher rates-of-return than in 2009.

One potential source of funding for the Imperial Valley Solar Project is through the Department of Energy (DOE) Loan Guarantee Program. The DOE Loan Guarantee is advantageous in that solar thermal power generation on the scale of the Imperial Valley Solar Project has not been done in the U.S. and financing would be difficult, although not impossible, without it. The DOE loan guarantee program requires equity participation by creditworthy parties. This can include equity from the project sponsor or a combination of the sponsor and committed, creditworthy joint venture partners.

In evaluating loan guarantee applications, the DOE gives the highest consideration to creditworthiness (30% of total score) including the financial viability of the proposed project and adequacy of the applicant's funding sources.

As noted above, another aspect of creditworthiness that an equity investor or the DOE will consider in evaluating the Imperial Valley Solar Project is the DSCR for the project. The DSCR measures the ability of the borrower to "cover" or pay back the debt. Without a sufficient DSCR, renewable energy projects are finding that it is either impossible to obtain credit for their project or lenders are restricting use of funds such as not allowing projects to use debt for construction costs (NREL 2009). In 2008, debt for renewable energy projects was essentially frozen (NREL 2009). Since then, Michael Liebreich, Chairman and CEO of New Energy Finance said, "There is capital available, but the depth of that market is not particularly robust" (REFF 2009). Market forecasts for 2010 find that although there is some capital available for projects, lenders will only be willing to invest in projects with conservative structures characterized by low risk, established techniques, strong PPA-type off takes, quality sponsors, and strong debt service coverage. (REFF 2009) In order to achieve an adequate DSCR, TSNA will need to keep the total capital cost of the project as low as possible and the potential income from power sales as high as possible. Therefore, even though a 300 MW project may have a lower total capital requirement than a 750 MW project (i.e. TSNA would not have to borrow as much money), a 300 MW project may not be able to achieve an adequate DSCR because total power sales are so much lower and capital costs per MW are at least 7% higher.

Overall, for every MW reduction in the size of the Imperial Valley Solar Project, the cost of power produced will increase measurably. In order to be practicable, TSNA must sell the power from the Imperial Valley Solar Project at a price near the MPR. The way to do this is to maximize the project size to keep the cost of SunCatchers' and capital costs as low as possible. Even more importantly, given the conditions of current equity and debt markets, the Imperial Valley Solar Project must be able to offer investors an adequate return on equity and assure lenders an adequate DSCR to be considered creditworthy and eligible for sufficient project financing to meet the criteria established by the DOE loan guarantee program. A project that cannot meet these standards could not obtain financing and therefore would not be practicable.

2.3.1.3 Logistics Criteria

In order to be practicable, an alternative must allow for the efficient layout of SunCatchers and related necessary infrastructure. There are a number of logistical considerations that constrain the site's layout. These constraints include industry and/or regulatory design standards usually having to do with safety and in other cases are driven by design efficiencies having to do with cost controls. These include:

SunCatchers:

- The SunCatcher units are required to be placed in a rectangular grid pattern in order to maximize the efficient conversion of solar energy directly into utility grade electric current. While some minor deviations to groups may be workable, significant deviations render a group impracticable.

- SunCatchers must be spaced at least 60 feet x 112 feet apart and potentially farther apart depending on surrounding grade. Spacing is dependent upon the site latitude and the slope of the natural terrain. Shading will cause a differential heating of the SunCatcher heat exchanger which will adversely affect the operation and life of the Stirling Engine.

- SunCatchers must be bundled together in 1.5 MW (60 SunCatchers) and then into 9 MW generation groups (360 SunCatchers) in order to utilize standard utility electrical transformers and equipment.

- Configuring SunCatchers into non-standard configurations creates transmission and hydrogen system operation restrictions/inefficiencies due to the increase in resistance of the transmission lines and pressure drops in the hydrogen distribution system. A standard 1.5 MW group includes 7,000 feet of electrical wire and 7,000 feet of hydrogen piping (Figure 3). If the configuration changes from a standard group to a non-standard configuration as shown in Figure 3, the costs can increase up to 8% based upon the extra length and the efficiency of the electrical line decreases up to 3%. Spreading out a 1.5 MW group lowers the efficiency of the system and increases the infrastructure and operation costs.

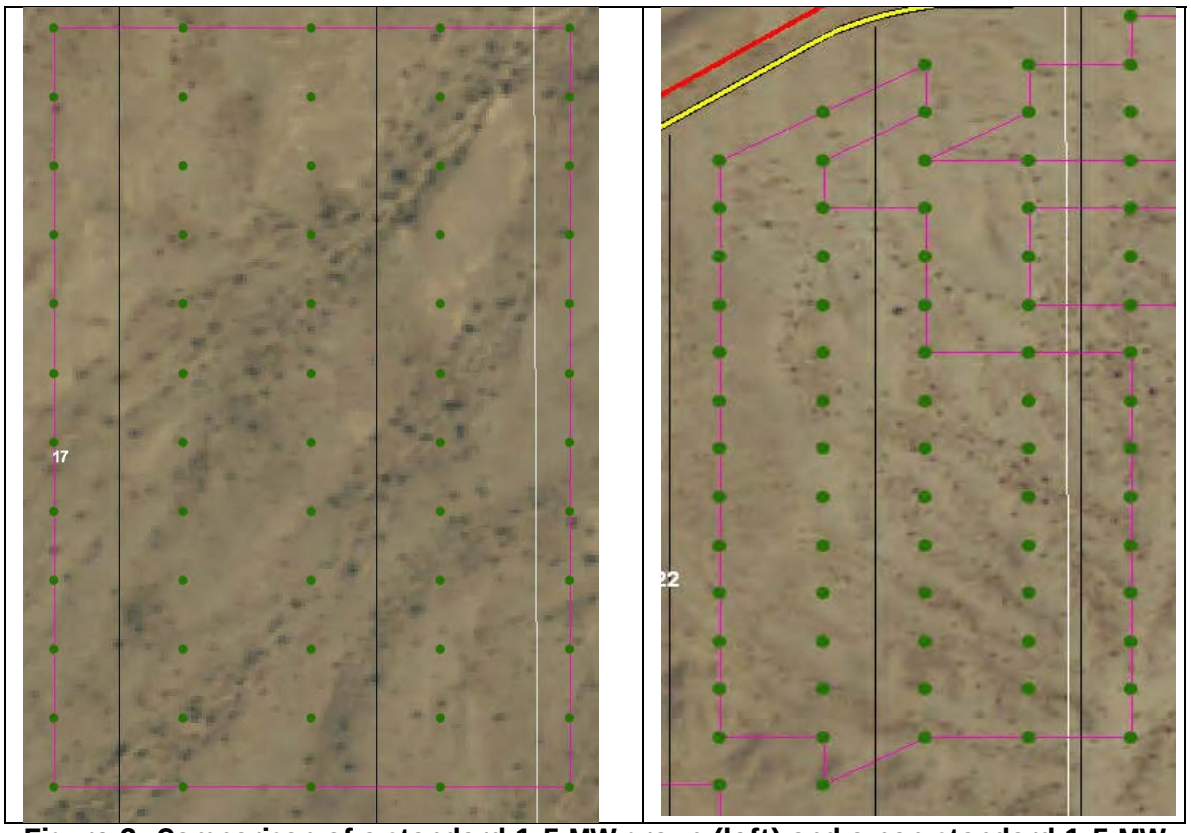


Figure 3. Comparison of a standard 1.5 MW group (left) and a non-standard 1.5 MW group (right).

- SunCatchers in rugged (hilly) terrain would require grading to eliminate shading from one unit to the next and to create a safe operating slope for the

maintenance cranes and lift equipment. The maintenance roadways that access SunCatchers rows would also require additional earth work (at an additional construction cost) to insure worker and equipment safety during transportation and various maintenance operations. Maintenance slopes are limited to 10% for service crane safety. SunCatchers would not be installed where grades are greater than 5%.

Roads:

- Arterial roads, 24 feet in width, are initially placed from ½ mile to 2 miles apart for delivery of the 38 foot wide SunCatcher assembled on-site and transported by semi-trailer to the field. The arterial roads will serve as the main routes for maintenance technicians servicing the units. Maintenance roads 10 feet in width are placed between every other row of SunCatchers and will be used for accessing the units by the maintenance technicians to service the units. There will be a 10 foot wide perimeter road adjacent to the fence line for plant security as required by the Energy Commission.

- Each SunCatcher must be accessible from a road to allow for necessary maintenance; elimination of access roads would result in elimination of SunCatcher units and groups.

- Maintenance roads must be configured in a complete grid, avoiding dead ends and ensuring that each connects to an arterial road. With reduction of maintenance roads from 12 feet (as originally proposed) to 10 feet, only one way traffic will be allowed. The narrower roads will not allow for construction equipment to turn around. Further, during operation, a dead end road would preclude the safe transit of maintenance vehicles due to turning radius restrictions.

- Roadway widths are per American Association of State Highway and Transportation Officials Geometric Design of Highways and Streets, page 312, Paragraph 2, "Lanes 3.0 m [10 feet] wide are acceptable on low-speed facilities, and lanes 2.7 m [9 feet] wide are appropriate on low-volume roads in rural and residential areas."

Main Service Complex:

- In order to minimize costs for interconnection of the SunCatchers™ to the transmission grid, for access roads to the site, and for other common facilities that provide services to the entire project site, the Main Services Complex needs to be centrally located, providing the shortest average distance to the farthest points of the project site.

- The site was also selected to be sufficiently away from the private property, Plaster City Beach, LLC., as not to interfere with the parcel's existing use.

Environmental:

- To be considered the LEDPA, an alternative design must have significantly less impacts to aquatic ecosystems than the proposed Project, without having other concomitant significant adverse environmental impacts.

Overall:

- In order to be considered practicable, an alternative must obtain the project purpose and be consistent with all the cost and logistical constraints identified above. A practicable alternative would be the LEDPA if it meets the environmental screening criteria.

2.4 Practicability of Off-Site Alternatives

In considering the practicability of the Off-Site alternatives that were not eliminated by the siting criteria (AS-3, Agricultural Lands, and South of Highway 98), the Project Team designed a preliminary site configuration and transmission and water supply pipeline route for each location. A summary of the preliminary design results is included in Table 3.

Table 3: Summary of Off-Site Alternative Preliminary Project Design

Project element	Alternative AS-3	Agricultural Lands	South of Hwy 98	Proposed Project
Land Area	5,007	4,103	5.833	6,500
Total MW[1]	578	473	672	750
Transmission Line (miles)	27	4.5	26	10.3
Water Supply Line (miles)	5.5	1.5	38	11.5

[1] - Assumes similar spacing as proposed project or 8.67 acres per MW (6,500 acres/750 MW).

2.4.1 Off-Site Alternative AS-3

Project Purpose: Off-Site Alternative AS-3 is estimated to have about 5,007 acres available for development. Assuming a project lay-out similar to the proposed project with a land requirement of 8.67 acres per MW, the land area of AS-3 could accommodate approximately 578 MW. This represents a reduction in 23% of the renewable energy available to contribute to California's renewable energy requirements. The significant reduction in electrical generation would also compromise the project's ability to significantly contribute to SDG&E's and the State of California's efforts to reduce greenhouse gas emissions. Therefore, this alternative does not meet the overall project purpose.

Cost: Based on the preliminary design for this site, the cost to develop a project at this alternative location will be similar to the proposed project location except for the difference in transmission and water supply line costs. Assuming a cost of $1.5 million per mile for transmission line and $400,000 per mile for water supply line, the net cost difference between implementing the proposed project at the AS-3 location and the proposed location would be an additional $23.1 million. Assuming that the proposed

project has a cost of approximately $950 million, the additional transmission line costs would increase the project cost by about 2.4%.

To size this alternative large enough to allow for the sale of electricity to a state regulated utility, at a cost that is within the range acceptable to the CPUC with the additional transmission line costs, would require a project of approximately 726 MW and a land area of approximately 6,294 acres. The available land area of the AS-3 location can only accommodate 578 MW. Therefore, the size of project that could be built at the AS-3 location does not meet cost criteria.

Logistics: The logistics for the proposed project at the AS-3 location would be similar to the preferred location. This alternative meets the logistics criteria.

Environmental: Based on a review of aerial photographs of the site and other data available for the AS-3 location, the Project Team estimates that there are approximately 9.8 miles of intermittent or ephemeral drainages (USGS 2008) and 1,069 acres of WUS that could be impacted by development at this alternative location (Table 1). This is higher than the miles of intermittent or ephemeral drainages and WUS at the preferred location. Given the smaller size of the project site and therefore reduced opportunities to avoid On-site resources, it is assumed that development of the proposed project at this location would result in a higher level of impacts to WUS.

Overall: This alternative is not practicable as it does not meet the overall project purpose or the cost screen criteria and has the potential for greater environmental impacts.

2.4.2 Agricultural Lands

Project Purpose: The Agricultural Lands Off-Site alternative is estimated to have about 4,103 acres available for development. Assuming a project lay-out similar to the proposed project with a land requirement of 8.67 acres per MW, the land area of this alternative could accommodate approximately 473 MW. This represents a reduction in 37% of the renewable energy available to contribute to California's renewable energy requirements. The significant reduction in electrical generation would also comprise the project's ability to significantly contribute to SDG&E's and the State of California's efforts to reduce greenhouse gas emissions. Therefore, this alternative does not meet the overall project purpose.

Cost: Based on a preliminary design for this location, it is estimated that approximately 4.5 miles of transmission line and 1.5 miles of water supply line will be required. Because this Off-Site alternative is comprised of seven different land parcels across a 100 square mile area, there would additional costs for power collection system including an additional substation. Assuming a cost of $28.1 million for additional power collection, the net cost difference between implementing the proposed project at the Agricultural Lands location and the proposed location would be an additional $4.1 million. Assuming that the proposed project has a cost of approximately $950 million, the additional transmission line costs would increase the project cost by about 0.4%.

To size this alternative large enough to allow for the sale of electricity to a state regulated utility at a cost that is within the range acceptable to the CPUC with the

additional costs would require a project of approximately 712 MW and a land area of approximately 6,172 acres. The available land area of the Agricultural Lands location can only accommodate about 473 MW. Therefore, the size of project that could be built at the Agricultural Lands location would not meet cost criteria.

Logistics: The logistics for the proposed project at the Agricultural Lands location would be similar to the preferred location even though the SunCatcher groups would be dispersed across seven different land parcels. This alternative meets the logistics criteria.

Environmental: Based on a review of aerial photographs and using data available for this location, the Project Team estimates that there are approximately 3.2 miles of intermittent or ephemeral drainages (USGS 2008) and 346 acres of WUS (Table 1) that could be impacted by development at this alternative location.

Overall: This alternative is not practicable as it does not meet the overall project purpose or the cost screen criteria.

2.4.3 South of Highway 98

Project Purpose: The South of Highway 98 Off-Site alternative is estimated to have about 5,833 acres available for development. Assuming a project lay-out similar to the proposed project with a land requirement of 8.67 acres per MW, the land area of this alternative could accommodate approximately 672 MW. This represents a reduction in 5% of the renewable energy available to contribute to California's RPS requirements. It therefore does not meet the overall project purpose.

Cost: Based on the preliminary design for this site, the cost to develop a project at this alternative location will be similar to the proposed project location except for the difference in transmission and water supply line costs. Assuming a cost of $1.5 million per mile for transmission line and $400,000 per mile for water supply line, the cost difference between implementing the proposed project at the this location and the proposed location would be an additional $34 million. Assuming that the proposed project has a cost of approximately $950 million, the additional transmission line costs would increase the project cost by about 3.6%.

To size this alternative large enough to allow for the sale of electricity to a state regulated utility at a cost that is within the range acceptable to the CPUC with the additional transmission line costs would require a project of approximately 777 MW and a land area of approximately 6,737 acres. The available land area of the South of Highway 98 location can only accommodate about 672 MW. Therefore, the size of project that could be built at the South of Highway 98 location would not meet cost criteria.

Logistics: The logistics for the proposed project at the South of Highway 98 location would be similar to the preferred location. This alternative meets the logistics criteria.

Environmental: The All American Canal flows through this alternative site. National Wetlands Inventory (NWI) mapping for the area includes palustrine shrub/scrub and emergent wetlands adjacent to the All American Canal (USFWS 2008). The NWI

mapping includes approximately 172 acres of palustrine scrub/shrub habitat and 6 acres of emergent wetlands within the alternative site boundaries. Given the reduced size of the project site, the Project Team assumes that significant avoidance of these resources would not be practicable and that construction on this site would likely result in impacts to WUS that are equal to or more likely greater than the proposed project. Additionally, the riparian habitat and the wetlands located on this site likely provide more diverse and higher functions than the washes found on the proposed project site.

Overall: This alternative is not practicable as it does not meet the overall project purpose or the cost screen criteria and has the potential for greater environmental impacts.

2.5 On-Site Alternatives

The project team evaluated four alternatives to the Project described in the Army Corps Individual Permit application that could possibly reduce impacts to WUS. Each of these alternatives was analyzed using practicability screening criteria to help identify the LEDPA. In addition to the proposed project and these four alternatives, this document also includes an analysis of the 900 MW facility initially proposed to help demonstrate the level of avoidance achieved by the Project Team. Finally, this document evaluates a no fill alternative.

This document evaluates the following On-site alternatives:

Alternative #1 - Applicant's Proposed Project. See Section 1.3 above for more information regarding the proposed action. The Applicant's original proposed project would permanently fill approximately 177 acres of jurisdictional WUS, would incur 5.2 acres of temporary impacts, and 13 acres would be indirectly affected on the project site. This alternative would permanently impact approximately 6,500 acres of flat-tailed horned lizard (FTHL) habitat, which would be mitigated through in-kind purchase agreements. No federally listed species are expected to be affected under this alternative. The Applicant's Proposed Project could affect at least a 20% subset of approximately 337 known prehistoric and historical surface archaeological resources and may affect an unknown number of buried archaeological deposits, many of which may be determined historically significant. Effects to cultural resources would be mitigated under a Programmatic Agreement (PA).

Alternative #2 - Maximum Energy Generation Alternative. The 900-MW Alternative was the original proposed Applicant Project. During the environmental review process conducted by the Applicant, the 750-MW Project later became the preferred Project to help avoid potential significant environmental impacts (specifically to cultural resources). The 900-MW Alternative was to be constructed on approximately 7,600 acres of land that extended east of the current project boundary to Dunaway Road. The 900-MW Alternative was proposed to be built in two phases. Phase I of the 900-MW Alternative would essentially correspond with both the 300-MW Alternative described earlier and Phase I of the 750-MW Project. Phase II of the 900-MW Alternative would expand Phase I of the 750-MW Project with an additional 600 MW of generating capacity. In total, approximately 36,000 SunCatchers would be required for the 900-MW Alternative. The jurisdictional delineation completed in 2009 did not extend into the additional 1,100 acres necessary for the 900 MW Alternative. Extrapolating from

the impacts to WUS from the original site plan (750 MW), it is estimated that the 900 MW alternative would have approximately 205 acres of permanent impacts and would use the same waterline as the 750 MW alternative maintaining the same acres of temporary impacts (5.2 acres). This Alternative would impact an additional 1,100 acres of FTHL habitat and would impact an area with a high density of cultural resource sites. The project was reduced to the 750 MW Proposed project to avoid these additional impacts, particularly the additional impacts to cultural resources.

Alternative #3 - Modified Project to Avoid the Highest Flow Resources. This alternative was designed to test the practicability of avoiding impacts to the highest flow drainages on the site. It allows for the generation of approximately 709 MW while significantly reducing impacts to aquatic resources. This alternative avoids the entirety of washes I, K, and C and avoids all of washes E and G southwest of the transmission line corridor as well as providing a 200 foot wide flow corridor in washes E and G northeast of the transmission line corridor. The following is a list of avoidance or minimization measures taken to reduce impacts to WUS to the extent practicable:

The primary avoidance and minimization measures include the following:

1. Reduced total generating capacity from 900 MW to 750 MW eliminating the entire eastern portion from the current project boundary to Dunaway Road which includes the downstream portions of drainages E and G.

2. Reduced the number of the east-west roads to minimize the number of roads in washes and the number of wash crossings.

3. The waterline that extends to the SWWTF was shifted and co-located beneath a site arterial and maintenance roads to reduce temporary impacts to WUS to 0.0 acres.

4. The complete avoidance of ephemeral drainages I, K, and C and the avoidance of the upper reaches of drainages E and G (Map 2 of Attachment B). This removed 1,163 SunCatchers from WUS and reduced permanent impacts from 177.4 acres to 39.1 acres.

5. Reducing the width of SunCatcher maintenance roads from 15 feet to 10 feet which is the narrowest road width allowed by industry standards.

6. The removal of spur roads to individual SunCatchers from the maintenance road that runs down the middle of the two roads of SunCatchers (Figures 4 and 5). This increases the temporary disturbance for the construction of the SunCatchers by the use of a temporary 50-foot road that includes the 2-foot wide trench for the installation of an underground utility line and hydrogen pipeline, but decreases the permanent impacts to WUS substantially.

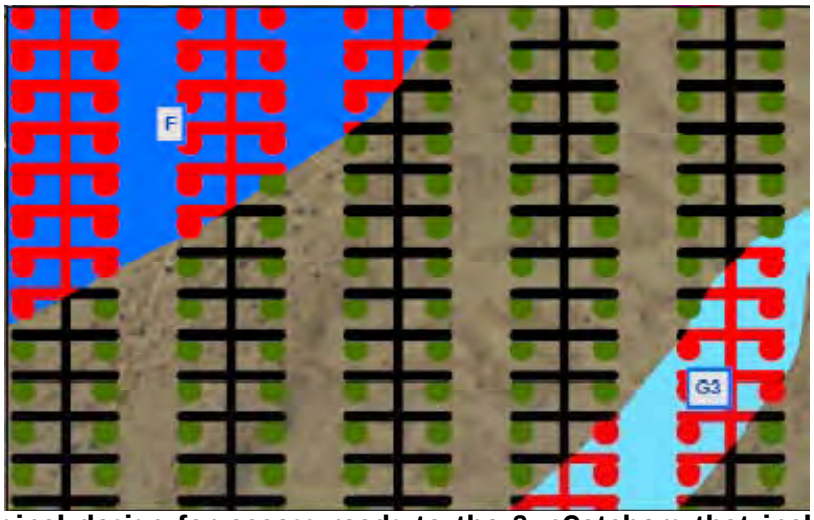


Figure 4. Orginal design for access roads to the SunCatchers that includes the 55 foot spur roads to each Sun Catcher.

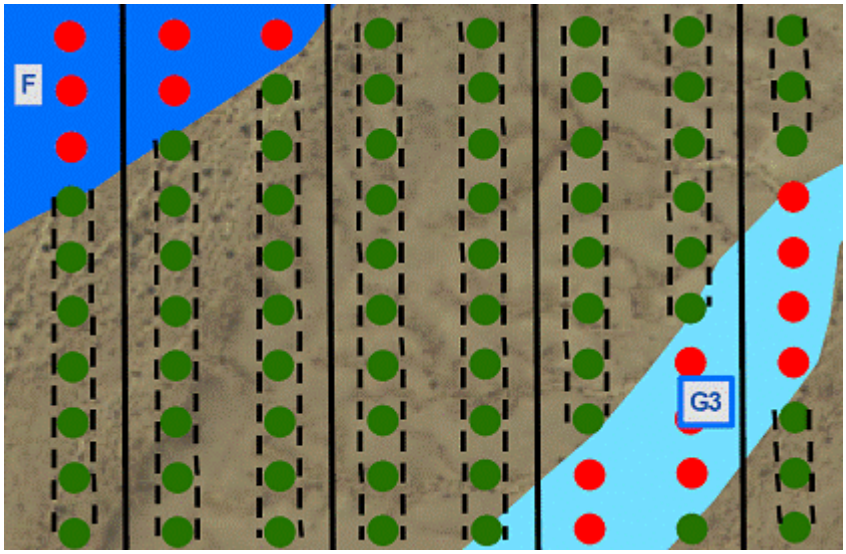


Figure 5. Current design for the SunCatchers and Maintenance roads. Dashed lines are utility trenches for the electrical and Hydrogen distribution lines.

7. Originally, sediment basins were proposed to retard water flow through the property and trap sediment. Hydrology and sediment modeling determined that the sediment basins would substantially change the pattern of sediment delivery for the ephemeral streambeds and result in a deficit of sediment transport downstream (Chang Consultants 2010a). The Applicant removed the sediment basins from the Proposed Action as a result of these findings which decreased the permanent impacts to WUS by 3.3 acres and reduced impacts to sediment transfer through the project area.
8. The Main Services Complex was moved north to move it out of a secondary wash complex. This reduced permanent impacts to WUS by 17.4 acres. In addition, it removed the two retention ponds from the wash and reduced the risk of pollutants entering the ephemeral wash system.

9. The main access road crosses Wash G and the crossing originally was planned to use culverts. Chang's initial report indicated that the culvert crossing would impede sediment and alter downstream sediment transfer (Chang 2010a). The crossing was changed to a precast concrete arches culvert system (like a bridge) that will not alter the downstream sediment transfer.
10. SunCatchers were removed from 200 foot corridors in the northern sections of washes E and G. This reduced the number of SunCatchers in WUS by 228. These corridors combined with the complete avoid of the washes south of the transmission corridor provide FTHL with clear routes to travel across the proposed project area (Map 4 of Attachment B).

The Applicant proposes numerous other avoidance and minimization measures that are intended to reduce, ameliorate, and/or avoid potential adverse effects on the aquatic ecosystem and wildlife. These measures are outlined in the Proposed Conditions of Certification/Mitigation Measures Sections of the Biological Resources and Soil and Water Resources portions of the SA/DEIS.

The Alternative would result in permanent impacts to approximately 39.1 acres of jurisdictional WUS and would incur 10.8 acres of temporary impacts. This is a reduction of 138 acres (78 % reduction) of permanent impacts to WUS. This alternative would permanently impact approximately 6,000 acres of FTHL habitat, which would be mitigated through in-kind purchase agreements. No federally listed species are expected to be affected under this alternative. This Alternative could affect at least a 20% subset of approximately 337 known prehistoric and historical surface archaeological resources and may affect an unknown number of buried archaeological deposits, many of which may be determined historically significant. Effects to cultural resources would be mitigated under a PA.

Alternative #4 - 300 MW Alternative. This alternative was designed to test the practicability of limiting the project to Phase 1 and would allow for the construction of a nominal 300 MW facility. This Alternative would reduce the disturbance area to 2,846 acres (40% of the proposed action). The Alternative would result in permanent impacts to approximately 27 acres of jurisdictional WUS and would incur 7.3 acres of temporary impacts. It would likely result in an incremental reduction in potential effects to FTHL habitat, and cultural resources by approximately 60%. No federally listed species are expected to be affected under this alternative. Effects to cultural resources would be mitigated under a PA.

Alternative #5 - Drainage Avoidance #1 Alternative. This alternative was designed to test the practicability of avoiding permanent impacts to the 10 primary ephemeral washes found within the proposed project area. Approximately 5,600 acres of the 6,500-acre site would be developed (86% of the proposed action). This alternative would reduce permanent impacts to jurisdictional WUS from 177 acres to 38 acres and reduce energy production from 750 MW to 606 MW. Effects to FTHL habitat would be reduced incrementally in proportion to the reduction in acres of impact. No federally listed species are expected to be affected under this alternative. Effects to cultural resources would be mitigated under a PA.

Alternative #6 - Drainage Avoidance #2 Alternative. This alternative was designed to test the practicability of eliminating development in the eastern and westernmost

portions of the project site essentially shrinking the project footprint to the center of the property. Drainage Avoidance #2 Alternative would avoid the largest ephemeral drainage complexes and many more of the cultural resources on the eastern portion of the property. It would reduce the disturbance area to 3,590 acres (55% of the proposed action), would reduce permanent impacts to WUS from 177 acres to 36.7 acres, and would reduce energy production to 438 MW. The impacts to FTHL habitat and to FTHL populations would be decreased by approximately 45%. No federally listed species are expected to be affected under this alternative. Effects to cultural resources would be incrementally reduced in proportion to the reduced acres of impacts and mitigated under a PA.

Alternative #7 - No Project/No Development Alternative. The No Project/No Development Alternative assumes that there are no project approvals in effect, and no future development of the project area would occur. This alternative would avoid the adverse effects associated with construction of the project and operation and would therefore preserve all of the WUS and FTHL habitat on-site. No federally listed species or cultural resources are expected to be affected under this alternative. The project area would remain it its existing condition. The jurisdictional resources would continue to degrade and be subject to further trash deposition, off-road vehicles and other transient use. Given the dispersal of aquatic resources located on the site, it was determined that the No Project Alternative described in the SA/DEIS is equivalent to the no fill alternative as it would be impossible to construct a large scale solar project on the site without impacting some aquatic resources.

2.6 Practicability of On-site Alternatives

2.6.1 Alternative #1 - Applicant's Proposed Project

Project Purpose: The proposed project would allow for the generation of 750 MW of utility grade electricity, assisting SDG&E and the State California in meeting it RPS (Map 2 of Attachment B). The proposed project would meet approximately 84.1% of SDG&E's renewable energy requirements. By adding 750 MW clean energy to the grid; the proposed project would also assist SDG&E and the State of California in reducing its greenhouse gas emissions. This alternative satisfies the overall project purpose.

Cost: The proposed project would allow for the generation of 750 MW at a cost of approximately $2,950 per kW. This alternative would be sized large enough to allow for the sale of electricity to a state regulated utility at a cost that is within the range acceptable to the CPUC. It would also allow for the project to have a rate of return on equity and a DSCR that would be sufficient to allow it to obtain financing necessary to support the project. This alternative meets the cost criteria.

Logistics: The proposed project allows for the installation of 30,000 SunCatcher™ units that can efficiently be grouped into 360 SunCatcher™ groups, allowing for the efficient generation and transmission of electricity generated. It allows for the installation of perimeter, arterial and maintenance roads necessary to service each of the SunCatcher groups and to meet necessary safety and security requirements. Utilities can be installed to serve each of the units and the central facilities complex can be located in the center of the project site. This alternative meets the logistics criteria.

Environmental: This alternative would result in 177 acres of permanent impacts and 5.2 acres of temporary impacts to WUS (Table 4).

Table 4. Permanent and temporary impacts to waters of the U.S. associated with Alternative #1.

Impacts		Permanent (Acres)		Temporary Acres	
		Primary	Secondary	Primary	Secondary
Roads	Main Access	0.7	0.5	0.0	0.0
	Maintenance	109.8	43.2	0.0	0.0
Debris Basins		3.3	1.5	0.0	0.0
SunCatchers (2 ft diameter)[1]		0.3	0.1	0.0	0.0
Main Services Complex		7.1	10.9	0.0	0.0
Waterline		0.0	0.0	5.2	0.0
Electrical Distribution		Included in maintenance road impacts			
Total		121.2	56.2	5.2	0.0

[1] – Impacts for the SunCatcher pedestals were calculated at 8.86×10^{-5} acres (4 square feet) per pedestal (4,528 pedestals total).

Overall: This alternative is practicable considering cost, logistics, and technology and would meet the overall project purpose.

2.6.2 Alternative #2 - Maximum Energy Generation Alternative

Project Purpose: Alternative 2 would involve the construction of a facility capable of generating 900 MW of utility quality electricity (Map 3 of Attachment B). This would provide approximately 100% of SDG&E's renewable energy requirements. It would also contribute significantly to assisting SDG&E and the State of California in reducing greenhouse gas outputs by providing 900 MW of clean energy. This alternative would meet the overall project purpose.

Cost: This alternative would allow for the generation of 900 MW at a cost of less than $2,900 per kW. This alterative would be sized large enough to allow for the sale of electricity to a state regulated utility at a cost that is within the range acceptable to the CPUC. It would also allow for the project to have a rate of return on equity and a DSCR that is sufficient to allow it to obtain financing necessary to support the project. This alternative meets the cost criteria.

Logistics: This alternative allows for the installation of 36,000 SunCatcher units that can efficiently be grouped into 360 SunCatcher groups, allowing for the efficient generation and transmission of electricity generated. It allows for the installation of perimeter, arterial, and maintenance roads necessary to service each of the SunCatcher groups and to meet necessary safety and security requirements. Utilities can be installed to serve each of the units and the main facilities complex can be located in the center of the project site. This alternative meets the logistical criteria.

Environmental: This alternative would result in approximately 205 acres of permanent impacts and temporary impacts to 5.2 acres of WUS (Table 5).

Table 5. Permanent and temporary impacts to waters of the U.S. associated with Alternative #2.

Impacts		Permanent (Acres)[1]		Temporary Acres	
		Primary	Secondary	Primary	Secondary
Roads	Main Access	0.8	0.6	0.0	0.0
	Maintenance	128	51	0.0	0.0
Debris Basins		3.9	1.8	0.0	0.0
SunCatchers (2 ft diameter)[2]		0.4	0.1	0.0	0.0
Main Services Complex		7.1	10.9	0.0	0.0
Waterline		0.0	0.0	5.2	0.0
Electrical Distribution		Included in maintenance road impacts			
Total		140.2	64.4	5.2	0.0

[1] – Permanent impacts were extrapolated using the permanent impacts from Alternative #1 and the 900 MW footprint (7,600 acres).

[2] – Impacts for the SunCatcher pedestals were calculated at 8.86×10^{-5} acres (4 square feet) per pedestal.

Overall: This alternative would be practicable in terms of cost, logistic, and technology and would meet the overall project purpose. It would not result in a reduction of impacts to aquatic resources; however, it is not the LEDPA.

2.6.3 Alternative #3 - Avoidance of the Highest Flow Aquatic Resources Alternative

Project Purpose: This alternative would allow for the generation of 709 MW of utility grade electricity ((Map 4 of Attachment B). Although it represents a reduction of over 10% of renewable energy that would be available, it would still significantly contribute to assisting SDG&E in meeting its renewable energy requirements. It would also contribute to SDG&E and the State of California in meeting its goal to reduce greenhouse gases, although it would not maximize this opportunity. This alternative would meet the overall project purpose.

Cost: This alternative would allow for the generation of 709 MW at a cost of approximately $3,000 per kW considering the cost of constructing the common facilities and installing the SunCatcher. By increasing the cost per kW by $50, the cost of generating 709 MW would increase by $35,400,000 as compared to the cost associated with the 750 MW proposed project. We note that this cost deviation may be increased if the cost of an individual SunCatchers is increased due to the decrease in the number of SunCatchers produced. Although this alternative would result in very significant additional costs, while at the same time reducing the amount of electricity generated, the project team has determined that it could meet the cost screening criteria. This alternative would be sized large enough to allow for the sale of electricity to a state regulated utility at a cost that is within the range acceptable to

the CPUC. It would also allow for the project to have a rate of return on equity and a DSCR sufficient to allow it to obtain financing necessary to support the project.

Logistical: This alternative allows for the installation of approximately 28,360 SunCatcher™ units that can efficiently be grouped into 360 SunCatcher™ groups, allowing for the efficient generation and transmission of electricity generated. It allows for the installation of perimeter, arterial, and maintenance roads necessary to service each of the SunCatcher groups and to meet necessary safety and security requirements. Utilities can be installed to serve each of the units and the main facilities complex can be located in the center of the project site. This alternative meets the logistical criteria.

Environmental: This alternative would result in permanent impacts to 39.1 acres and temporary impacts to 10.8 acres of WUS (Table 6).

Table 6. Permanent and temporary impacts to waters of the U.S. associated with Alternative #3.

		Permanent		Temporary	
Impacts		**Primary**	**Secondary**	**Primary**	**Secondary**
Roads	**Arterial Roads**	8.1	3.6	0.0	0.0
	Perimeter Roads	1.8	0.1	0.0	0.0
	Maintenance Roads	15.2	9.3	0.0	0.0
Waterline		0.0	0.0	0.0	0.0
Main Services Complex		0.01	0.7	0.0	0.0
SunCatchers (2 ft diameter)[1]		0.2	0.1	0.0	0.0
Electrical and Hydrogen Trenches[2]		0.0	0.0	6.5	4.3
Total		**25.3**	**13.8**	**6.5**	**4.3**

[1] – Impacts for the SunCatcher pedestals were calculated at 8.86×10^{-5} acres (4 square feet) per pedestal (3,214 pedestals total).

[2] – Temporary impacts associated with the electrical and hydrogen trenches necessary to each SunCatcher were calculated using a 6 inch wide trench for the hydrogen trench and a 24 inch wide trench for the electrical trench and 58 feet of trenching for each SunCatcher.

Overall: Although this alternative results in a reduction of electricity generated, it allows for sufficient generation to be practicable. It represents a significant reduction in impacts to aquatic resources.

2.6.4 Alternative #4 - Phase 1 Alternative

Project Purpose: This alternative would allow for the generation of 300 MW of utility grade electricity (Map 5 of Attachment B). It would result in a 60% reduction in the amount of electricity made available to SDG&E as compared to the proposed project. It would only provide approximately 33.6% of the SDG&E renewable energy requirement and would significantly reduce the project's contribution to the ability of

SDG&E and the State of California in reducing greenhouse gas emissions. Therefore, the project does not satisfy the overall project purpose.

Cost: This alternative would allow for the generation of 300 MW at a cost of approximately $3,200 per kW. By increasing the cost per kW by $250, the cost of generating 300 MW would increase by $75,000,000, as compared to the cost of generating 300 MW with the costs associated with the 750 MW proposed project. We note that this cost deviation may be increased if the cost of an individual SunCatcher is increased due to the decrease in the number of SunCatchers produced. This cost would necessitate a price per MW-hour that exceeds the price in Tessera Solar's PPA with SDG&E and would be in excess of what a state regulated utility could pay for electricity in California. It would also result in a return on equity and a DSCR that is not sufficient to allow the project to obtain financing or to obtain loan guarantees from the DOE. Therefore, this alternative does not meet the cost criteria.

Logistical: This alternative allows for the installation of 12,000 SunCatcher™ units that can efficiently be grouped into 360 SunCatcher™ groups, allowing for the efficient generation and transmission of electricity generated. It allows for the installation of perimeter, arterial and maintenance roads necessary to service each of the SunCatcher™ groups and to meet necessary safety and security requirements. Utilities can be installed to serve each of the units, but the main facilities complex would be located at one end of the project site, not providing the most efficient location for common facilities. This alternative does not meet the logistical criteria.

Environmental: This alternative would result in permanent impact to 27 acres and temporary impacts to 7.3 acres of WUS (Table 7).

Table 7. Permanent and temporary impacts to waters of the U.S. associated with Alternative #4.

Impacts		Permanent (Acres)		Temporary (Acres)	
		Primary	Secondary	Primary	Secondary
Roads	Arterial	1.2	1.1	0.0	0.0
	Perimeter	0.1	0.0	0.0	0.0
	Maintenance	2.0	4.5	0.0	0.0
Debris Basins		0.0	0.0	0.0	0.0
Water Line		0.0	0.0	4.4	0.2
Main Services Complex		7.1	10.9	0.0	0.0
SunCatchers (2 ft diameter)[1]		0.0	0.1	0.0	0.0
Electrical and Hydrogen Trenches[2]		0.0	0.0	1.2	1.5
Total		10.5	16.5	5.6	1.7

[1] – Impacts for the SunCatcher pedestals were calculated at 8.86×10^{-5} acres (4 square feet) per pedestal (983 pedestals total).

[2] – Temporary impacts associated with the electrical and hydrogen trenches necessary to each SunCatcher were calculated using a 6 inch wide trench for the hydrogen trench and a 24 inch wide trench for the electrical trench and 58 feet of trenching for each SunCatcher.

Overall: This alternative does not satisfy the project purpose nor does it meet the cost and logistical criteria. Therefore it is not practicable.

2.6.5 Alternative #5 - Drainage Avoidance #1 Alternative

Project Purpose: This alternative would allow for the generation of 606 MW of utility grade electricity (Map 6 of Attachment B). This represents a reduction in 19% of the renewable energy available to SDG&E and therefore significantly reduces the projects contribution to SDG&E's ability to meet its renewable energy requirements. The significant reduction in electrical generation would also comprise the project's ability to significantly contribute to SDG&E's and the State of California's efforts to reduce greenhouse gas emissions. Therefore, this alternative does not meet the overall project purpose.

Cost: This alternative would allow for the generation of 606 MW at a cost of approximately $3,050 per kW. By increasing the cost per kW $100, the cost of generating 606 MW would increase by $60,600,000 as compared to generating 630 MW under the cost of associated with the 750 MW proposed project. We note that this cost deviation may be increased if the cost of an individual SunCatcher is increased due to the decrease in the number of SunCatchers produced. This cost would necessitate a price per MW-hour that exceeds the price in Tessera Solar's PPA with SDG&E and would be in excess of what a state regulated utility could pay for electricity in California. It would also result in a return on equity and a DSCR which is not sufficient to allow the project to obtain financing or to obtain loan guarantees for the DOE. Therefore, this alternative does not meet the cost criteria.

Logistics: This alternative has been designed to ensure that the logistical constraints are met. It would allow for the installation of 25,200 SunCatcher™ units that can efficiently be grouped into 360 SunCatcher™ groups, allowing for the efficient generation and transmission of electricity generated. It allows for the installation of perimeter, arterial, and maintenance roads necessary to service each of the SunCatcher™ groups and to meet necessary safety and security requirements. Utilities can be installed to serve each of the units and the main facilities complex can be located generally in the center of the project site. This alternative meets the logistical criteria.

Environmental: This alternative would result in 38 acres of permanent impacts and 12.5 temporary impacts to WUS (Table 8).

Table 8. Permanent and temporary impacts to waters of the U.S. associated with Alternative #5.

Impacts		Permanent (Acres)		Temporary (Acres)	
		Primary	Secondary	Primary	Secondary
Roads	Arterial	6.1	2.8	0.0	0.0
	Perimeter	1.7	0.3	0.0	0.0
	Maintenance	0.0	9.0	0.0	0.0
Debris Basins		0.0	0.0	0.0	0.0
SunCatchers (2 ft diameter)[1]		0.0	0.1	0.0	0.0
Water Line		0.0	0.0	4.4	0.2
Main Services Complex		7.1	10.9	0.0	0.0
Electrical and Hydrogen Trenches[2]		0.0	0.0	0.0	7.9
Total		14.9	23.1	4.4	8.1

[1] – Impacts for the SunCatcher pedestals were calculated at 8.86×10^{-5} acres (4 square feet) per pedestal (1,218 pedestals total).

[2] – Temporary impacts associated with the electrical and hydrogen trenches necessary to each SunCatcher were calculated using a 6 inch wide trench for the hydrogen trench and a 24 inch wide trench for the electrical trench and 58 feet of trenching for each SunCatcher.

Overall: This alternative is not practicable as it does not meet the overall project purpose or the cost screen criteria. Additionally, it only reduces permanent impacts to WUS by one acre compared to the Alternative #3 which does not significantly reduce the proposed project's impacts to aquatic resources.

2.6.6 Alternative #6 - Drainage Avoidance #2 Alternative

Project Purpose: This alternative would allow for the generation of 438 MW of utility grade electricity (Map 7 of Attachment B). This represents a reduction in 42% of the renewable energy available to SDG&E and therefore significantly reduces the projects contribution to SDG&E's ability to meet its renewable energy requirements. The significant reduction in electrical generation would also comprise the project's ability to significantly contribute to SDG&E's and the State of California's efforts to reduce greenhouse gas emissions. Therefore, this alternative does not meet the overall project purpose.

Cost: This alternative would allow for the generation of 438 MW at a cost of approximately $3,200 per kW. By increasing the cost per kW $250, the cost of generating 438 MW would increase by $109,500,000 as compared to the cost of generating 438 MW with the costs associated with the 750 MW proposed project. We note that this cost deviation may be increased if the cost of an individual SunCatcher is increased due to the decrease in the number of SunCatchers produced. This cost would necessitate a price per MW-hour that exceeds the price in Tessera Solar's PPA with SDG&E and would be in excess of what a state regulated utility could pay for electricity in California. It would also result in a return on equity and a DSCR which is not sufficient to allow the project to obtain financing or to obtain loan guarantees for the DOE. Therefore, this alternative does not meet the cost criteria.

Logistics: This alternative has been designed to ensure that the logistical constraints are met. It would allow for the installation of 15,960 SunCatcher units that can efficiently be grouped into 360 SunCatcher groups, allowing for the efficient generation and transmission of electricity generated. It allows for the installation of perimeter, arterial and maintenance roads necessary to service each of the SunCatcher groups and to meet necessary safety and security requirements. Utilities can be installed to serve each of the units and the main facilities complex can be located near the center of the project site. This alternative meets the logistical criteria.

Environmental: This alternative would result in 31.9 acres of permanent impacts and 10.4 acres of temporary impacts to WUS (Table 9).

Table 9. Permanent and temporary impacts to waters of the U.S. associated with Alternative #6.

Impacts		Permanent (Acres)		Temporary (Acres)	
		Primary	Secondary	Primary	Secondary
Roads	Arterial	2.7	1.8	0.0	0.0
	Perimeter	1.1	0.0	0.0	0.0
	Maintenance	6.8	6.1	0.0	0.0
Debris Basins		0.0	0.0	0.0	0.0
SunCatchers (2 ft diameter)[1]		0.1	0.1	0.0	0.0
Water Line		0.0	0.0	4.4	0.2
Main Services Complex		7.1	10.9	0.0	0.0
Electrical and Hydrogen Trenches[2]		0.0	0.0	3.7	2.1
Total		17.8	14.1	8.1	2.3

[1] – Impacts for the SunCatcher pedestals were calculated at 8.86×10^{-5} acres (4 square feet) per pedestal (1,550 pedestals total).

[2] – Temporary impacts associated with the electrical and hydrogen trenches necessary to each SunCatcher were calculated using a 6 inch wide trench for the hydrogen trench and a 24 inch wide trench for the electrical trench and 58 feet of trenching for each SunCatcher.

Overall: This alternative is not practicable as it does not meet the overall project purpose or the cost screen criteria. Additionally, it only reduces permanent impacts to WUS by three acres compared to the Alternative #3 which does not significantly reduce the proposed project's impacts to aquatic resources.

3.0 Existing Conditions

3.1 Location and General Description

The project site lies within the Imperial Subregion of the Colorado River Regional Water Quality Control Board (RWQCB). There are no perennial or intermittent drainages on the project site. The closest perennial drainage to the project site is the New River, created in the early 1900's when the Colorado River overflowed a dike, and with the Alamo River further east, flowed through the Imperial Valley to form the Salton Sea. Currently, the highly polluted New River obtains its flow primarily from agricultural irrigation return.

Ten (10) primary ephemeral drainages traverse the proposed Imperial Valley Solar Project site from the south to north in the western portion of the site and toward the northeast in the eastern half of the site. Headwaters for these drainages are gently sloping upland areas located to the south and west. Culverts under the I-8 Freeway allow flows from primary drainages south of the freeway to flow across and into the site. Some large secondary drainages (i.e. C-5) that have large watersheds south of the interstate have been effectively intercepted by the interstate and as a consequence had their flows diverted by Caltrans to the culverts feeding the primary washes.

Ephemeral drainages in the project area provide beneficial functions and services typical of high quality, low disturbance desert scrub systems. Riverine functions are generally categorized into hydrologic, physical, and biologic. Functions performed include, but are not limited to groundwater recharge, flood peak attenuation, floodwater storage, sediment trapping and transport, nutrient trapping, and maintenance of wildlife corridors and habitat. These functions could be impaired by construction and operation of the proposed Imperial Valley Solar Project.

3.1.1 Jurisdictional Determination

Jurisdictional WUS were defined using a combination of high resolution aerial photography, hydrological information provided in the October 2009 Revision 1 version of the "Hydrologic Assessment Report Imperial Valley Solar Project Site" by RMT (2009), and personal communication with the ACOE. The drainages on the site were considered primary or secondary drainages (equivalent to main stem and tributary drainages) based upon their size, the acreage of the watershed upstream of the drainage, and whether the drainage originates on-site. A total of 637 acres of primary drainages and 244 acres of secondary drainages were mapped (Table 10).

Table 10. Primary and secondary drainages mapped and considered jurisdictional by the USACE.

Ephemeral Drainage ID		Acres
Primary	**Secondary**	
I		24
J		11
K		37
	K1	5
	K2	3

Ephemeral Drainage ID		Acres
A		25
	B	10
C		40
	C1	12
	C2	10
	C3	13
	C4	7
	C5	2
D		75
	D1	27
	D2	29
	D3	6
E		199
	E1	22
	E2	2
	E3	3
	E4	2
	E5	8
F		104
	F1	12
	F2	5
	F3	7
G		115
	G1	18
	G2	9
	G3	10
H		7
	SI	22
Total		**881**

3.1.2 Primary vs. Secondary Washes

<<ACOE WILL POPULATE WITH CRAM DATA>>

3.2 Physical and Chemical Characteristics

3.2.1 Physical Substrate Determinations

Soil map units on the proposed project site primarily correspond to the Rositas, Carrizo and Orita soil series, as classified by the United States Department of Agriculture (USDA) in *Soil Survey of Imperial County California Imperial Valley Area* (USDA, Soil Conservation Service [SCS] 1981) and *Web Soil Survey* (USDA, Natural Resources Conservation Service [NRCS] 2010). Soil map units in the eastern 300 acres of Phase II, the laydown area, and portions of the proposed water line correspond to the Meloland, Vint, and Indio soil series or the Imperial, Glenbar, and Gilman soil

series. A small area, consisting of soil map units that correspond to the Badland miscellaneous land type and Beeline and Rillito soil series, occurs along the alignment for the proposed transmission line.

The Rositas, Carrizo and Orita soil series consist of sands to gravelly loams that typically formed on alluvial fans, floodplains and alluvial basin floors. These soils are extremely to highly erodible, and exhibit high permeability and potential for wind erosion. Erosion factors are used to predict the erodability of a soil and its tolerance to erosion related to specific land uses and treatments. The soil erosion factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible, with values ranging from 0.10 to 0.64. To estimate the annual soil loss per acre, the K value is modified by site-specific and/or regional parameters that include vegetative cover, grade and length of slope, management practices, and climate. The K value is relatively low for these soils at 0.20, which generally indicates a low potential for erosion-related annual soil loss per acre. However, since K also factors in climate as a modifier and total precipitation is very low in the region, a low K value does not necessarily indicate that these soils are resistant to erosion during precipitation events.

The Meloland, Vint, and Indio soil series consist of sands, sandy loams, or silty loams that formed in recent mixed alluvium on floodplains, and alluvial basin floors. These soils are highly erodible to erodible, and exhibit moderate permeability and potential for wind erosion. The K value is generally moderate to high for these soils (~0.40, but up to 0.55), which suggests these soils have a higher potential for erosion-related annual soil loss per acre than the above soil series.

The Imperial, Glenbar, and Gilman soil series are included among the highly productive farmland soils located in the agricultural area of Imperial County. These soils are erodible to moderately erodible, and exhibit low permeability and potential for wind erosion. The K value is moderate for these soils (~0.40), indicating these soils have a moderate potential for erosion-related annual soil loss per acre.

The Badland miscellaneous land type consists of barren land on unconsolidated, stratified alluvium, and generally includes clays to gravelly sands in steep to very steep barren lands that are dissected by drainages. This land type is extremely erodible, with surface runoff that is rapid or very rapid and the hazard of erosion is high. However, the K value is low for this miscellaneous land type at 0.10, which implies a low potential for erosion-related annual soil loss per acre. As previously discussed, the K value factors in climate as a modifier and total precipitation is very low in the region; therefore, a low K value does not always indicate soil resistance to erosion during flood events.

The Beeline soil series consists of shallow and very shallow, well-drained sandy loams that formed in mixed alluvium, and typically occur on fan terraces and hillslopes. Beeline soils are well-drained with medium to rapid runoff and moderately rapid permeability. The Rillito soil series consists of very deep, somewhat excessively drained sandy loams that formed in mixed alluvium that are found on fan terraces or stream terraces. Rillito soils are somewhat excessively drained, and exhibit slow or medium runoff and moderate permeability.

3.2.2 Water Circulation, Fluctuation, and Salinity Determinations

As presented in Section 3.1, no perennial or intermittent drainages are present within the proposed project site, with the closest perennial drainage being the New River. Several ephemeral drainages traverse the project site, generally conveying water from the south to north in the western portion of the site and toward the northeast in the eastern portion of the site.

The ephemeral drainages on the site are normally dry. They convey water infrequently and only following precipitation events of intensities sufficient to result in flowing water. Rainfall is minimal in this region and long periods of time may pass between rain events. When it does occur, flowing water within the drainages is generally activated by summer monsoons that produce short-duration, high-intensity flash flooding. According to Chang (2010a), a 100 year flood event would result in approximately a 1 foot depth of water flowing in project area washes. Winter storms typically result in greater rainfall totals on average than the summer monsoons, but they are widespread, low-intensity events that result in little runoff. For example, stream gage records for San Felipe Creek located approximately 20 miles north of the project site indicate that August and September flows are nearly five times higher than the December to February flows. Although the majority of the rainfall occurs during winter, the majority of annual runoff occurs during the summer months of July to September.

Figure 1 of the SA/DEIS Soil and Water Resources section shows the location, watershed areas, and estimated 100-year peak discharges of 12 drainages entering the project site from the south. Stream flow estimates have been made for these watersheds using a rainfall/runoff model (SES, 2008a). This model uses rainfall estimates (2.62 inches over a 6-hour period for a 100-year event), soil type, and area and topographic information to estimate peak runoff. Watershed areas for the drainages shown in Figure 1 of the SA/DEIS Soil and Water Resources section range from 58 to 1,574 acres, averaging 548 acres. The estimated 100-year discharges range from 57 cubic feet per second (cfs) to 777 cfs.

The 100-year discharge represents the discharge from a flood event with an annual probability of occurrence of 1%. Commonly called the 100-year flood, a flood of this magnitude is expected to occur, on average, once every 100 years. Since there is a 1% chance that this flood occurs every year, it is possible for more, or fewer, than one flood of this magnitude to occur in a 100-year period. The 100-year flood has been designated by the Federal Emergency Management Agency (FEMA) as the national regulatory flood for flood insurance and floodplain management purposes.

As the ephemeral drainages pass through the project site, some combine and form new watersheds. Figure 1 of the SA/DEIS Soil and Water Resources section shows the location, watershed areas, and 100-year peak discharges for ten watercourses exiting the site toward the north and east. Watersheds for these drainages range from 147 to 18,856 acres in area, averaging 3,246 acres (median 1,274 acres). The 100-year discharge for these watersheds ranges from 126 cfs to 4,223 cfs.

Discharges for more frequent floods have also been determined. The 25-year peak discharges, with 4% chance of occurrence in any given year, are roughly 50% of the 100-year peaks given in Figure 1 of the DEIS *Soil and Water Resources* section. The 10-

year discharges, with 10% chance of occurrence per year, are roughly 30% of the 100-year peaks. The 5-year discharges, with 20% chance of occurrence per year, are roughly 15% to 20% of the 100-year peaks. For instance, for concentration point "CS", the estimated discharges are: 100-year = 777 cfs; 25-year = 397 cfs; 10-year = 217 cfs; and 5-year = 119 cfs.

Flows exiting the site on the north in the Phase I area are returned to the site at a point east of Plaster City, where they join other on-site flows in the Phase II area. All Phase II flows eventually exit the site on the east, overtop Dunaway Road, and drain toward the Westside Main Canal This large drainage feature located south of Plaster City consolidates flows from much of the eastern portion of the property and is mapped as a FEMA floodplain. Flows of sufficient volume and discharge to cross the canal would be conveyed either north via the Westside Main Canal, north and east through local drainage and irrigation ditches, or overland east to the New River to be eventually deposited in the Salton Sea. It is likely that most flows would infiltrate the soil prior to reaching the New River or the Salton Sea.

Flooding is considered to be that area of a channel or area adjacent to a channel that is subject to inundation by channel flows. Flooding can occur anywhere there is a natural drainage on the project site. The FEMA prepares 100-year flood maps for flood insurance purposes and for floodplain management use by local agencies. FEMA map panels 06025C-1650C and 06025C-1675C cover the project site. Two watercourses, corresponding to E2 to Dunaway and C North on Figure 1 of the DEIS Soil and Water Resources section have been mapped by FEMA as Zone A, which means 100-year flood zone with no base flood levels determined. These are considered approximate flood zones. Figure 2 of the DEIS Soil and Water Resources section shows the location of the FEMA-mapped floodplain on the project site.

FEMA maps do not cover all floodplains. Rural areas, such as the project site, are commonly not mapped. Independent floodplain mapping has been performed based on the discharges given in Figure 1 of the SA/DEIS Soil and Water Resources section. This flood mapping is shown in Figure 3 of the SA/DEIS Soil and Water Resources section and shows floodplains associated with 24 drainages and one sink area (Basin D Lake) on the project site.

Salinity is expressed as the electrical conductivity of the soil saturation extract, in mmhos per centimeter (mmhos/cm) at 25 degrees Celsius. Salinity estimates for soil series types present on the site were derived by the USDA, SCS (1981) based on field and laboratory measurements of soils at representative sites in the Imperial Valley area. Results of these estimates indicated that: Glenbar, Indio, and Rositas soil series generally exhibited salinity levels of less than 4 mmhos/cm; Meloland and Vint soil series generally exhibited salinity levels of 2-8 mmhos/cm; and Imperial soil series generally exhibited salinity levels of 4-8 mmhos/cm.

3.2.3 Suspended Particulate/Turbidity Determinations

No perennial or intermittent drainages are located within the project site, and no water quality data is available for the site. Water quality of surface runoff flows would be dependent on materials picked up on the ground surface, which is currently natural desert. The downstream disposition of surface runoff from the site is the desert area west of the Westside Main Canal, possibly the Westside Main Canal itself, local

drainage and irrigation ditches west of the Westside Main Canal, the New River, and eventually the Salton Sea.

3.2.4 Contaminant Determinations

As previously stated, the downstream deposition of surface runoff from the site is the desert area west of the Westside Main Canal, possibly the Westside Main Canal itself, local drainage and irrigation ditches west of the Westside Main Canal, the New River, and eventually the Salton Sea.

The New River is considered highly polluted from agricultural runoff, sewage from Mexico, and discharges from manufacturing plants in Mexico, and is listed as impaired under Section 303(d) of the Clean Water Act for a wide range of pollutants including, but not limited to: trimethylbenzene, chlordane, chloroform, chlorpyifos, copper, DDT, diazinon, dieldrin, mercury, meta-para xylenes, nutrients, organic enrichment, pesticides, and selenium. The Salton Sea is listed as impaired for nutrients, salinity, and selenium.

The RWQCB identifies beneficial uses of waters of the State that may be protected against water quality degradation. These include such uses as domestic, municipal, agricultural, recreation, natural resources, and aesthetic enjoyment. Beneficial uses identified for washes in the west Colorado River basin (Colorado River Basin Regional Water Quality Control Board, 2006) include groundwater recharge, non-contact water recreation, and wildlife habitat.

Groundwater in the Coyote Wells Valley Groundwater Basin is type sodium bicarbonate-chloride. Total dissolved solids (TDS) content ranges from 750 to 1,240 milligram/liter (mg/L) in shallow wells to 300 to 450 mg/L in deeper wells (California Department of Water Resources, 1973). Fluoride levels in some wells are as high as 3.5 mg/L (California Department of Water Resources, 2003). Water quality in the Imperial Valley Groundwater Basin varies extensively throughout the basin. TDS content ranges from 498 to 7,280 mg/L in the basin. Department of Health Services data from five public supply wells show an average TDS concentration of 712 mg/L with a range from 662 to 817 mg/L. In general, groundwater beneath the basin is unusable for domestic and irrigation purposes without treatment. TDS values typically exceeding 2,000 mg/L are reported from a limited number of test wells drilled in the western part of the basin. Groundwater in areas of the basin have higher than recommended levels of fluoride and boron. Approximately 7,000-acre-feet per year of groundwater is estimated to recharge the basin from the New River which drains the Mexicali Valley. This groundwater is related to surface flow from the highly polluted New River and negatively affects groundwater quality in the basin (California Department of Water Resources, 2003).

3.3 Biological Characteristics

Several dry desert washes traverse the site and convey flows following a substantial rainfall. The vegetation community type of the washes, classified as Sonoran creosote bush scrub, also contain sparse stands of mesquite and tamarisk (SES 2008a). The ephemeral washes generally contain a greater vegetative diversity and density than the creosote bush scrub habitat outside of the washes (SES 2009c). For the Imperial Valley Solar project site, the USACE jurisdictional WUS is approximately 881 acres and jurisdictional state waters is approximately 620 acres.

Off-Site linear features, such as the reclaimed water pipeline, would either span the seven irrigation canals and the New River via attachment to bridge crossings or other structures or go under the waterbodies via directional boring. The canals and the New River are considered WUS and jurisdictional state waters. The estimated acreage of jurisdictional state waters is 0.20 acres (SES 2009b). Seepage from some of the canals has created adjacent wetlands with large stands of tamarisk scrub (*Tamarix* sp.) and arrow weed (*Pluchea sericea*) scrub, which are under federal jurisdiction. The estimated acreage of WUS is 2.33 acres (SES 2009b).

The SWWTF is located at 1898 West Main Street in Seeley, California, approximately 13 miles east of the project site. According to the Draft MND for the SWWTF upgrades (Dudek 2009), the SWWTF site supports developed/disturbed land with limited to no vegetative growth, and discharges up to 0.15 cfs of effluent to the New River through an unlined earthen channel that is approximately 800 feet long and 50 feet wide (0.92 acre). The approximately 0.92 acre channel supports narrow-leaved cattail (*Typha latifolia*), salt cedar, arrow weed, and Emory's baccharis (*Baccharis emoryi*) but because of its small size and fragmented character it was considered sub-optimal for breeding use by Yuma clapper rail and other riparian bird species (Dudek 2009). A vegetation map has been completed for the area around the SWWTF including 500 feet upstream and downstream of the site on the New River. This map is included in the Seeley Environmental Review Update which is part of the EIS (Dudek 2010).

3.3.1 California Rapid Assessment Method

<<ACOE TO COMPLETE >>

3.3.2 Threatened and Endangered Animals

One species proposed for listing as threatened and one federally listed endangered species have been detected on the project site. Flat-tailed horned lizard (*Phrynosoma mcallii*, FTHL) is proposed for listing as Threatened and Peninsular bighorn sheep (Distinct Population Segment of desert bighorn sheep: *Ovis canadensis nelsoni,* PBS) is federally listed as Endangered. Designated Critical Habitat (DCH) for PBS exists approximately four miles west of the project site.

Another federally listed endangered species, the Yuma clapper rail (*Rallus longirostris yumanensis*), has potential habitat and known populations within 2 miles north of the SWWTF near where the New River empties into the Salton Sea and one mile south in an area known as Fig Lagoon (Dudek 2010). Another state-listed bird, the California black rail (*Laterallus jamaicensis coturniculus*) had potential habitat in similar areas as the Yuma clapper rail. Surveys for the special status species in the vicinity of SWWTF have been negative. Endangered and threatened species and impacts associated with the Proposed Action and the various alternatives are discussed in detail in Section C.2 – Biological Resources of the SA/DEIS. Formal Section 7 consultation with the United States Fish and Wildlife Service (USFWS) was initiated on December 16, 2009 for the PBS and January 29, 2010 for the FTHL. The USFWS has preliminary concluded that the SWWTF upgrade will have no effect on listed species.

In the summers of 2007 and 2008, focused protocol surveys were conducted for the FTHL. Two FTHL were detected along the eastern boundary, one within the Project

Site and one just outside, and four desert horned lizards were detected in the Project Site during 2007 focused surveys. Two deceased flat-tailed horned lizards were observed along the Off-Site transmission line in 2007. One flat-tailed horned lizard and two desert horned lizards were detected on the Project Site during 2008 focused surveys. Based on the findings, it was determined that the entire plant site and Off-Site transmission line provide suitable habitat and food sources to support FTHLs.

Due to the small size and fragmented character of the small wetland area below the SWWTF, the area is considered sub-optimal for breeding use by Yuma clapper rail and other riparian bird species (Dudek 2009). Focused protocol surveys for the Yuma clapper rail, California black rail and other sensitive were conducted near the SWWTF in April and May of 2010. No individuals of any sensitive species had been detected at the time of submitting this analysis (URS 2010). It should be noted that most protocol surveys for listed birds are designed to detect birds during migration and courtship behavior on territories, with later surveys focused on determining breeding status and brood fledging. Early negative surveys usually result in no birds being detected during the breeding period either.

PBS were not observed during field surveys in 2007 and 2008; however, a small herd of five females and/or juveniles were observed in the north-central portion of the Project site during a site visit by Dr. Joe Platt of the company PBS&J on March 25, 2009.

3.3.3 Fish, Crustaceans, Mollusks, and Other Aquatic Organisms in the Food Web

As presented in Section 3.1, no perennial or intermittent drainages are present within the proposed project site, with the closest perennial drainage being the New River. In addition, the waterline from the proposed project site to the SWWTF would avoid all irrigation ditches and the New River either through spanning the water features along existing bridges or by boring underneath.

As for aquatic organisms downstream of the SWWTF, it is well documented that the New River is highly polluted making it difficult for any aquatic life to thrive. The Regional Water Quality Control Board monitoring data show that dissolved oxygen (DO) concentrations in the New River near the Mexican Border are consistently below 1.0 mg/l, which represents a lethal environment for most aquatic organisms (e.g., there is not enough DO for the fish to breath) and violates the State standards for the New River. The SWWTF has in fact been a contributor to this problem having been cited on multiple occasions for violating NPDES pollutant limits with their discharge to the river system.

Between 1993 and 2002 DeVlaming (2004) conducted a series of studies to assess water quality using three aquatic species from the New River: a cladoceran (Ceriodaphnia dubia), a mysid (Neomysis mercedis), and a larval fish (Pimephales promelas). Although no mortality was observed with the P. promelas, high-level toxicity to the invertebrate species was documented in samples from the New River during many months of each year. Toxicity identifications and chemical analyses identified the organophosphorus insecticides (OP), chlorpyrifos and diazinon, as the cause of C. dubia toxicity. The extent of the C. dubia mortality was highly correlated with quantities of these OPs applied in the watersheds. C. dubia mortality occurred during

more months of our 2001/2002 study than in the 1990s investigations. During 2001/2002, the extensive C. dubia mortality observed in New River samples was caused by OP insecticide pollution that likely originated from Mexico. Mortality to N. mercedis in New River samples was likely caused by contaminants other than OP insecticides. No aquatic sampling was conducted along the New River related to the IVSP.

3.3.4 Other Wildlife

The project area is known to support a variety of special status wildlife species. Due to the suitable habitat being present, most of the special status wildlife species listed in Biological Resources Table 2 (SA/DEIS Page C.2-17) have a moderate potential of occurring on the project site, though they were not detected during surveys. Species which were detected on-site, the detection of wildlife signs (i.e., scats, burrows, or tracks), or those species with a high potential for occurrence are discussed in more detail in the SA/DEIS. Vegetation in the desert wash contains a greater vegetative diversity and density than the areas outside of the washes and provide wildlife habitat and movement corridors for the species listed in Biological Resources Table 2 (SA/DEIS Page C.2-17).

3.3.5 Special Aquatic Sites

The Imperial Valley Solar Project site does not contain any special aquatic sites. The jurisdictional WUS found on the project site include ephemeral washes that are largely dominated by upland plant species.

As described above, a small (less than 0.3 ac) brackish water emergent wetland occurs immediately downstream from the SWWTF outfall discharge. The wetland type typically occurs in drainages, seeps, and other perennially-moist low places where the water table is close to or at the ground surface.

3.4 Potential Effects on Human Use Characteristics

3.4.1 Municipal and Private Water Supplies

Runoff from the ephemeral washes within the proposed project area does not recharge municipal or private water supplies. Therefore, no impacts are expected to municipal and private water supplies as a result of construction and operation of the proposed project.

3.4.2 Recreational and Commercial Fisheries

There are no recreational or commercial fisheries located in the New River, Westside Canal, or the Salton Sea. The proposed Imperial Valley Solar project would not impact any recreational or commercial fisheries during its construction or operation.

3.4.3 Water-Related Recreation

The SA/DEIS did not identify any water-related recreation in the vicinity of the Proposed Project or any water-related recreation activities downstream of the Proposed Project that would be affected by the proposed project (Land Use, Recreation, and Wilderness section of the SA/DEIS).

3.4.4 Aesthetics

The Visual Resources section of the SA/DEIS provides a comprehensive analysis of the proposed project in relation to the surrounding viewshed.

3.4.5 Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites and Similar Preserves

The proposed Imperial Valley Solar Project is not located near any National Parks, Monuments, Seashores, or research sites. The wilderness areas closest to the proposed project site are the Yuma Area of Critical Concern, which is adjacent to the southern boundary of the project site, the Jacob Wilderness located approximately 4 miles southeast of the project site, and the Coyote Mountains Wilderness located approximately 7 miles northeast of the project site. For more information, see section C.8 – Land Use, Recreation, and Wilderness of the SA/DEIS.

4.0 Impacts Analysis

4.1 Impacts to Waters of the U.S.

4.1.1 Construction Impacts

Permanent impacts to the ephemeral washes will result from the placement of SunCatchers on 24-inch bases and the construction or maintenance, arterial and perimeter roads across project area washes. All wash crossings, with the exception of the Lifeline Road G will be at grade Arizona crossings. The Lifeline Road G will be spanned over Wash G with a concrete box culvert structure. Temporary impacts to the ephemeral streambeds include the underground placement of the electrical collection system and the hydrogen distribution system, and mowing of vegetation between the rows of SunCatchers (SES 2009d).

All arterial roads would be 24 feet in width and would be paved due to high traffic use. All the perimeter roads and maintenance routes down SunCatchers rows would be unpaved and 10-feet in width (Table 11). The unpaved roads would be treated with a tackifier to maintain the integrity of the road; however, none of the roads located within washes would be treated with tackifier. Map 4 of Attachment B shows the proposed project layout with the location all roads, SunCatchers, the Main Services Complex, the Off-Site transmission line, and the Off-Site waterline that connects to the SWWTF.

Table 11. Types of impacts and the width or area of their disturbance.

Type of Impact	Width or Area of Disturbance
Arterial Roads (Paved)	24 feet
Perimeter Roads (Unpaved)	10 feet
Maintenance Roads (Unpaved)	10 feet
Main Services Complex	0.7 acres
Utility Trench	3 feet
SunCatcher Pedestal	4 square feet
Waterline	Co-located beneath perimeter road over Wash E

Arterial roads would cross 93 jurisdictional WUS. These crossings would be at-grade Arizona crossings and Diagram 1 of Attachment C shows a diagram of how they would be constructed. The crossing would be a low water crossing that is not paved and no tackifier would be applied.

Some impacts to jurisdictional washes were unavoidable due to safety and security concerns. According to multiple publications prepared by the American Association of State Highway and Transportation Officials (AASHTO) 10 foot wide lanes are acceptable on low-speed facilities to ensure the safety of the driver and any passengers. Likewise, on Page C.5-11 of the SA/DEIS, CEC's proposed conditions of certification HAZ-4 and HAZ-5 address both construction security and operations security plans and require that there be a perimeter fence and road installed to ensure the security of the site. In addition, the intersections of the arterial roads need to be a certain width in order to allow the flatbed trucks that transport the SunCatchers to the field to safely negotiate the intersections.

The LEDPA would not place SunCatchers or associated maintenance roads in the entirety of washes C, I, and K and the southern portions of washes E and G (Map 4). Along the northern portions of washes E and G a 200 foot wide corridor was left through the center of the wash as a FTHL movement corridor. While placing SunCatchers in these washes was avoided or minimized, the applicant needs access throughout the project area and requires arterial and perimeter road crossings of the avoided washes. The applicant has reduced the number of crossing to only those necessary for operation of the proposed project and to ensure that the perimeter of the project is secure. Table 12 lists the avoided washes and the number and type of road crossings per wash.

Table 12. Number and type of road crossings for the avoided washes.

	Primary Wash									
	I		C		K		E		G	
Type of Road	Number of Crossings	Acres of Impacts	Number of Crossings	Acres of Impacts	Number of Crossings	Acres of Impacts	Number of Crossings	Acres of Impacts	Number of Crossings	Acres of Impacts
Arterial	0	0	4	0.41	3	0.48	6	0.4	1	0.04
Perimeter	0	0	0	0	1	0.05	0	0	0	0
Fence	1	0.001	3	0.003	1	0.002	1	0.001	2	0.002
Total	**1**	**0.001**	**7**	**0.413**	**5**	**0.532**	**7**	**0.401**	**3**	**0.042**

The construction and installation of the SunCatchers and the requisite electric and hydrogen gas utilities requires excavation of two trenches that would parallel the rows of SunCatchers in a north-south direction. The necessary electrical lines would be in one trench and the hydrogen system would be in the other trench (Figure 4). The electrical trench would be 24 inches wide and 30 inches deep and the hydrogen trench would be 4 inches wide and 24 inches deep. Table 15 shows the temporary impacts that the trenching will have to primary and secondary washes.

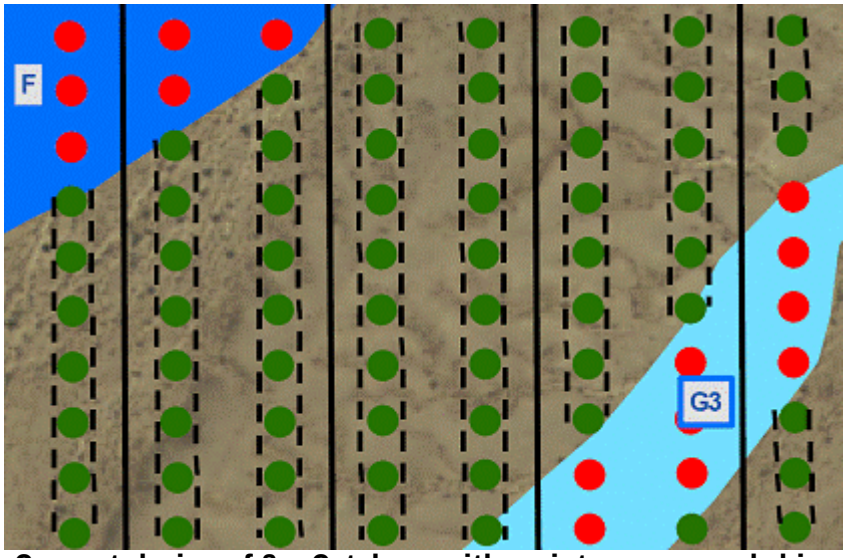


Figure 6. Current design of SunCatchers with maintenance roads bisecting two rows of SunCatchers with utility trenches running parallel to each side of the maintenance road. A utility trench then extends to each SunCatcher to connect it to the overall system.

During construction, vegetation would be trimmed between two rows of SunCatchers including the area around the maintenance roads. This would be about a 112 foot wide area and vegetation would not be mowed in the 112 feet corridors between rows of SunCatchers (Diagrams 2 and 3 of Attachment C). The vegetation would continue to be trimmed around the base of the SunCatchers to remove any obstruction from the

SunCatchers tracking the sun. In addition, any tall vegetation that might shade the SunCatchers would be removed; however, there are only a few mesquite trees that would be tall enough to cast shadows on a SunCatcher.

A perimeter fence is required by the CEC for security purposes and will surround the entire site (Diagram 4 of Attachment C). In addition, a temporary perimeter fence would be constructed around Phase 1 of the project in order to secure the site during construction and operation. The substation would also require an additional section of fencing. Fence posts would be constructed every ten feet and would be pushed into the substrate. Corner posts would require a concrete base be poured for stability. Corner posts would require a hole 12 to 18 inches wide and at least three feet deep (Diagrams 6 and 7 of Attachment C). Table 13 includes the total number of feet of fencing that would be in the primary and secondary washes on the site for each of the fences. In total, the perimeter fence would have 0.14 acres of permanent impacts to WUS.

Table 13. Perimeter fence impacts to primary and secondary washes and the total number of crossings.

		Perimeter Fence	Substation Fence	Temporary Phase 1 Fence	Total
Primary	# of Crossings	17	6	3	**26**
	Feet	14,782.1	73.3	508.4	**15,364**
	# of Fenceposts[1]	1,478	7	51	**1,536**
	Acres of Permanent Impacts[2]	0.107	0.001	0.004	0.111
Secondary	# of Crossings	16	3	14	**33**
	Feet	2,951.8	156.7	1,228.9	**4,337**
	# of Fenceposts[1]	295	16	123	**434**
	Acres of Permanent Impacts[2]	0.021	0.001	0.009	0.031
Total	# of Crossings	33	9	17	**59**
	Feet	17,733.9	230.0	1,737.3	**19,701**
	# of Fenceposts[1]	1773	23	174	**1,970**
	Acres of Permanent Impacts[2]	0.128	0.002	0.013	0.142

[1] – Number of fence posts was calculated assuming that there would be a fencepost every 10 feet.

[2] – Acres of impacts were calculated assuming a hole two feet in diameter.

An approximately 12-mile reclaimed water supply pipeline is proposed for construction from the Seeley Waste Water Treatment Facility to the project site along Evan Hewes

Highway. Off-Site the proposed reclaimed water line would either span or go under seven irrigation canals and the New River. There would be no impacts to any of these canals, adjacent wetlands or the New River as Best Management Practices (BMPs) would be utilized to avoid impacts to WUS. These BMPs include either boring under or using existing bridges or spans to cross the irrigation ditches, associated adjacent wetlands and the New River. On-site the waterline would be co-located (buried beneath) proposed roadways that cross Wash E. As such, no additional impacts to WUS are created by the proposed waterline.

Overall permanent and temporary impacts of the proposed project are listed in Table 15. This includes the permanent disturbance of placing 3,442 SunCatchers in jurisdictional washes (Table 14), all paved and unpaved roads constructed within jurisdictional washes, the construction of the Main Services Complex, and the trenches that extend to each SunCatcher from the maintenance road. No fill or dredging operations are anticipated with the proposed upgrade to the SWWTF.

Table 14. Number of SunCatchers in ephemeral washes for Phases 1 and 2 of construction.

Number of SunCatchers	Primary Washes	Secondary Washes	Total
Phase 1	332	650	982
Phase 2	1,605	627	2,460
Overall	**1,937**	**1,277**	**3,214**

The substation would be constructed within a small area (0.7 acres) of a secondary wash and would require a diversion ditch to reroute water away from the facility. Diagram 5 in Attachment C provides an engineered drawing that depicts how the small wash would be diverted around the Substation building and complex.

Table 15. Temporary and permanent impacts to jurisdictional washes due to construction of the proposed Imperial Valley Solar Project.

		Permanent		Temporary	
Impacts		**Primary**	**Secondary**	**Primary**	**Secondary**
Roads	**Arterial Roads**	8.07	3.62	0.00	0.00
	Perimeter Roads	1.78	0.06	0.00	0.00
	Maintenance Roads	15.22	9.31	0.00	0.00
Waterline		0.00	0.00	0.00	0.00
Main Services Complex		0.01	0.66	0.00	0.00
SunCatchers (2 ft diameter)[1]		0.19	0.11	0.00	0.00
Electrical Distribution		0.00	0.00	6.5	4.3
Total		**25.27**	**13.75**	**6.5**	**4.3**

[1] – Impacts for the SunCatcher pedestals were calculated at 8.86×10^{-5} acres (4 square feet) per pedestal (3,214 pedestals total).

4.1.2 Operational Impacts

During operation of the Imperial Valley Solar Project, the perimeter road would be constantly patrolled for security purposes. On average, the perimeter road would be used for surveillance 2 times a day. The perimeter road has 52 wash crossings. There would be a total of 3,120 wash crossings per month for security purposes.

The SunCatchers require washing once a month to maintain efficiency. In addition, maintenance would be required as SunCatchers break down or require regular maintenance. There are 3,214 SunCatchers located in jurisdictional washes. It is assumed that each SunCatcher would be visited once a year for maintenance that would equal 13 vehicle trips annually to each SunCatcher. Over the course of an average month, there would be 3,481 crossings of the ephemeral washes for the regular maintenance of the SunCatchers. The vehicles would include a maintenance truck and a water truck. Table 16 shows the approximate number of wash crossings per month including the type of vehicles used during operation of the power plant.

The Applicant would not cross the washes when the washes are flowing or after rain events when the ground is soft except for emergency situations.

Table 16. Wash crossings required monthly during normal operation of the proposed project including the type of vehicle.

Type of Activity	Vehicles used	Number of wash crosses per month
Patrolling the perimeter road[1]	Pickup Truck	3,120
Routine SunCatcher washing[2]	Water Truck	3,214
Routine and On-call SunCatcher maintenance[3]	Maintenance truck	268

1 – It is assumed that TSNA would patrol the perimeter of the project area two times a day.

2 – Each SunCatcher would be washed once a month.

3 – It is assumed that each SunCatcher would require maintenance once a year.

4.1.3 Indirect Effects

An indirect effect of the SunCatchers in the washes would be the scour created around the pedestals after a rain event due to the obstruction in the flow path and due to the bare soil following vegetation removal. The hydraulics of flow were used to compute the depth of local scour as well as the area affected by scour using the equation recommended by the Federal Highway Administration given in Hydraulic Engineering Circular No. 18, FHWA, 2006 by Chang Consultants (2010b). Wash D was used as a sample wash to model the indirect effects of scour around SunCatcher pedestals placed in washes. Chang's modeling used a 100-year flood event as the precipitation event and determined that the average scour radius during the storm event was 44.9 square foot circle around the SunCatcher pedestal. The scour hole gets partially

refilled during the falling stage of the storm flow (i.e., the scour hole becomes smaller by the end of the storm). It calculates that 50% of the scour depth is refilled toward the end of the storm for a scour disturbance of 21.9 square feet around the SunCatcher pedestal (Chang 2010b). Table 17 quantifies the indirect effects of the SunCatchers placed in the washes on the project site.

It is anticipated that scour repair would be ongoing throughout the life of the project but would only require maintenance following large flood events. In addition, it is anticipated that trimming and/or removal of vegetation within the washes would continue throughout the life of the project; however, maintenance trimming would consist primarily of removing any shrubs or trees that shade the SunCatchers and any vegetation that would impede the ability of the SunCatcher to track the sun.

Table 17. Acres of scour around the bases of the SunCatcher pedestals during a 100-year flood event.

	Primary		Secondary		Total	
Construction Phase	**# of SunCatchers**	**Acres of Scour[1]**	**# of SunCatchers**	**Acres of Scour[1]**	**# of SunCatchers**	**Acres of Scour[1]**
Phase 1	332	0.17	650	0.33	982	**0.49**
Phase 2	1,605	0.81	627	0.31	2,232	**1.12**
Overall	1,937	0.97	1,277	0.64	3,214	**1.61**

1 – Acres of scour were determined using 21.9 square feet of disturbance per SunCatcher pedestal during a 100-year storm event (Chang 2010b).

4.2 Physical and Chemical Impacts

4.2.1 Physical substrate impacts

Construction and Operation Impacts

Construction of the project is expected to take approximately 40 months to complete. Construction would include soil excavation, clearing, grading, installation of solar disks, construction of the Main Services Complex, roads, utilities, water pipeline, substation, and other ancillary features. During these activities there would be both permanent and temporary impacts to the physical substrate of WUS from dredge and fill activities and construction of permanent facilities. Of these impacts only the installation of SunCatcher pedestals into washes would penetrate into the substrate of WUS (to a depth beyond sand layers in washes). SunCatcher pedestals would be vibrated into the ground to approximately 17 feet in depth at 3,214 locations resulting in 0.02 acres of disturbance to WUS. This small disturbance is not expected to fracture shallow substrate layers that could result in cross mixing between shallow aquifers or result in drainage of perched aquifers. In fact, the shallowest known depth to groundwater on the project site is 45 feet but is in the 100-300 feet depth range for most of the site.

Other potential impacts to the surface substrate of WUS would be from periodic vehicle crossings of WUS via at-grade, unsurfaced crossings. Chang (2010a) determined that impacts to site geomorphology as well as downstream morphology would be insignificant (and in witness testimony to the CEC). As detailed in the SA/DEIS, the project is expected to generate short term increases in erosion during construction.

Mitigation Measures
The Applicant has prepared a SWPPP and Drainage, Erosion and Sediment Control Plan (DESCP) which describes a series of BMPs intended to reduce erosion during construction and operation of the facility. Multiple additional conditions of certification to minimize erosion are detailed in the SA/DEIS.

4.2.2 Water circulation, Fluctuation, and Salinity Impacts

Construction and Operational Impacts
SunCatcher foundation poles in the flow path would create local areas of flow turbulence, resulting in local stream scour around the foundation poles. Scour such as this occurs on bridge piers, resulting in the need to bury bridge piers to a depth below the depth of scour to ensure stability. Chang (2010b) modeled the extent of scour for a SunCatcher pedestal during a 100-year flood event and determined the extent of scouring was a 21.9 square foot circle around the pedestal. Table 17 includes the indirect impacts of pedestal scouring during a 100-year flood event for the project site. Because project area washes are generally very wide, flows are typically very shallow and of low velocity. Flow velocities and depths for the 100-year flood as estimated from the HEC-RAS modeling are fairly uniform across the site. Flow depths on the site average approximately 1.2 feet, with flow velocities approximately 3 feet per second (Stantec Consulting, Inc. 2008), HEC-HMS (Stantec Consulting, Inc. 2008), HydroCAD (RMT, Inc. 2009), and FLUVIAL-12 (CHANG Consultants 2010a). Chang's sediment modeling study (2010a) and subsequent testimony submitted to the CEC showed that the project will not change hydrology, sediment flow or delivery towards areas downstream from the project site, or change stream morphology on or off site.

Mitigation Measures
Condition of Certification *Soil&Water-7* is proposed to prevent soil surface damage and contamination resulting from SunCatcher™ instability in all areas. Condition of Certification *Soil&Water-1* would also mitigate impacts associated with stream scour and SunCatcher™ instability, as well as ensuring no significant increase in Off-Site flooding potential. Condition of Certification *Soil&Water-1* and *Soil&Water-7* would also ensure hydrology and flooding impacts are kept to less than significant levels.

4.2.3 Suspended Particulate/Turbidity Impacts

Construction and Operation Impacts
Storm water runoff from the site during construction could include excess sediment from construction activities. Chang's sediment modeling study (2010a) showed that with the sediment basins removed from the site plan, that the project will not change sediment flow or delivery towards areas downstream from the project site. Further, as the project will not change flow or sediment flow to offsite areas, there should be no impacts to offsite fluvial morphology.

Mitigation Measures
Site construction would require a SWPPP which would specify BMPs that would minimize mobilization of sediments and soils on-site and eliminate or reduce non-storm water discharges to WUS. Conditions of Certification *Soil&Water-1* and *Soil&Water-5* would ensure adequate control of construction storm water pollutants.

Condition of Certification *Soil&Water-1* and *Soil&Water-5* would ensure minimization of operations-related storm water runoff contaminants and mitigate to a level less than significant.

4.2.4 Contaminant Impacts

Construction and Operation Impacts

During construction and operation of the IVSP surface water quality could be affected through the introduction of pollutants such as excess trash, oils, solvents, paints, cleaners, asphaltic emulsions, mortar mix, spilled fuel, vehicle fluids and other construction or industrial site-related contaminants.

Runoff from the Main Services Complex would be directed into a one-acre storm water retention pond. Runoff-borne contaminants from the Main Services Complex would be discharged into the retention basin rather than being discharged into the natural channel system. The project would include an oil/water interceptor to collect oil and other contaminants from the Main Services Complex. Oil collected from this interceptor would be transported to a certified recycling facility.

Mitigation Measures

The Applicant proposes to collect and remove construction waste, including hazardous wastes, according to a regular schedule. Site construction would adhere to the required SWPPP Conditions of Certification *Soil&Water-1* and *Soil&Water-5* would ensure adequate control of construction storm water pollutants.

Condition of Certification *Soil&Water-1* would ensure no adverse water quality or soils impact from mirror washing. Condition of Certification *Soil&Water-1* and *Soil&Water-5* would ensure minimization of operations-related storm water runoff contaminants and mitigate to a level less than significant in all areas.

4.3 Biological Impacts

4.3.1 Impacts to the Ephemeral Washes

<<ACOE TO POPULATE WITH CRAM DATA>>

4.3.2 Threatened and Endangered Animals Impacts

Impacts associated with the Proposed Action on threatened and endangered species is discussed in detail in Section C.2 of the SA/DEIS and the Biological Assessment which will be included with the FEIS.

It has been determined that the project would likely adversely affect the flat-tailed horned lizard. Approximately 6,500 acres of FTHL suitable habitat would be directly affected by the project. This represents 0.66% of the estimated amount (400,000 hectares) of suitable habitat occurring in California. The SA/DEIS states the Conditions of Certification the Applicant proposes to reduce and minimize impacts to the FTHL. The full list of mitigation measures for biological resources is listed on pages C.2-74 through C.2-100 of the SA/DEIS. Conditions of Certification BIO-9, BIO-10, and BIO-11 would minimize and/or mitigate for impacts to FTHL populations and habitat.

The LEDPA would provide corridors for FTHL to traverse the proposed project site. Washes C, I, and K would only have perpendicular road crossings (Table 12) with no

SunCatchers or maintenance roads built within the wash (Map 4 of Attachment B). These washes traverse the entire site from I-8 to the south to Evan Hewes Highway and the railroad dike to the north. The culvert under I-8 for wash C allows for FTHL movement; however, the culverts underneath I-8 currently restrict movement through washes I and K (Figure 5). The at-grade crossings for the roads would not impede FTHL travel from south to north.

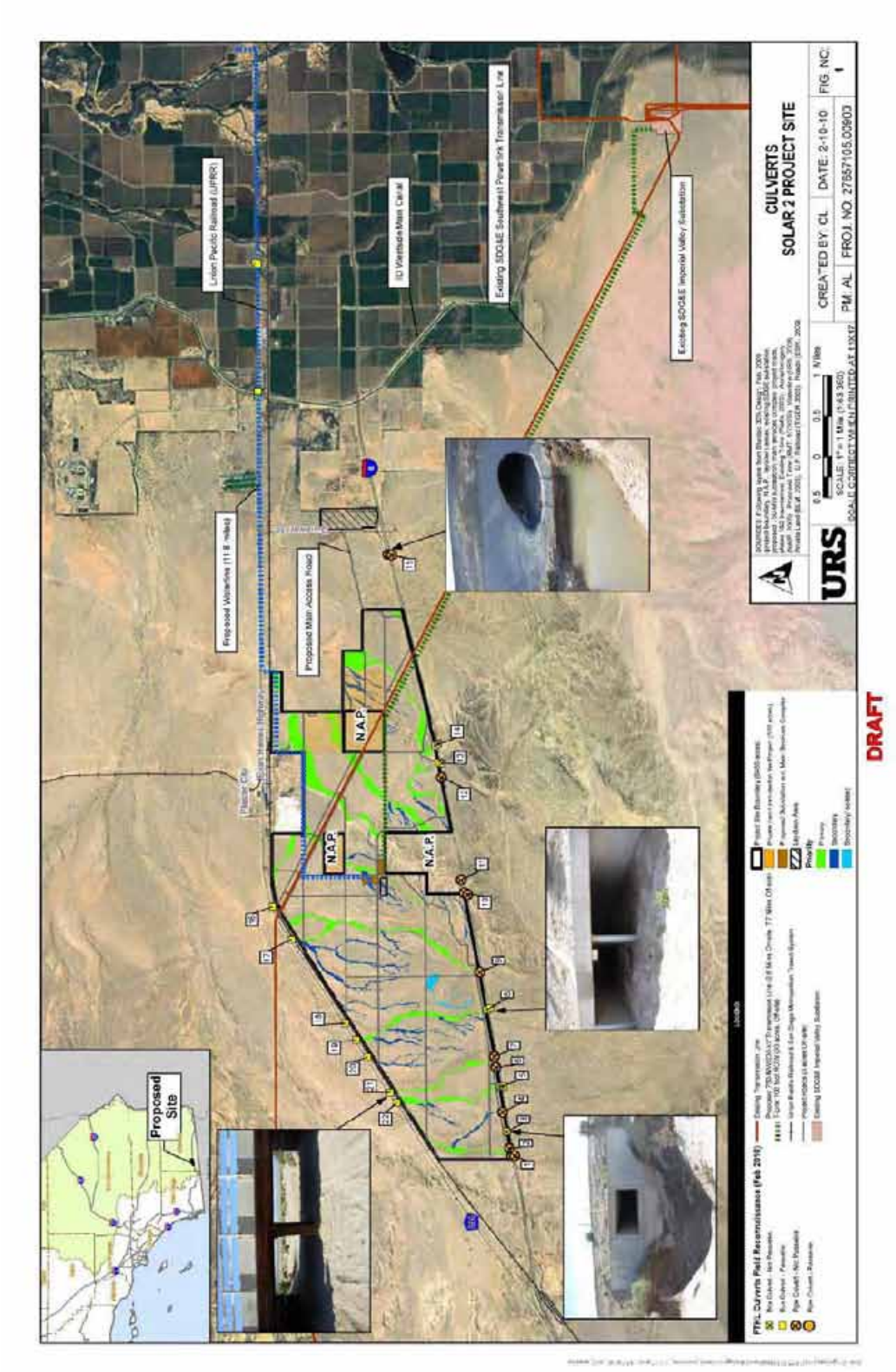
Washes E and G on the eastern section of the project would not have SunCatchers or maintenance roads in the southern portion of the project area up to the existing transmission line road. In addition, TSNA has agreed to provide 200 foot corridors that are free of SunCatchers along the northern portion of the washes (reduction of 228 SunCatchers in WUS). This would provide FTHL with the ability to traverse the entire eastern portion of the project area with only a few road crossings. There would be 26 road crossings of Wash E and 9 road crossings of Wash G. However, the culverts under I-8 restrict movement from the Yuha Desert FTHL Management Area to the south and washes E (Figure 5). While providing these FTHL transportation corridors on the eastern and western portions of the project area would not mitigate the impacts to the remaining acres of potential FTHL habitat impacted within the project area, it would allow the FTHL relatively unimpeded passageways through the project area and allow some limited movement between the two FTHL Management Areas (Yuha Desert and West Mesa). The avoided washes would preserve 242 acres of desert wash and potential FTHL habitat. It is expected that the applicant would still mitigate the loss of FTHL habitat as defined by the FTHL Management Strategy and outlined in the Section C.2 of the DEIS.

In addition, the roads within the washes throughout the site would be used minimally (Table 16) during operation of the project. It is anticipated that the maintenance roads would only be used approximately once a month to wash and maintain the SunCatchers. This would reduce the potential for FTHL mortality by vehicles and allow the FTHL relatively undisturbed washes for their movement.

The Proposed Project may affect, but is unlikely to adversely affect PBS. The Proposed Project would not adversely affect PBS Designated Critical Habitat. Potential incidental take would be in the form of harassment. No mortality of PBS is anticipated. BIO Condition of Certification #8 (SA/DEIS page C.2-80) would erect fences and gates to prevent wildlife access and contain construction equipment, and cover excavated areas or install wildlife escape ramps in the excavated areas should sheep wander on-site. This mitigation measure would ensure that the proposed project does not have any significant impacts on PBS individuals or habitat in the area.

The Proposed Project may affect, but is unlikely to adversely affect the Yuma clapper rail. This determination is based on the potential that marginal habitat downstream of the SWWTF would be degraded from the small reduction in flows. Focused surveys along the New River near the SWWTF for the Yuma clapper rail and for burrowing owl, California black rail, least Bell's vireo, southwestern willow flycatcher and western yellow-billed cuckoo have all been negative in 2010.

Figure 7. Culverts on the perimeter of the project site and the ability of FTHL to cross them.



4.3.3 Fish, Crustaceans, Mollusks, and Other Aquatic Organisms in the Food Web

No fish, crustaceans, mollusks, or other aquatic organisms were observed within the project site. Therefore, no impacts are expected to these organisms from the Proposed Project.

The SWWTF expansion would not fill any wetlands along the New River. During operation of the project, a small portion of the effluent from the SWWTF would be used for the project (up to 33.7 acre feet). The small reduction in effluent discharge is not anticipated to impact the small wetland located immediately downstream of the SWWTF discharge point as this wetland is also fed by agricultural return flow. The minimal decrease in flows to the New River (estimated to represent between 0.03% to 0.16% of the total flow in the New River) is not anticipated to a have a measurable impact on the New River or the Salton Sea.

4.3.4 Other Wildlife

Impacts to other BLM or state listed wildlife are discussed in section C.2 of the SA/DEIS. The full list of mitigation measures for biological resources is listed on pages C.2-74 through C.2-100 of the SA/DEIS.

The LEDPA would reduce permanent impacts to washes within the project area by 111.4 acres compared to the original proposed project (Tables 3 and 5). In addition, the LEDPA would not place SunCatchers or associated maintenance roads in washes C, I, and K and the southern portions of washes E and G (Map 4 of Attachment B). The only impacts to these sections are perpendicular arterial or perimeter road crossings and the perimeter fence (Table 12). This would provide habitat for the numerous animal species that utilize the denser wash vegetation and provide corridors of movement through the project area. In addition, 200-foot wide corridor without SunCatchers through the northern portions of washes E and G would provide corridors through the eastern half of the project area.

4.3.5 Special Aquatic Sites

The proposed project site does not include any special aquatic sites.

4.4 Impacts on Human Use Characteristics

4.4.1 Municipal and Private Water Supplies

None.

4.4.2 Recreational and Commercial Fisheries

None.

4.4.3 Water-Related Recreation

None.

4.4.4 Aesthetics

See the Visual Resources section (C.13) of the SA/DEIS for a detailed discussion of the Proposed Action's impacts to the viewshed.

4.4.5 Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites and Similar Preserves

See the Land Use, Recreation, and Wilderness section of the SA/DEIS for a detailed description of the impacts analysis.

4.5 Determination of Cumulative Effects on WUS

Cumulative effects associated with the Proposed Action on are described in detail in Sections C.2 and C.7 of the SA/DEIS. Given the minimal amount of water that would be diverted from the SWWTF, diversion of this water would not measurably contribute to any potential cumulative impact on the flows in the New River or the Salton Sea that could result from other projects in the project vicinity.

5.0 Mitigation Proposed by the Applicant

For unavoidable adverse impacts to WUS, the Applicant proposes to replace the functional losses through active wetlands and riparian habitat creation, enhancement and preservation. The creation and enhancement of wetland and riparian habitat will be implemented at an approximately 2:1 ratio that is, for every acre permanently impacted 2 acres will be replaced concurrent with or immediately following construction. The permanent impacts to WUS (e.g. ephemeral drainages) are 39.1 acres. Final mitigation requirements will be calculated following the receipt of the CRAM scores prepared by the Southern California Coastal Water Research Project (SCCWRP). Several alternative mitigation site opportunities have been field reviewed by the USACOE. Currently it is anticipated that enhancement and creation mitigation will be completed along Carrizo Creek and marsh on lands managed by the California State Parks. The extent (acres) required of mitigation enhancement/creation will be determined by the USACOE following their review of the CRAM analysis being completed by SCCWRP; following which a formal Mitigation Plan will be submitted to USACOE.

In addition, approximately 6,527 acres of creosote bush shrubland will be preserved to offset adverse impacts to the flat tailed horned lizards (see Condition of Certification Bio-10 Flat-tailed Horned Lizard Compensatory Mitigation). The exact location of the preservation lands are unknown at this point, but it is anticipated that these locations would have similar ephemeral streambeds as the proposed project area and these washes would be preserved.

The details of the proposed compensatory mitigation measures, responsible parties, mitigation goals and objectives, implementation schedule, and monitoring and success criteria will be included in a Mitigation and Monitoring Plan to be approved by the Corps.

In addition to the compensatory mitigation enhancement/creation site and 6,527 acres of preservation of flat-tailed horned lizard habitat, the Applicant proposed other mitigation measures that are specific to federally listed and/or BLM-listed species and are intended to ameliorate or offset the loss in wetland/sensitive habitat that supports these species. The mitigation measures are located in the Biological Section of the SA/DEIS and in the Seeley Environmental Review Update docketed with the CEC on May 10th, 2010 (URS 2010).

6.0 Findings

<<ACOE TO COMPLETE>>

7.0 References

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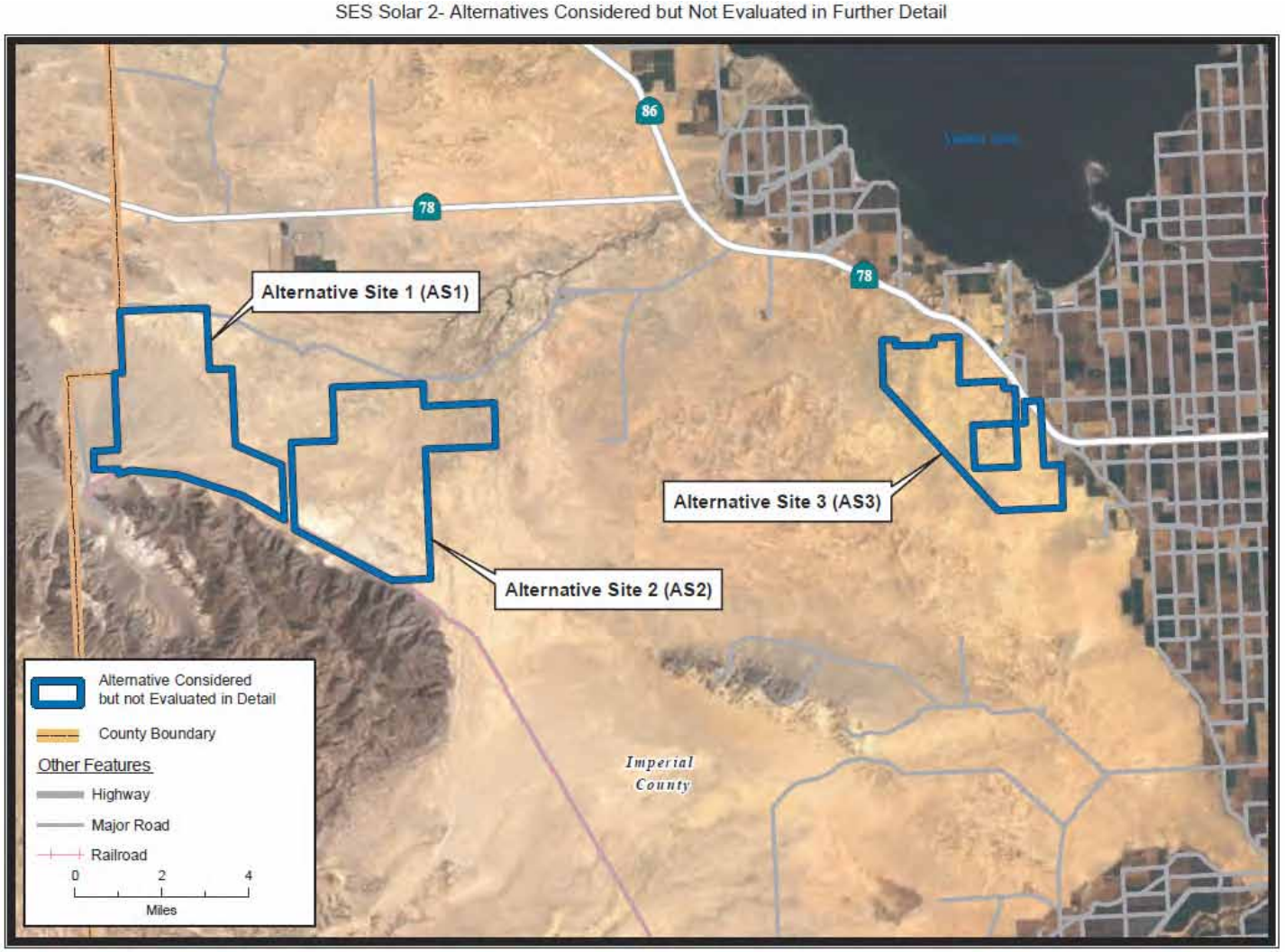
Attachment A – Maps of Off-Site Alternatives

Figure 1. Locations for Alternatives AS-1, AS-2, and AS-3



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, FEBRUARY 2010
SOURCE: SES 2008a

Figure 2. Alternative Site Locations

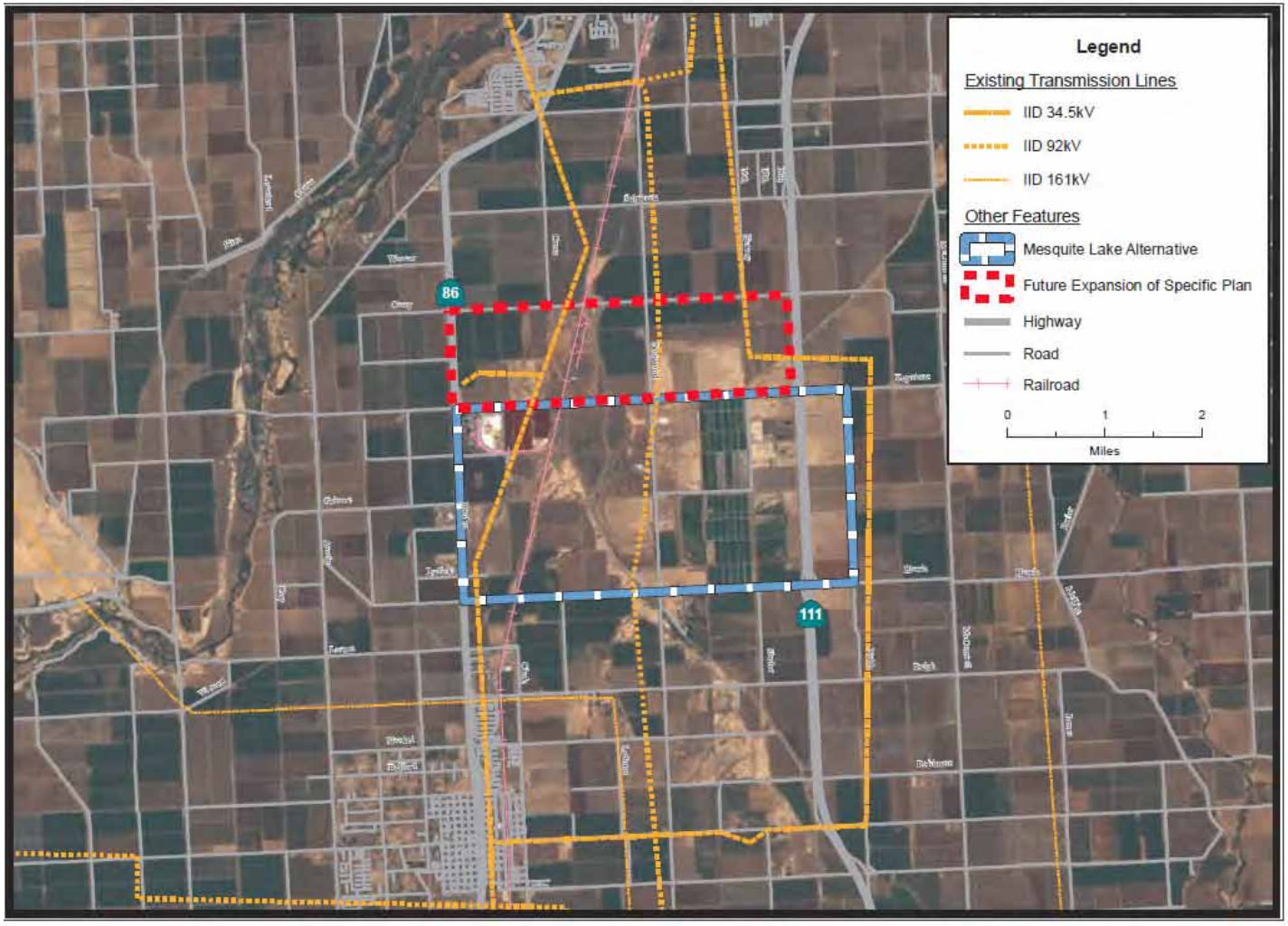
SES Solar 2 - Site Alternatives Evaluated under CEQA

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, FEBRUARY 2010

SOURCE: California Energy Commission

Figure 3. Mesquite Lake Alternative

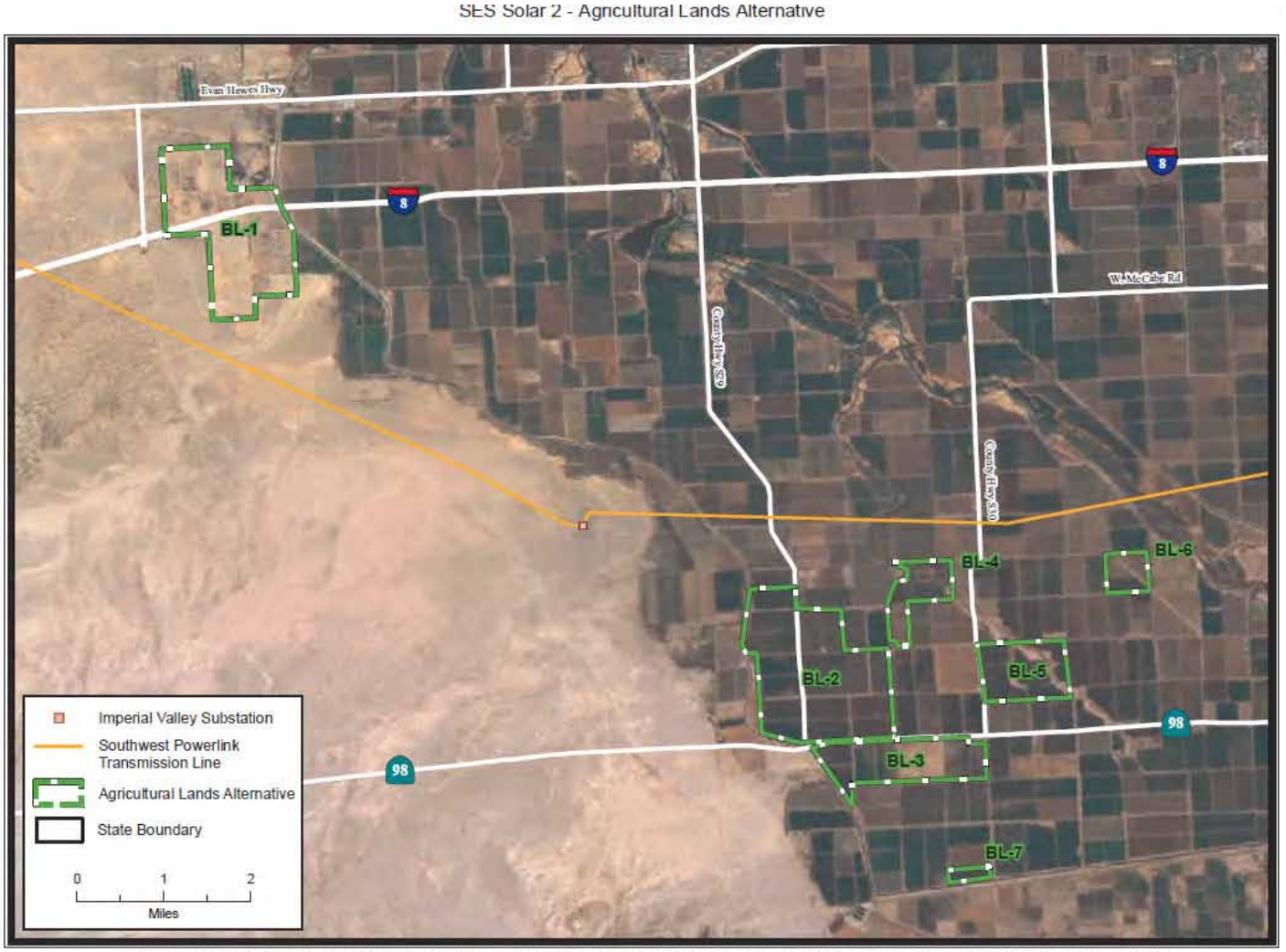
SES Solar 2 - Mesquite Lake Alternative



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, FEBRUARY 2010

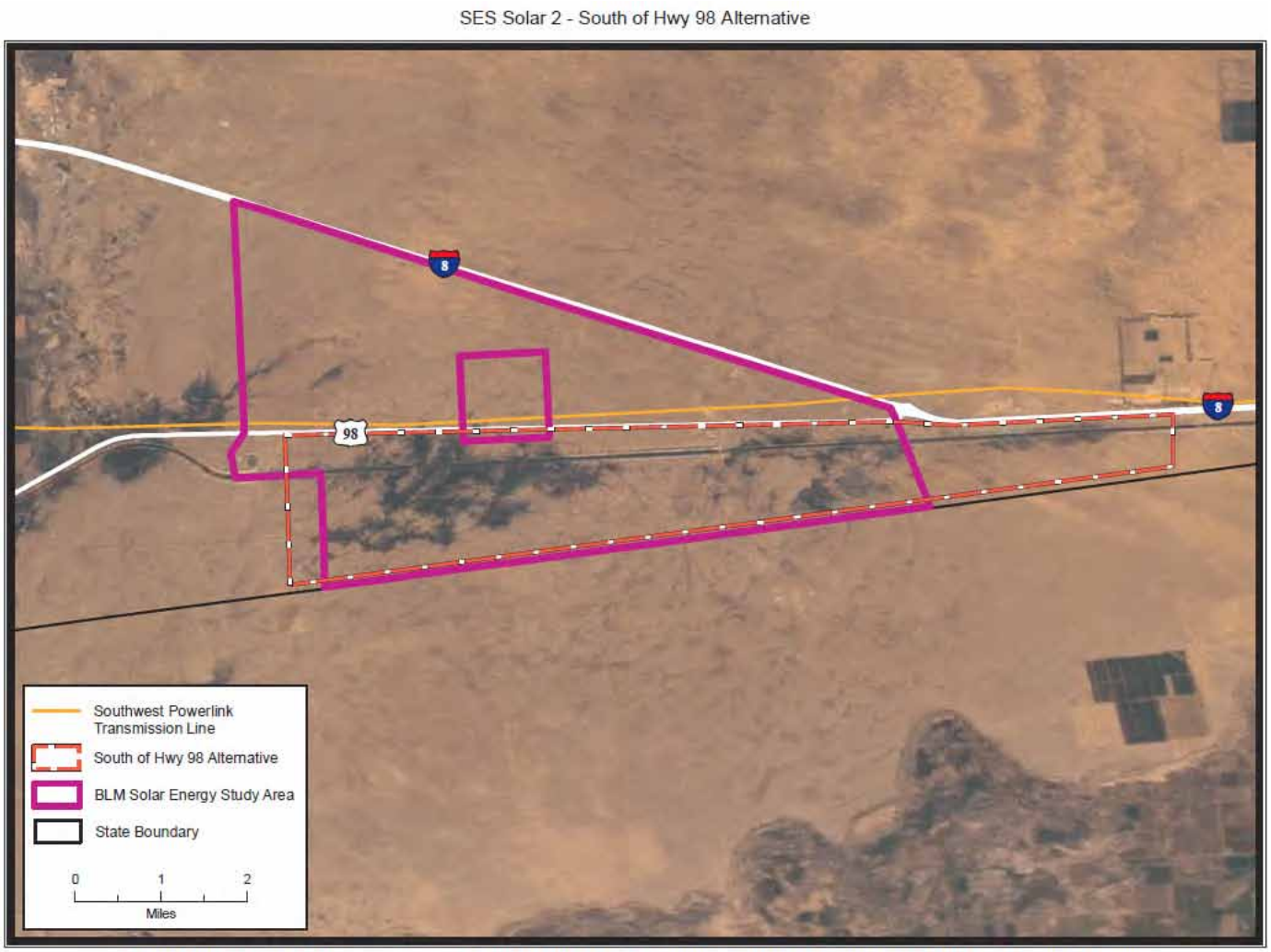
SOURCE: California Energy Commission

Figure 4. Agricultural Lands Alternative



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, FEBRUARY 2010
SOURCE: California Energy Commission

Figure 5. South of Highway 98 Alternative

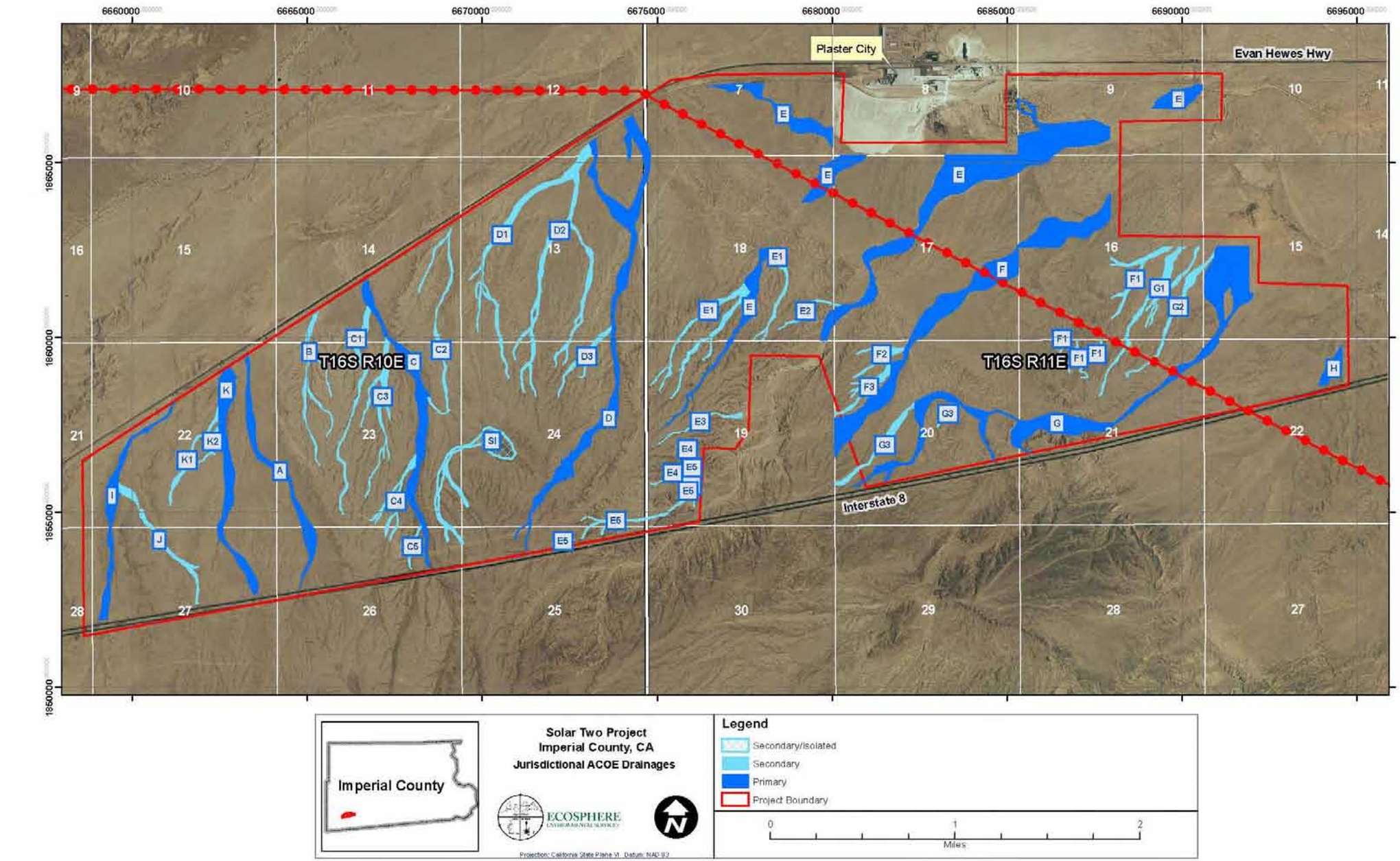


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION, FEBRUARY 2010
SOURCE: California Energy Commission

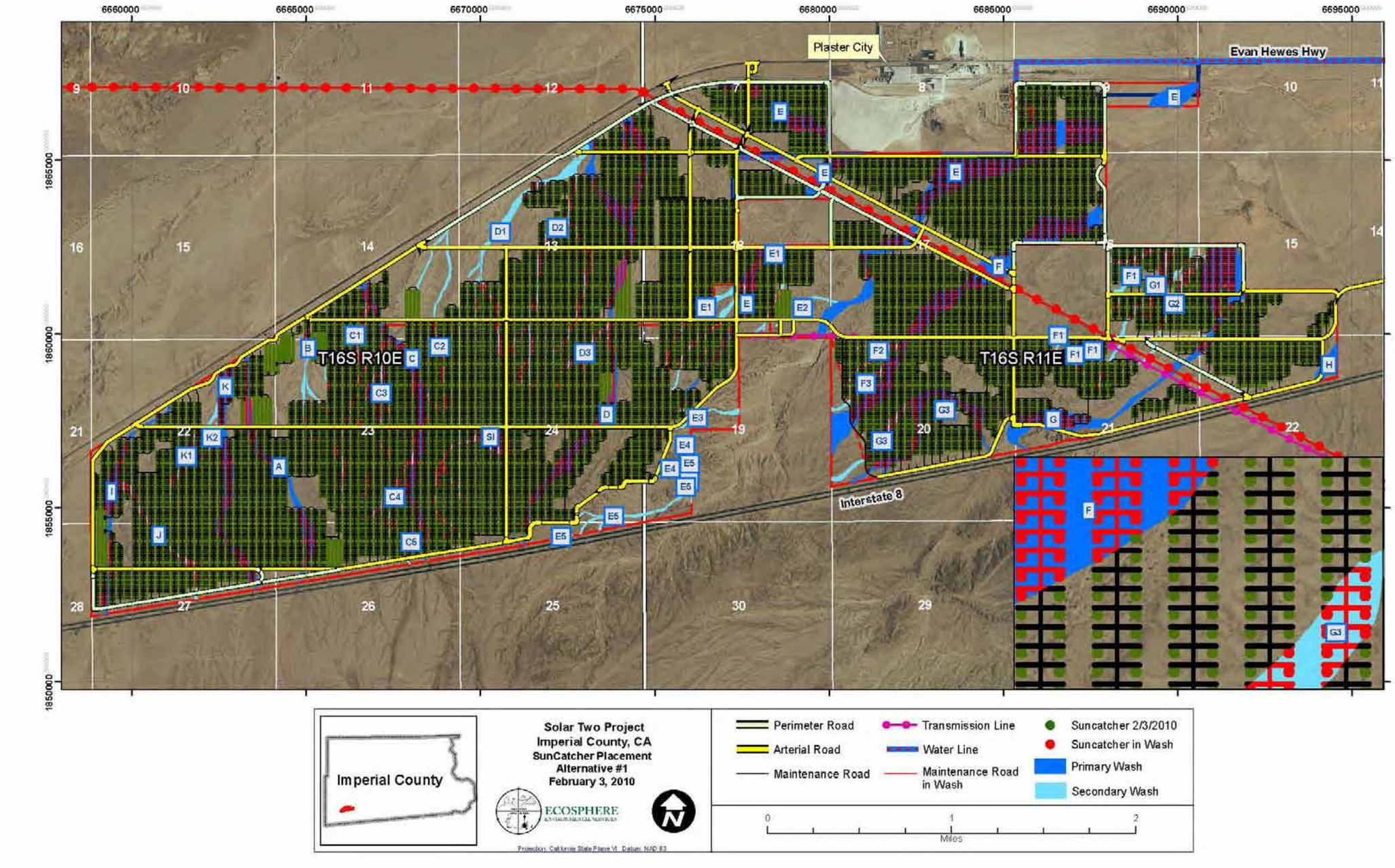
Attachment B – Maps of On-Site Alternatives

Map 1. Jurisdictional Waters of the U.S. on the Proposed Project site.
Map 2. Site plan for Alternative # 1 – Applicant's Proposed Project.
Map 3. Site plan for Alternative #2 – Maximum Energy Generation Alternative.
Map 4. Site plan for Alternative #3 – Avoidance of the Highest Value Aquatic Resources Alternative.
Map 5. Site plan for Alternative #4 – Phase 1 Alternative.
Map 6. Site plan for Alternative #5 – Drainage Avoidance #1 Alternative.
Map 7. Site Plan for Alternative #6 – Drainage Avoidance #2 Alternative.

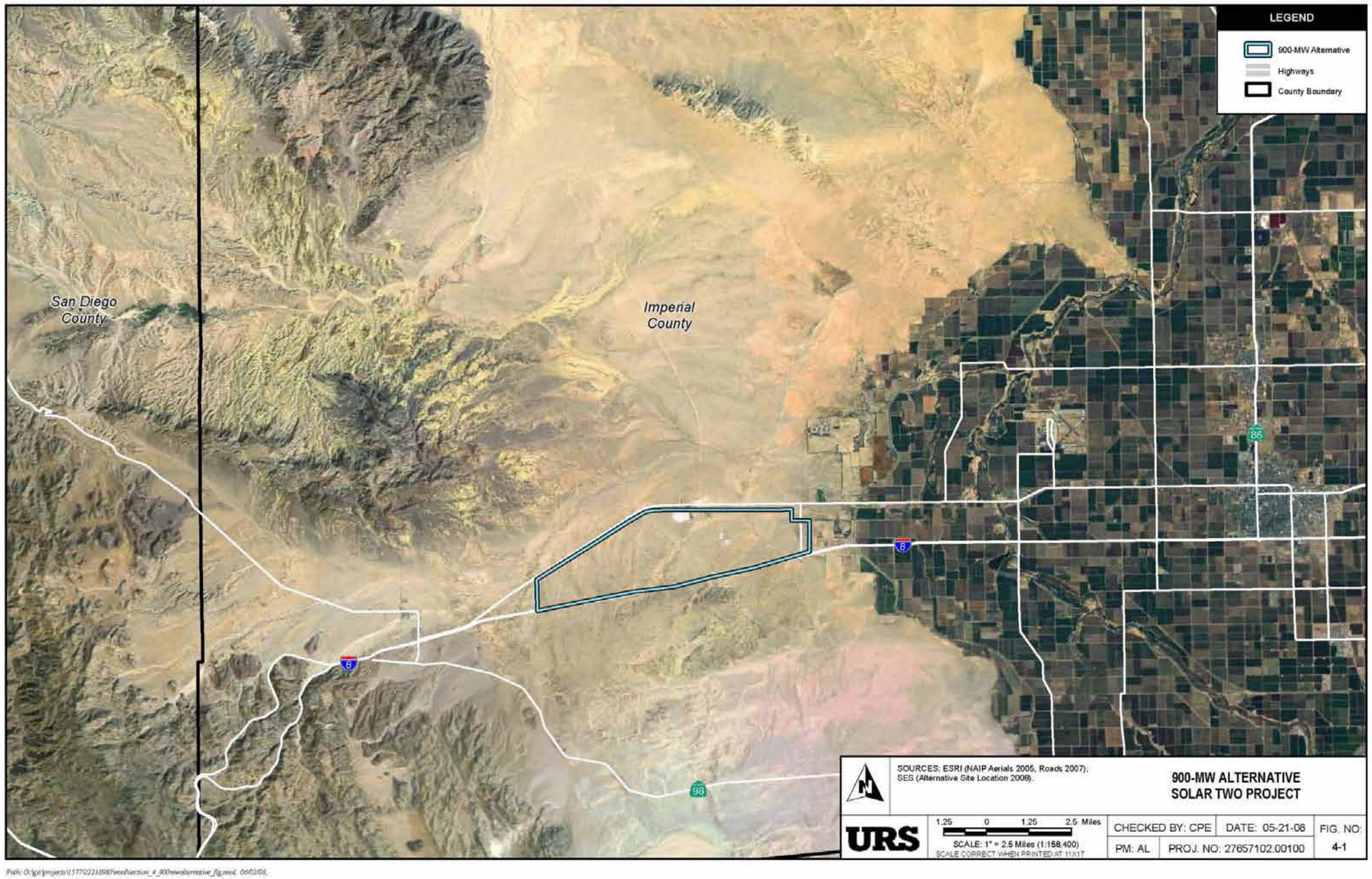
Map 1. Jurisdictional Waters of the U.S. on the Proposed Project site.



Map 2. Site plan for Alternative # 1 – Applicant's Proposed Project.



Map 3. Site plan for Alternative #2 – Maximum Energy Generation Alternative.



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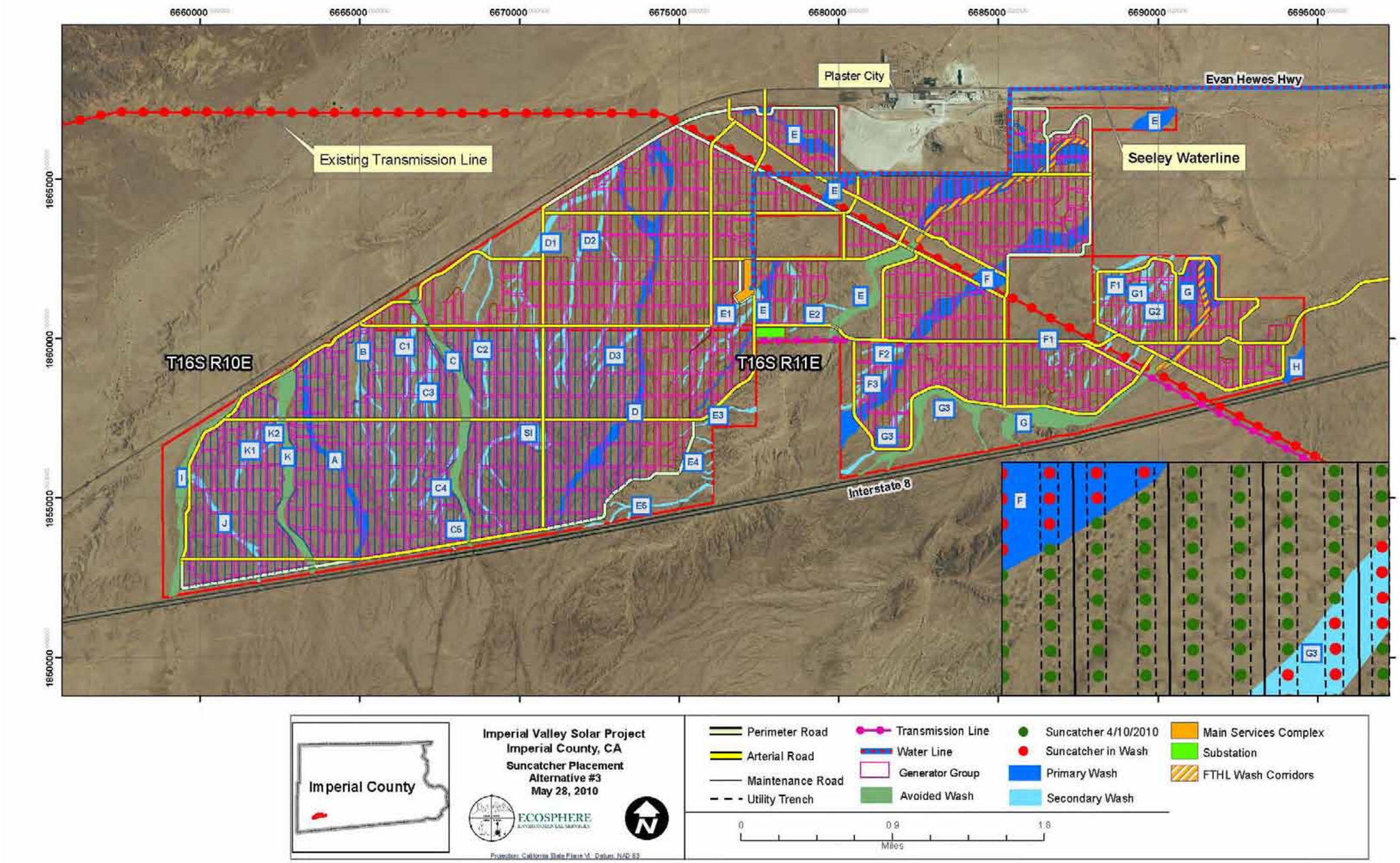
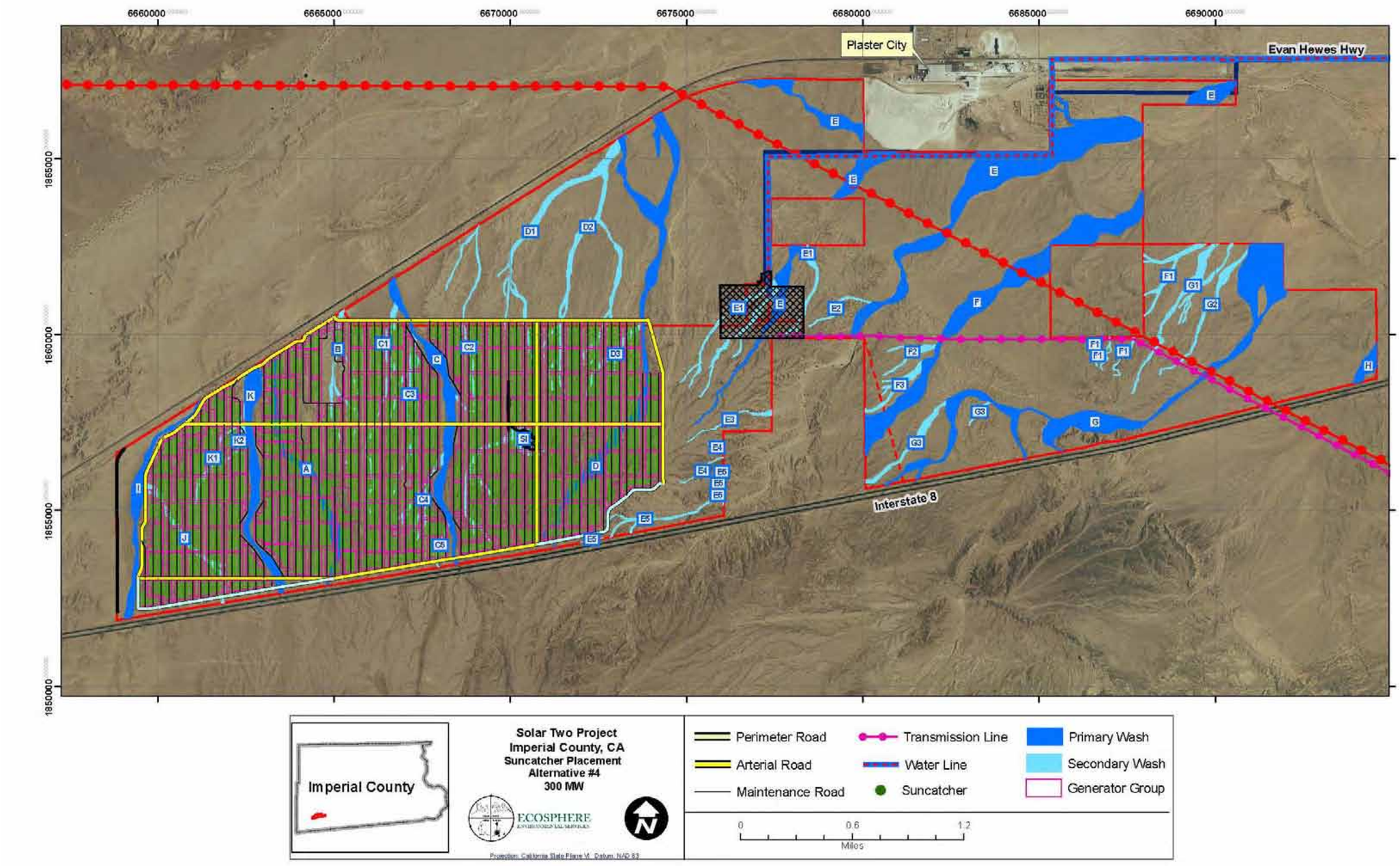
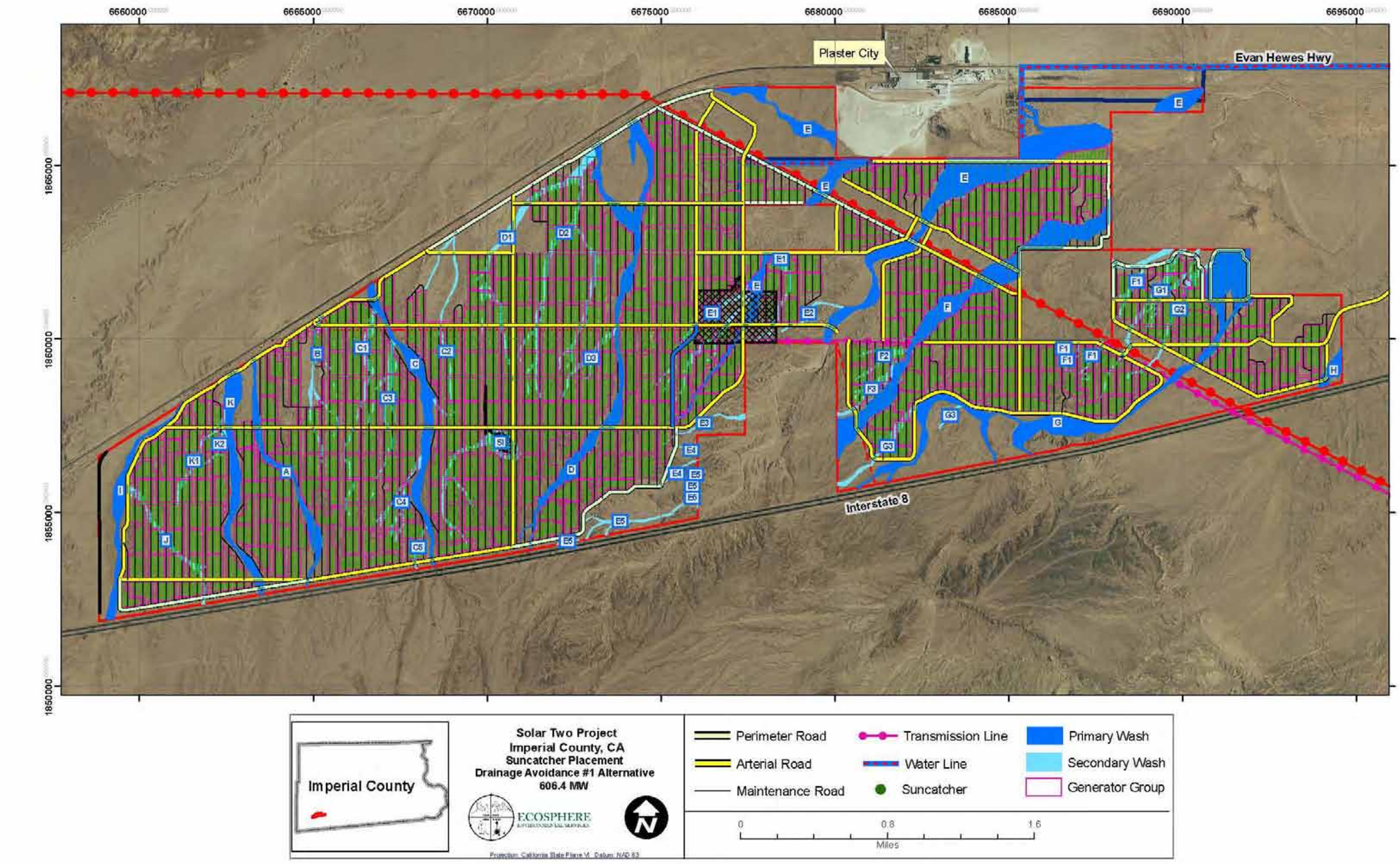
Map 4. Site plan for Alternative #3 – Avoidance of the Highest Value Aquatic Resources Alternative.



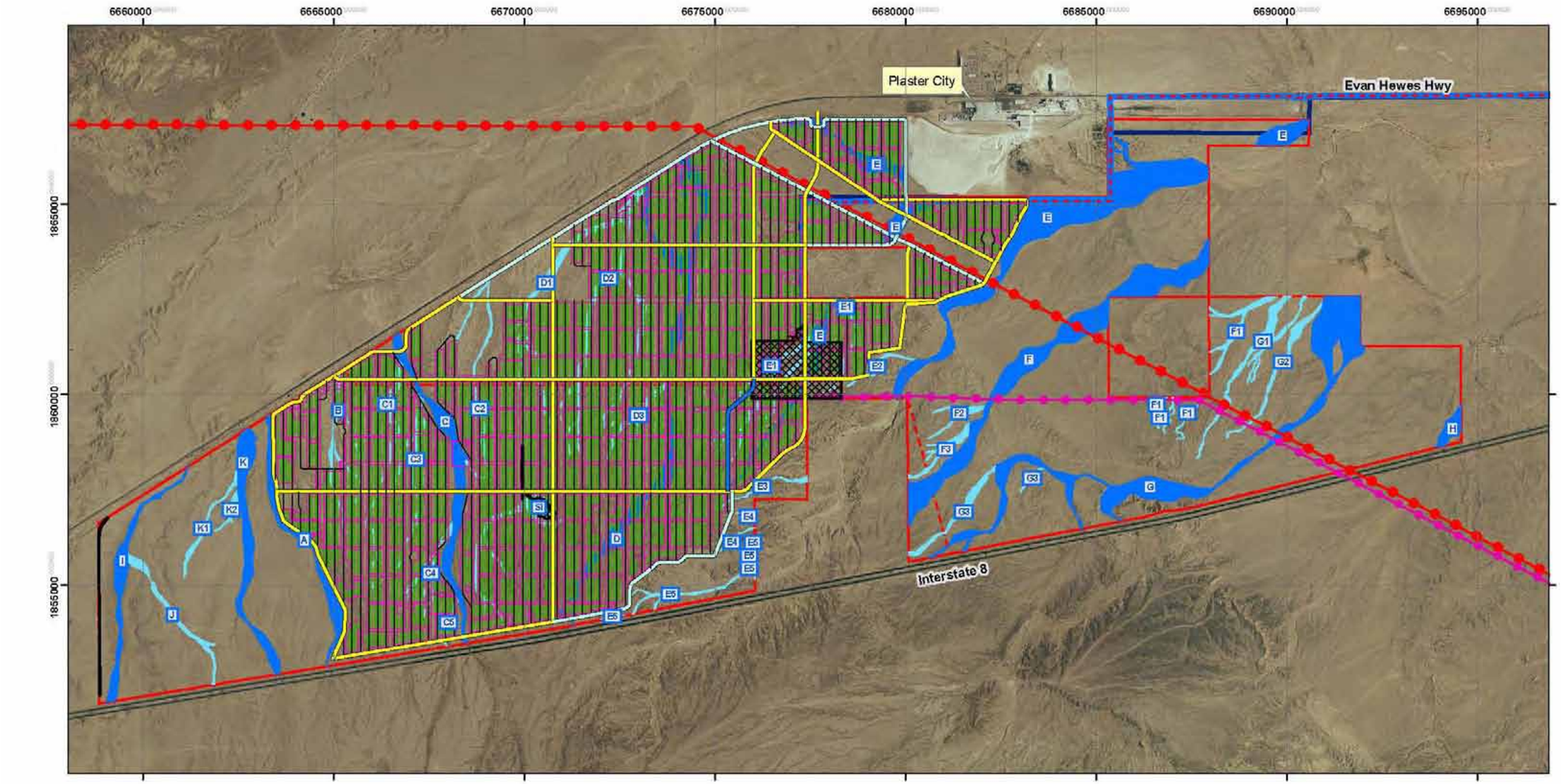
Map 5. Site plan for Alternative #4 – Phase 1 Alternative.

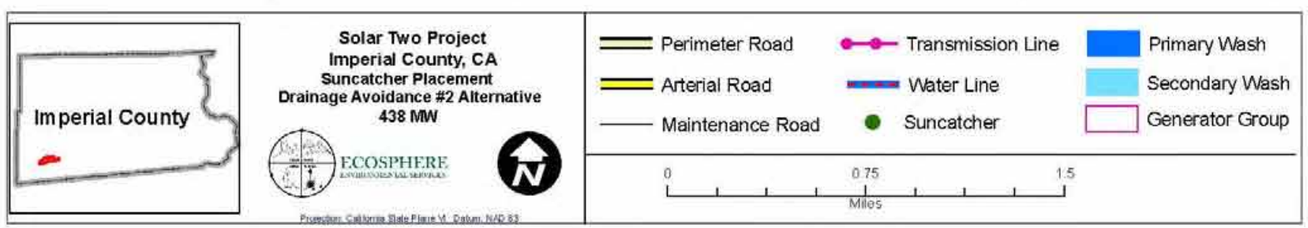


Map 6. Site plan for Alternative #5 – Drainage Avoidance #1 Alternative.



Map 7. Site Plan for Alternative #6 – Drainage Avoidance #2 Alternative.





Attachment C – Construction Diagrams

Diagram 1. At grade road crossing for ephemeral washes.
Diagram 2. Vegetation clearing plan for 1.5MW clusters of SunCatchers™.
Diagram 3. SunCatcher™ layout and vegetation clearing plan.
Diagram 4. Perimeter fence layout including the substation fencing and temporary Phase 1 fencing.
Diagram 5. Stormwater diversions around the substation building near the Main Services Complex.
Diagram 6. Layout of the perimeter fence with the spacing between posts.
Diagram 7. Fence post dimensions for corner posts and line posts.

Diagram 1. At grade road crossing for ephemeral washes.

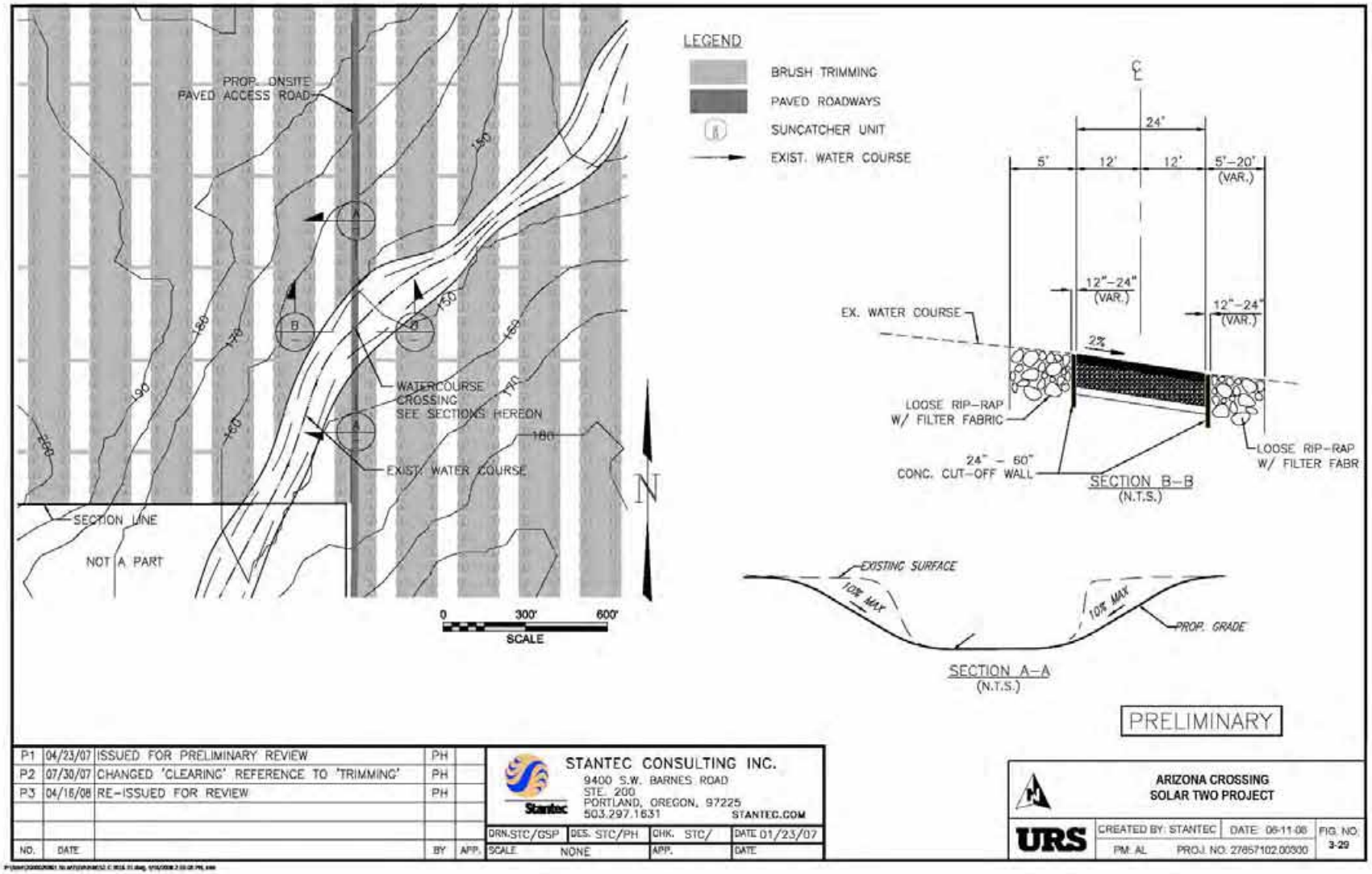


Diagram 2. Vegetation clearing plan for 1.5MW clusters of SunCatchers™.

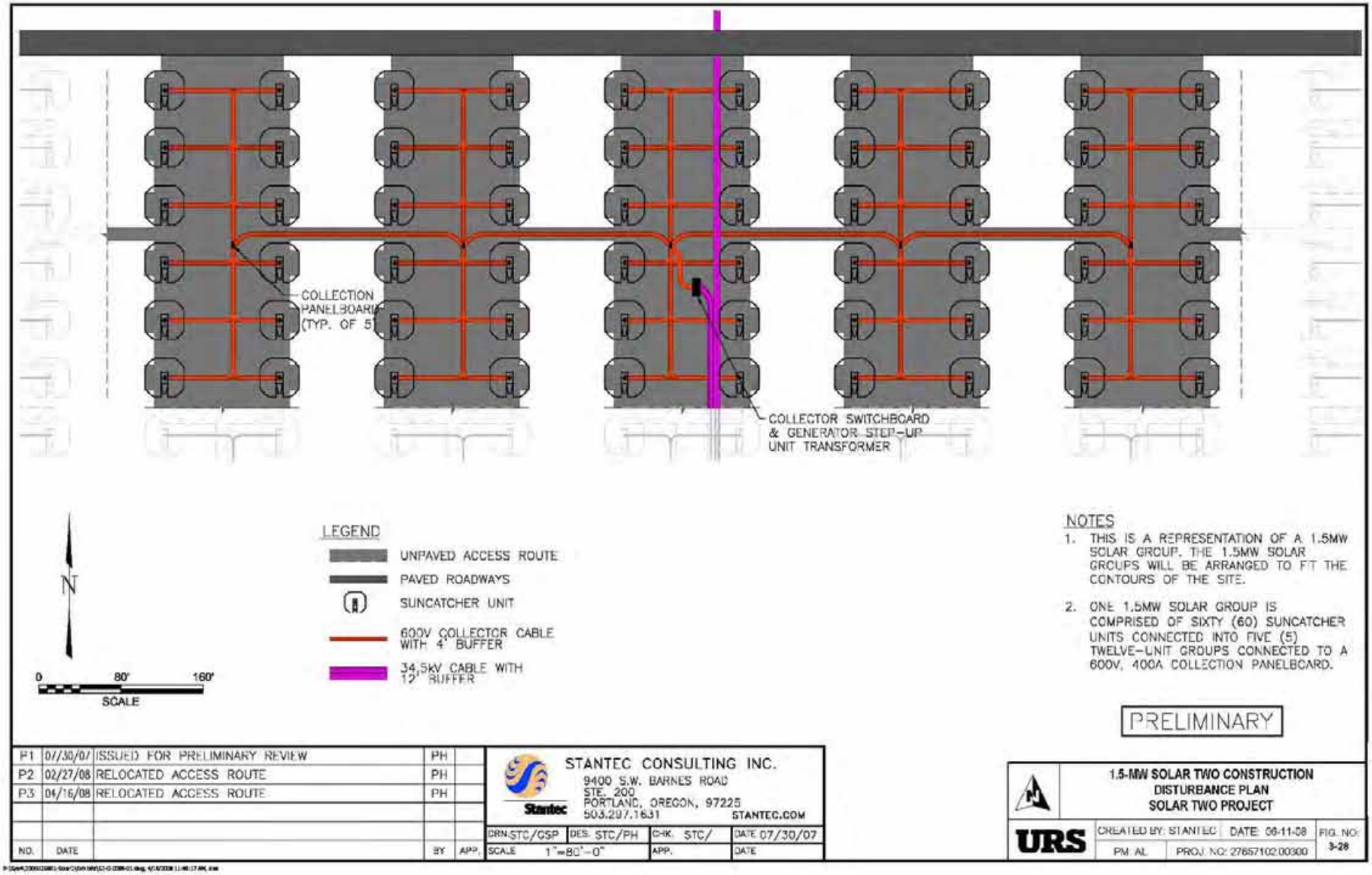


Diagram 3. SunCatcher™ layout and vegetation clearing plan.

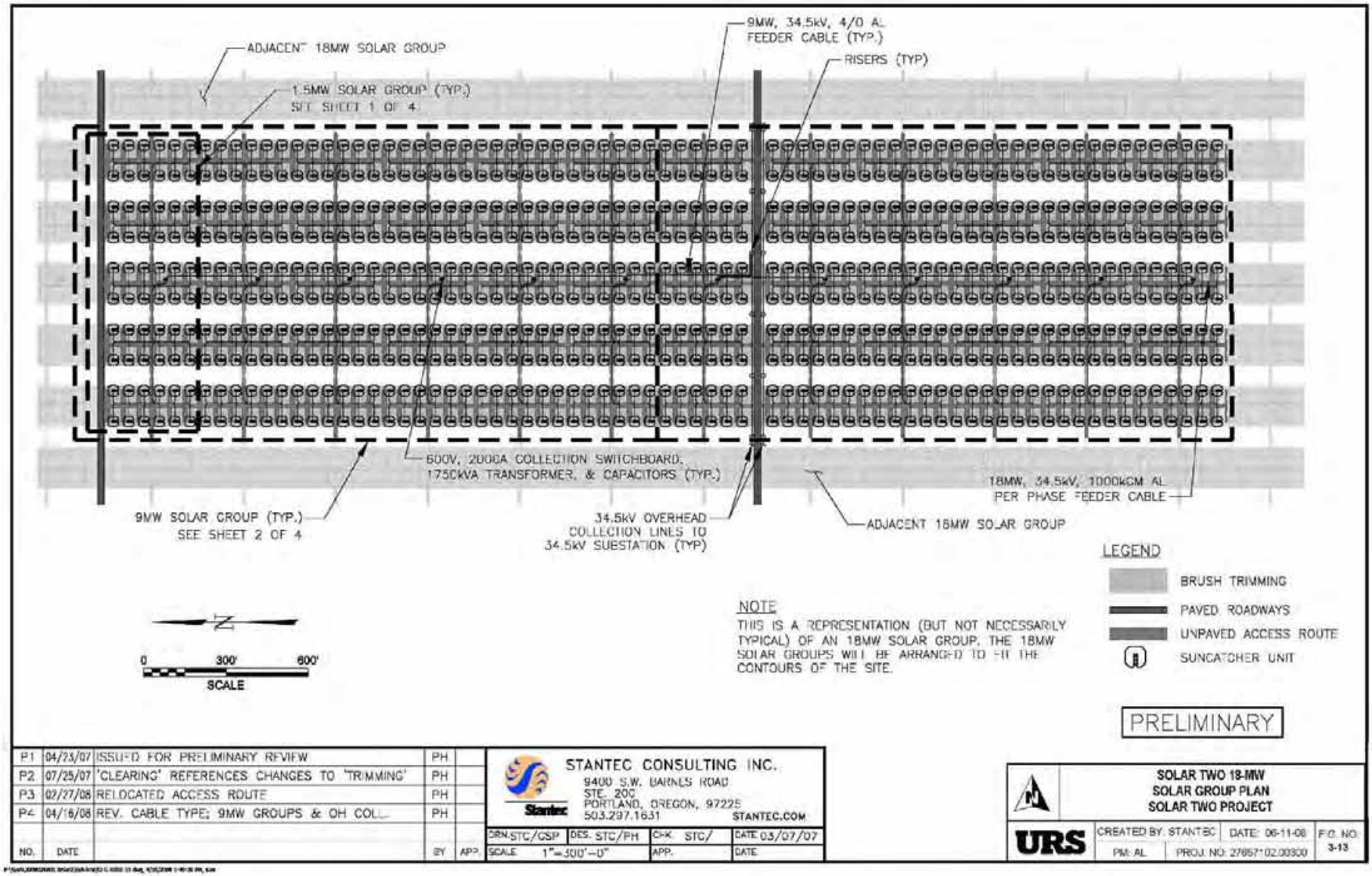


Diagram 4. Perimeter fence layout including the substation fencing and temporary Phase 1 fencing.

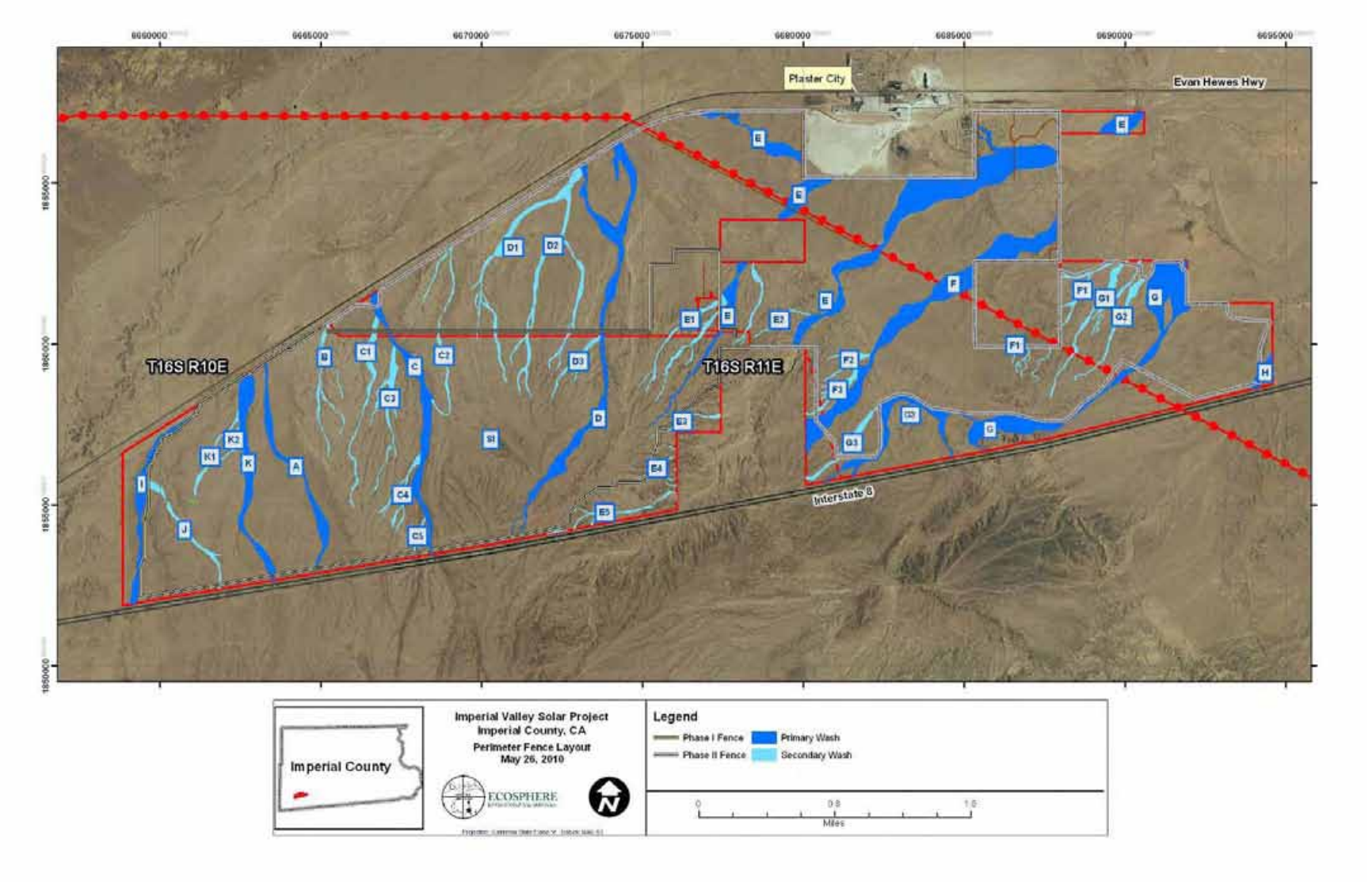


Diagram 5. Stormwater diversions around the substation building near the Main Services Complex.

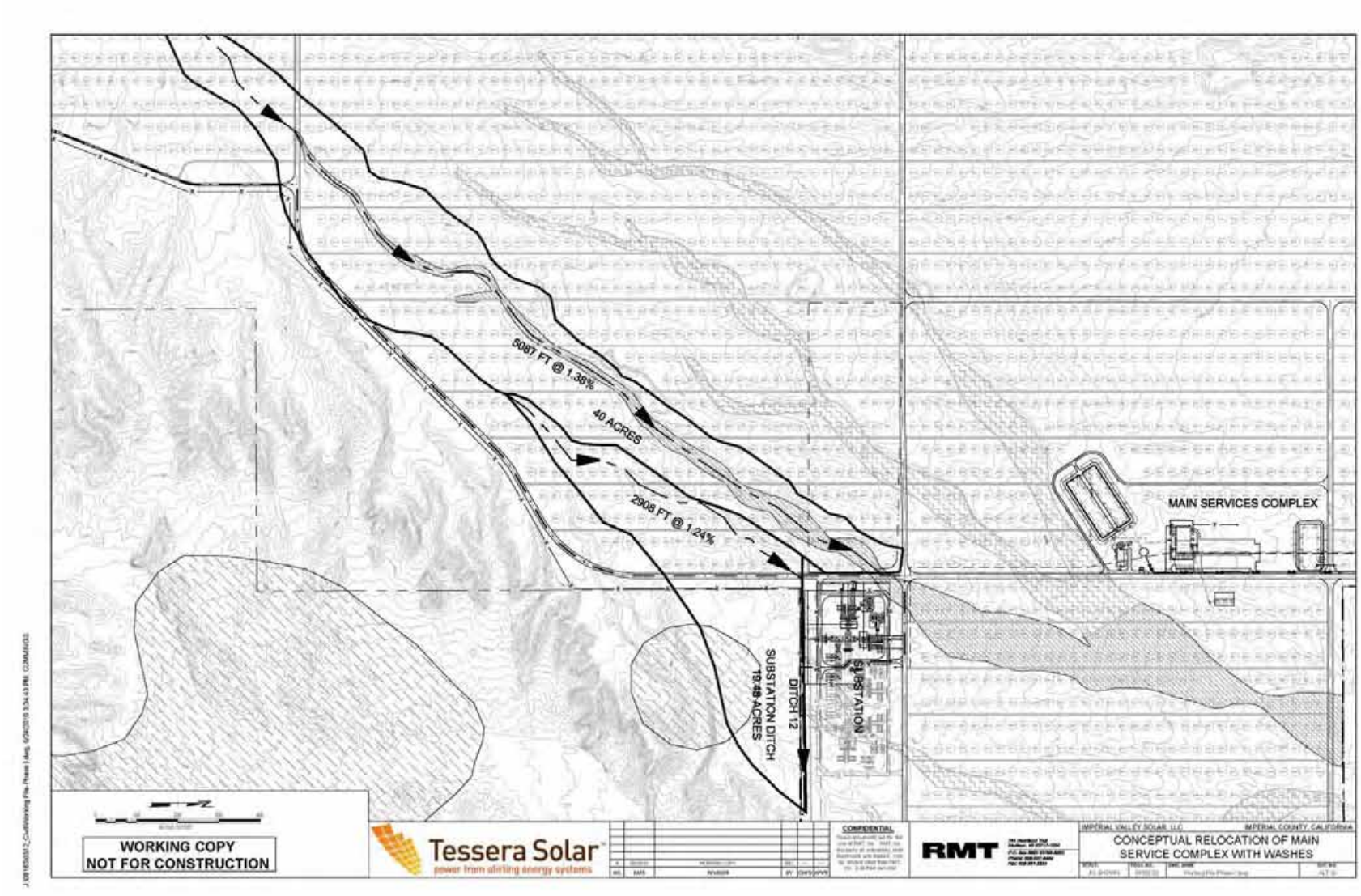


Diagram 6. Layout of the perimeter fence with the spacing between posts.

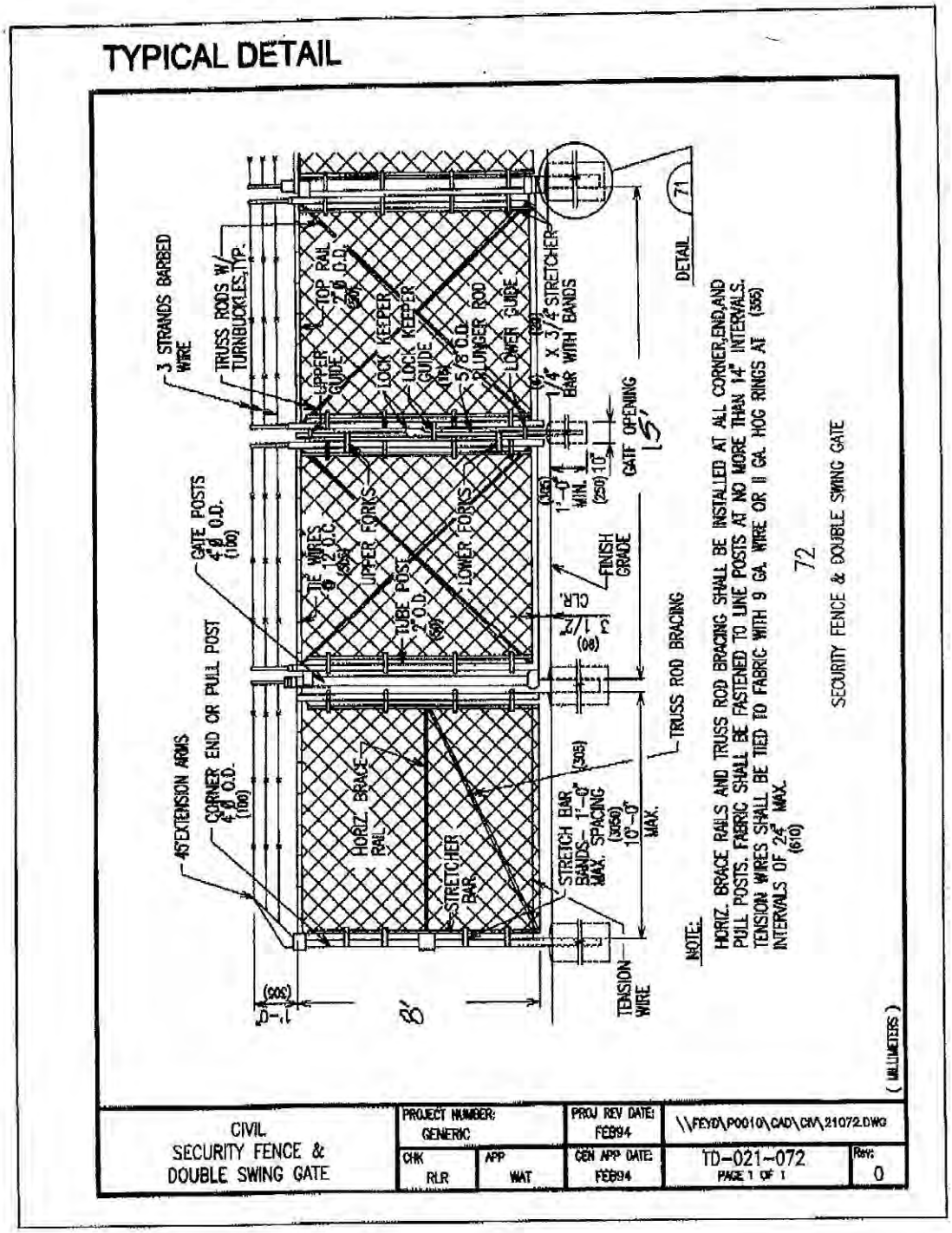
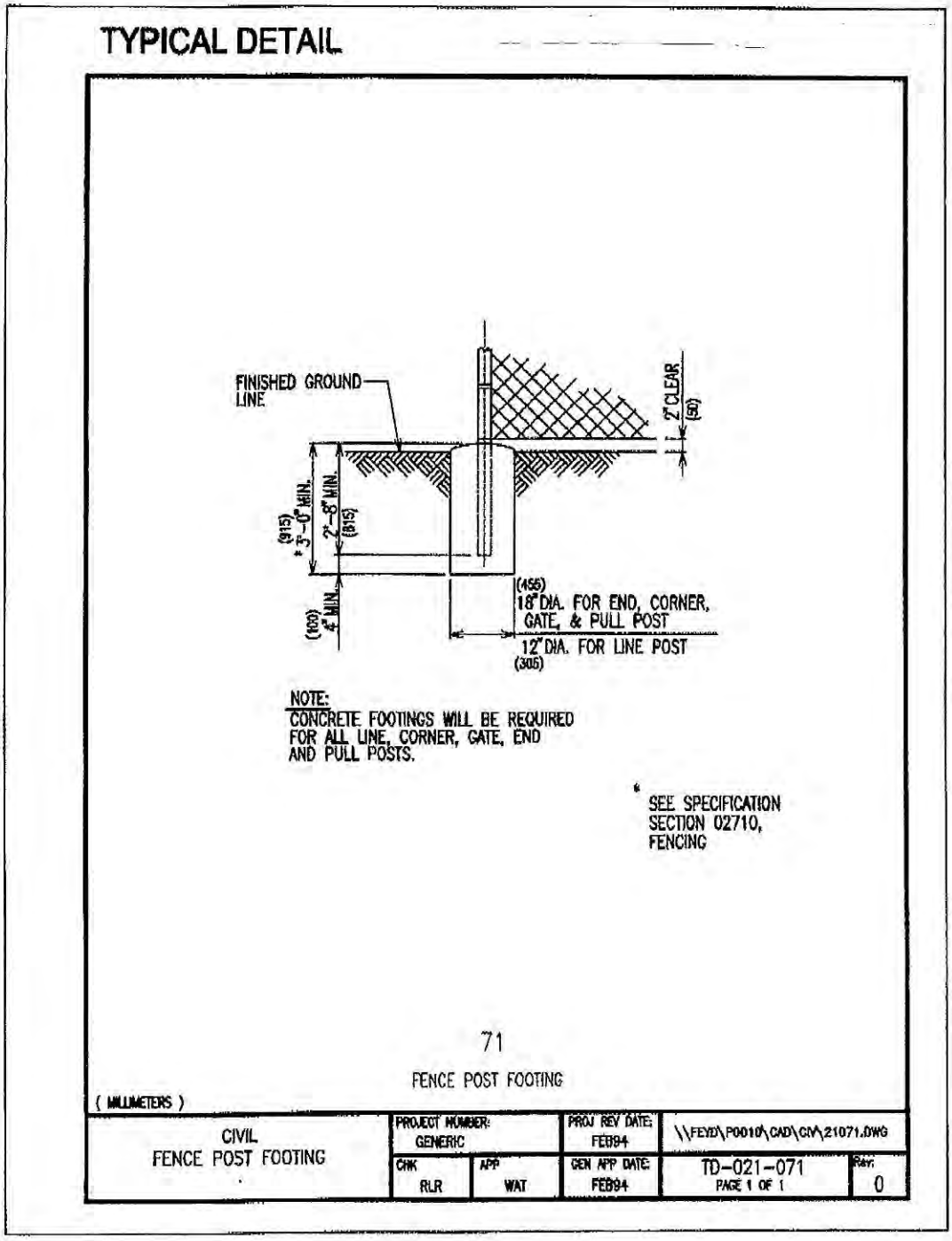


Diagram 7. Fence post dimensions for corner posts and line posts.



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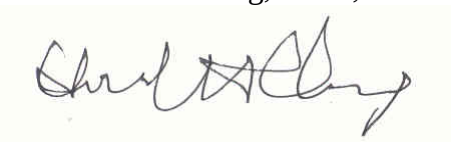
COMPUTATION OF LOCAL SCOUR ON STREAMBED INDUCED BY SUNCATCHERS

Submitted to
Ecosphere Environmental Services
Durango, CO

Prepared by
Howard H. Chang, Ph.D., P.E.



May 28, 2010

EXECUTIVE SUMMARY

SunCatchers will be installed in Washes A, D and F at the Solar Two project site in Imperil Valley, California. The pedestal supporting a SunCatcher induces local scour during the storm flow. Wash D is selected as the sample to determine the scour depths and stream bed surface areas affected by scour around the pedestals. A total of 465 SunCatchers will be installed in Wash D. The pedestals are 2 feet in diameter

The basic data on the hydraulics of flow were used to compute the depth of local scour as well as the area affected by scour using the equation recommended by the Federal Highway Administration given in Hydraulic Engineering Circular No. 18, FHWA, 2006. The computed results for Wash D are summarized below:

Maximum flow depth around pedestals = 1.27 feet
Maximum scour depth around pedestals = 2.97 feet
Range of scour depths around pedestals during peak 100-yr storm = 1.31 feet to 2.97 feet
Range of scour depths around pedestals at end of 100-yr storm= 0.66 feet to 1.49 feet

Maximum area affected by scour during peak 100-yr storm = 78.0 square feet
Range of area affected by scour during peak 100-yr storm = 20.5 to 78.0 square feet
Range of area affected by scour at end of 100-yr storm = 12.8 to 33.6 square feet

Average maximum scour area during peak 100-yr storm = 44.86 square feet
Average area affected by scour at end of 100-yr storm = 21.87 square feet

Number of pedestals in Wash D = 465
Total maximum scour area = 44.86 x 465 = 20,860 square feet
Total scour area at end of storm 21.87 x 465 = 10.167 square feet
Land surface area of Wash D covered by 100-yr storm = 3,090,000 square feet
= 70.93 acres

Ratio of maximum scour area to total wash area = 0.00675 = 0.675%
Ratio of scour area at end of storm to total wash area = 0.00329 = 0.329 %.

In summary, local scour will be induced by SunCatcher pedestals. The scour depth and area affected by scour have been determined based on the 100-yr storm. The scour depth and area affected by scour are the largest during the peak flow; they become partially refilled as the flow recedes. The total area affected by local scour around SunCatcher pedestals is less than one percent of the wash area.

I. INTRODUCTION

In alluvial streams, the scour around bridge piers, abutments, and other local obstructions is first initiated by the interference to flow and sediment transport. Figure 1 shows the local around a bridge pier taken soon after a storm flow. SunCatchers will be installed in Washes A and D and F at the Solar Two project site. The pedestal supporting a SunCatcher induces local scour during the storm flow.

Figure 1. Local scour around bridge pier

During a storm flow, local scour is first initiated by the pier's interference to flow and sediment transport as illustrate in Figure 2. The erodible bed deforms until it reaches an equilibrium scour configuration for which the rate of sediment supplied to the scour area is

balanced by the rate of transport out of the area, that is, $(Q_s)_{in} = (Q_s)_{out}$. Sediment transport through a scour hole is also affected by the horseshoe vortices, which, as a turbulent motion, increase the particle mobility. The sediment rate is an inverse function of the particle size. Because sediment rates flowing into and out of a scour area change with the size, at nearly the same proportion, the scour depth is not significantly affected by the sediment size which is therefore missing in most formulas for local scour.

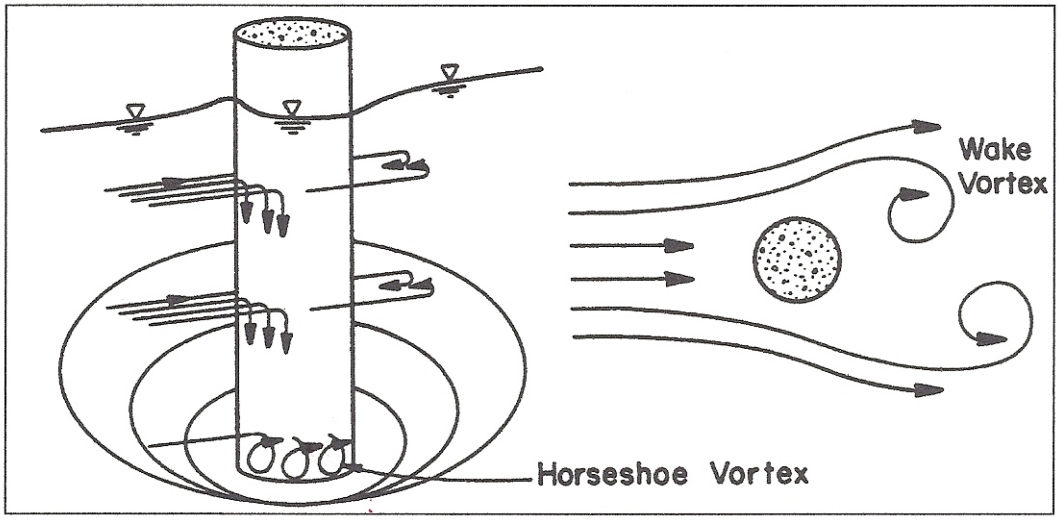


Figure 2. Interference to flow by a pier (After Federal Highway Administration, 2006)

The scour hole shaped like an inverted cone changes in size with the flow, it normally reaches the maximum during the peak flow and it becomes partially refilled during the receding stage of the storm flow.

Different formulas have been developed for predicting local scour around bridge piers. Despite the large number, such formulas contain a limited number of variables, namely, approach flow depth, effective pier width, Froude number, shear stress, and critical shear stress. The Federal Highway Administration (2006) recommends the CSU formula, which was also employed in this study

II. PEDESTALS IN WASH D

For the project site, Wash C is totally avoided by SunCatchers in the wash, as are Washes I, K and portions of E and G in the current revised site plan. Washes A and D and F are impacted by placement of SunCatchers along their entire reach in the current and previously proposed plans. Wash D is selected as the sample to determine the depths and stream bed surface areas affected by the scour around the pedestals.

A total of 465 SunCatchers supported by pedestals will be installed in Wash D. The spacing between SunCatchers is 122 feet in the east-west direction and 58 feet between SunCatchers north to south.

The basic information on the hydraulics of flow in Wash D is required in order to compute the depth of local scour and the area affected by local scour. The hydraulic modeling study for the washes was prepared by Stantec Consulting, Inc. for Stirling Energy Systems, Inc. Figure 3 shows the layout of the channel cross sections used to define the stream channel geometry. A summary of the flow hydraulics for the 100-yr storm from the hydraulic study is listed in Table 1.

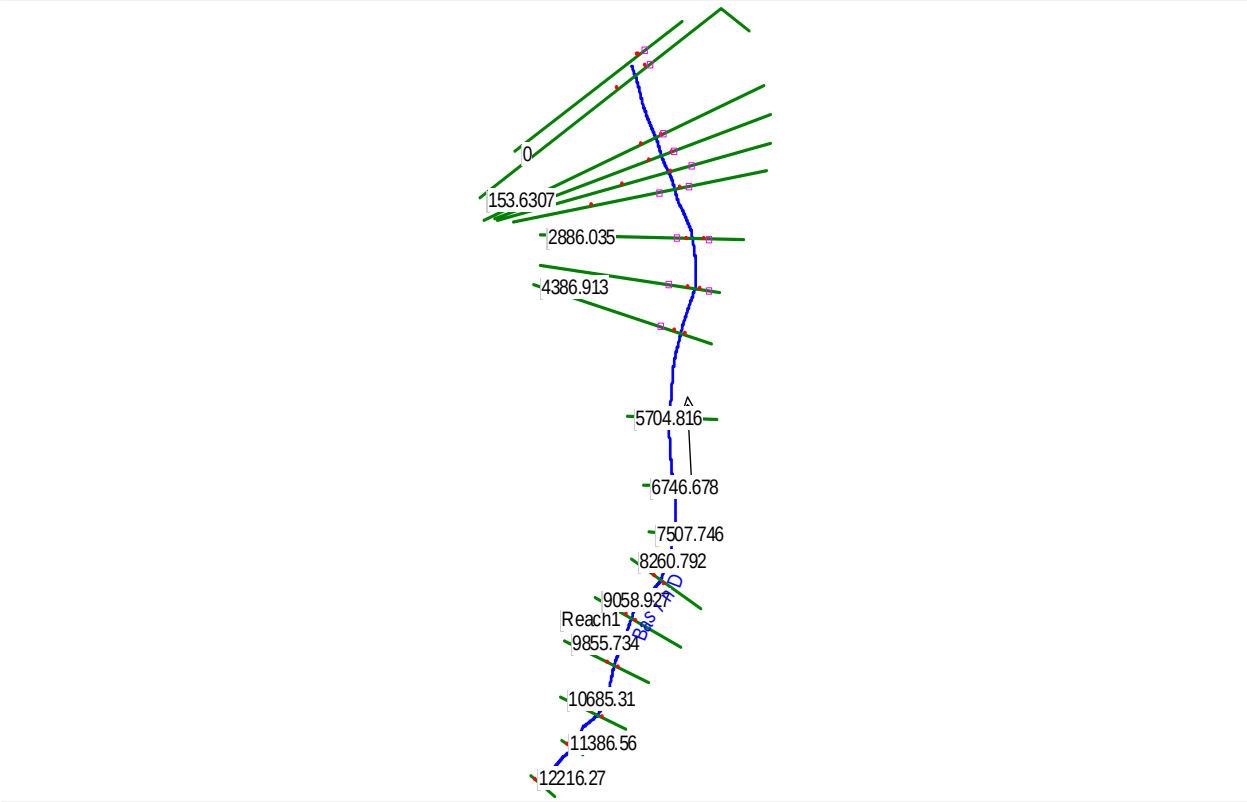


Figure 3. Location of channel cross sections for Wash D

Table 1. Summary of hydraulic parameters for Wash D

River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Vel Chnl (ft/s)	Top Width (ft)	Froude #
12216.27	57.00	292.74	293.50	1.93	87.73	0.55
11386.56	76.00	280.50	281.29	2.81	115.90	1.03
10685.31	92.00	274.20	275.09	0.99	252.09	0.29
9855.734	110.00	270.12	270.53	1.95	409.90	0.81
9058.927	129.00	265.91	266.41	1.10	445.04	0.32
8260.792	147.00	262.17	263.19	1.86	271.17	0.52
7507.746	164.00	255.83	257.64	2.58	113.36	0.61
6746.678	181.00	249.31	250.23	2.81	135.61	0.72
5704.816	205.00	238.00	239.45	2.76	133.44	0.65
4386.913	234.00	222.44	222.96	1.75	411.82	0.73
3656.229	251.00	213.11	214.06	2.76	188.12	0.65
2886.035	268.00	204.00	205.01	2.83	241.91	0.79

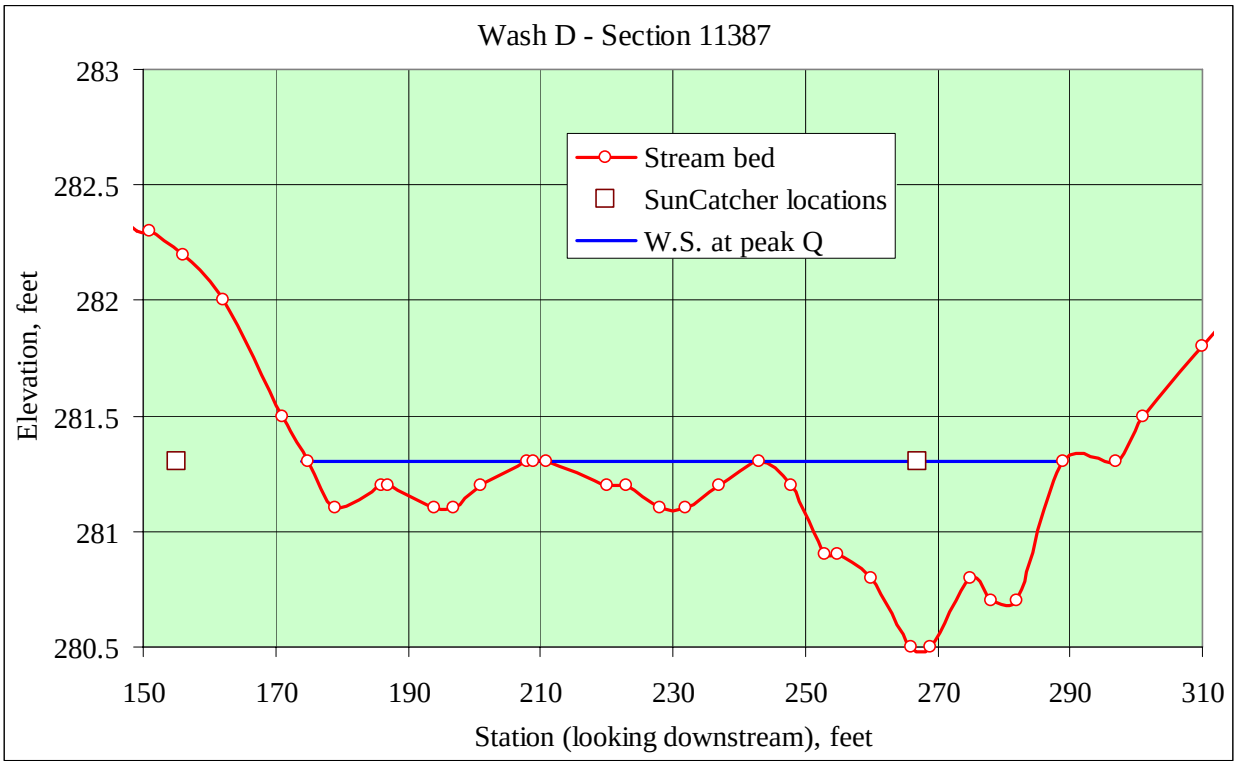
2050.257	287.00	188.10	190.41	4.15	128.80	1.00
1765.222	294.00	184.99	186.25	1.67	407.21	0.45
1484.783	300.00	182.92	183.37	1.07	382.25	0.43
1183.998	307.00	179.68	180.28	2.86	366.07	0.96
153.6307	568.00	167.91	169.60	1.69	390.97	0.32
0	607.00	164.09	167.21	8.92	33.71	0.97

Important data for the channel cross sections are listed below. The water-surface elevation, surface width of flow, and the Froude number are from the hydraulic computations listed in Table 1. The channel sections are oriented primarily in the east-west direction. The number of SunCatchers that can be installed within the surface width of low at a channel section is determined based on the spacing between units along the direction of the channel cross section. The locations of SunCatchers at sample cross sections are shown in the cross-sectional profiles.

Each channel section is assumed to represent the channel reach centered at the section. The number of SunCatcher rows along the channel reach is the reach length divided by the spacing of 58 feet between the SunCatcher rows. The total number of SunCathers in a channel reach is estimated based on the number of SunCathers at the channel section multiplied by the number of SunCatcher rows. The total number of SunCatchers for Wash D is 465.

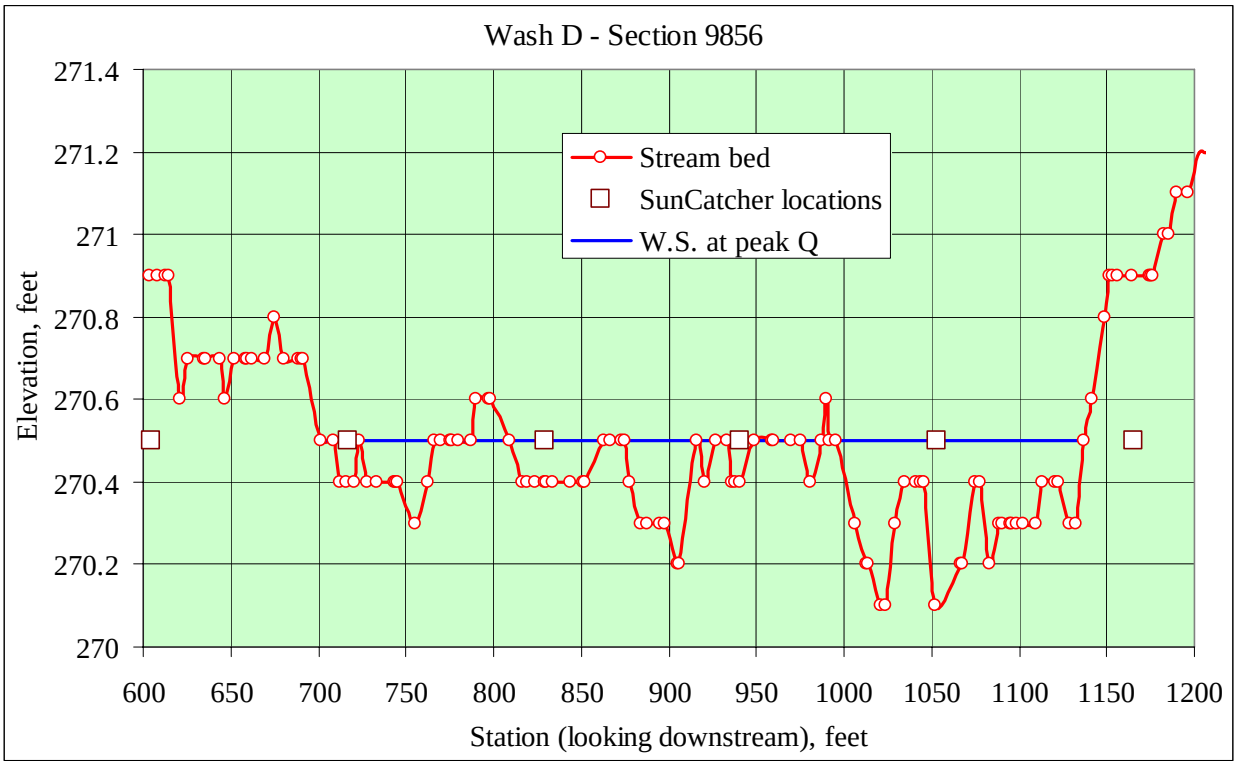
The local scour depth is directly related to the flow depth at the pedestal. To get the maximum local scour, it is assumed that one pedestal is located at the point with the largest depth at a channel section.

Section 11387
Water-surface elevation for 100-yr storm: 281.3 feet
Surface width of flow: 115.9 feet
Number of SunCathers in wash: 1
Length of channel reach: 765.5 feet
Number of SunCatcher rows: 18
Approximate number of SunCatchers in reach: 18



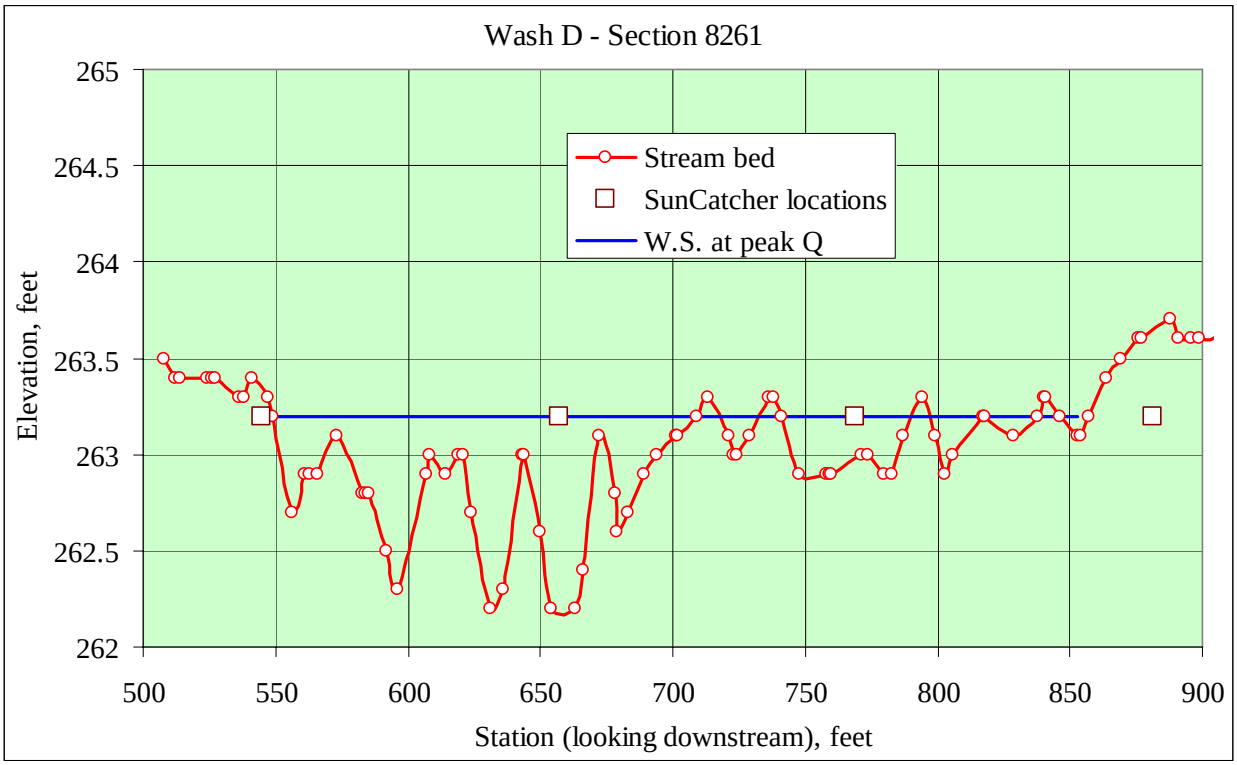
Section 10685
Water-surface elevation for 100-yr storm: 275.1 feet
Surface width of flow: 252.1 feet
Number of SunCathers in wash: 2
Length of channel reach: 765 feet
Number of SunCatcher rows: 12
Approximate number of SunCatchers in reach: 24

Section 9856
Water-surface elevation for 100-yr storm: 270.5 feet
Surface width of flow: 409.9 feet
Number of SunCathers in wash: 3
Length of channel reach: 813 feet
Number of SunCatcher rows: 13
Approximate number of SunCatchers in reach: 39



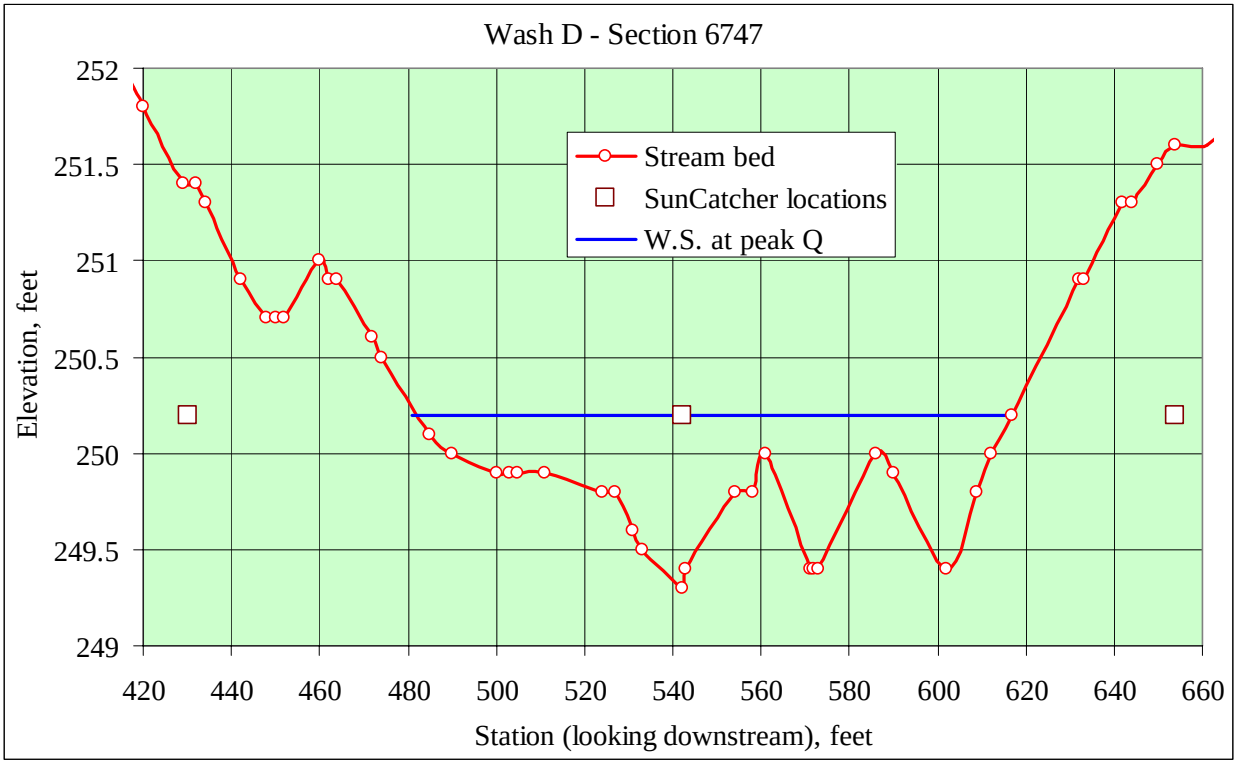
Section 9059
Water-surface elevation for 100-yr storm: 266.4 feet
Surface width of flow: 445.0 feet
Number of SunCathers in wash: 3
Length of channel reach: 797 feet
Number of SunCatcher rows: 14
Approximate number of SunCatchers in reach: 42

Section 8261
Water-surface elevation for 100-yr storm: 263.2 feet
Surface width of flow: 271.2 feet
Number of SunCathers in wash: 2
Length of channel reach: 775 feet
Number of SunCatcher rows: 13
Approximate number of SunCatchers in reach: 26



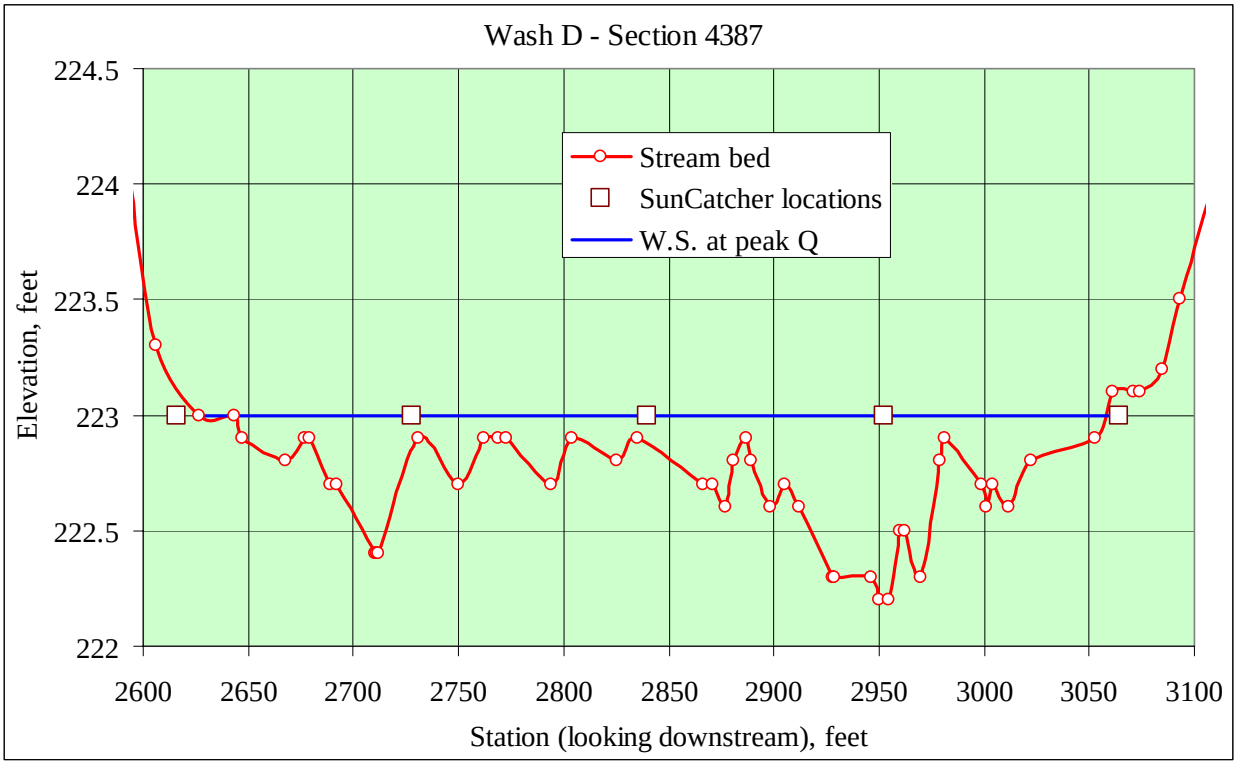
Section 7508
Water-surface elevation for 100-yr storm: 257.6 feet
Surface width of flow: 113.4 feet
Number of SunCathers in wash: 1
Length of channel reach: 757 feet
Number of SunCatcher rows: 12
Approximate number of SunCatchers in reach: 12

Section 6747
Water-surface elevation for 100-yr storm: 250.2 feet
Surface width of flow: 133.6 feet
Number of SunCathers in wash: 2
Length of channel reach: 901 feet
Number of SunCatcher rows: 15
Approximate number of SunCatchers in reach: 30



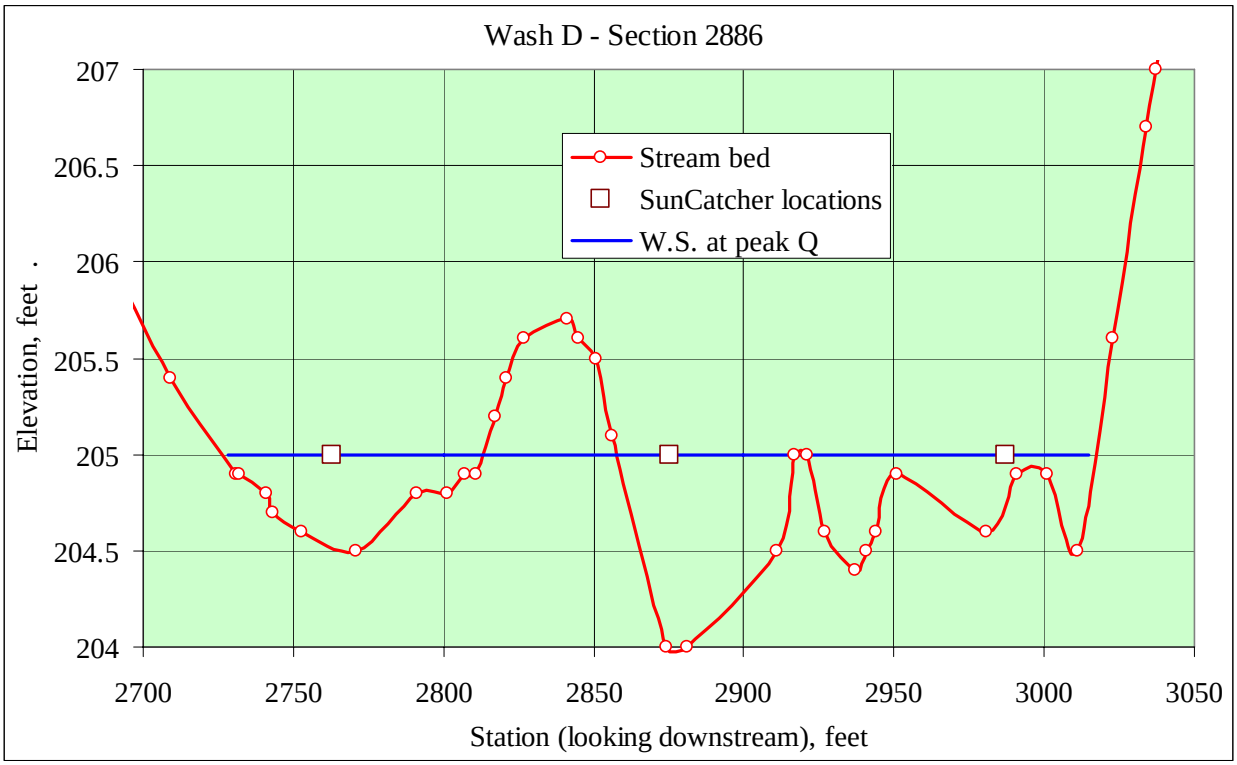
Section 5705
Water-surface elevation for 100-yr storm: 239.5 feet
Surface width of flow: 133.4 feet
Number of SunCathers in wash: 2
Length of channel reach: 1180 feet
Number of SunCatcher rows: 20
Approximate number of SunCatchers in reach: 40

Section 4387
Water-surface elevation for 100-yr storm: 223.0 feet
Surface width of flow: 411.8 feet
Number of SunCathers in wash: 3
Length of channel reach: 1024 feet
Number of SunCatcher rows: 17
Approximate number of SunCatchers in reach: 51



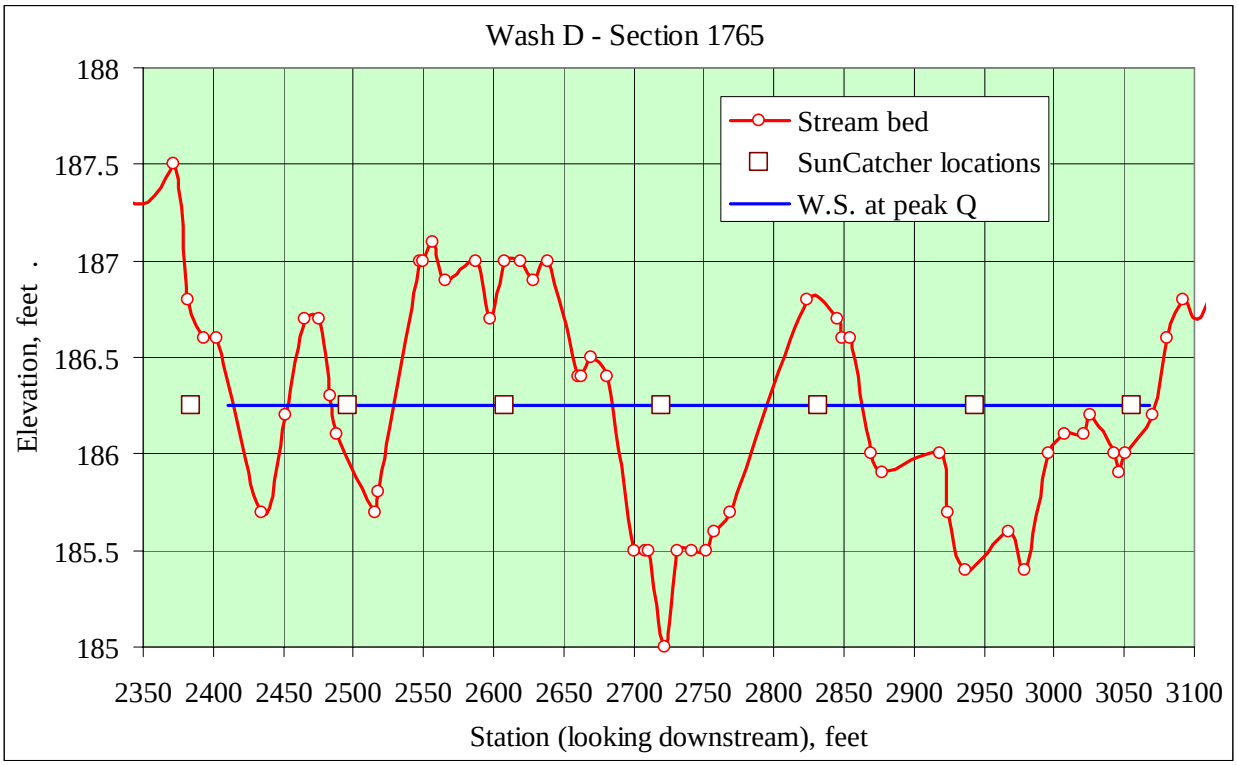
Section 3656
Water-surface elevation for 100-yr storm: 214.1 feet
Surface width of flow: 188.1 feet
Number of SunCathers in wash: 1
Length of channel reach: 751 feet
Number of SunCatcher rows: 13
Approximate number of SunCatchers in reach: 13

Section 2886
Water-surface elevation for 100-yr storm: 205.0 feet
Surface width of flow: 241.9 feet
Number of SunCathers in wash: 2
Length of channel reach: 803 feet
Number of SunCatcher rows: 14
Approximate number of SunCatchers in reach: 28



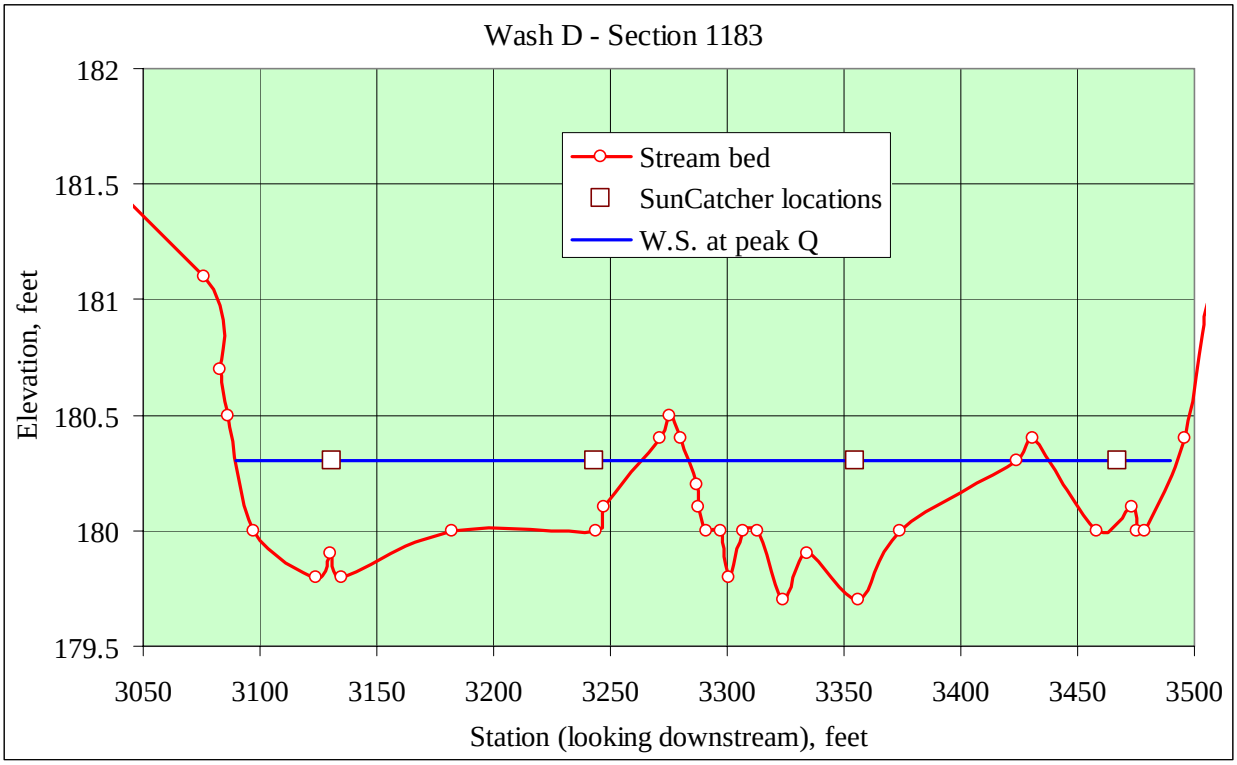
Section 2050
Water-surface elevation for 100-yr storm: 190.4 feet
Surface width of flow: 129 feet
Number of SunCathers in wash: 1
Length of channel reach: 500 feet
Number of SunCatcher rows: 9
Approximate number of SunCatchers in reach: 9

Section 1765
Water-surface elevation for 100-yr storm: 186.3 feet
Surface width of flow: 407.2 feet
Number of SunCathers in wash: 3
Length of channel reach: 283 feet
Number of SunCatcher rows: 4
Approximate number of SunCatchers in reach: 12



Section 1484.8
Water-surface elevation for 100-yr storm: 183.4 feet
Surface width of flow: 382.3 feet
Number of SunCathers in wash: 4
Length of channel reach: 290.6 feet
Number of SunCatcher rows: 5
Approximate number of SunCatchers in reach: 20

Section 1183.9
Water-surface elevation for 100-yr storm: 180.28
Surface width of flow: 366.1 feet
Number of SunCathers in wash: 4
Length of channel reach: 665 feet
Number of SunCatcher rows: 665/58 = 11.5
Approximate number of SunCatchers in reach: 11.5 x 4 = 66



Section 154
Water-surface elevation for 100-yr storm: 169.6
Surface width of flow: 391 feet
Number of SunCathers in wash: 3
Length of channel reach: 591 feet
Number of SunCatcher rows: 10
Approximate number of SunCatchers in reach: 30

III. COMPUTATION OF LOCAL SCOUR AROUND PEDESTALS IN WASH D

Local Scour at Bridge Piers/Bents - The magnitude of local scour around a pedestal may be estimated using certain established formulas. The Federal Highway Administration has adopted the following equation (see Hydraulic Engineering Circular No. 18, FHWA, 2006) for round-nosed piers/bents or cylindrical piers/bents.

$$Y_s/Y_1 = 2.0\ K_1\ K_2\ (b/Y_1)^{0.65}\ F^{0.43} \qquad (1)$$

where Y = depth of local scour measured from the mean bed elevation, in feet;
K_1 = correction for pier/bent nose shape, equal to 1 for circular piers/bents and 1.1 for rectangular piers/bents;
K_2 = correction factor for angle of attack, equal to 1 for zero skew;
b = projected pier/bent width;
Y_1 = approach flow depth;
F = Froude number = $V//gY_1$; and
V = velocity of approach flow.

Local scour depths and areas affected by local scour were computed for the sample cross sections shown above. The required hydraulic data used in the computation are from the listed values in Table 1. The local depths of flow at the individual pedestals are shown in the figures for the sample cross sections.

The depths of local scour at the pedestals were computed using Equation 1. The computation for the area affected by scour is illustrated by the numerical example given below for the assumed local scour depth of 2.9 feet. The angle of repose for the bed material is assumed to be 36 degrees and the pedestal diameter is 2 feet.

For the scour depth of 2.9 feet and angle of repose of 36 degrees:
Horizontal distance due to the scour depth = 2.9/tan 36 = 3.99 feet
Radius of scour hole measured from the center of pedestal = 1+ 3.99 = 4.99
Diameter of pedestal = 2 feet
Cross-sectional area of pedestal = 3.14 square feet
Area of scour hole = $3.14 \times 4.99^2 - 3.14 = 78.18 - 3.14 = 75.0$ square feet

The depth of scour is directly related to the depth of flow. For this reason, the maximum scour occurs near the peak flow and it gets partially refilled during the falling stage of the storm flow. The scour hole becomes smaller at the end of the storm. It is assumed that the scour depth is 50% refilled toward the end of the storm follow; the area affected by scour decreases with the depth of scour. The hydraulic parameters together with the computed results for scour depths and areas affected by scour are summarized in Table 2 below:

Table 2. Summary of hydraulic parameters and computed results for local sour.

Section . No. Number	Froude Number	Local Flow Depth	Maximum Scour Depth	Maximum Scour Area	Final Scour Area
11387	1.03	0.82	2.97	78.0	33.6
9856	0.81	0.26	1.79	34.5	18.2
9856	0.81	0.26	1.79	34.5	18.2
9856	0.81	0.26	1.79	34.5	18.2
9856	0.81	1.03	2.90	75.0	32.6
8261	0.52	1.03	2.39	54.8	25.6
8261	0.52	0.19	1.32	21.9	13.3
6747	0.72	0.87	2.60	62.6	28.3
4387	0.73	0.12	1.31	21.4	13.1
4387	0.73	0.15	1.41	24.1	14.2
4387	0.73	0.79	2.52	59.8	27.3
2886	0.79	0.45	2.14	45.9	22.4
2886	0.79	1.03	2.87	73.7	32.1
2886	0.79	0.27	1.79	34.7	18.3
1765	0.45	0.26	1.39	23.5	14.0
1765	0.45	1.27	2.42	55.8	26.0
1765	0.45	0.77	2.03	42.2	21.1
1765	0.45	0.20	1.27	20.5	12.8
1183	0.96	0.40	2.24	49.2	23.6
1183	0.96	0.30	2.02	41.9	21.0
1183	0.96	0.58	2.55	60.7	27.7
1183	0.96	0.25	1.90	37.9	19.5

Summary of Computed Results – The computed results for Wash D are summarized below:

Maximum flow depth around pedestals = 1.27 feet
Maximum scour depth around pedestals = 2.97 feet
Range of scour depths around pedestals during peak 100-yr storm = 1.31 feet to 2.97 feet
Range of scour depths around pedestals at end of 100-yr storm= 0.66 feet to 1.49 feet

Maximum area affected by scour during peak 100-yr storm= 78.0 square feet
Range of area affected by scour during peak 100-yr storm = 20.5 to 78.0 square feet
Range of area affected by scour at end of 100-yr storm = 12.8 to 33.6 square feet

Average maximum scour area during peak 100-yr storm = 44.86 square feet
Average area affected by scour at end of 100-yr storm = 21.87 square feet

Number of pedestals in Wash D = 465
Total maximum scour area = 44.86 x 465 = 20,860 square feet
Total scour area at end of storm 21.87 x 465 = 10.167 square feet
Land surface area of Wash D covered by 100-yr storm = 3,090,000 square feet
= 70.93 acres

Ratio of maximum scour area to total wash area = 0.00675 = 0.675%
Ratio of end of storm scour area to total wash area = 0.00329 = 0.329 %

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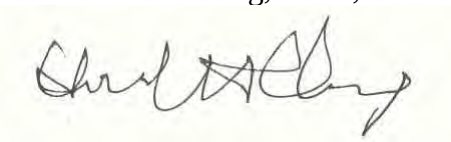
Evaluation of Engineering Impacts of Revised Plan of Development, Site Plan, and Fencing Design for Solar 2 Site and Recommendations for Impact Mitigation

Submitted to

Mike Fitzgerald
Principal
Ecosphere Environmental Services
Durango, CO

Prepared by
Howard H. Chang, Ph.D., P.E.



May 19, 2010

EXECUTIVE SUMMARY

Ecosphere Environmental Services has revised the original Plan of Development (POD) for the Solar Two project site in Imperial Valley. The revised POD as shown in Figure 1 has the following major features:

(1) The original solar energy project site is expanded to the north of the transmission corridor along Washes E, F, and G.
(2) The detailed placement of the solar catchers is shown the site plan. Many such units are located in washes.
(3) Within each generator group, the solar catchers are connected by maintenance roads, which are at grade and unpaved.
(4) All sediment basins have been removed.
(5) All road crossings are Arizona at grade crossings with the exception of 2 "life line" road crossings. The two "life line" road crossings will either remain culvert crossings or, more likely, a precast concrete arched culvert system (like a bridge); and vegetation clearing is minimized (approach described in revised POD).
(6) The project site will be surrounded by a fence.

The hydraulics of storm flow, sediment transport and potential stream channel changes along several representative washes at the project site were modeled in my previous study for the project. The flow depths in the washes at the peak 100-yr flood were determined to be generally less than 1 foot. The velocities at the 100-yr peak flood discharge vary from low to moderate; they are generally lower than 3 feet per second. From the sediment modeling study, it was determined that these washes are not subject to substantial changes in channel bed profiles for the existing and proposed conditions. Because of these findings, it was decided that the solar catchers may be placed in the washes.

The solar units are supported on 2-foot cylindrical pedestals. For a pedestal in a wash, the maximum scour, including general scour and local scour, was determined be no greater than 5 feet. According to the structural design, the pedestals are imbedded into the ground for a length of 17 feet. Such a footing design is considered adequate to safeguard the structure against potential scour.

The revised POD was also evaluated in consideration of the necessary mitigation measures that I recommended previously. The sediment study provides an assessment of whether the project is likely to increase or decrease sediment delivery toward downstream. In order to minimize the impacts, the project should cause no substantial changes to the sediment delivery. Sediment impacts are mitigated by the following measures incorporated in the POD:

(1) Deletion of all sediment basins.
(2) Modification of Lifeline Crossing in Wash G.
(3) Set-back of at least 100 feet for the solar units along the base of the hills.

In summary, the revised POD has incorporated measures to comply with my recommendations made for the project site in order to mitigate the project impacts. The revised POD has also provided necessary design feature for the pedestals of solar catchers located in washes for scour protection. In consideration of these points, the revised POD meets the requirements stated in my previous studies for the project site.

I. INTRODUCTION

The proposed Solar Two Project is on the Bureau of Land Management property south of Plaster City in Imperial County, California. The Evan Hewes Highway is the north boundary and Interstate 8 is the south boundary of the project site. Hydrology of surface water runoff plays a key role in the desert ecosystem of the southwestern United States. For this reason, many environmental issues for the project must be analyzed from the perspective of hydrology. As a consultant, I provided studies of hydrologic impacts as well as sediment studies for the project site. Mitigation measures for project impacts have also been recommended.

Ecosphere Environmental Services has revised the original Plan of Development (POD) for the project site. Figure 1 is a wash impact avoidance/minimization site plan that Ecosphere Environmental Services have been working with the Corps and EPA on to finalize as the least environmentally damaging practicable alternative (LEDPA). The revised POD was developed in consideration of my previous recommendations. The revised POD as shown in the figure has the following major features:

(1) The project site is crossed by a transmission line. The original solar energy project site was south of the transmission line. It is now extended to the north of the transmission corridor along Washes E, F, and G.
(2) The detailed placement of solar catchers is shown the POD. Many such units are located in washes.
(3) Within each generator group, the solar catchers are connected by maintenance roads, which are at grade and unpaved.
(4) All sediment basins have been removed.
(5) All road crossings are Arizona at grade crossings with the exception of 2 "life line" road crossings. The two "life line" road crossings will either remain culvert crossings or, more likely, a precast concrete arched culvert system (like a bridge); and vegetation clearing is minimized (approach described in revised POD).
(6) The project site will be surrounded by a fence.

This report has been prepared to provide a qualitative assessment of potential engineering impacts of the revised POD for the Solar Two Energy Project site. In connection with the review and evaluation, a one-day site visit was made on May 10, 2010. This report covers the following major items:

(1) Review and comment on revised Plan of Development (POD) and site plan – The consultant made a hydrology and sediment study for the solar energy site. In connection with the study, specific recommendations were also made for project impact mitigation. The consultant has reviewed the revised POD and site pan to insure recommendations are fulfilled. Necessary changes, if any, to the POD and site plan are specified.

(2) Review the fencing design and make design recommendations – The perimeter fencing is along the entire border of the project site. It will cross ephemeral drainages. The fencing design has potential impacts on surface water flow and sediment transport. The EPA is concerned about obstructing natural flows and the resulting effects of sediment transfer. Such potential impacts will be evaluated and specific recommendations will be made for the purpose of impact mitigation.

F

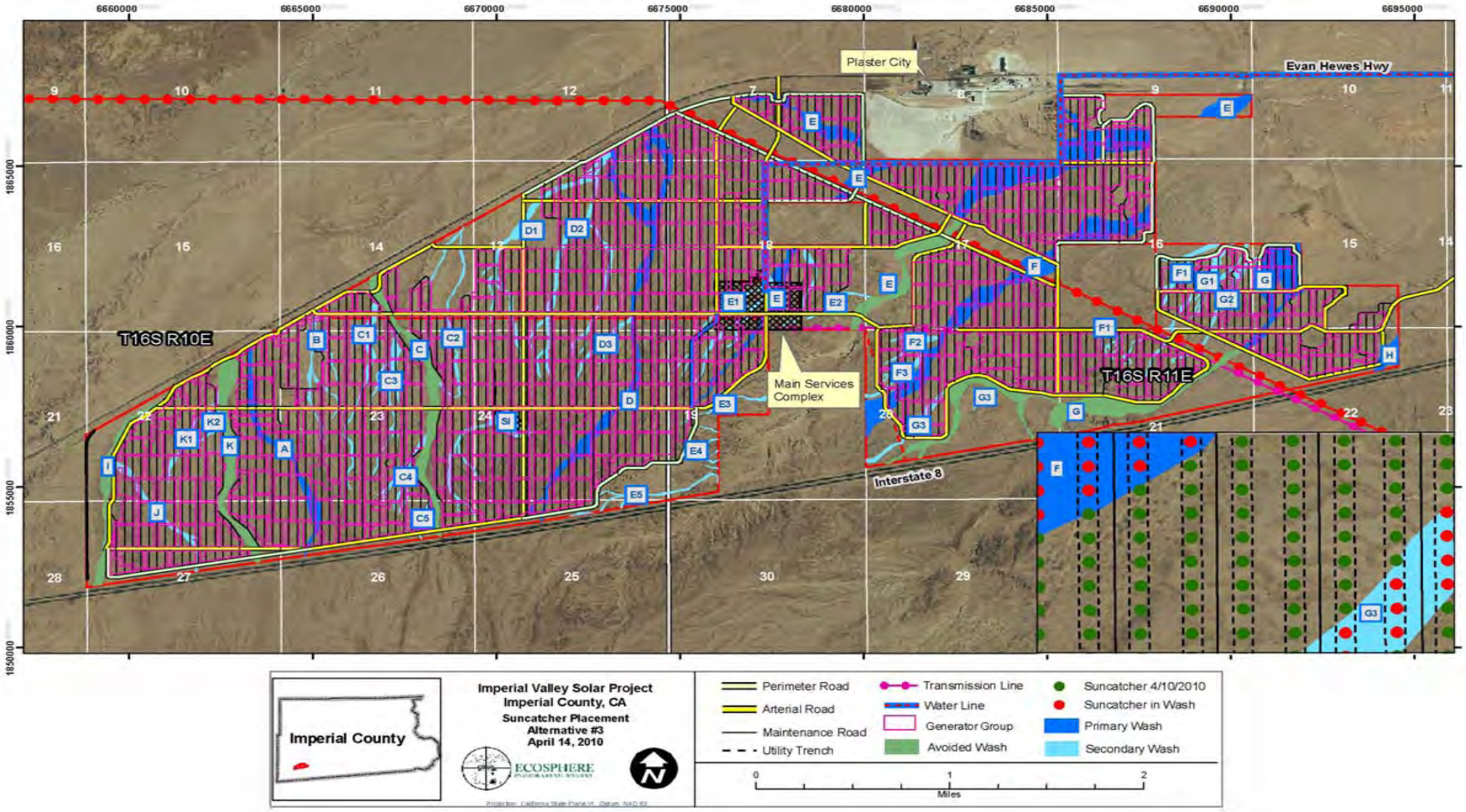


Figure 1. Revised Plan of Development (POD) site plan by Ecosphere Environmental Services

II. COMMENT ON THE REVISED PLAN OF DEVELOPMENT

Storm flows in the desert generally occur as flash floods with the discharge rising and falling rapidly. The hydraulics of storm flow, sediment transport and potential stream channel changes along several representative washes at the project site were modeled in my previous study for the project. The flow depths in the washes at the peak 100-yr flood were determined to be generally less than 1 foot. The velocities at the peak flood discharge vary from low to moderate; they are generally lower than 3 feet per second. From the sediment modeling study, it was determined that these washes are not subject to substantial changes in channel bed profiles for the existing and proposed conditions. Changes in bed elevation due to general scour are less than 1 foot during the 100-yr flood. Such changes are even less during the 10-yr flood. Because of these findings, it was decided that the solar catchers may be placed in the washes.

The solar units are supported on 2-foot cylindrical pedestals. For a pedestal in a wash, the total scour is the general scour plus the local scour at the pedestal base. The maximum local scour that occurs under the worst combination of flow depth and flow velocity has been computed to be 4.2 feet during the 100-yr flood. The maximum scour, including general scour and local scour, was determined be no greater than 5 feet. According to the structural design, the pedestals are imbedded into the ground for a length of 17 feet. Such a footing design is considered adequate to safeguard the structure against potential scour.

As a first step, the revised POD was evaluated in consideration of the necessary mitigation measures that I recommended previously. The sediment study provides representative sediment transport modeling to assess potential stream channel changes as well as an assessment of whether the project is likely to increase or decrease sediment delivery toward downstream. It is necessary to determine consequences of increased or decreased sediment delivery downstream. Possible consequences could include excess sediment deposition upstream of the existing railroad and culvert crossings along the north side of the project, or excess sediment delivery toward the east and the Westside Main Canal, or downstream channel degradation affecting existing infrastructure and channel morphology. In order to minimize the impacts, the project should cause no substantial changes to the sediment delivery. Otherwise, adverse impacts should be mitigated.

Sediment impacts may be mitigated by different methods. Basically, the road crossings, sediment basins, culverts, vegetation, buildings, etc. all affect sediment transport. In order to mitigate adverse impacts, modifications to these structures are considered. Based on the results of this study, the following mitigations for project impacts were recommended:

(3) Deletion of all sediment basins – The study has shown that the sediment basins will have short-term and long-term effects in reducing sediment flow along a wash and toward downstream. It is recommended all sediment basins be deleted from the proposed plan.

(4) Modification of Lifeline Crossing in Wash G – Under the original proposed plan, the 24-foot Lifeline Crossing has five 3-foot culverts for cross drainage. The top of roadway is about 5 feet above the channel bed elevation. This road crossing together with the two adjacent sediment basins will have major effects in reducing sediment flow along the stream channel. It is recommended that this crossing be changed into an at-grade road

crossing with all the culverts removed. Another alternative is to replace the road crossing with a large culvert or a small bridge that does not interfere with the flow.

(5) Set-back of at least 100 feet for the solar units along the base of the hills.

The first two items are now incorporated in the revised POD. For the third item, the most significant hills are located in the southern part of Basin E just north of Interstate 8. There are small streams coming out of the steep hillside. Alluvial fan formation at the base of the hills is possible. However, these small steep streams have very small watersheds. For this reason, there can be no major flow to cause large alluvial fan formation in this area of the project site. To insure safety of the solar units, it was recommended that a minimum setback of 100 feet be applied to the units along base of the hills. In the exhibit shown in Figure 2 below, the blue line marks the setback limit. Solar units should stay outside the boundary enclosing the hills. The recommended area of exclusion is from the consideration of hydrology. The revised POD complies with this recommendation.

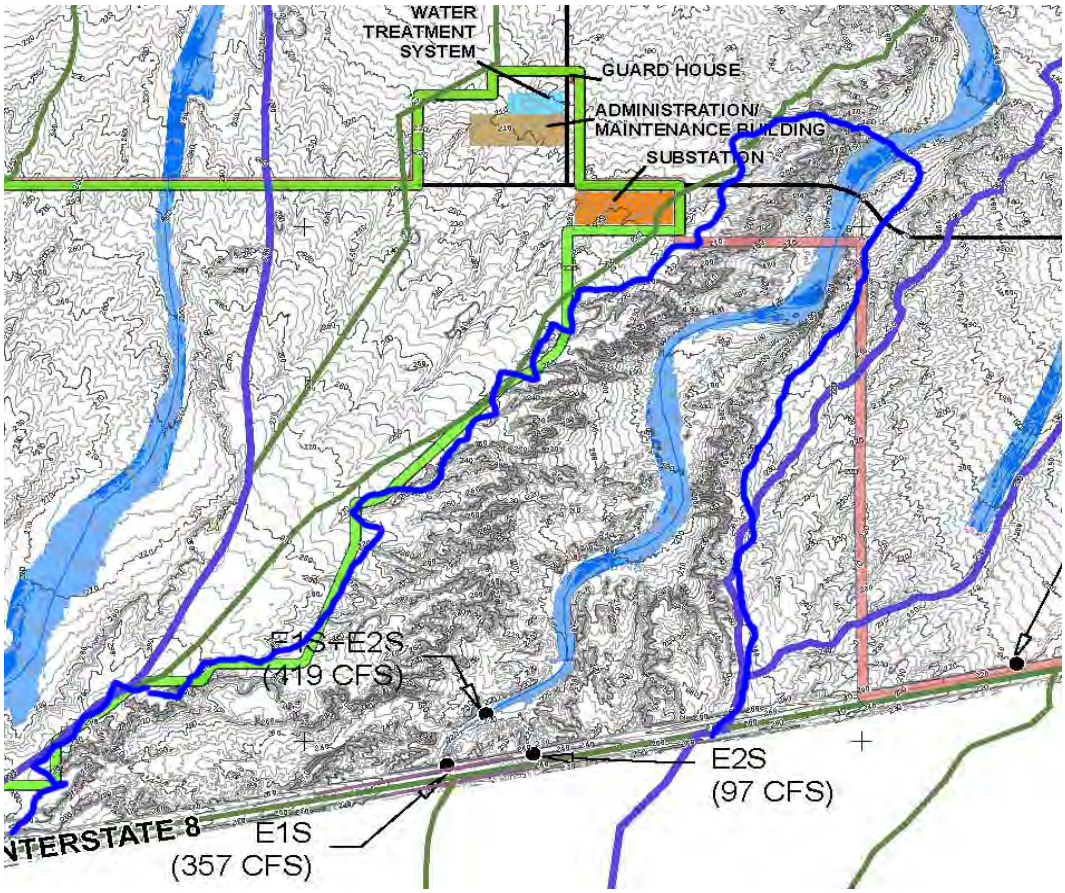


Figure 2. Blue line boundary to exclude inside area for solar units

II. AREAS IN REVISED POD NOT COVERED IN PREVIOUS STUDIES

The revised POD consists of areas for the Solar Two project that are not covered in my previous studies. Such areas are located north of the transmission line and south of Evan Hewes Highway. As shown in Figure 1, these areas are drained by three major washes E, F, and G and several smaller ones. In order to assess the hydrologic impacts on the solar units without any quantitative evaluation, these reaches are compared with their upper reaches south of the transmission line that have been evaluated previously.

Field inspections were made on May 10, 2010 of the washes north the of transmission corridor. Pictures of these washes are shown in Figures 3 for Wash E, in Figure 4 for Wash F, and in Figure 5 for Wash G. These washes are on flat terrains with wide and shallow channels. These lower reaches are generally flatter and wider than the upper reaches south of the transmission corridor.

Storm flows in the desert generally occur as flash floods with the discharge rising and falling rapidly. The flow depths in the washes at the peak 100-yr flood have been determined to be generally less than 1 foot. The velocities at the peak flood discharge vary from low to moderate; they are generally lower than 3 feet per second.

From the sediment modeling study, it was determined that these washes are not subject to substantial changes in channel bed profiles for the existing and proposed conditions. Changes in bed elevation due to general scour are less than 1 foot during the 100-yr flood. Such changes are even less during the 10-yr flood. The solar units are supported on 2-foot cylindrical pedestals. For a pedestal in a wash, the total scour is the general scour plus the local scour at the pedestal base. The maximum local scour that occurs under the worst combination of flow depth and flow velocity has been computed to be 4.2 feet during the 100-yr flood. In view of the stream morphology, the lower wash reaches have slightly lower flow velocities and hence present no significant potential hazard for solar units.

Figure 3. Views of Wash E from the transmission corridor.
The upper picture is a view of Wash E toward upstream.
The lower picture is a view of Wash E toward downstream.

Figure 4. Views of Wash F from the transmission corridor.
The upper picture is a view of Wash F toward upstream.
The lower picture is a view of Wash F toward downstream.

Figure 5. Views of Wash G from the transmission corridor.
The upper picture is a view of Wash G toward south.
The lower picture is a view of Wash G toward downstream.

III. BORDER FENCE DESIGN RECOMMENDATIONS

A fence surrounding the entire project site has been planned. The conceptual design of the fence has not been provided, but it is believed to be tall enough to prevent human passage. It may be a fence with horizontal and vertical steel bars, or a chain link fence. In order to protect the project site, the fence should not allow human passage. The fence will cross certain washes. Depending on the design, the fence may have impacts on surface water flow and sediment transport in the washes.

In order to avoid impacts on the flow and sediment transport, the following features are recommended for fence design:

(1) The steel bar fence is less likely to capture debris carried by the flow, and hence it is considered more desirable than the chain link fence.
(2) At a wash crossing, the bottom of the fence should maintain a clearance of 1 about foot from the stream bed. The 1-foot clearance will pass the 100-yr storm with minimum interference since the flow depth of the 100-yr storm has been determined be about 1 foot.
(3) At a wash crossing, the vertical bars of the fence should maintain a span of at least 8 feet. The vertical bars interfere with the surface water flow. Major interference to flow can be avoided if the spacing between two adjacent bars is at least 8 feet.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT
COMMISSION OF THE STATE OF CALIFORNIA
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APPLICATION FOR CERTIFICATION FOR THE
IMPERIAL VALLEY SOLAR PROJECT
(formerly known as SES Solar Two Project)
IMPERIAL VALLEY SOLAR, LLC

Docket No. 08-AFC-5
PROOF OF SERVICE
(Revised 6/8/10)

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DECLARATION OF SERVICE

I, Jennifer Draper, declare that on July 13, 2010, I served and filed copies of the attached, Applicant's Submittal of Additional Opening Testimony. The original documents, filed with the Docket Unit, are 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/solartwo/index.html]

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*)

FOR SERVICE TO ALL OTHER PARTIES:

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

_____ by personal delivery;

__X__ by delivering on this date, for mailing with the United States Postal Service with first-class postage thereon fully prepaid, to the name and address of the person served, for mailing that same day in the ordinary course of business; that the envelope was sealed and placed for collection and mailing on that date to those addresses NOT marked "email preferred."

AND

FOR FILING WITH THE ENERGY COMMISSION:

__X__ 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. 08-AFC-5
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, that I am employed in the county where this mailing occurred, and that I am over the age of 18 years and not a party to the proceeding.

original signed by
Jennifer Draper

*indicates change