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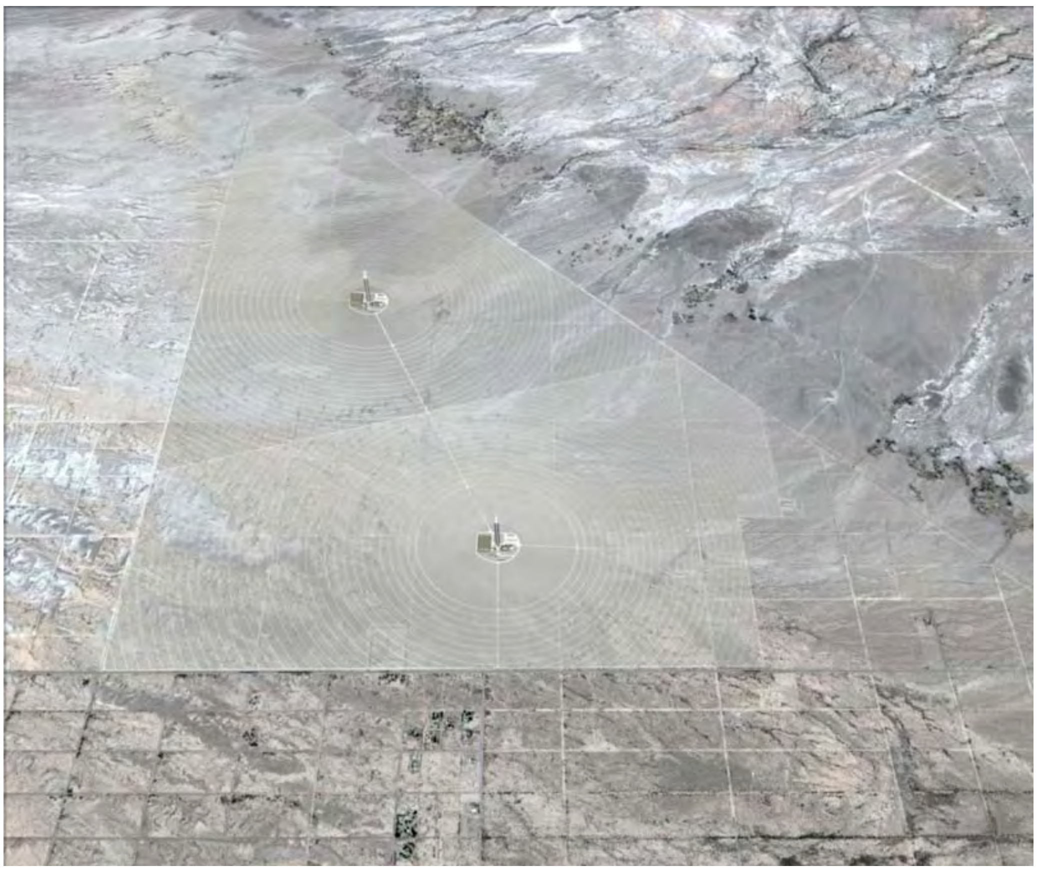
HIDDEN HILLS SOLAR ELECTRIC GENERATING SYSTEM (HHSEGS)

Final Staff Assessment



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HIDDEN HILLS SOLAR GENERATION SYSTEM (11-AFC-2)
FINAL STAFF ASSESSMENT

EXECUTIVE SUMMARY

Testimony of Mike Monasmith

INTRODUCTION

This Final Staff Assessment (FSA) contains staff's independent evaluation of the BrightSource Energy, Inc. (Applicant) Hidden Hills Solar Electric Generating System (HHSEGS) Application for Certification (11-AFC-2). The FSA examines engineering, environmental, public health, and safety aspects of the proposed HHSEGS project, based on the information provided by the applicant, government agencies, interested parties and other sources available at the time the FSA was prepared. The FSA includes analyses prepared to satisfy the requirements of the California Environmental Quality Act (CEQA).

The Energy Commission is the CEQA lead agency. In addition to CEQA analyses, the FSA must consider whether the project conforms with all applicable local, state, and federal laws, ordinances, regulations and standards (LORS). The FSA also recommends measures to mitigate significant and potentially significant environmental effects, which take the form of conditions of certification for construction, operation, maintenance, and eventual decommissioning of the project, if approved by the Energy Commission.

This FSA is not the decision document for these proceedings, nor does it contain findings of the Energy Commission related to environmental impacts or the project's compliance with local/state/federal legal requirements. However, the FSA does include "Proposed Findings of Fact" for each of its 21 separate technical sections.

The FSA serves as staff's testimony in evidentiary hearings to be held by the HHSEGS Committee (composed of Commissioner and Presiding Member Karen Douglas, Commissioner and Associate Member Carla Peterman, and Hearing Officer Kenneth Celli), who oversee this case. The Committee will hold evidentiary hearings in January 2013, and will consider the recommendations presented by staff, the applicant, intervenors, governmental agencies, and the public prior to proposing its recommended decision to the full Commission. Energy Commissioners will make a final decision on HHSEGS, including findings, after the Committee's publication of the Presiding Member's Proposed Decision (PMPD).

PROPOSED PROJECT LOCATION, DESCRIPTION AND COMPONENTS

HHSEGS is proposed to be located on approximately 3,097 acres of privately owned land leased in Inyo County, California, adjacent to the Nevada border. The project site is approximately 8 miles directly south of Pahrump, Nevada (with a driving distance of 28 miles), and approximately 45 miles northwest of Las Vegas, Nevada (**Project Description Figure 1**). The project site is currently undeveloped and unoccupied. This rural area is primarily served by State Route (SR) 160, Old Spanish Trail Highway (also known as "Tecopa Road") and various unpaved roads. A sparsely populated residential community, Charleston View, lies immediately south of the proposed project site and Tecopa Road.

The HHSEGS project is being developed by Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC. Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC, are wholly owned subsidiaries of Hidden Hills Solar Holdings, LLC, which is in turn a wholly owned subsidiary of BrightSource Energy, Inc., (Applicant).

HHSEGS would comprise two solar fields and associated facilities: the northern solar plant (Solar Plant 1) and the southern solar plant (Solar Plant 2). Each solar plant would generate 270 megawatts (MW) gross (250 MW net), for a total net output of 500 MW. Solar Plant 1 would occupy approximately 1,483 acres (or 2.3 square miles), and Solar Plant 2 would occupy approximately 1,510 acres (or 2.4 square miles). A 103-acre common area would be established on the southeastern corner of the site to accommodate an administration, warehouse, gas metering station, and a 138kV transmission switchyard and maintenance complex. A temporary construction lay-down and parking area on the west side of the proposed site would temporarily occupy approximately 180 acres. The temporary construction laydown area in addition to the entire HHSEGS site would total 3,277 acres.[1]

If permitted, Solar Plant 1 and Solar Plant 2 would take approximately 29 months to construct. Average and peak workforce is estimated at approximately 1087 and 2293 workers, respectively, consisting of construction craft people, supervisory, support, and construction management personnel onsite during construction. The peak construction site workforce level is expected to occur in month 19 of the 29-month construction period. Construction-related truck traffic would be entering and leaving the project on to Tecopa Road by way of what is now known as Topaz Street, at the westernmost boundary of the project site.

Project Features and Facilities

Each solar plant would use heliostats (elevated mirrors guided by a tracking system mounted on a pylon) to focus the sun's rays on a solar receiver steam generator (SRSG) – a solar boiler used to make steam which can then generate electricity – atop a solar "power tower" near the center of each solar field. The solar field and power generation equipment would start each morning after sunrise and, unless augmented by auxiliary boilers, would shut down when insolation (sun ray intensity) drops below the level that would be required to keep the turbines online and producing electricity. Please see the **Project Description** section of this **FSA** for specific discussions on the following project components: Solar Field, Solar Plants, Steam Turbine Generators, Natural Gas Auxiliary Boilers, Boiler Feedwater System, Condensate System, Demineralized Water System and Power Cycle Makeup and Storage. **Project Description Figure 8** illustrates the technology of the proposed HHSEGS.

Water Supply and Use

Groundwater would be drawn daily from six onsite groundwater supply wells that would be drilled and developed to provide raw water for the HHSEGS project; two new wells per power block (primary and backup) and two wells at the administration complex. The wells would supply both solar plants and would be used for the power cycle make-up water, mirror wash water, and other domestic uses. The entire 500-MW net project would require up to 84.5 gallons per minute (gpm) (average) raw water make-up, with 30 to 50 gpm required by each plant, and 3.5 gpm (average) required for potable water use. The total annual water

[1] 3,277 acres would be leased by Applicant on land owned by The Roland John Wiley Trust, The Mary Wiley Trust and Section 20, LLC.

use for HHSEGS would be 140 acre feet[2] per year. The **Water Supply** section of this **FSA** details the various aspects of this critical natural resource.

HHSEGS would generate electricity up to 16 hours a day. However, the water treatment plant would operate continuously in order to minimize water treatment system size and capital costs, and to use off-peak energy at night. A breakdown of the estimated average daily quantity of groundwater required for HHSEGS operation is presented in **Table 1**. The daily water requirements shown are estimated quantities based on HHSEGS operating at full load.

TABLE 1
Average Daily Water Requirements with Both Solar Plants in Operation

Water Use	Average Daily Use (gpm)	Annual Use (ac-ft/yr)
Process and heliostat wash	84.5	135
Potable water service (including Common Area)	3.5	5

ac-ft/yr = acre-feet per year

To reduce the number of truck trips during construction, the applicant proposes to drill a temporary well to be used during construction only, primarily for the onsite concrete batch plant that would be used to serve project construction needs. This temporary well would eliminate the need to bring water to the construction area via tanker truck, and would not increase water usage above the 288 acre-feet per year needed during the 29-month construction period.

Electrical Transmission System

The HHSEGS would interconnect to the Valley Electric Association (VEA) system[3]. The interconnection would require an approximately 10-mile long generation tie line (gen tie line) from the HHSEGS to the proposed Crazy Eyes Tap Substation[4], where the project would interconnect to the VEA electric grid. The gen tie line would originate at the HHSEGS's onsite switchyard, cross the state line avoiding the mesquite vegetation to the south and continue east for approximately 1.5 miles until reaching Tecopa Road. At Tecopa Road, the route would head northeast paralleling Tecopa Road until it reaches the Crazy Eyes Tap Substation, which would be located immediately east of the Tecopa Road/SR 160 intersection. The Crazy Eyes Tap Substation would interconnect to the existing VEA Pahrump Bob Tap 230 kV line. Please see **Project Description Figure 6.**

The bulk of the electric power produced by the facility would be transmitted to the grid. A small amount of electric power would be used onsite to power auxiliaries such as pumps and fans, control systems, and general facility loads including lighting, heating, and air conditioning. Some power would also be converted from alternating current (AC) to direct current (DC) and stored in batteries, which would be used as backup power for the plant control systems and essential uses.

[2] An acre foot of water equals 325,851 gallons.

[3] In January 2013, VEA will become a participating transmission owner (PTO) and will turn operational control of its facilities over to the California Independent System Operator (CAISO).

[4] In the HHSEGS Application for Certification, this substation was referred to as the Tap Substation.

Natural Gas Supply System

A 12-inch diameter natural gas pipeline would be required for the HHSEGS project. Kern River Gas Transmission Company (KRGT) proposes to construct the pipeline from the HHSEGS meter station, to be located in the HHSEGS Common Area, extending 32.4 miles to KRGT's existing mainline system just north of Goodsprings in Clark County, Nevada. The HHSEGS meter station, including pig receiver facilities, would be approximately 300 feet by 300 feet and would be surrounded by a 6-foot tall chain link fence topped with three strands of barbed wire (approximately 7 feet high total). The meter station would be shaded by a canopy to cover the meter runs and associated instrumentation and valves. A data acquisition and control (DAC) building would be located within the meter station. Data acquisition, control, uninterrupted power supply (UPS), and communication equipment would be installed inside the DAC building. Yard lights would be installed on the DAC building and meter building exterior. In addition, the light fixtures would be shielded or hooded and directed downward.

Facilities in Nevada subject to federal analysis

The FSA focuses on the HHSEGS project that would be built in California and its local and regional environmental impacts. Features of the project built in Nevada (e.g., the transmission line and natural gas supply line) may be mentioned to provide informational context. However, projects (or parts of projects) to be located in Nevada are not required to be analyzed under CEQA if they are assessed separately pursuant to federal environmental law (the National Environmental Policy Act, or "NEPA"). The federal Bureau of Land Management (BLM) is preparing NEPA analysis for the transmission and gas line project elements. Accordingly, the FSA does not focus on the parts of the project in Nevada, and proposes no mitigation for those elements of the project.

PROPOSED HHSEGS PROJECT OBJECTIVES

The project objectives of the Hidden Hills Solar Electric Generating System (HHSEGS) are based on applicant's stated project objectives, but modified to allow the reasonable range of alternatives required by CEQA:

- Safely and economically construct and operate a nominal 500-megawatt renewable electrical generation facility resulting in sales of competitively priced renewable energy consistent with the needs of California utility companies;
- Develop a renewable energy facility that will supply electricity for use by retail sellers and publicly owned electric utilities to help satisfy their required California Renewables Portfolio Standard (RPS) program goals;
- Develop a renewable energy facility capable of providing grid support by offering power generation that is flexible;
- Develop a renewable energy facility in an area with high solar insolation (high solar energy intensity);
- Ensure construction and operation of a renewable electrical generation facility that will meet permitting requirements and comply with applicable laws, ordinances, regulations, and standards (LORS);

- Develop a renewable energy facility in a timely manner that will avoid or minimize significant environmental impacts to the greatest extent feasible;
- Obtain site control and use within a reasonable time frame; and
- Develop a renewable energy facility in an area with high solar value and minimal slope.

PUBLIC AND AGENCY INVOLVEMENT

PUBLIC COORDINATION

The Energy Commission collaborated with a number of state and federal agencies in order to facilitate robust public participation in the regulatory review of HHSEGS. To reach this goal, Energy Commission staff conducted ten Workshops during the 180-day discovery phase; and four PSA Workshops between publication of the PSA in late May 2012 and publication of the FSA in October of 2012. These Workshops allowed parties to the proceeding the opportunity to informally discuss several technical issues related to the proposed project; determine if HHSEGS should be approved for construction and operation; and, if approved, under what set of conditions. These workshops helped inform the discovery and analysis process for the proceeding, and provided the public, parties to the proceeding (including applicant and intervenors), as well as local, state, and federal agencies the opportunity to ask questions about, and provide input on, the proposed project. The Energy Commission issued notices for each of these workshops a minimum of ten days prior to each meeting, and posted them accordingly. Moreover, parties to the proceeding and members of the public were also provided opportunities to keep abreast of the proceeding, and make comments, during seven monthly Status Conferences held by the HHSEGS Committee between January and August of 2012.

INITIAL PUBLIC NOTICE AND OUTREACH

On November 3, 2011, the Energy Commission held a publicly-noticed Informational Hearing at the Tecopa Community Center in Tecopa, Inyo County, California. The hearing followed a Site Visit and brief presentation at the proposed project site. **Executive Summary Figures 1 – 5** provide views from various locations on the proposed project site; these pictures were taken during the November 3, 2011, Site Visit and an earlier October 27, 2012, staff field trip and workshop[5].

ENERGY COMMISSION STAFF'S PUBLIC OUTREACH

Energy Commission staff typically provides formal notices to property owners within 1,000 feet of the proposed site and within 500 feet of a linear facility (such as transmission lines, gas lines and water lines). Staff mailed notices on August 19, 2011, informing the public, agencies, and elected officials of the Commission's receipt and availability of the Application for Certification, 11-AFC-2. Following publication of the Preliminary Staff Assessment on May 24, 2012, notices were likewise distributed informing property owners of the PSA (and June 15, 2012 Supplemental Staff Assessment, which contained the preliminary Cultural Resources staff assessment). Each notice contained a link to the Commission-maintained HHSEGS project website (http://www.energy.ca.gov/sitingcases/hiddenhills/index.html).

[5] tn:62873 11/10/2011, M. Monasmith Photos of 10-27-11 Field Trip and 11-3-11 Site Visit: http://www.energy.ca.gov/sitingcases/hiddenhills/documents/2011-10-27_Field_Trip_and_Site_Visit_Photos.pdf

LIBRARIES

On August 19, 2011, Energy Commission staff also sent paper copies of the Hidden Hills Solar Electric Generating System AFC to the following libraries:

Pahrump Community Library **701 East Street** **Pahrump, NV 89048**	**Barstow Branch Library** **304 E. Buena Vista Street** **Barstow, CA 92311**
Inyo County Library **168 North Edwards Street** **Independence, CA 93626**	**Inyo County Library** **410 Hot Springs Rd** **Tecopa, CA 92389**

Likewise, on June 1, 2012, Energy Commission staff distributed copies of the PSA to the same library list (and also distributed copies of the June 15, 2012 Supplemental Staff Assessment, or "SSA"). In addition to the local libraries listed above, copies of the AFC, PSA and SSA were also made available at the Energy Commission's Library in Sacramento, the California State Library in Sacramento, as well as, state libraries in Eureka, Fresno, Los Angeles, San Diego, and San Francisco.

ENERGY COMMISSION'S PUBLIC ADVISER'S OFFICE

The Energy Commission's outreach program is also facilitated by the Public Adviser's Office (PAO). The PAO requested public service announcements at a variety of organizations, distributed notices informing the public of the Commission's receipt of the HHSEGS Application for Certification (AFC), and invited the public to attend the Public Site Visit (of the proposed HHSEGS site) and Informational Hearing/BLM Scoping Meeting on November 3, 2011 in Tecopa (Inyo County), California.

PUBLIC WORKSHOPS

Staff from the Energy Commission organized and conducted numerous Data Request, Data Response and Issues Resolution and PSA Workshops in the following California communities: Bishop, Shoshone and Tecopa (Inyo County), and Sacramento, California, as well as Pahrump, Nevada. A total of ten publicly-noticed workshops conducted during discovery were held on the following days: October 21 and 27, 2011; November 18, 2011, December 1 and 16, 2011; January 18, 2012; February 22, 2012; April 26 and 27, 2012; and May 9, 2012. PSA Workshops were held on June 14 and June 27, 2012, July 3, 2012 and August 28, 2012. During each of these workshops, specific time for public participation was allocated, and public comments were taken. These workshops provided a public forum for the applicant, interveners, staff and cooperating agencies to interact regarding project issues. Specific information related to the HHSEGS proceeding, including details on public participation, as well as ongoing Committee notices and announcements, can be reviewed at the following Energy Commission website: http://www.energy.ca.gov/sitingcases/hiddenhills/notices/index.html

AGENCY COORDINATION

On August 19, 2011, the Energy Commission staff sent a notice of receipt and a copy of the HHSEGS Application for Certification to all local, state, and federal agencies that may have an interest in the proposed project. Likewise, on June 1, 2012, Energy Commission staff sent a notice of receipt and copy of the HHSEGS Preliminary Staff Assessment to the same agency list. These notices sought cooperation and or comments from critical regulatory agencies that administer LORS which may be applicable to the proposed project.

These agencies included the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, Inyo County, California Department of Transportation, State Water Resources Control Board, Lahontan Regional Water Quality Control Board, California Department of Fish and Game (CDFG), and the California Air Resources Board/Big Basin Air Quality Management District, among others. Staff (particularly the Biological Resources staff) worked collaboratively with the CDFG and the USFWS to evaluate the proposed HHSEGS project, and provided input[6] that informed staff's analyses contained within this Final Staff Assessment.

CONSULTATION WITH LOCAL NATIVE AMERICAN COMMUNITIES

Energy Commission staff conducted pre-filing consultation with several local Native American tribes regarding the proposed HHSEGS project on August 2, 2011, at the Pahrump Community Library in Pahrump, Nevada. The meeting was designed to seek comments and input on the proposed project, and served as an early invitation for tribes to consult on the project before it was officially filed with the Energy Commission. Following written and verbal correspondence between staff and tribal representatives, additional meetings occurred with tribal representatives in December, 2011 and January, 2012. Following the January 19, 2012, meeting in Shoshone, California, Energy Commission staff ethnographer, Dr. Thomas Gates, embarked on a series of in-depth meetings and interviews with members of the local Pahrump Paiute tribe to document the stories, songs and history of Native American life for the project site and the larger project area. These accounts are provided in the **Cultural Resources** section of this document.

RESPONSE TO COMMENTS

Thirteen organizations, including public agencies; members of the public; intervenors; and the applicant, BrightSource Energy, LLC, submitted comments on the May 24, 2012, Preliminary Staff Assessment (PSA). A Supplemental Staff Assessment (SSA) containing staff's preliminary **Cultural Resources** analysis was subsequently published on June 15, 2012. The deadline for submitting comments on both the PSA and SSA was July 23, 2012.

Comments were received from three public agencies -- Inyo County (Inyo Co.), U.S. Bureau of Land Management (BLM) and the National Park Service (NPS); and three conservation organizations — the Amargosa River Conservancy (Amarg. River), The Nature Conservancy (TNC), and Basin and Range Watch (Basin & Range Watch). Several Native American organizations also submitted comments, including Richard Arnold (now an Intervenor in the Hidden Hills SEGS proceeding), Pahrump Paiute Tribe (Paiute Tribe) and the Big Pine Paiute Tribe of the Owens Valley (Big Pine Tribe). Intervenors submitting comments (in addition to Richard Arnold) include the Center for Biological Diversity (CBD), Cindy

[6] Several Records of Conversation (ROC) reflect the high-level of information exchange between USFWS and CDFG staff biologists and Energy Commission staff: http://www.energy.ca.gov/sitingcases/hiddenhills/documents/roc/

MacDonald (Cindy Mac) and the Old Spanish Trail Association (OSTA). The final commenter listed in **Table 2** below is the applicant, BrightSource Energy, LLC (BSE). Following submission of the comment letters, staff bracketed each letter in order to highlight the pertinent questions and issues for review. The comment letters can be reviewed in **Appendix RTC**.

Table 2
Response to PSA Comments Matrix

	Inyo Co.	BLM	NPS	Amarg. River	TNC	Basin & Range Watch	Richard Arnold	Paiute Tribe	Big Pine Tribe	CBD	Cindy Mac	OSTA	BSE	TOTALS:
AQ/GHG	3										105		44	**152**
Alts				2		6			1	8	4		62	**83**
Bio	20	1		1	2	15	1	1	2	36	7		176	**262**
Cultural	2		1	1		2	5	7	6	6		7	76	**113**
Haz Mat											6		6	**12**
Land Use	7										10		36	**53**
Proj. Desc	4										10		12	**26**
Socio	40			1		3	3		1	2	13		64	**127**
Soils	1	2									62		12	**77**
TSLN													8	**8**
Traffic	7										3		27	**37**
Public Health											16		6	**22**
Visual	2			1		16		1			13		60	**93**
Waste	3										30		8	**41**
WS/FP											1		7	**8**
Water	11	7		7	21	6		1	1	3	31		79	**167**
Efficiency													10	**10**
Facility Design											18		3	**21**
Geo/Paleo													27	**27**
Noise	1										18			**19**
Reliability													2	**2**
TSE											6		5	**11**
TOTALS:	**101**	**10**	**1**	**13**	**23**	**48**	**9**	**10**	**11**	**55**	**353**	**7**	**730**	**1371**

Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," focuses federal attention on the environment and human health conditions of minority communities and calls on federal agencies to achieve environmental justice as part of its mission. The order requires the United States Environmental Protection Agency (EPA) and all other federal agencies to develop strategies to address this issue. The agencies are required to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority or low-income populations. Some agencies have also interpreted this order as applying to state agencies that receive federal funding. Energy Commission staff assumes that the order applies, and conducts its analysis accordingly.

Environmental Justice: Guidance Under the National Environmental Policy Act, defines minority individuals as members of the following groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. The focus of the screening analysis under the guidance is to determine whether there is a minority/low income population adversely affected by a project that is greater than fifty percent or when the minority population percentage is "meaningfully greater" than that of the population in the general population or other appropriate unit of geographic analysis (please see **Socioeconomics Figure 1**). *Final Guidance for Incorporating Environmental Justice Concerns in EPA's Compliance Analyses* (US EPA 1998) also encourages including outreach to community-based organizations and tribal governments early in the screening process, in order to identify the presence of distinct minority communities residing both within, and in close proximity to, the proposed project. It also identifies those minority groups that utilize or are dependent upon natural and cultural resources that could be potentially affected by the proposed action.

In addition to the demographic screening analysis, staff follows the steps recommended by the U.S. EPA's guidance documents in regard to outreach and involvement, and if warranted, a detailed examination of the distribution of impacts on segments of the population. Under this federal approach, staff determined that the minority population identified in **Socioeconomics Figure 1** does not constitute an environmental justice population. Accordingly, no further environmental justice analyses are necessary.

CUMULATIVE EFFECTS

Staff conducted an extensive search of past, present, and reasonably foreseeable "probable" future projects in Inyo County (CA), Pahrump Valley (CA and NV), Mesquite Valley (CA), Ivanpah Valley (CA and NV), and Piute Valley (NV) (see **Cumulative Effects Figure 1**). Staff reviewed project tracking information and available environmental reports and notices through various resources, including websites of local, regional and state jurisdictions and the U.S. Bureau of Land Management (CA and NV). Additionally, staff queried project managers from various California and Nevada public agencies to compile a comprehensive list of past, present and probable future projects that resulted in a full list of cumulative projects. **Table 3** below presents a master list of the projects considered part of the HHSEGS cumulative setting.

The State CEQA Guidelines define cumulative impacts as “two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts.” (Cal. Code Regs., tit. 14, § 15355.) The CEQA Guidelines continue: (a) “[t]he individual effects may be changes resulting from a single project or a number of separate projects” and (b) “[t]he cumulative impact from several projects is the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.” (*Ibid*.)

Accordingly, staff in each technical section of this FSA determined which of the “closely related” projects from the Cumulative Projects list could create impacts specific to their technical area or discipline. Staff developed lists for each discipline, then evaluated whether the cumulative effect(s) were significant, and if so, whether the proposed project’s contribution to that combined effect would be “cumulatively considerable.”[7]. Therefore, this FSA attempts to analyze the impacts of all aspects and phases of HHSEGS, including the combined effect the proposed project would have in conjunction with other projects.

Table 3
Hidden Hills Master List of Cumulative Projects

Project Name; Agency ID	Location	Ownership	Status	Project Description
St. Therese Mission	881 E. Old Spanish Hwy, approx. 1.5 miles west of CA/NV border along Tecopa Road.	Magnificat Ventures Corporation, Las Vegas, NV	Inyo Co. approved June 2010	17.5 acre environmental park, memorial and internment center
Pahrump Airport	Pahrump, NV	Nye County	EIS in preparation	The Town of Pahrump, Nevada, proposes to lease approx. 650 acres of Bureau of Land Management (BLM) - managed public land to build and operate a new public-use, general aviation airport in the southwest portion of the town.
Element Solar (NVN 089655)	Pahrump Valley, 6 ½ miles north of proposed HHSEGS in NV	First Solar Development	POD	100 megawatt (MW) Photovoltaic (PV) project 2,560 acres land requested
Amargosa Farm (NVN 084359)	80 miles northwest of Las Vegas, in the Amargosa Valley in Nye County, NV	Solar Millennium	On hold	Two 250 MW dry-cooled solar power plants (parabolic solar trough) equipped with thermal energy storage on 4,350 acres of BLM-administered property. http://www.blm.gov/nv/st/en/fo/lvfo/blm_programs/energy/proposed_solar_millenium.html
PSI Amargosa PV Solar Project (NVN 084465)	South of Amargosa Valley, Nye County, NV	Pacific Solar Investments, Inc. (Iberdrola)	Public Scoping	150 MW solar PV project with a developed area of 1,700 acres of BLM-managed lands in Nye County, Nevada. No water or fuel required to operate PV solar systems according to Pacific Solar Investments. http://www.blm.gov/nv/st/en/fo/lvfo/blm_programs/energy/PSI_Amargosa_PV_Solar_Project.html
Silver State South Solar Project (NVN 089530, NVN 085801)	Just south of Primm, NV, on the CA/ NV border	First Solar Development	Record of Decision, 10/12/10	350 MW solar PV project located on approximately 2,900 of public land administered by the Bureau of Land Management (BLM) in Clark County, Nevada near Primm. The project consists of Phases II and III. http://www.blm.gov/nv/st/en/fo/lvfo/blm_programs/energy/nextlight_renewable0.html

[7] “Cumulatively considerable” means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects. (Cal.Code Regs., tit. 14, section 15064, subd. (h)(1).)

Project Name; Agency ID	Location	Ownership	Status	Project Description
Stateline Solar Farm (CACA 048669)	Just south of Primm, NV, on the CA/ NV border	First Solar Development	DEIS pending	300 MW solar PV project in Eastern San Bernardino County, two miles southwest of the CA/NV border on 2,114 acres of Federal land managed by the BLM. http://www.blm.gov/ca/st/en/prog/energy/fasttrack/stateline/fedstatus.html
Sandy Valley (NVN 090476)	Clark Co., NV, approx. 8 miles southeast of proposed HHSEGS near Highway 160	Bright Sources Energy Solar Partners	POD	750 MW, 170 AFY, 15,190 acres http://wilderness.org/files/Joint-Comments-on-the-Supplement-to-the-Draft-Solar-PEIS.pdf A BrightSource Energy project to use proprietary solar "power tower" technology.
Searchlight Wind Energy (NVN 084626)	Searchlight, NV	Duke Energy	Draft EIS published Jan. 2012	200 MW wind energy facility consisting of up to 140 wind turbine generators (maximum 427.5 ft. tall) located on 18,949 acres of both private and BLM-administered lands in the Eldorado Mountains. http://www.blm.gov/nv/st/en/fo/lvfo/blm_programs/energy/searchlight_wind_energy.html
Southern Owens Valley Solar Ranch	Southern Owens Valley in Inyo County	LADWP	DEIS being prepared	200 MWs of solar photovoltaic electrical energy and associated equipment within a 3,100-acre area in the southern Owens Valley in Inyo County.
Lathrop Wells Solar (NVN 086571)	Amargosa Valley, Nye Co, NV	Abengoa Solar	DEIS pending	Phase I – 250 MW, Phase II – 250 MW. 5,336 acres. CSP/Trough. http://www.blm.gov/nv/st/en/fo/lvfo/blm_programs/energy/Lathrop_Wells_Solar.html
Table Mountain (NVN 073726)	Clark County, NV	Table Mountain Wind, LLC.	Renewal, testing	205 MW, 15 MET towers/turbines, 8,300 acres BLM land, 249 disturbed acres. http://www.blm.gov/pgdata/etc/medialib/blm/nv/energy.Par.56189.File.dat/renewable_energy_project_table_feb2011.pdf
South Solar Ridge (NVN 086782)	Clark/Nye counties, NV	Southwest Solar Land Co (First Solar)	POD	50 MW PV project on 530 acres. http://www.blm.gov/pgdata/etc/medialib/blm/nv/energy.Par.56189.File.dat/renewable_energy_project_table_feb2011.pdf
Hidden Hills Valley Electric Transmission Project (NVN 089669)	Clark County, NV	Valley Electric Association	DEIS pending (BLM lead)	A new 10-acre 230/500 kV Substation located immediately northeast of the existing VEA 138 kV and VEA 230 kV transmission line alignments adjacent to Highway 160. Approximately 9.7 miles of new 230 kV single circuit transmission line from the HHSEGS project site to the new Substation. Approximately 53.7 miles of new 500 kV Transmission Line from the Tap Substation to the existing Eldorado Substation. http://www.blm.gov/nv/st/en/fo/lvfo/blm_programs/energy/hidden_hills_transmission.html
Calnev Pipeline Expansion Project	Counties of San Bernardino, CA and Clark, NV, plus various cities along the Interstate 15 corridor from Colton, CA to Las Vegas, NV	Kinder Morgan Energy Partners, LP	DEIS/DEIR published March 2012	Add an additional refined petroleum products pipeline in CA and Nevada, to expand the capacity of the Calnev Pipeline System. The project would involve the construction, operation, and maintenance of a new 16-inch-diameter, 233-mile long pipeline and ancillary facilities from an existing facility in Colton to McCarran International Airport in Las Vegas.

Alternatives Summary

Section 15126.6(a) of the State CEQA Guidelines indicates that the alternatives analysis must "describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives." CEQA also requires (1) evaluation of a "no-project alternative," (2) identification of alternatives that were initially considered but then rejected from further evaluation, and (3) identification of the “environmentally superior alternative” among the other alternatives (Cal. Code Regs., tit. 14, §15126.6).

Staff reviewed many potentially feasible off-site alternatives and alternative renewable technologies during the effort to determine the scope and content of the alternatives analysis. That review led to selection by staff of these six project alternatives for CEQA analysis and comparison to the proposed HHSEGS project:

- No-Project Alternative
- Sandy Valley Off-site Alternative (same technology as the proposed project)
- Solar Power Tower with Energy Storage Alternative (at the proposed HHSEGS site)
- Solar Photovoltaic Alternative (at the proposed HHSEGS site)
- Parabolic Trough Alternative (at the proposed HHSEGS site)
- Reduced Acreage Alternative

Staff’s alternatives analysis includes an assessment of the potential for each project alternative to attain the basic project objectives and identifies potential feasibility issues.

The primary environmental benefits of the Solar Photovoltaic (PV) Alternative compared to the proposed project are reduced impacts on Water Supply, Visual Resources, and Cultural Resources. The Solar PV Alternative would also reduce the potential for avian species to collide with project structures and eliminate the potential for mortality from exposure to concentrated solar flux. Staff concludes that the Solar PV Alternative would be environmentally superior to the proposed project. A full analysis of the environmentally superior alternative that compares the effects of each of the project alternatives to the proposed HHSEGS project is included in the **Alternatives** section of this final staff assessment.

FINAL STAFF ASSESSMENT CONCLUSIONS

Each technical area section of the FSA contains a discussion of the project setting, impacts, findings of fact, and where appropriate, mitigation measures and conditions of certification. The FSA includes staff’s assessment of these aspects of the proposed project:

- the environmental setting of the proposal;
- impacts on public health and safety, and measures proposed to mitigate these impacts;
- environmental impacts, and measures proposed to mitigate these impacts;
- the engineering design of the proposed facility, and engineering measures proposed to ensure construction and operation of the proposed project could be accomplished safely and reliably;
- project closure;
- project alternatives;
- compliance of the project with all applicable laws, ordinances, regulations and standards (LORS) during construction and operation;

- environmental justice for minority and low income populations, when appropriate; and
- proposed conditions of certification.

Staff has prepared its final analyses and made proposed findings and recommendations for all technical areas. These proposed findings followed the publication of staff's Preliminary Staff Assessment (PSA) on May 24, 2012. As indicated above, staff conducted four public PSA workshops in the months following the PSA's release: on June 14, 2012 in Pahrump, Nevada (discussions included Traffic & Transportation, Water Supply, Worker Safety / Fire Protection and Visual Resources); on June 27, 2012 in Bishop, California (discussions included Biological Resources, Socioeconomics, Air Quality and Public Health); July 3, 2012 in Sacramento, California (discussions included Alternatives, Biological Resources, Cultural Resources and Transmission System Engineering); and, August 28, 2012 (joint workshop focused on solar flux / avian impacts). As a result of these PSA Workshops, and PSA Comments received, staff developed additional analyses and recommended mitigation measures in critical technical areas. These new analyses and recommendations include Biological Resources (solar flux impacts detailed in **Appendix BIO-1** and **Appendix BIO-2**), and Worker Safety / Fire Protection and Socioeconomics (Emergency Services impacts and mitigation measures related to Southern Inyo Fire Protection District).

Based upon the information provided, discovery achieved and analyses completed, staff concludes that the HHSEGS project does not comply with all applicable laws, ordinances, regulations and standards (LORS). Specifically, there is non-compliance, or potential non-compliance, for **Biological Resources** (prohibited take of fully protected golden eagle), **Land Use** ((County of Inyo General Plan, Zoning Ordinance and Renewable Energy Ordinance [Title 21])), and **Visual Resources** (several applicable goals and policies of the Inyo County General Plan and Renewable Energy Ordinance, Title 21).

With the implementation of its recommended mitigation measures (described in each technical section's conditions of certification), potential environmental impacts of the project will be mitigated to levels of less than significant, except in four technical areas: Biological Resources, Cultural Resources, Land Use and Visual Resources. Furthermore, in the areas of Biological Resources, Cultural Resources, and Visual Resources, staff concludes that even with implementation of all feasible mitigation measures, impacts on certain environmental resources would remain significant and unavoidable, As indicated in **Table 4**, below, the technical disciplines where issues exist (with LORS compliance and/or significant impacts determinations and mitigation):

> **Biological Resources:** staff concludes that with implementation of proposed conditions of certification, the project could comply with all federal laws, ordinances, regulations, and standards (LORS) protecting Golden Eagle and migratory birds. Most direct, indirect, and cumulative impacts on biological resources would be avoided, minimized, or mitigated to less than significant levels. Desert tortoise is the only state and federally listed endangered species that would be taken by the proposed project; these impacts can be fully mitigated with the mitigation proposed. Waters of the U.S. and waters of the state would be directly impacted by the proposed project, but these impacts would be reduced to less than significant with implementation of conditions of certification.

Feasible mitigation measures are recommended by staff to lessen impacts on avian species from exposure to solar flux and potential collisions with project features. However, impacts on avian species are still considered significant and unavoidable. Staff is undetermined whether the project complies with state law preventing the “take” of “fully protected” species such as golden eagle.

Cultural Resources: Staff concludes there would be significant and unavoidable impacts to several historical resources, including: an archaeological landscape (the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape); three ethnographic landscapes (the Salt Song Landscape, Pahrump Paiute Home Landscape and Ma-hav Landscape); and, a historic transportation corridor (Old Spanish Trail–Mormon Road Northern Corridor). Feasible mitigation measures for impacts on these historical resources would reduce some of the impacts of the proposed project, but not to a less than significant level.

Land Use: Staff concludes that the HHSEGS project would not be consistent with the County of Inyo General Plan, Zoning Ordinance and Renewable Energy Ordinance; the proposed project conflicts with these applicable land use plans. Staff has determined that the substantial size of the project, the degree of variation from local planning designations, and the presence of other potential impacts is a conflict with these LORS, and therefore causes a significant environmental impact under CEQA Guidelines Appendix G (Land Use and Planning).

Visual Resources: Staff concludes that the proposed project would substantially degrade the existing visual character or quality of the site and its surroundings. After implementing all recommended conditions of certification, the proposed project would still have significant and unavoidable direct and cumulative visual impacts. Staff also concludes that the project would not be consistent with several applicable goals and policies of the Inyo County General Plan and Renewable Energy Ordinance.

Table 4

Summary of HHSEGS FSA Technical Analyses

Technical Area	Complies with LORS	Impacts Fully Mitigated
Air Quality / GHG	Yes	Yes
Alternatives	Not Applicable	Not Applicable
Biological Resources	**Undetermined**	**NO**
Cultural Resources	Yes	**NO**
Efficiency	Not Applicable	Not Applicable
Facility Design	Yes	Yes
Geology and Paleontology	Yes	Yes

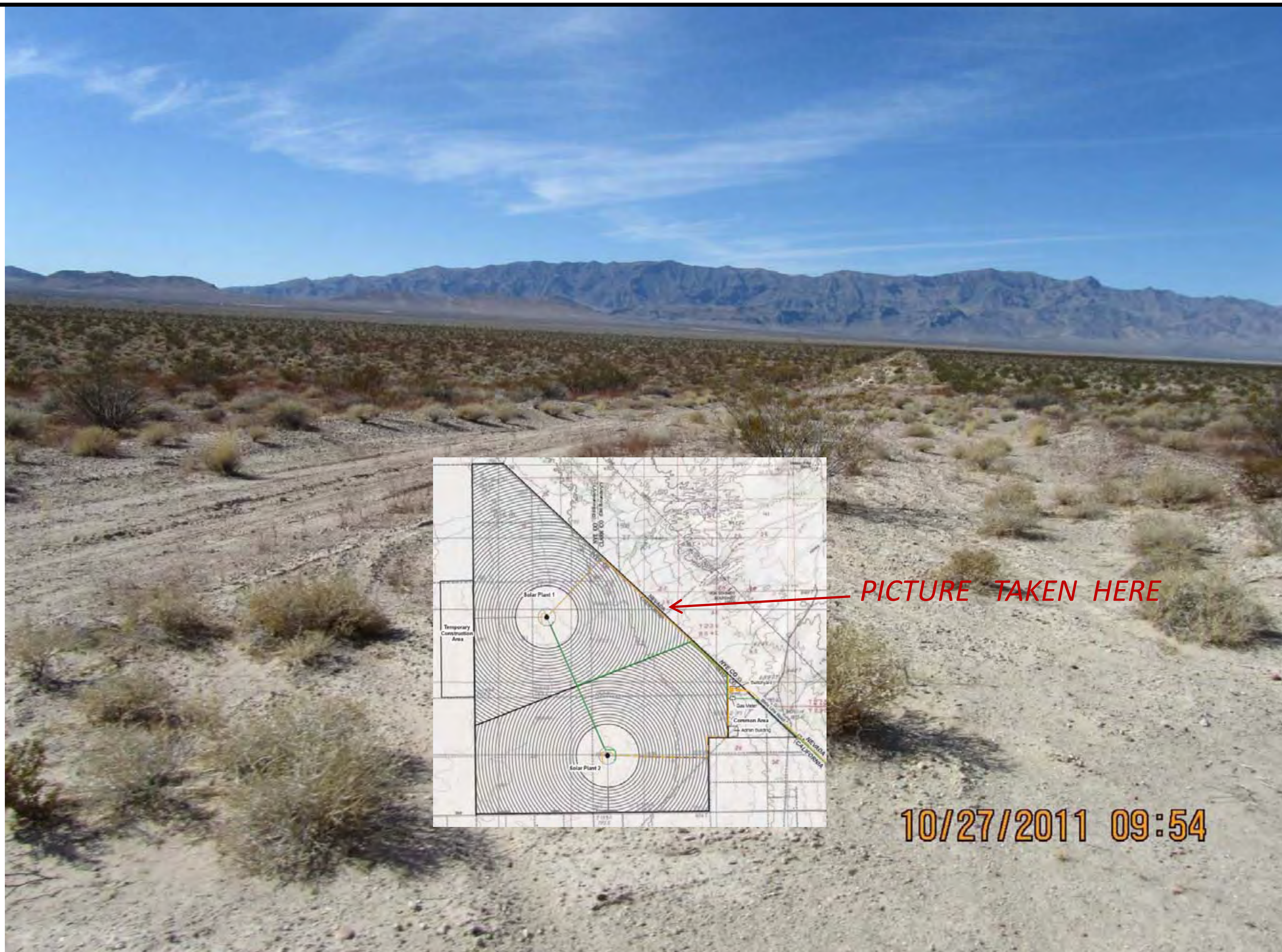
Technical Area	Complies with LORS	Impacts Fully Mitigated
Hazardous Materials Management	Yes	Yes
Land Use	**NO**	**NO**
Noise and Vibration	Yes	Yes
Public Health	Yes	Yes
Reliability	Not Applicable	Not Applicable
Socioeconomics	Yes	Yes
Soils and Surface Water	Yes	Yes
Traffic and Transportation	Yes	Yes
Transmission Line Safety and Nuisance	Yes	Yes
Transmission System Engineering	Yes	Yes
Visual Resources	**NO**	**NO**
Waste Management	Yes	Yes
Water Supply	Yes	Yes
Worker Safety and Fire Protection	Yes	Yes

SUMMARY

Staff has concluded that the proposed Hidden Hills Solar Electric Generating System does not comply with all applicable LORS, and will have significant impacts to the environment after the implementation of all feasible mitigation. If the Commission certifies the project, it must find that the project would not have significant impacts on the environment or make "overriding findings" that the benefits of the project outweigh the unavoidable significant adverse environmental effects that may be caused by the construction and operation of the facility. Moreover, for those areas not in compliance with LORS, the Commission must make specific findings of "public convenience and necessity".

EXECUTIVE SUMMARY - FIGURE 1

Hidden Hills Solar Electric Generating System (HHSEGS) - Looking west from the CA/NV border towards the Project site, with the Nopah Range in the distance. Overgrown road indicates sub-divided parcels for previously planned housing development.



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: tn:62873 M. Monasmith Photos

EXECUTIVE SUMMARY - FIGURE 2

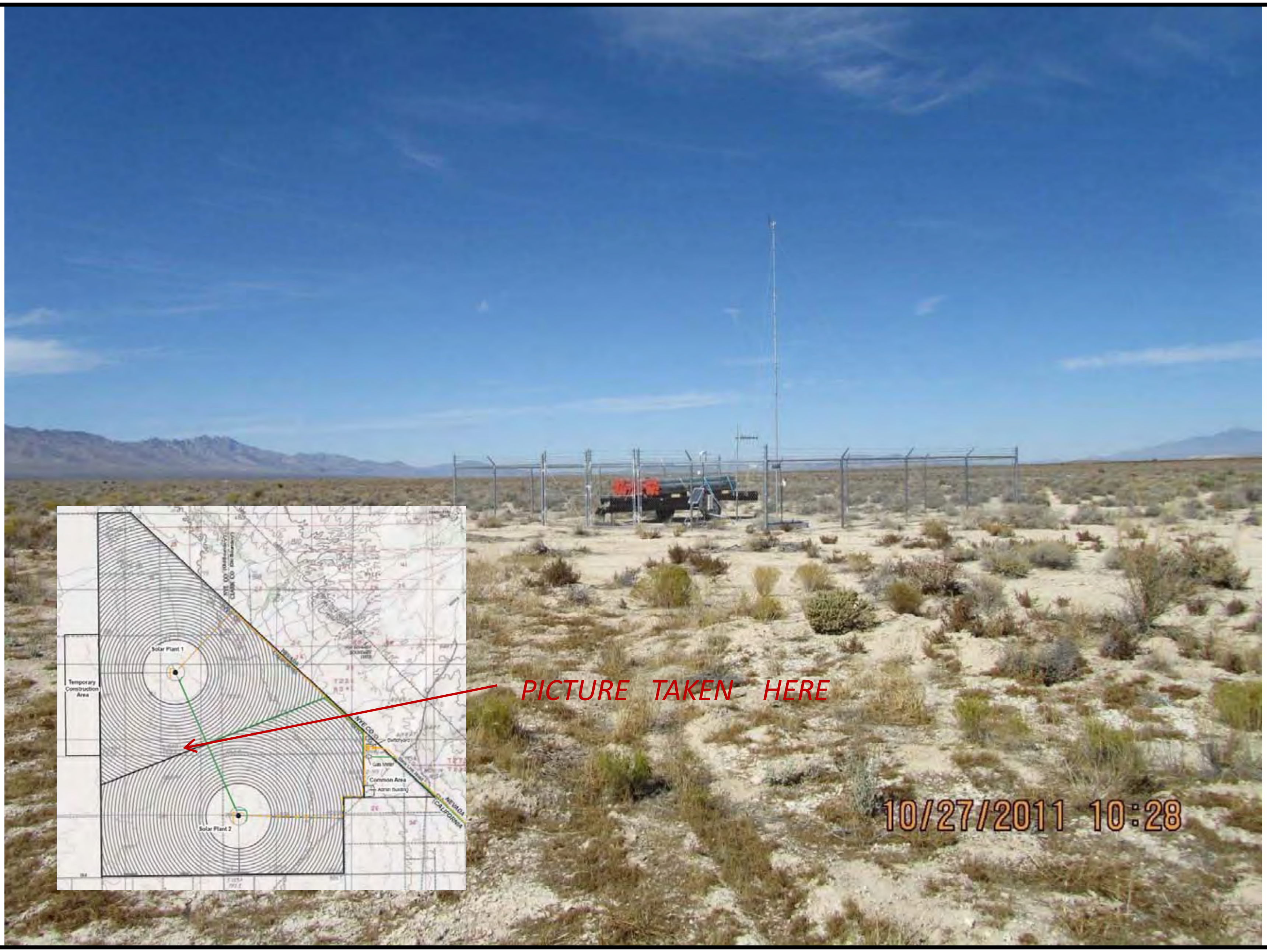
Hidden Hills Solar Electric Generating System (HHSEGS) - Looking south over the Project site with the Charleston View community and the Kingston Mountain Range in the distance. Pictured is a weakly braided ephemeral wash, which appeared on the western border of Solar Plant 1 running along the CA/NV border.

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: tn:62873 M. Monasmith Photos

EXECUTIVE SUMMARY - FIGURE 3

Hidden Hills Solar Electric Generating System (HHSEGS) - Looking north at BrightSource's Meteorological/Weather Station, located along boundary area between Solar Plant 1 and Solar Plant 2.

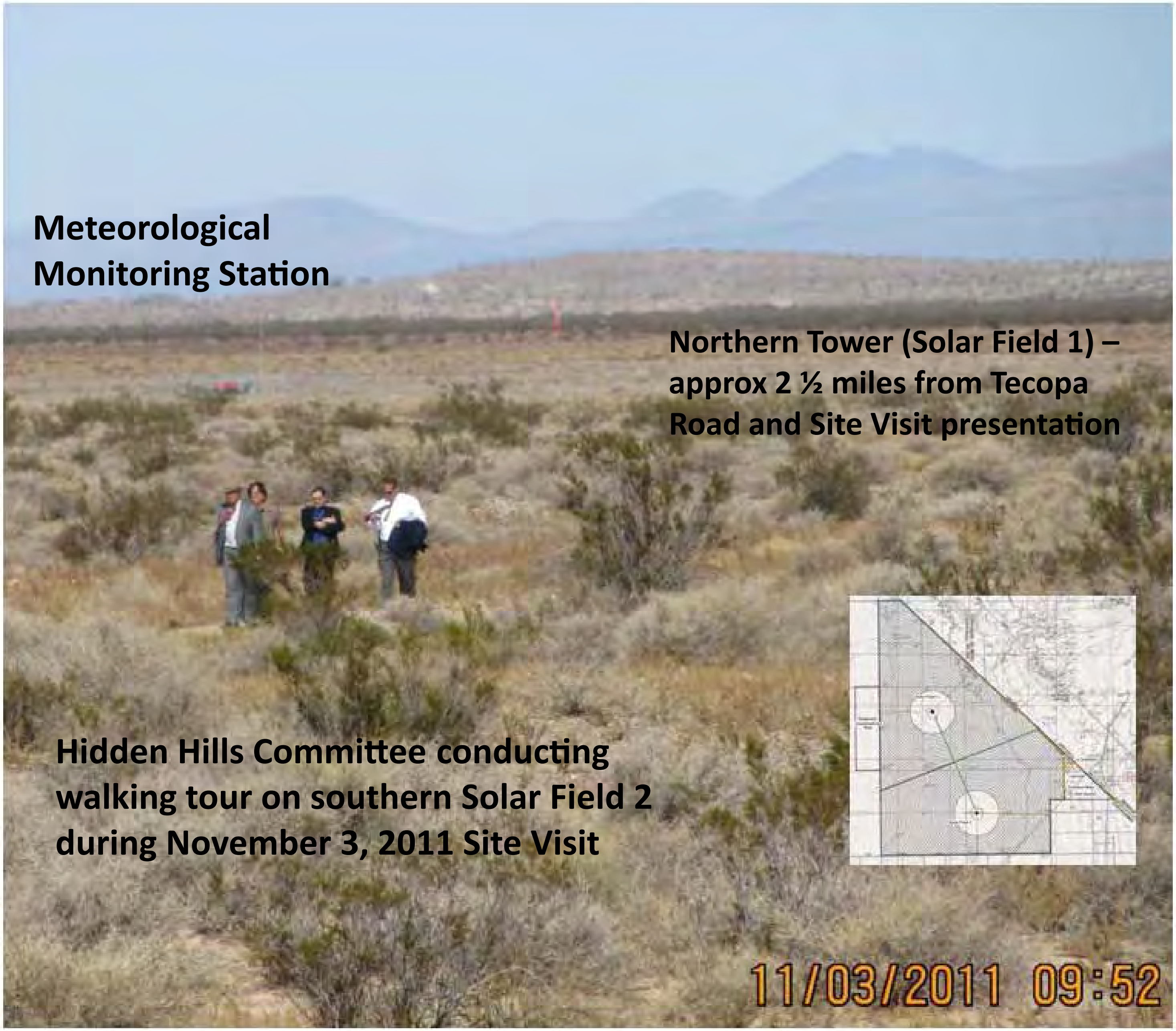


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: tn:62873 M. Monasmith Photos

EXECUTIVE SUMMARY - FIGURE 4

Hidden Hills Solar Electric Generating System (HHSEGS) - Site Visit November 3rd, 2011



SOURCE: tn:62873 M. Monasmith Photos

CUMULATIVE PROJECTS - FIGURE 1

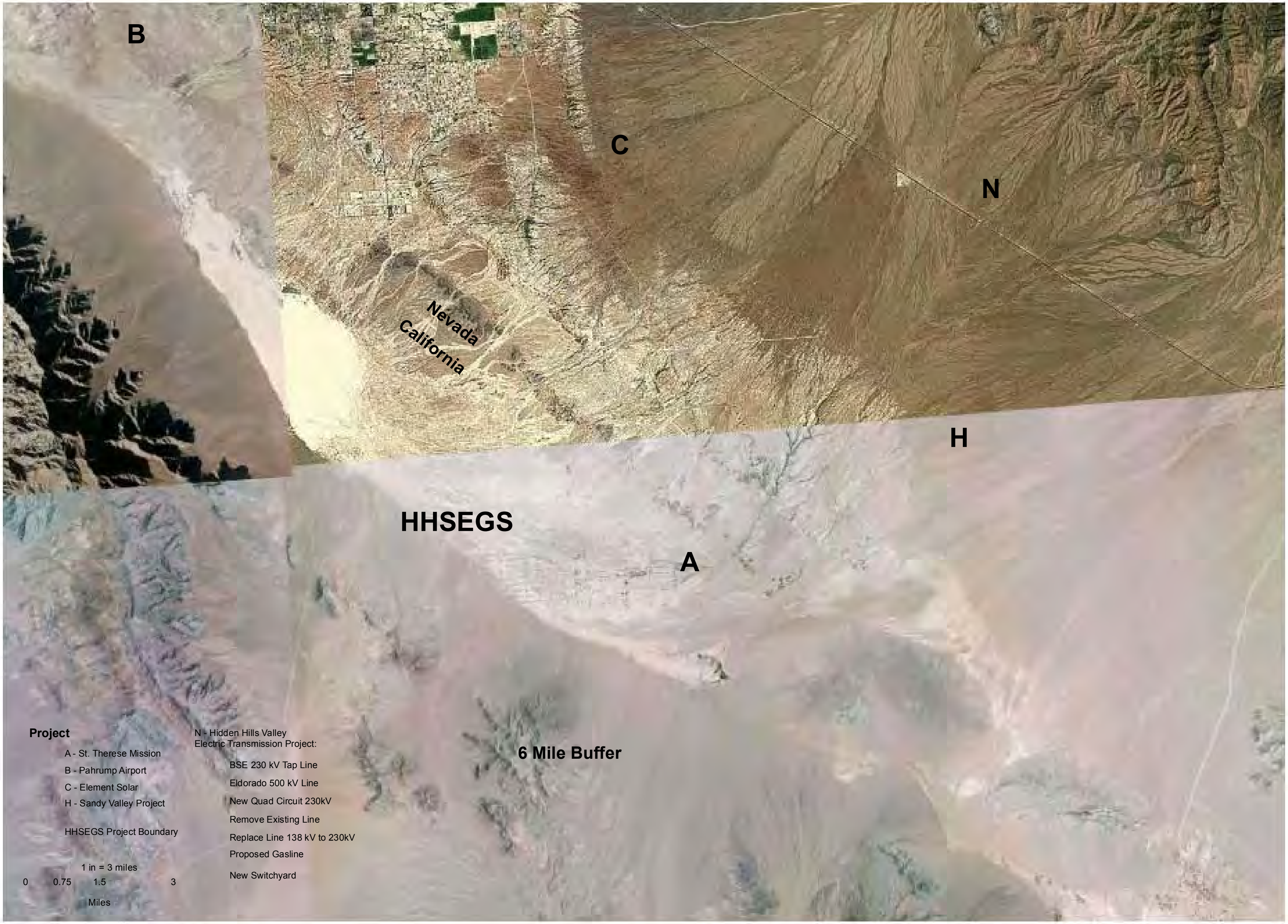
Hidden Hills Solar Electric Generating System (HHSEGS) - Master List of Cumulative Projects

CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: BLM Southern Nevada District - Renewable Energy in Southern Nevada, BLM California - Renewable Energy Priority Projects, and Los Angeles Department of Water and Power.

CUMULATIVE PROJECTS - FIGURE 2

Hidden Hills Solar Electric Generating System (HHSEGS) - Cumulative Projects within a Six Mile Buffer of HHSEGS Boundary



CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: BLM Southern Nevada District - Renewable Energy in Southern Nevada, BLM California - Renewable Energy Priority Projects, and Los Angeles Department of Water and Power.

INTRODUCTION

PURPOSE OF THIS REPORT

This Final Staff Assessment (FSA) is the California Energy Commission staff's independent analysis of the proposed Hidden Hills Solar Electric Generating System (here after referred to as HHSEGS). This FSA is a staff document. It is neither a Committee document, nor a draft decision. The FSA describes the following:

- the proposed project;
- the existing environment;
- whether the facilities can be constructed and operated safely and reliably in accordance with applicable laws, ordinances, regulations and standards (LORS);
- the environmental consequences of the project including potential public health and safety impacts;
- the potential cumulative impacts of the project in conjunction with other existing and known planned developments;
- mitigation measures proposed by the applicant, staff, interested agencies, local organizations and intervenors which may lessen or eliminate potential impacts;
- the proposed conditions under which the project should be constructed and operated, if it is certified; and
- project alternatives.

The analyses contained in this FSA are based upon information from the: 1) Application for Certification (AFC), 2) responses to data requests, 3) supplementary information from local, state, and federal agencies, interested organizations and individuals, 4) existing documents and publications, 5) independent research, and 6) comments at public workshops. The analyses for most technical areas include discussions of proposed conditions of certification. Each proposed condition of certification is followed by a proposed means of "verification." The FSA presents staff's testimony about potential environmental impacts and conformity with LORS, as well as proposed conditions that apply to the design, construction, operation and closure of the facility.

The Energy Commission staff's analyses were prepared in accordance with Public Resources Code section 25500 et seq. and Title 20, California Code of Regulations section 1701 et seq., and the California Environmental Quality Act (CEQA) (Pub. Resources Code, §21000 et seq.)

ORGANIZATION OF THE FINAL STAFF ASSESSMENT

The FSA contains an Executive Summary, Introduction, Project Description and Project Alternatives. The environmental, engineering, and public health and safety analysis of the proposed project is contained in a discussion of 20 technical areas. Each technical area is addressed in a separate chapter. They include the following: 1) air quality/greenhouse gas; 2) biological resources; 3) cultural resources; 4) facility design; 5) geology and paleontology; 6) hazardous materials management; 7) land use; 8) noise and vibration; 9) power plant efficiency; 10) power plant reliability; 11) public health; 12) socioeconomics; 13) soils and surface water; 14) traffic and transportation; 15) transmission line safety and nuisance; 16) transmission system engineering; 17) visual resources; 18) waste management; 19) water supply; and, 20) worker safety and fire protection; These chapters are followed by a discussion of facility closure, project construction and operation compliance monitoring plans called “General Conditions”, and a list of staff that assisted in preparing this report.

Each of the 20 technical area assessments includes a discussion of:

- laws, ordinances, regulations and standards (LORS);
- the regional and site-specific setting;
- project specific and cumulative impacts;
- mitigation measures;
- conclusions and recommendations; and
- conditions of certification for both construction and operation (if applicable).

ENERGY COMMISSION SITING PROCESS

The Energy Commission has the exclusive authority to certify the construction, modification and operation of thermal electric power plants 50 megawatts (MW) or larger. The Energy Commission certification is in lieu of any permit required by state, regional, or local agencies, and federal agencies to the extent permitted by federal law (Pub. Resources Code, §25500). The Energy Commission must review power plant AFCs to assess potential environmental impacts including potential impacts to public health and safety, potential measures to mitigate those impacts [Pub. Resources Code, §25519), and compliance with applicable governmental laws or standards (Pub. Resources Code, §25523 (d)].

The Energy Commission’s siting regulations require staff to independently review the AFC and assess whether the list of environmental impacts contained is complete, and whether additional or more effective mitigation measures are necessary, feasible and available [Cal. Code Regs., tit. 20, §§1742 and 1742.5(a)]. In addition, staff must assess the completeness and adequacy of the measures proposed by the applicant to ensure compliance with health and safety standards, and the reliability of power plant operations [Cal. Code Regs., tit. 20, §1743(b)]. Staff is required to develop a compliance plan (coordinated with other agencies) to ensure that applicable laws, ordinances, regulations and standards are met [Cal. Code Regs., tit. 20, §1744(b)].

Staff conducts its environmental analysis in accordance with the requirements of CEQA. No additional Environmental Impact Report (EIR) is required because the Energy Commission’s site certification program has been certified by the California Resources Agency as meeting all requirements of a certified regulatory program [Pub. Resources

Code, §21080.5 and Cal. Code Regs., tit. 14, §15251 (j)]. The Energy Commission is the CEQA lead agency.

Staff prepares a FSA that presents for the applicant, intervenors, organizations, agencies, other interested parties and members of the public, the staff's analysis, conclusions, and recommendations. Where it is appropriate, the PSA incorporates comments received from agencies, the public and parties to the siting case, comments made at the workshops, and Preliminary Staff Assessment (PSA) comments.

Staff provided a comment period following publication of the PSA to resolve issues between the parties and to narrow the scope of adjudicated issues in the evidentiary hearings. During the period after the publishing of the PSA, staff conducted three community workshops to discuss its findings, proposed mitigation, and proposed compliance-monitoring requirements. Based on the workshops and written comments, staff refined its analysis, corrected errors, and finalized conditions of certification to reflect areas where agreements had been reached with the parties, and now publishes its Final Staff Assessment (FSA).

The FSA is only one piece of evidence that will be considered by the Committee (consisting of two Commissioners who have been assigned to this project, and a Hearing Officer) in reaching a decision on whether or not to recommend that the full, five-member Energy Commission approve the proposed project. At public hearings that will be conducted following publication of the FSA, all parties will be afforded an opportunity to present evidence and to rebut the testimony of other parties, thereby creating a hearing record on which a decision on the project can be based. The hearing before the Committee also allows all parties to argue their positions on disputed matters, if any, and it provides a forum for the Committee to receive comments from the public and other governmental agencies.

Following the hearings, the Committee's recommendation to the full Energy Commission on whether or not to approve the proposed project will be contained in a document entitled the Presiding Member's Proposed Decision (PMPD). Following publication, the PMPD is circulated in order to receive written public comments. At the conclusion of the comment period, the Committee may prepare a revised PMPD. At the close of the comment period for the revised PMPD, the PMPD is submitted to the full Energy Commission for a decision.

AGENCY COORDINATION

As noted above, the Energy Commission certification is in lieu of any permit required by state, regional, or local agencies, and federal agencies to the extent permitted by federal law (Pub. Resources Code, § 25500). However, the Commission typically seeks comments from and works closely with other regulatory agencies that administer LORS that may be applicable to proposed projects. These agencies may include as applicable the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, U.S. Bureau of Land Management, California State Lands Commission, State Water Resources Control Board/Regional Water Quality Control

Board, California Department of Fish and Game, and the California Air Resources Board.

OUTREACH

The Energy Commission's outreach program is primarily facilitated by its Public Adviser's Office (PAO). This is an ongoing process that provides a consistent level of public outreach, regardless of outreach efforts conducted by the applicant or other parties.

On June 1, 2012, the Energy Commission staff sent the HHSEGS PSA to public libraries in Pahrump and Las Vegas, Nevada, as well as public libraries in Barstow, Bishop, Independence and Tecopa, California. The documents were also sent to state libraries in Eureka, Fresno, Los Angeles, Sacramento, San Diego, and San Francisco.

The PAO's public outreach work is an integral part of the Energy Commission's AFC review process. The PAO reviewed information provided by the applicant and also conducted its own outreach efforts to identify any "sensitive receptors" (including schools, community, cultural and health facilities, daycare and senior-care centers, as well as environmental and ethnic organizations) within a six-mile radius of the proposed site for the project. If present, these sensitive receptors, especially elementary schools, are contacted and kept informed of Energy Commission proceedings through PAO outreach. The PAO also works with the siting division and the governmental affairs office to identify and contact local elected and appointed officials from the area.

The PAO provided notification by letter and enclosed notice of the November 3, 2011 Informational Hearing and Site Visit, held at the Tecopa Community Center in Tecopa, California. Notices were distributed to local residences and community organizations as well as representatives of environmental, Native American, and certain public interest and regulatory organizations with an expressed or anticipated interest in this project. Also, elected and certain appointed officials from Inyo County (California) and Nye County (Nevada) were similarly notified of the hearing and site visit.

Energy Commission regulations require staff to notice, at a minimum, property owners within 1,000 feet of a project and 500 feet of a linear facility (such as transmission lines, gas lines and water lines). This was done for the HHSEGS project. Staff's ongoing public and agency coordination activities for this project are discussed under the Public and Agency Coordination heading in the **EXECUTIVE SUMMARY** section of the **FSA**.

PROJECT DESCRIPTION

Testimony of Mike Monasmith

INTRODUCTION

The Hidden Hills Solar Electric Generating System (HHSEGS) project is being developed by Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC. Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC, are wholly owned subsidiaries of Hidden Hills Solar Holdings, LLC, which is in turn a wholly owned subsidiary of BrightSource Energy, Inc., (Applicant). As proposed, HHSEGS would be located on approximately 3,096 acres of privately owned land leased in Inyo County, California, adjacent to the Nevada border. The project site is approximately 8 miles directly southeast of Pahrump, Nevada (with a driving distance of 28 miles), and approximately 45 miles northwest of Las Vegas, Nevada (**Project Description Figure 1**).

As proposed, HHSEGS would comprise two solar fields and associated facilities: the northern solar plant (Solar Plant 1) and the southern solar plant (Solar Plant 2). Each solar plant would generate 270 megawatts (MW) gross (250 MW net), for a total net output of 500 MW. Solar Plant 1 will occupy approximately 1,483 acres (or 2.3 square miles), and Solar Plant 2 will occupy approximately 1,510 acres (or 2.4 square miles). A 103-acre common area would be established on the southeastern corner of the site to accommodate an administration, warehouse, and maintenance complex, an onsite 138 kV switchyard and a natural gas metering station. A temporary construction lay down and parking area on the west side of the proposed project site would temporarily occupy approximately 180 acres (**Project Description Figure 2**). The temporary construction laydown area in addition to the entire HHSEGS site would total 3,277 acres.

PROJECT LOCATION AND JURISDICTION

HHSEGS is located in Township 22 North, Range 10 East, Sections (or portions thereof) 15, 16, 20, 21, 22, 23, 26, 27, and 28[1] on privately owned land. The assessor parcel numbers (APNs) for the site are: 048-110-002; 048-120-010; Book 048, page 30, parcels 03 to 06 and 12 to 14; Book 048, page 62, parcels 03 to 06 and 11 to 14, and all parcels in Book 048 pages 50, 60, 61, and 64 through 71.

The project site is located in the southern portion of Pahrump Valley, an internally drained basin bound by the Resting Spring and Nopah Ranges on the west and northwest, by the Kingston Range on the southwest, and by the Spring Mountains on the east. Pahrump Dry Lake lies about three miles northwest of the HHSEGS site. To the southeast, a low divide separates Pahrump Valley from Sandy Valley while, to the northeast, another low divide separates it from Stewart Valley. To the north, the Last Chance Range separates the Pahrump Valley from the Amargosa Desert.

The project site is bordered by paved Old Spanish Trail Highway (also called Tecopa Road) to the south, unpaved Quartz Street to the west, the California-Nevada border to the east, and an unpaved road along the northern border. Numerous unpaved roads

[1] San Bernardino Base and Meridian

also extend in a north-south and east-west grid pattern across the site from a 1960’s housing subdivision that was never constructed. Please see **Project Description Figure 7** to view existing landscape conditions on the proposed project site, The nearest community to the project site is several dozen residences that comprise Charleston View, immediately south of the project site and Tecopa Road . The closest town is Pahrump, Nevada, located approximately 8 miles directly north of the project area (with a driving distance of approximately 28 miles via Tecopa Road and Nevada State Route 160).

Project access would be from Old Spanish Trail Highway (Tecopa Road) to the project entrance road on the east side of the project (**Project Description Figure 4**). The internal roadway and utility corridors for each heliostat field and its power block would contain a 20-foot-wide paved road from the entrance of the solar plant site to the power block, and then around the power block. Within the heliostat fields, 10-foot wide “drive zones” would be located concentrically around the power block to provide access to the heliostat mirrors for maintenance and periodic cleaning. A 12-foot-wide unpaved path would be constructed on the inside perimeter of the project boundary fence for use by HHSEGS personnel to monitor and maintain perimeter security, and for tortoise exclusion fencing. These paths would be grubbed, bladed, and smoothed to facilitate safe use with minimal grading where necessary to cross washes.

State and Federal Jurisdiction

Once offsite, the HHSEGS transmission line and natural gas pipeline are both located wholly within the state of Nevada, primarily on federal land managed by the Bureau of Land Management (BLM). The Energy Commission has exclusive permitting jurisdiction for the siting of thermal power plants of 50 MW or more and related facilities in California. The Energy Commission also has responsibility for ensuring compliance with the California Environmental Quality Act (CEQA) through the administration of its certified regulatory program. The HHSEGS project site is located within California. As such, the Energy Commission has CEQA jurisdiction over the direct, indirect, and cumulative impacts for proposed activities on the HHSEGS project site.

Once the transmission line and the natural gas pipeline exit the eastern border of the project site into Nevada, the those linear portions of the project are considered a federal action requiring review under and compliance with the National Environmental Policy Act of 1969 (NEPA). The NEPA process for the proposed BLM project (Valley Electric Association Hidden Hills Transmission Project) is anticipated to occur within a 12 month timeframe and consist of several steps. At the early stage in BLM’s process, they will identify the range or scope of public and agency issues through comments received in meetings and discussions with relevant agencies and the public. Once the BLM has an understanding of the issues, their study team will begin to gather data on resources within the study area. Based on the description of the proposed project and any alternatives to be evaluated; issues identified; and resource data, an Environmental Impact Statement (EIS) team will assess potential impacts that could result from the project and identify measures to mitigate, or reduce those impacts to a less-than-significant level. A Draft EIS for the Valley Electric Association (VEA) Hidden Hills Transmission Project is expected to be published by BLM (Nevada) in late 2012 or early 2013.

The Energy Commission and BLM staff (from Nevada and California) have coordinated several aspects of their respective CEQA and NEPA regulatory review processes, including the technical disciplines of **Biological Resources**, **Cultural Resources** and **Water Supply**. This coordination, particularly for Biological Resources, involves the active participation of several other state and federal agencies, including the California Department of Fish and Game and the US Fish & Wildlife Service.

PROJECT DESCRIPTION, DESIGN AND OPERATION

This section describes HHSEGS's conceptual design and various aspects of its proposed operation, if approved and once constructed.

PROCESS DESCRIPTION

In each solar plant, one Rankine-cycle non-reheat steam turbine would receive live steam from a *solar receiver steam generator* (SRSG) located in the power block at the top of the solar power tower (**Project Description Figure 5**). The solar field and power generation equipment would be started each morning after sunrise and insolation build-up, and would shut-down when insolation drops below the level required keeping the turbines online. Natural-gas-fired auxiliary boilers may also be used to extend daily power generation and to pre-warm the SRSG to minimize the amount of time required for startup each morning, to assist during shutdown cooling operation, and to augment the solar operation during the evening shoulder period as solar energy diminishes.

Power Cycle

Solar energy is reflected by the heliostats onto the SRSG where the energy heats water into superheated steam. The steam is then routed via the main steam pipe to the steam turbine generator (STG) where the steam's energy is converted to electrical energy. The solar plant's power cycle is based on a Rankine-cycle steam turbine with three pressure stage casings. Primary thermal input is via an SRSG located at the top of the solar power tower. Live superheated steam enters a high pressure (HP) turbine casing at 2,466 pounds per square inch absolute (psia) and 1,085 degrees Fahrenheit (°F) Following expansion through the HP turbine, the steam is conveyed to the inlet of the intermediate pressure (IP) turbine. Steam enters the IP turbine at 535 psia and 666°F. Upon exiting the IP turbine, the steam travels via the crossover pipe to the inlet of the low pressure (LP) turbine. Steam enters the LP turbine at 78 psia and 310° F and exits at 1.6 psia or 3.25 inches of mercury into the air-cooled condenser.

Condensate is sent from the condenser well through four low-pressure feed water heaters to the deaerator, which also serves for feed water reserve storage and is the point of feed water make-up injection. From the deaerator, high-pressure feed water pumps send feed water through three high pressure feed water heaters and it is returned to the SRSG.

PROJECT FEATURES AND FACILITIES

Each solar plant would use heliostats (elevated mirrors guided by a tracking system mounted on a pylon) to focus the sun's rays on a solar receiver steam generator (SRSG) – a solar boiler that produces steam used to generate electricity – atop a solar power tower near the center of each solar field. The solar field and power generation equipment would start each morning after sunrise and, unless augmented, would shut down when insolation (sun ray and intensity) drops below the level required keeping turbines online and producing electricity. Please see **Project Description Figure 8** for an illustration of HSEGS technology.

Heliostats

Each of the heliostat assemblies is composed of two mirrors, each approximately 12 feet high by 8.5 feet wide with a total reflecting surface of 204.7 square feet. Each heliostat assembly is mounted on a single pylon, along with a computer-programmed aiming control system that directs the motion of the heliostat to track the movement of the sun. Communication between the heliostats and the operations center will be done via surface-mounted anchored cable or wireless remote system. The solar field for each solar plant will consist of approximately 85,000 heliostats, for a total of 170,000.

Solar Plants

The following provides further details regarding the two 270-MW (250-MW net) solar plants.

- The SRSG located at the top of the 590 foot tall solar power tower is approximately 160 feet tall, resulting in an overall power tower height of approximately 750 feet.
- No heliostat will be built closer than 394 feet from the solar power tower location.
- For Solar Plant 1, the distance between the solar power tower and the farthest heliostat in the solar field, approximately 7,660 feet, is in the northwest section of the heliostat array. For Solar Plant 2, the longest distance between the solar power tower and the farthest heliostat in the solar field (approximately 6,523 feet) is in the northeast section of the heliostat array. Generally, this is due to the higher efficiency of heliostats in the northern section in the northern hemisphere. With the sun predominantly in the southern sky, the cosine effect of incidence and reflection angles is less in the northern heliostats than in the southern ones. The converse (lower collection efficiency in the southern section) is also true, and, therefore, the maximum southern arc radius is the shortest.
- The eastern sector heliostat energy collection is more valuable than the western sector collection because afternoon energy collection, during on-peak utility hours, is more valuable than morning energy collection, during part-peak or off-peak hours.

Steam Turbine Generator

The steam turbine system consists of a condensing STG with gland steam system, lubricating oil system, hydraulic control system, and steam admission/induction valving. HP steam from the SRSG super-heater enters the HP steam turbine section through the inlet steam system. The steam expands through multiple stages of the turbine, driving the generator. On exiting the LP turbine, the steam is directed into the air-cooled condenser.

Natural Gas Boilers

Each solar plant would include a 249 MMBtu/hr natural gas fired auxiliary boiler that would be used to pre-warm the SRSG to minimize the amount of time required for startup each morning, to assist during shutdown cooling operation, and to augment the solar operation during the evening shoulder period as solar energy diminishes. Additionally, each solar plant would include a 15 MMBtu/hr nighttime preservation boiler to maintain system temperatures overnight.

Boiler Feed water System

The boiler feed water system transfers feed water from the deaerator to the SRSG. The System would consist of one turbine driven pump (booster and main), one motor driven backup (booster and main) feed water pump, and one motor driven startup pump. The turbine driven pump is sized for 100% capacity for supplying the SRSG. The startup pump would be sized for 25% capacity and include a variable frequency drive (VFD). The backup pump would be sized for 50% tribune load and include a VFD. The pumps would be multistage, horizontal and would include regulating control valves, minimum flow recirculation control and other associated piping and valves.

Condensate System

The condensate system would provide a flow path from the condensate collection tank to the deaerator. The condensate system would include two 50% capacity multistage vertical, motor-driven condensate pumps with VFDs. The system would also include deep bed condensate polishers with offsite regeneration.

Demineralized Water System

The demineralized water system would consist of ion exchanges. Resin media from the vessels would be regenerated off site by a third party water treatment supplier. Spare resin for the two plants would be stored in the warehouse located in the common area. Demineralized water would be stored in the demineralized water tank.

Power Cycle Makeup and Storage

The power cycle makeup and storage subsystem provides demineralized water storage and pumping capabilities to supply high purity water for system cycle makeup and chemical cleaning operations. Major components of the system are the demineralized water storage tank; demineralized water treatment system, and two 100% capacity, horizontal, centrifugal cycle makeup water pumps.

Water Supply and Use

Groundwater would be drawn daily from six onsite groundwater supply wells that would be drilled and developed to provide raw water for the HHSEGS project; two new wells per power block (primary and backup) and two wells at the administration complex. The wells would supply both solar plants and would be used for the power cycle make-up water, mirror wash water, and other domestic uses. The entire 500-MW net project would require up to 84.5 gallons per minute (gpm) (average) raw water make-up, with 30 to 50 gpm required by each plant, and 3.5 gpm (average) required for potable water use (please see the **Water Supply** section of this **FSA** for more details).

HHSEGS will generate electricity up to 16 hours a day, with the exception of a scheduled shutdown in late December for maintenance. However, the water treatment plant would operate continuously in order to minimize water treatment system size and capital cost, and to use off-peak energy at night. A breakdown of the estimated average daily quantity of water required for HHSEGS operation is presented in **Table1**. The daily water requirements shown are estimated quantities based on HHSEGS operating at full load.

TABLE 1
Average Daily Water Requirements with Both Solar Plants in Operation

Water Use	Average Daily Use (gpm)	Annual Use (ac-ft/yr)
Process and heliostat wash	84.5	135
Potable water service (including Common Area)	3.5	5

ac-ft/yr = acre-feet per year

To reduce the number of truck trips during construction, the applicant intends to drill a temporary well to be used during construction only, primarily for the onsite concrete batch plant used to serve project construction needs. This temporary well will eliminate the need to bring water to the construction area via tanker truck, and will not increase water usage above the 288 acre-feet per year needed during 29 months of construction, which is expected to take place from the second quarter of 2013 to the fourth quarter of 2015.

Electrical Transmission System

HHSEGS will interconnect to the Valley Electric Association (VEA) system.[2] The interconnection would require an approximately 10-mile-long generation tie-line (gen-tie line) from the HHSEGS to the proposed Crazy Eyes Tap Station,[3] where the project would interconnect to the VEA electric grid. The gen-tie line would originate at the HHSEGS' onsite switchyard, cross the Nevada state line, and continue east for approximately 1.5 miles until reaching Tecopa Road. At Tecopa Road, the route would head northeast paralleling Tecopa Road until it reaches the Crazy Eyes Tap Substation, which would be located immediately east of the Tecopa Road/SR 160 intersection (see (**Project Description Figure 6**). The Crazy Eyes Tap Substation would interconnect to the existing VEA Pahrump-Bob Tap 230-kV line.

The bulk of the electric power produced by the facility would be transmitted to the grid. A small amount of electric power would be used onsite to power auxiliaries such as pumps and fans, control systems, and general facility loads including lighting, heating,

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[2] In January, 2013, VEA will become a participating transmission owner (PTO) and will turn operational control of its facilities over to the California Independent System Operator (CAISO).

[3] In the HHSEGS AFC, and in the Preliminary Staff Assessment published on 5/24/2012, this substation was referred to as the "Tap Substation."

and air conditioning. Some power would also be converted from alternating current (AC) to direct current (DC) and stored in batteries, which would be used as backup power for the plant control systems and essential uses. No electrical power would be made available off-site.

Natural Gas Supply System

A 12-inch-diameter natural gas pipeline would be required for the project. The gas pipeline would enter the HHSEGS site in the common area where it would connect with an onsite gas metering station. It would exit the HHSEGS site at the California-Nevada border, extending 32.4 miles to the Kern River Gas Transmission (KRGT) existing mainline system just north of Goodsprings in Clark County, Nevada (see **Project Description Figure 6**).

Plant Cooling Systems

The cycle heat rejection system would consist of an air-cooled steam condenser system. The heat rejection system would receive exhaust steam from the low-pressure section of the steam turbine and feed water heaters and condense it back to water for reuse. The condenser would be designed to normally operate at a pressure of about 3.2 inches of mercury absolute (0.11 millibar absolute). The condenser would remove heat from the condensing steam up to a maximum of 1,140 million British thermal units per hour (MMBtu/hr), depending on ambient temperature and plant load. An auxiliary cooling system would cool the generator, steam turbine generator lubrication oil, boiler feed pump lubricating oil, SRSG circulating water pumps, and other equipment requiring cooling. A maximum of 34 MMBtu/hr would be rejected to the atmosphere via a fin-fan heat exchanger. Above 85°F, the fin-fan heat exchanger would be assisted by wet surface air coolers using intermediate quality deionized water.

Fire Protection

The fire protection system would be designed to protect personnel and limit property loss and plant downtime in the event of a fire. The primary source of fire protection water will be the raw water storage tank. Each solar plant would have a raw water tank with a capacity of 250,000 gallons. A portion of the raw water (100,000 gallons) is for plant use while the majority would be reserved for fire water. An electric jockey pump and electric-motor-driven main fire pump would be provided to increase the water pressure in the plant fire main to the level required to serve all fire fighting systems. In addition, a back-up, diesel-engine-driven fire pump would be provided to pressurize the fire loop if the power supply to the electric-motor-driven main fire pump fails. A fire pump controller would be provided for each fire pump.

The fire pump would discharge to a dedicated underground firewater loop piping system. Normally, the jockey pump would maintain pressure in the firewater loop. Both the fire hydrants and the fixed suppression systems would be supplied from the firewater loop. Fixed fire suppression systems would be installed at determined fire risk areas such as the transformers and turbine lube oil equipment.

Sprinkler systems would also be installed in the administration complex buildings and fire pump enclosure as required by National Fire Protection Association (NFPA), and local code requirements. Handheld fire extinguishers of the appropriate size and rating would be located in accordance with NFPA 10 throughout the facility. The project site is within the Southern Inyo Fire Protection Department (SIFPD) jurisdiction. Please refer to the **Worker Safety / Fire Protection** section of this **FSA** for more detailed specifics related to all aspects of fire response and emergency services for HHSEGS construction and operation.

HAZARDOUS MATERIALS

There will be a variety of hazardous materials used and stored during construction and operation of the Project. The **Hazardous Materials Management** section of this **FSA** provides additional data on the hazardous materials that will be used during construction and operation, including quantities, associated hazards and permissible exposure limits, storage methods, and special handling precautions. Hazardous materials that will be used during construction include gasoline, diesel fuel, oil, lubricants, and small quantities of solvents and paints. All hazardous materials used during construction and operation will be stored on site in storage tanks, vessels and containers that are specifically designed for the characteristics of the materials to be stored; as appropriate, the storage facilities will include the needed secondary containment in case of tank/vessel failure.

WASTE MANAGEMENT

Waste management is the process whereby all wastes produced at the project site are properly collected, treated (if necessary), and disposed of. Wastes include process and sanitary wastewater, nonhazardous waste, and hazardous waste, both liquid and solid. The **Soils and Surface Water** section of this **FSA** discusses process wastewater and sanitary wastewater. For all other wastes, the **Waste Management** section of this **FSA** will detail the process by which both hazardous and nonhazardous wastes from HHSEGS construction and operation will be appropriately stored, transferred and disposed.

EMISSION CONTROL AND MONITORING

Air emissions from the combustion of natural gas in the auxiliary-boilers at each plant would be controlled using appropriate air emission control devices. The auxiliary boilers are subject to acid rain requirements; however, because of their low emissions, they are eligible to use the low mass emissions (LME) methodology and will not be required to use acid rain continuous emissions monitoring systems (CEMS).

PROJECT CONSTRUCTION AND CLOSURE

The Construction of HHSEGS, from perimeter fencing to site preparation and grading to commercial operation, is expected to take place from the second quarter of 2013 to the fourth quarter of 2015 (29 months total). Major milestones are listed in **Table 2** (although the construction order may change). Construction of the common area facilities would occur concurrently with the construction of the first plant.

Table 2
Project Schedule Major Milestones

Activity	Date
Solar Plant 1	
Fencing and tortoise clearance	Second Quarter 2013
Begin construction	Second Quarter 2013
Startup and commissioning	Second Quarter 2015
Commercial operation	Third Quarter 2015
Solar Plant 2	
Fencing and tortoise clearance	Second Quarter 2013
Begin construction	Third Quarter 2013
Startup and commissioning	Third Quarter 2015
Commercial operation	Fourth Quarter 2015

The construction workforce need would range from a high of 2,293 workers in month 19, a low of 128 workers in the first month, and an average of 1,087 workers during the entire 29-month construction period. A permanent operations workforce of 100 workers would be needed for the project. A comprehensive workforce analysis can be reviewed in the **Socioeconomics** section of this **FSA.**

The nearest residence to the proposed project would be approximately 3,500 feet south of Solar Plant 2, and 950 south of the perimeter. The St. Therese Mission is approximately 1.7 miles from the nearest power block (Solar Plant 2). Noisy construction activities occurring within 500 feet of existing noise sensitive uses would be limited to the hours of 7:00 a.m. to 7:00 p.m. Monday through Saturday. Generally, construction activities would occur from 5:00 a.m. to 3:30 p.m. with a swing shift from 6:00 p.m. to 4:30 a.m. Additional hours may be necessary to make up schedule deficiencies, or to complete critical construction activities (e.g., tower construction, foundation pouring, or working around time-critical shutdowns and constraints). During some construction periods and during the startup phase of the project, some activities would continue 24 hours per day, seven days per week. Specific information on noise impacts can be reviewed in the **Noise and Vibration** section of this **FSA**.

PROJECT CONSTRUCTION

General Grading and Leveling

The surface soil grade of each area would be designed for access of installation equipment and materials during site construction and operations. Most of the natural drainage features would be maintained and any grading required would be designed to promote sheet flow where possible. Heavy to medium grading would be performed within each plant's solar power tower and power block areas, for the switchyard, within the administration complex area, and for the heliostat assembly buildings. The deepest excavations would be restricted to foundations and sumps. Within each of these individual areas, earthwork cuts and fills will be balanced to the degree possible. The earthwork within the power blocks and common area would be excavated and compacted to the recommendations of the associated geotechnical report. At some washes, limited grading may be required. Surface rocks and boulders would need to be relocated to allow proper installation of heliostats and facilities when they cannot be avoided.

Storm Drainage System

The majority of the project site would maintain the original grades and natural drainage features and, therefore, will require no added storm drainage control. In limited areas, such as the power blocks, switchyard, heliostat assembly buildings and administrative areas, the storm water management system would include diversion channels, bypass channels, or swales to direct run-on flow from up-slope areas and run-off flow through and around each facility. Diversion channels would be designed so that a minimum ground surface slope of 0.5% would be provided to allow positive, puddle-free drainage. To reduce erosion, storm drainage channels may be lined with non-erodible materials such as compacted rip-rap, geo-synthetic matting, or engineered vegetation. The design would be developed for sheet flow for all storm events less than or equal to a 100-year, 24-hour storm event. All surface runoff during and after construction would be controlled in accordance with the requirements of the Drainage, Erosion, and Sedimentation Control Plan, and all other applicable LORS.

Erosion and Sediment Control Measures

Protection of soil resources would be an important factor in the design of the erosion and sedimentation controls. To minimize wind and water erosion, open spaces would be preserved and left undisturbed maintaining existing vegetation to the extent possible with respect to site topography and access requirements. Areas compacted during construction activities would be restored, as appropriate, to approximate preconstruction compaction levels to minimize the opportunity for any increase in surface runoff.
If needed, stone filters and check dams would be strategically placed throughout the project site to provide areas for sediment deposition and to promote the sheet flow of storm water prior to leaving the project site boundary. Native materials (rock and gravel) would be used for the construction of the stone filter and check dams. Diversion berms would be used to redirect storm water around critical facilities (please see the **Soils and Surface Water** section of this **FSA** for more analysis).

Periodic maintenance would be conducted as required after major storm events and when the volume of material behind the check dams exceeds 50% of the original volume. Stone filters and check dams are not intended to alter drainage patterns but to minimize soil erosion and promote sheet flow

Solar Field Preparation

Vegetation clearing, grubbing, and contour smoothing in the solar fields would occur where necessary to allow for equipment access and storm water management. In areas where these activities are not required for access or construction, the vegetation will not be removed but would be mowed (if needed) to a height of approximately 12 to 18 inches.

A linear swath of vegetation along the outer edge of each heliostat field would be cleared, grubbed and smoothed to create an external perimeter path for installation and maintenance of the tortoise and security fence and associated external perimeter inspection roads. Grading of the roads would be performed in limited areas to afford safe passage of vehicles. To allow for external roads, the setback area from the property line would be a minimum of 8 to 12 feet between the tortoise fence and the property line. Additional setbacks may be required due to installation of gas and electric utilities. Elsewhere, vegetation would remain but would be cut (when necessary) to a height that will allow clearance for heliostat function while leaving the root structures intact. Occasional cutting of the vegetation would be performed as needed to permit unobstructed heliostat mirror movement.

Drive zones would be used for installation of the heliostats and then subsequent washing of the mirrors. The drive zones would be located approximately every 152 feet in a circumferential fashion surrounding the power blocks. The drive zones would be approximately 10 feet wide and would be cleared, grubbed, smoothed, and rolled to permit safe and efficient installation of the heliostats and washing of the mirrors. The shoulders of washes crossed by the drive zones would be graded as necessary to permit safe passage of vehicles for installation and maintenance activities.

Installation of Heliostats

The heliostats will be installed in two steps. Initially, the support pylons would be installed using vibratory technology to insert the pylons into the ground (pre-augering prior to the installation of the pylon may be required). Then, the heliostat assembly (mirrors, support structure and aiming system) would be mounted on the pylon. The siting of pylons would be guided by global positioning system (GPS) technology. Pylons would be delivered to their locations by an all-terrain vehicle. Installation of the heliostat assemblies would be accomplished with a rough terrain crane. The crane would be able to mount heliostat assemblies on several pylons before moving to the next location.

Construction of Power Blocks

Project construction would commence with the building of site roads and the installation of temporary construction facilities including office trailers, parking areas, material lay down areas, a concrete batch plant, and a heliostat assembly facility. The construction of each plant would begin with the excavation and placement of foundations and other underground facilities. Superstructures and equipment would then be placed on the foundations. Major items include the 750-foot-tall solar power tower and SRSG construction, the STG pedestal and STG, and construction of the air-cooled condenser. Once the mechanical equipment is in place, construction would continue with the installation of the piping, electrical equipment, and cables necessary to connect and power the equipment. Upon completion of construction, the checkout, testing, startup and commissioning of the various plant systems would begin resulting in a fully operational solar plant.

Restoration of Temporary Disturbance

As proposed, temporarily disturbed areas will be restored to their preconstruction conditions. Temporary access roads used during construction will also be re-graded and restored to pre-existing function and grade. Approved seed mixes will be applied to temporarily disturbed areas, as required. No fertilizer will be used during stabilization or rehabilitation activities unless specifically authorized. No vegetation will be restored or encouraged within the solar field because of the fire hazard. Vegetation within the common area will be controlled to prevent containment from being compromised. When construction of storm water management structures is complete, contours will be carefully restored to the extent feasible.

FACILITY CLOSURE

At some point in the future, the project will cease operation, and the facility will close down. At that time, it will be necessary to ensure that the closure occurs in such a way that public health and safety and the environment are protected from adverse impacts. Although the project setting for this project does not appear, at this time, to present any special or unusual closure problems, it is impossible to foresee what the situation will be in 30 years or more when the project ceases operation. Therefore, provisions must be made that provide the flexibility to deal with the specific situations and project setting that exist at the time of closure. Facility closure will be consistent with Laws, Ordinances, Regulations and Standards (LORS) in effect at the time of closure, and are discussed in the **General Conditions** section of this **FSA.**

PROJECT DESCRIPTION - FIGURE 1

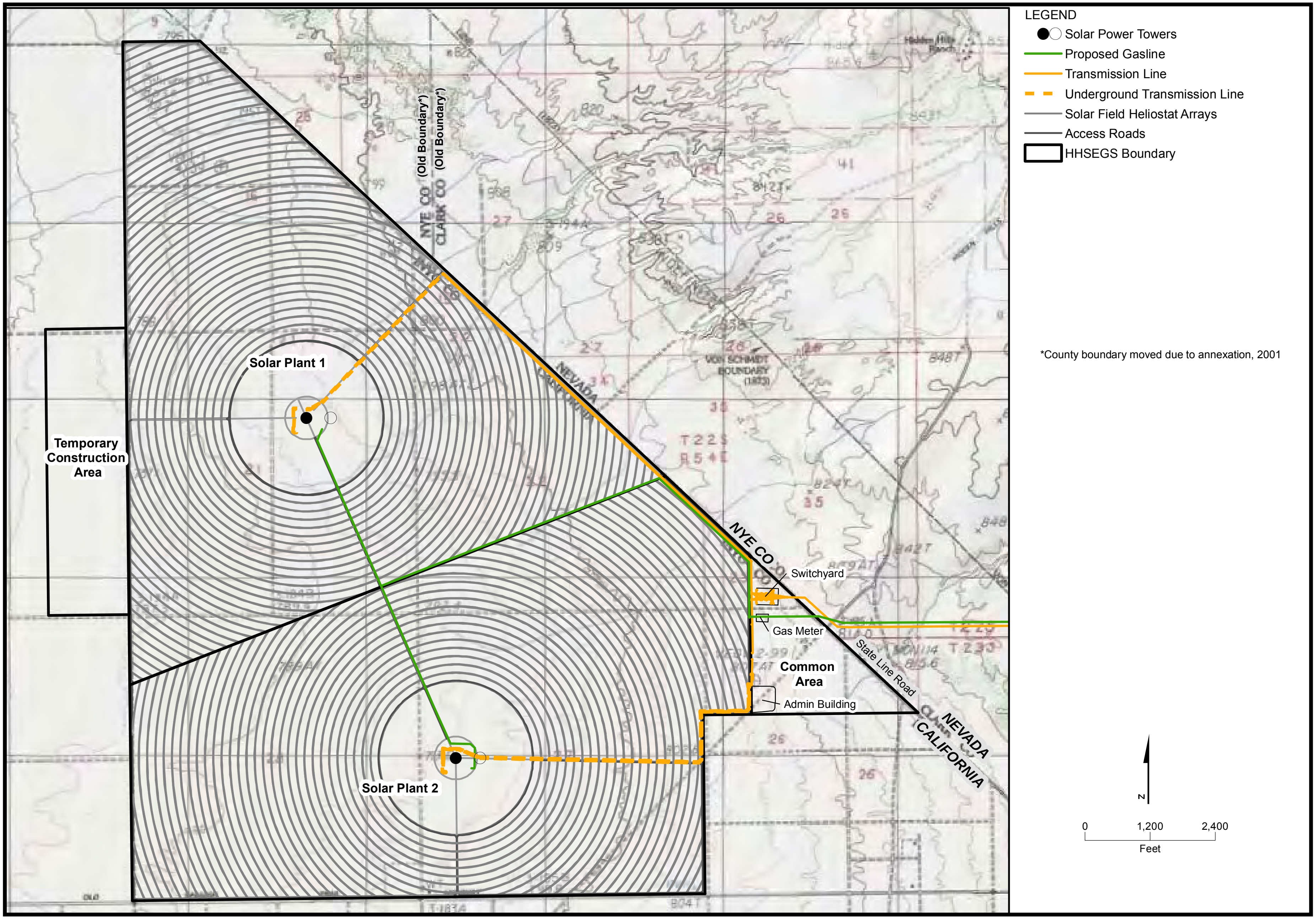
Hidden Hills Solar Electric Generating System (HHSEGS) - Vicinity Map

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: AFC, August 2011, Figure 2.1-1, CH2MHILL

PROJECT DESCRIPTION - FIGURE 2

Hidden Hills Solar Electric Generating System (HHSEGS) - Site Plan and Linear Facilities

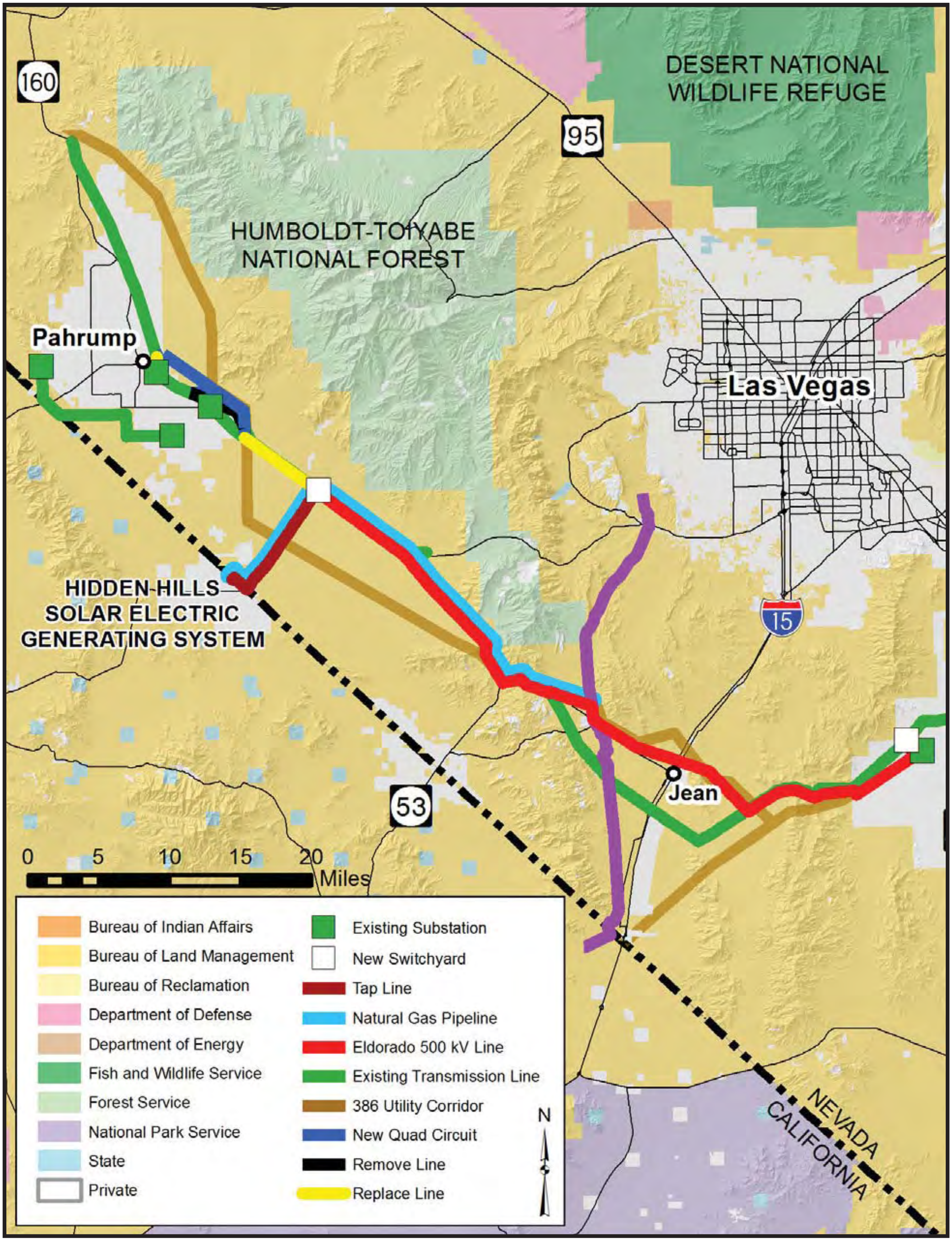


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Figure 2.1-2R1, CH2MHILL

PROJECT DESCRIPTION - FIGURE 3

Hidden Hills Solar Electric Generating System (HHSEGS) - Project Description Map

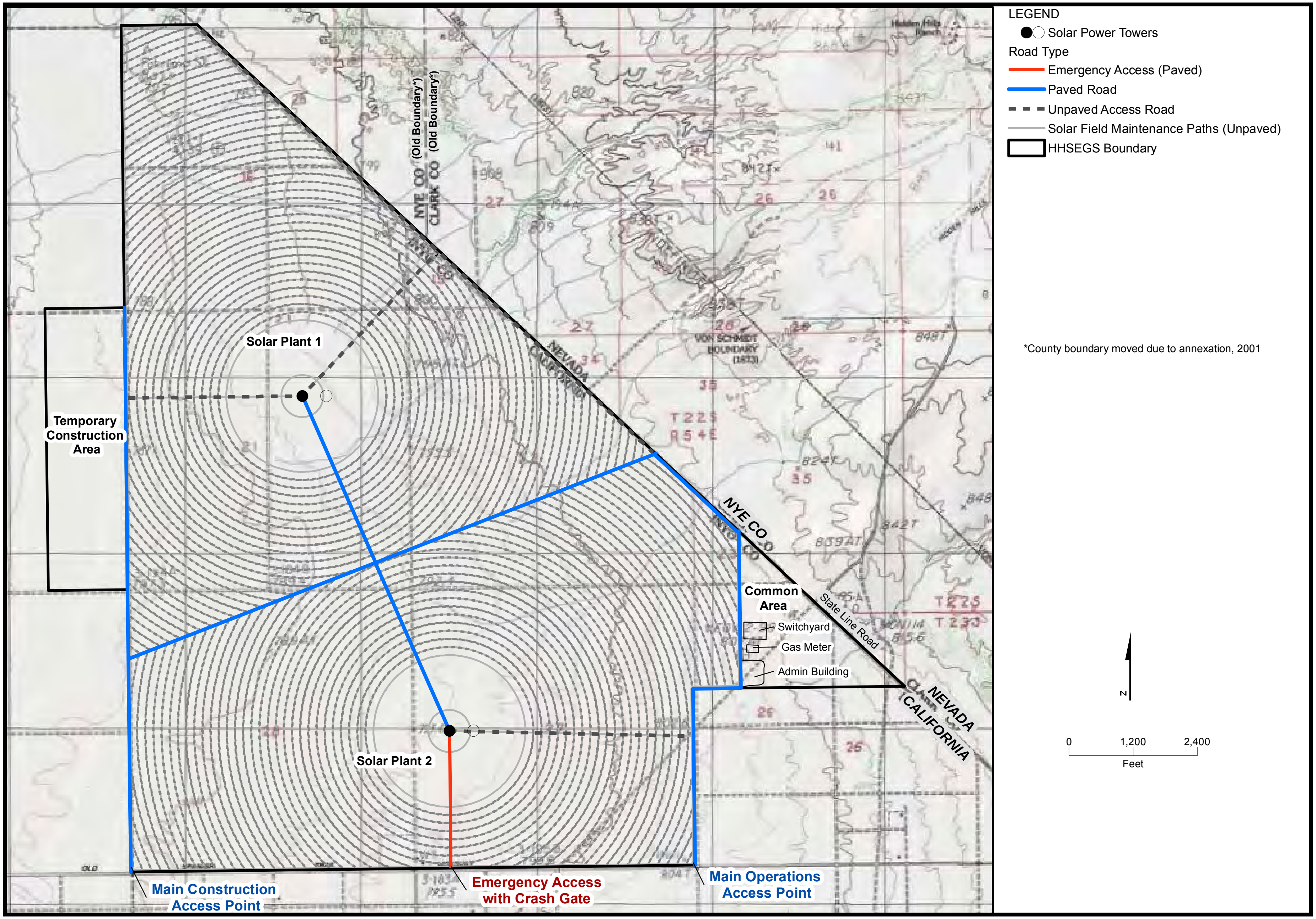


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Bureau of Land Management Draf t EIS, Nov. 2011

PROJECT DESCRIPTION - FIGURE 4

Hidden Hills Solar Electric Generating System (HHSEGS) - Access Roads and Paved Internal

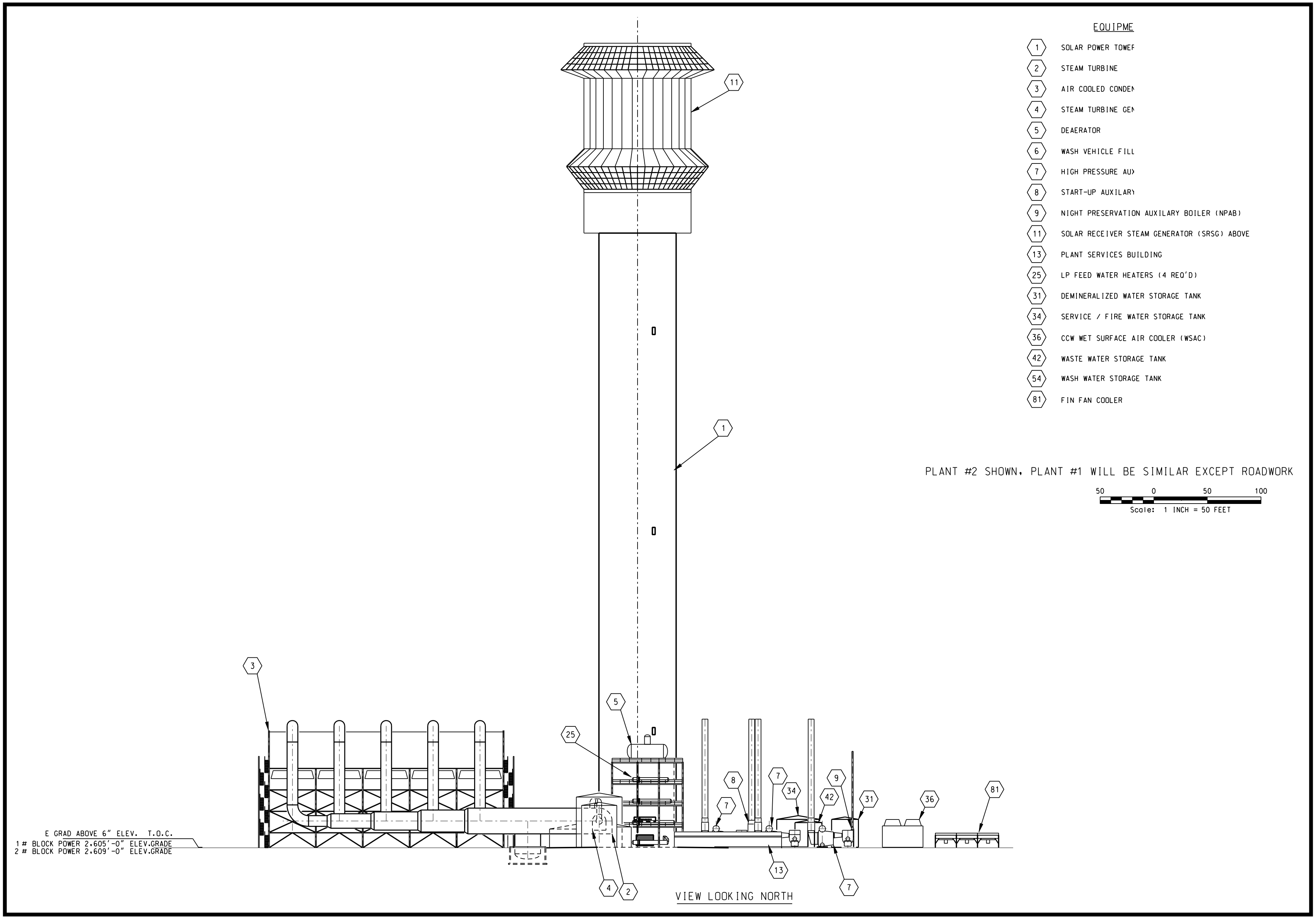


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: AFC, August 2011, Figure DR, CH2MHILL

PROJECT DESCRIPTION - FIGURE 5

Hidden Hills Solar Electric Generating System (HHSEGS) - Solar Plant 2 Elevation

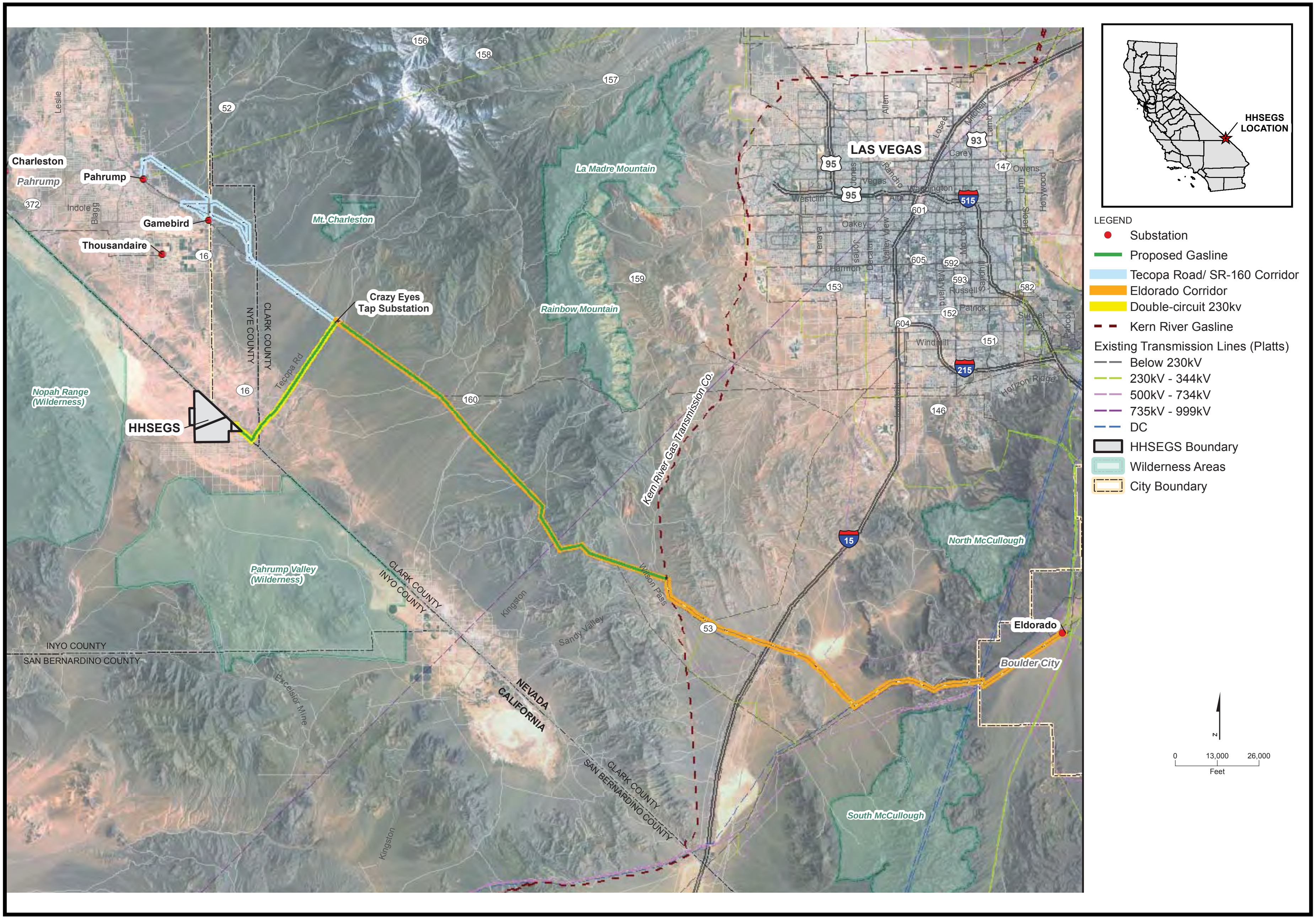


PROJECT DESCRIPTION

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

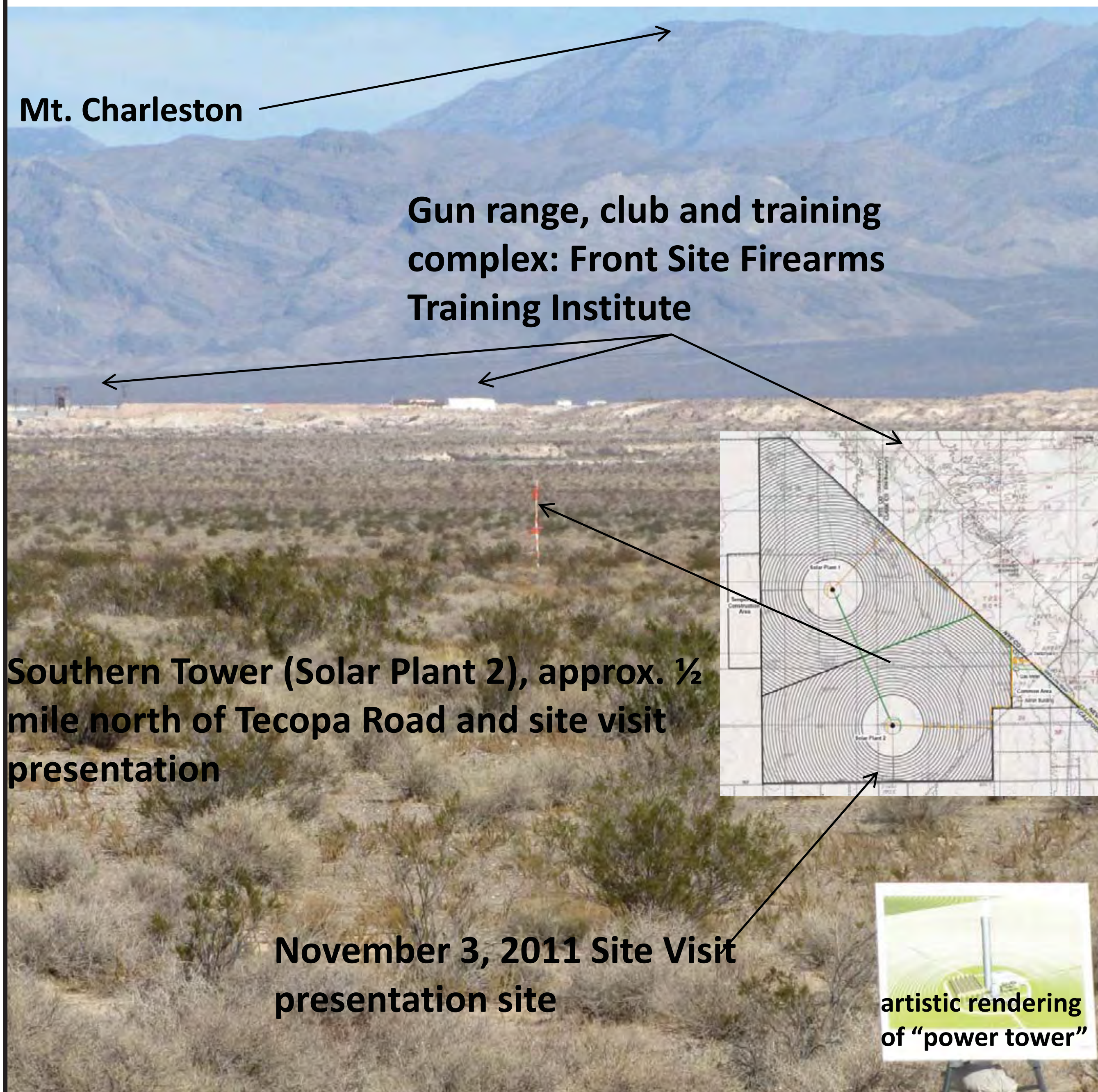
SOURCE: AFC, August 2011, Figure 2.2-2a, CH2MHILL

PROJECT DESCRIPTION - FIGURE 6
Hidden Hills Solar Electric Generating System (HHSEGS) - Linear Corridors



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: AFC, August 2011, Figure 2.1-4, CH2MHILL

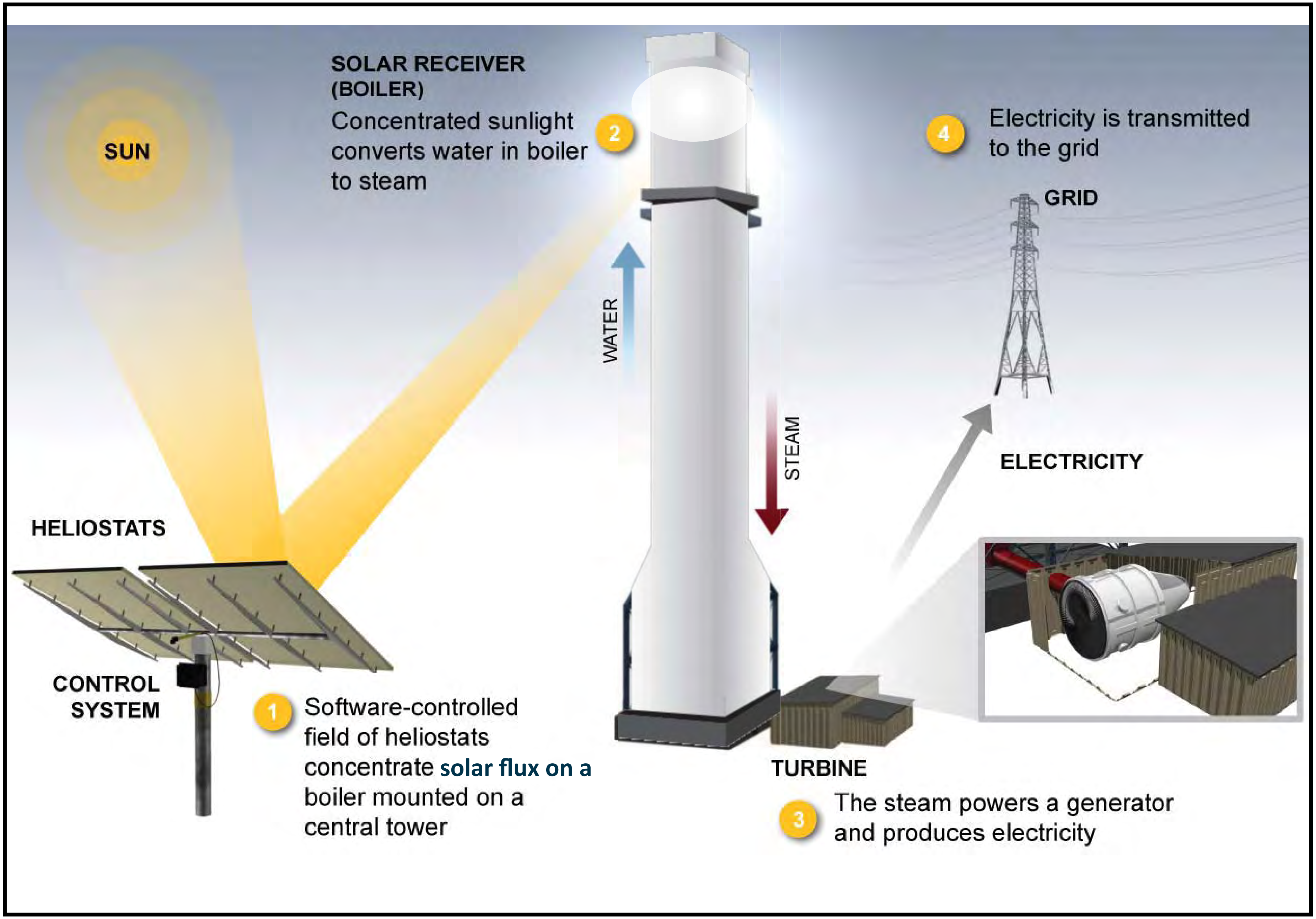
PROJECT DESCRIPTION - FIGURE 7
Hidden Hills Solar Electric Generating System (HHSEGS) - Site View



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: Staff Photo, 11/3/2011

PROJECT DESCRIPTION - FIGURE 8

Hidden Hills Solar Electric Generating System (HHSEGS) - Technology Overview



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 11-AFC-2 Hidden Hills TN 68362 BrightSource Energy-submitted Power Point Presentation for August 28, 2012 Joint Workshop, page 11

AIR QUALITY

Testimony of Jacquelyn Leyva

SUMMARY OF CONCLUSIONS

Energy Commission staff (staff) concludes that with the adoption of the attached conditions of certification the proposed Hidden Hills Solar Electric Generating System (HHSEGS) project would comply with all applicable laws, ordinances, regulations, and standards (LORS) and would not result in any significant air quality-related California Environmental Quality Act (CEQA) impacts. With implementation of the conditions of certification referred to herein, the project would comply with LORS and mitigate otherwise adverse impacts for purposes of CEQA. Without adequate fugitive dust mitigation, the project could cause potential localized exceedances of the PM10 National Ambient Air Quality Standards (NAAQS) during construction and operation. This impact would be less than significant with adoption of the proposed construction and operation fugitive dust mitigation measures.

Staff concludes that the project would meet the minor source provisions of the federal New Source Review (NSR) program and thus would not require Prevention of Significant Deterioration (PSD) review or Nonattainment New Source Review.

The HHSEGS project would emit substantially fewer greenhouse gas (GHG)[1] emissions per megawatt-hour produced than fossil-fueled generation resources in California. The project is not subject to the requirements of SB 1368 (Greenhouse Gases Emission Performance Standard; Cal. Code Reg., tit. 20, § 2900 et. seq.) and the Emission Performance Standard; however it would nevertheless meet the Emission Performance Standard.

INTRODUCTION

This analysis evaluates the expected air quality impacts from the emission of criteria air pollutants from both the construction and operation of the HHSEGS project. Criteria air pollutants are air contaminants for which the state and/or federal governments have established an ambient air quality standard to protect public health.

The criteria pollutants analyzed are nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), and particulate matter (PM). Toxic air pollutant emissions impacts are analyzed in the **Public Health** section of this FSA. Two subsets of particulate matter are inhalable particulate matter (less than 10 microns in diameter, or PM10) and fine particulate matter (less than 2.5 microns in diameter, or PM2.5). Nitrogen oxides (NOx, consisting primarily of nitric oxide [NO] and NO_2) and volatile organic compound (VOC) emissions readily react in the atmosphere to form ozone and, to a lesser extent, particulate matter. Sulfur oxides (SOx) readily react in the atmosphere to form particulate matter and are major contributors to acid rain. Global

[1] Greenhouse gas emissions are not criteria pollutants; they affect global climate change. In that context, staff evaluates the GHG emissions from the proposed project (Appendix Air-1), presents information on GHG emissions related to electricity generation, and describes the applicable GHG standards and requirements.-

climate change and greenhouse gas (GHG) emissions from the project are discussed in **Appendix Air-1** in the context of cumulative impacts.

In carrying out this analysis, the California Energy Commission (Energy Commission) staff evaluated the following major points:

- whether the HHSEGS project is likely to conform with applicable federal, state, and Great Basin Unified Air Pollution Control District (District) air quality laws, ordinances, regulations and standards (Title 20, California Code of Regulations, section 1744 (b));
- whether the HHSEGS project is likely to cause new violations of ambient air quality standards or contribute substantially to existing violations of those standards (Title 20, California Code of Regulations, section 1743);
- whether mitigation measures proposed for the project are adequate to lessen potential impacts to a level of insignificance (Title 20, California Code of Regulations, section 1742 (b)).

LAWS, ORDINANCES, REGULATIONS AND STANDARDS (LORS)

The federal, state, and local laws and policies applicable to the control of criteria pollutant emissions and mitigation of air quality impacts for the HHSEGS are summarized in **Air Quality Table 1**. Staff's analysis examines the project's compliance with these requirements and summarizes the applicable LORS.

Air Quality Table 1
Laws, Ordinances, Regulations, and Standards

Applicable LORS	Description
Federal	
40 Code of Federal Regulations (CFR) Part 52	Nonattainment New Source Review (NSR) requires a permit and requires Best Available Control Technology (BACT) and Offsets. Permitting and enforcement is delegated to GBUAPCD with EPA oversight. Prevention of Significant Deterioration (PSD) requires major sources or major modifications to major sources to obtain permits for attainment pollutants. The HHSEGS project is a new source has and is a rule-listed emission source, thus the PSD trigger levels are 100 tons per year for NOx, VOC, SO_2, PM2.5 and CO. This project's proposed emissions are below NSR and PSD applicability thresholds.

Applicable LORS	Description
40 CFR Part 60	**New Source Performance Standards (NSPS), Subpart Dc Standards of Performance for Electricity Steam Generation Units.** Establishes emission standards and monitoring/recordkeeping requirements for units with less than 30 MMBtu/hr heat input. **Subpart Db Standards of Performance for Electricity Steam Generation Units.** Establishes emission standards and monitoring/recordkeeping requirements for units with greater than 100 MMBtu/hr heat input. **Subpart IIII Standards of Performance for Stationary Compression Ignition Internal Combustion Engines.** Establishes emission standards for compressions ignition internal combustion engines, including emergency firewater pump engines.
State	
Health and Safety Code (HSC) Section 40910-40930	Permitting of source needs to be consistent with Air Resource Board (ARB) approved Clean Air Plans.
HSC Section 41700	Restricts emissions that would cause nuisance or injury.
TItle17, California Code of Regulations (CCR),section 93115	**Airborne Toxics Control Measure for Stationary Compression Ignition Engines.** Limits the types of fuels allowed, established maximum emission rates, establishes recordkeeping requirements on stationary compression ignition engines, including emergency firewater pump engines.
Title13 ,CCR, section 2423	**Exhaust Emission Standards and Test Procedures: Heavy-Duty Off-Road Diesel Cycle Engines.** Limits the tier levels of emissions from heavy-duty off-road diesel cycle engines, including emergency backup generators and emergency firewater pump engines.
Assembly Bill 32: Global Warming Solutions Act of 2006 and related GHG reduction regulations	Reduce emissions of GHGs; operator must purchase and surrender GHG allowances, as required.
Local (Great Basin Unified Air Pollution Control District, GBUAPCD)	
Rule 200, 209, 210, 216 Permits Required	Requires a Permit to Construct before construction of an emission source occurs. Prohibits operation of any equipment that emits or controls air pollutant without first obtaining a permit to operate.
Rules 400, 401, and 402 Nuisance, Visible Emissions, Fugitive Dust	Limits the visible, nuisance, and fugitive dust emissions. Applicable to both the construction and operation phases of the project.
Rule 403 – Breakdown	Defines breakdown conditions and describes procedures to be followed by the owner/operator and by the APCO in the event of occurrence of breakdown conditions.

Applicable LORS	Description
Rule 404-A Particulate Matter - Concentration	Limits the particulate matter concentration from stationary source exhausts.
Regulation IX Standard of Performance for New Stationary Source	Incorporates the Federal NSPS (40 CFR 60) rules by reference.
Rule 217– Federal Operating Permits	Requires new or modified major facility or facilities that trigger NSPS, Acid Rain or other federal air quality programs to obtain a Title V federal operating permit.
Regulation III – Permit Fees	Requires facilities subject to this regulation to pay permit fees.
Rule 416 Sulfur Compounds and Nitrogen Oxides	Limits NOx and SO_2 emissions from combustion sources.

SETTING

CLIMATE AND METEOROLOGY

The project would be located in southeastern Inyo County, on the edge of California's eastern border with Nevada at approximately 2,600 feet above sea level. Relatively high daytime temperatures, extremely low relative humidity, large and rapid diurnal temperature changes, occasional high winds, and sand, dust, and thunderstorms characterize the high desert climate. Seasonally, the precipitation totals in the area range from 0.84 inches in February to 0.09 inches in June. The average precipitation in the project area is about 4.7 inches per year, half of which falls from December through March.

The most recent meteorological (weather) data, collected and maintained by the National Weather Service Cooperative Network located in Pahrump, on SR 160 in Nye County, Nevada is located approximately 8 miles "straight line" distance from the project site. The measured wind data are graphically represented by quarterly wind roses, provided in the AFC Figures 5.1-1 thru 5.1-5 (HHSEGS 2011a). Note that the standard convention is for the wind direction to head into the center of the plot. These wind roses show that for most of the year, prevailing winds are from the south through southeast, at an average wind speed of 2.1 meters per second. Mixing heights in the area, which represent the altitudes where different air masses mix together, are estimated to be on average 230 feet (70 meters) above ground in the morning to as high as 5,250 feet (1,600 meters) above ground level in the afternoon. Applicant and staff used supplemental cloud cover data from Henderson Airport in Nevada (located 48 miles east of the proposed site) and upper air data from Elko, NV (located 334 miles north of the proposed site).

The proposed project site is located within California at the California-Nevada border. It is near and generally upwind from Nevada's Clark and Nye Counties. Clark County's Department of Air Quality and Environmental Management, and the Nevada Division of Environmental Protection, Department of Air Quality Management, Bureau of Air Pollution Control ("Nevada DEP") provide air quality management for these two counties, respectively.

Sensitive Receptors

The local population is proximate to the project site, and includes many sensitive subgroups that may be at greater risk from exposure to emitted pollutants. These sensitive subgroups include the very young, the elderly, and those with existing illnesses. In addition, the location of the population in the area surrounding a project site may have a large bearing on health risk. The nearest residence to any power block equipment is approximately 3,500 feet south of the Solar Plant 2 power block and about 950 feet south of the project's southern boundary.

There is also a nearby project called the St. Therese Mission. It is a commercial facility under construction, which is located approximately 0.5 mile southeast of the HHSEGS site. This facility will be treated as a sensitive receptor because it will include a chapel, a garden, a restaurant, a visitor's center that will include a children's playground, and a residential unit. This facility is located within the modeling area for air quality. Impacts are assumed at this site and elsewhere in the modeling domain. For more detailed information on sensitive receptors, please see the **Public Health** section of this **FSA**.

EXISTING AMBIENT AIR QUALITY

The Federal Clean Air Act and the California Clean Air Act both require the establishment of standards for ambient concentrations of air pollutants, called ambient air quality standards (AAQS), set at levels to protect public health and welfare. The state AAQS, established by the California Air Resources Board (ARB), are typically lower (more protective) than the federal AAQS, which are established by the United States Environmental Protection Agency (U.S. EPA). The state and federal ambient air quality standards are listed in **Air Quality Table 2**. As indicated in **Air Quality Table 2**, the averaging times for the various air quality standards, the times over which they are measured, range from one-hour to annual averages. The standards are read as a concentration, in parts per million (ppm), or as a weighted mass of material per a volume of air, in milligrams or micrograms of pollutant in a cubic meter of air (mg/m^3 or $\mu g/m^3$, respectively).

In general, an area is designated attainment of an ambient air quality standard if the concentration of a particular air contaminant does not exceed the respective standard. Likewise, an area is designated non-attainment for an air contaminant if that contaminant standard is exceeded. Where not enough ambient air quality data are available to support designation as either attainment or non-attainment, the area is designated as unclassified. An unclassified area is normally treated the same as an attainment area for regulatory purposes. An area could be in attainment for one air contaminant while non-attainment for another, or attainment for the federal standard and non-attainment for the state standard for the same air contaminant.

HHSEGS is located in the Great Basin Valleys Air Basin (GBVAB) and within the Great Basin Unified Air Pollution Control District (GBUAPCD). This area is designated as moderate nonattainment for the state ozone standard, nonattainment for the state PM10 standard, unclassified for federal ozone standard, and attainment or unclassified for the state and federal CO, NO_2, SO_2, and PM2.5 standards. **Air Quality Table 3** summarizes the area's attainment status for various applicable state and federal standards.

Air Quality Table 2
Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Standard	California Standard
Ozone (O_3)	8 Hour	0.072 ppm (147 μg/m^3)	0.070 ppm (137 μg/m^3)
	1 Hour	—	0.09 ppm (180 μg/m^3)
Carbon Monoxide (CO)	8 Hour	9 ppm (10 mg/m^3)	9.0 ppm (10 mg/m^3)
	1 Hour	35 ppm (40 mg/m^3)	20 ppm (23 mg/m^3)
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm (100 μg/m^3)	0.03 ppm (57 μg/m^3)
	1 Hour	100 ppb [b] (188 μg/m^3)	0.18 ppm (339 μg/m^3)
Sulfur Dioxide (SO_2)	Annual	0.030 ppm (80 μg/m^3)	—
	24 Hour	0.14 ppm (365 μg/m^3)	0.04 ppm (105 μg/m^3)
	3 Hour	0.5 ppm (1300 μg/m^3)	—
	1 Hour	75 ppb [c] (196 μg/m^3)	0.25 ppm (655 μg/m^3)
Particulate Matter (PM10)	Annual	—	20 μg/m^3
	24 Hour	150 μg/m^3	50 μg/m^3
Fine Particulate Matter (PM2.5)	Annual	15 μg/m^3	12 μg/m^3
	24 Hour	35 μg/m^3 [a]	—
Sulfates (SO_4)	24 Hour	—	25 μg/m^3
Lead	30 Day Average	—	1.5 μg/m^3
	Calendar Quarter	1.5 μg/m^3	—
Hydrogen Sulfide (H_2S)	1 Hour	—	0.03 ppm (42 μg/m^3)
Vinyl Chloride (chloroethene)	24 Hour	—	0.01 ppm (26 μg/m^3)
Visibility Reducing Particulates	8 Hour	—	In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70%.

a To attain this standard, the 3-year average of the 98th percentile of the daily concentrations must not exceed 35 μg/m3.
b To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average must not exceed 100 ppb.
c To attain this standard, the 3-year average of the 99th percentiles of the daily maximum 1-hour average must not exceed 75 ppb.
ppm= parts per million
Source: ARB 2012a

Ambient air quality monitoring data for ozone, PM10, PM2.5, CO, NO_2, and SO_2, compared to most restrictive applicable standards for the years between 2006 through 2011 (the last year that the complete annual data is currently available) at the most representative monitoring stations for each pollutant are shown in **Air Quality Table 4.** All ozone, PM10, and PM2.5 (up through 2011) data shown are from the Jean, Nevada, monitoring station located approximately 34 miles southeast of the project site. All CO data are from the Barstow, CA monitoring station located approximately 97 miles southwest of the project site. All SOx and NOx data are from the Trona, CA monitoring station located approximately 82 miles west southwest of the project site. Besides the

Jean monitoring station, which provides reasonably near ozone and particulate monitoring data, available monitoring stations for CO, NOx or SOx either are located just under a hundred miles away from the site, or in the case of Las Vegas, are otherwise not representative due to their urban location. Therefore, staff chose the GBVAB monitoring locations located in Barstow and Trona because they best represent the air quality conditions at the site. Staff expects that the background ambient concentrations for both of these pollutants to be relatively low at the project site due to its remote location. However, due to the relatively large distances from the proposed site, there is a reduced overall confidence in the representativeness of data from these monitoring stations.

Air Quality Table 3
Federal and State Attainment Status GBUAPCD [a]

Pollutant	Attainment Status [b]	
	Federal	State
Ozone	Unclassifiable/Attainment	Nonattainment
CO	Attainment	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
PM10	Attainment	Nonattainment
PM2.5	Attainment	Attainment

Source: ARB 2011b, U.S. EPA 2011b.
a. Attainment status for the site area only, not the entire air basin. b. Attainment = Attainment or Unclassifiable.

Air Quality Table 4
Criteria Pollutant Summary Maximum Ambient Concentrations (ppm or μg/m^3)

Pollutant	Monitoring Station Location	Averaging Period	Units	2006	2007	2008	2009	2010	2011	Limiting AAQS
Ozone	Jean, NV	1 hour	ppm	0.092	0.092	0.087	0.082	0.082	.085	0.09
Ozone	Jean, NV	8 hours	ppm	0.083	0.088	0.078	0.079	0.076	.078	0.07
PM10 [a]	Jean, NV	24 hours	μg/m	62	60	96	81.3	49	79	50
PM10 [a, b]	Jean, NV	Annual	μg/m	12.1	12.7	14	12.4	8.5	*	20
PM2.5[c]	Jean, NV	24 hours	μg/m	9	9	13	11	10	12.6	35
PM2.5	Jean, NV	Annual	μg/m	3.52	4.0	4.9	4.0	3.5	*	12
CO	Barstow,	1 hour	ppm	3.5	1.4	1.4	1.2	1.3	4.4	20
CO	Barstow,	8 hours	ppm	1.19	0.7	1.23	0.089	0.089	1.35	9.0
NO_2	Trona, CA	1 hour	ppm	0.050	0.055	0.062	0.049	0.052	0.049	0.18
NO_2	Trona, CA	1 hour (98th	ppm	.042	.046	.043	.039	.043	0.043	.100
NO_2	Trona, CA	Annual	ppm	0.005	0.004	0.004	0.004	0.005	*	0.03
SO_2	Trona, CA	1 hour	ppm	0.033	0.014	0.036	0.011	*	0.001	0.25
SO_2	Trona, CA	24 hours	ppm	0.004	0.005	0.005	0.003	0.003	0.006	0.04
SO_2	Trona, CA	Annual	ppm	0.000	0.000	0.000	0.001	0.001	0.001	0.03

Source: ARB 2012, U.S. EPA 2012 Notes: * insufficient data available to determine the value.
a. Exceptional PM concentration events, such as those caused by windstorms are excluded in the data presented.
b. Annual average data is federal data and may not exactly represent California annual average.
c. The U.S. EPA database used for retrieval of the PM2.5 data did not allow direct determination of the calculated 98th percentile, which is the basis of the standard, so the closest proxy (third highest values) are presented.

Ozone

The area is considered "unclassified/attainment" for the federal 8-hour ozone standard and nonattainment for the state 8-hour ozone standard. The ambient data shown in **Air Quality Table 3** indicates that 8-hour concentrations near the site (Jean, Nevada) exceed the recently revised federal 8-hour ozone standard (0.075 ppm). However, the values shown are peak values that correspond to the state standard. The federal standard is the fourth highest 8-hour concentration in a year averaged over three years.

In a letter dated October 12, 2011, the California Air Resources Board proposed to U.S. EPA that the southern portion of Inyo County be designated attainment for the new federal 8-hour ozone standard (ARB 2011c) due to a design value which was measured during 2008 to 2010 at a fourth highest value equal to 0.072 ppm (averaged over the 3-year period) compared to the federal standard of 0.075 ppm. In April 2012 the U.S. EPA classified Inyo County as "unclassifiable/attainment" for the federal 8-hour ozone standard.[2]

Ozone is not directly emitted from stationary or mobile sources, but is formed as the result of chemical reactions in the atmosphere between directly emitted nitrogen oxides (NOx) and hydrocarbons (volatile organic compounds [VOC]), which are called ozone precursors. These can transform to ozone in the presence of sunlight. The maximum 1-hour ozone concentrations monitored near the site in Jean, Nevada, have been relatively stable over the past ten years and are just over California's 1-hour standard for most years from 2006 to 2011. The maximum 8-hour ozone concentrations also have been relatively stable over the past years and are somewhat closer to their standard than the 1-hour ozone levels.

Staff notes that in the area of the project site at the far southeastern end of the GBVAB, there is the potential for ozone and ozone precursor transport from the Las Vegas area. The main geographical locations of the ozone precursor emissions for ozone levels observed in this region are primarily from pollutant transport from distant urban areas.

Nitrogen Dioxide

The entire air basin is classified attainment of the state 1-hour and federal short-term and annual nitrogen dioxide (NO_2) standards. The NO_2 levels monitored in Jean, Nevada, are no more than 35 percent of the most stringent California NO_2 ambient air quality standard. Most of the NOx typically emitted from combustion sources is in the form of nitric oxide (NO), while the balance is NO_2. NO is oxidized in the atmosphere to form NO_2, but some level of photochemical activity is needed for this conversion. The highest concentrations of NO_2 typically occur during the fall. The winter atmospheric conditions can trap NO emissions near the ground but lacking substantial photochemical activity (sun light), the oxidation rate of NO to NO_2 and NO_2 levels remain relatively low. In the summer, the conversion rates of NO to NO_2 are high, but the relatively high temperatures and windy conditions disperse pollutants, preventing the accumulation of NO_2 at levels that might approach the 1-hour federal ambient air quality standard.

[2] http://www.epa.gov/airquality/ozonepollution/designations/2008standards/final/region9f.htm

Carbon Monoxide

The area is classified attainment of the state and federal 1-hour and 8-hour carbon monoxide (CO) standards. The highest concentrations of CO occur when low wind speeds and a stable atmosphere trap the pollution emitted at or near ground level. These conditions occur frequently in the wintertime late in the afternoon, persist during the night and may extend one or two hours after sunrise.

Particulate Matter (PM10)

The area is nonattainment for the state PM10 standard and attainment/unclassified for the federal standard. PM10 can be emitted directly as fugitive dust or combustion particulates, or it can be formed many miles downwind from emission sources when various precursor pollutants interact in the atmosphere. Gaseous emissions of pollutants like NOx, SOx and VOC from combustion sources, and ammonia (NH_3) from human and animal wastes or combustion NOx control equipment can, given the right meteorological conditions, form particulate matter known as nitrates (NO_3), sulfates (SO_4), and organic compounds. These pollutants are secondary particulates because they are not directly emitted but are formed through complex chemical reactions between directly emitted pollutants in the atmosphere.

Fine Particulate Matter (PM2.5)

Fine particulate matter, or PM2.5 (particulate matter less than 2.5 microns in diameter), is derived either mainly from the combustion of materials, or from precursor gases (SOx, NOx, and VOC) through complex reactions in the atmosphere. PM2.5 consists mostly of sulfates, nitrates, ammonium, elemental carbon, and a small portion of organic and inorganic compounds. A small percentage of PM2.5 emissions come from fugitive dust sources and motor vehicles combustion sources from the construction vehicles.

The Great Basin Valleys Air Basin in southeastern Inyo County where the proposed project site is located is classified as attainment or unclassified for both the state and the federal PM2.5 air quality standards, but as noted previously the area is not in attainment of the state PM10 standard. This divergence indicates that the ambient PM10 levels are most likely due to localized fugitive dust sources, such as vehicles travel on unpaved roads, agricultural operations, or wind-blown dust.

Sulfur Dioxide

The entire air basin is attainment for the state and federal SO_2 standards.
Sulfur dioxide is typically emitted from the combustion of fuels containing sulfur. Sources of SO_2 emissions within the GBVAB come from a wide variety of fuels: gaseous, liquid and solid; however, the total SO_2 emissions within the eastern GBVAB are limited due to the limited number of major stationary sources and California’s and U.S. EPA’s substantial reduction in motor vehicle fuel sulfur content. The project area’s SO_2 concentrations are well below the state and federal ambient air quality standards.

Nitrates and Sulfates

PM nitrate (mainly ammonium nitrate) forms in the atmosphere from the reaction of NOx and ammonia. NOx from combustion sources is mainly in the form of nitric oxide (NO). NO converts to NO_2 primarily by reacting with ozone in the ambient air and sunlight. The formed NO_2 can convert back to NO, which sustains the ozone formation reactions. NO_2 can also form organic nitrates, or can be reduced to nitric acid by available hydroxyl radicals in the ambient air. Nitric acid reacts with ammonia in ambient air to form ammonium nitrate. Ammonium nitrate, in its particulate form, can remain suspended in the ambient air and/or be transported long distances downwind as PM2.5. Ammonium nitrate, under certain conditions of heat and humidity, breaks down to NOx and starts a new ozone cycle.

PM sulfate (mainly ammonium sulfate) forms in the atmosphere from the oxidation of SO_2 and subsequent neutralization by ammonia in the atmosphere. This oxidation of SO_2 depends on many factors, which include the availability of sulfur, hydroxyl, hydroperoxy and methylperoxy radicals, and atmospheric humidity. Given the low SO_2 and humidity levels in the site vicinity, PM sulfate levels would be low.

Summary

In summary, staff recommends the background ambient air concentrations in **Air Quality Table 5** for use in the modeling and impacts analysis. The recommended background concentrations are the maximum criteria pollutant concentrations from the past three years of available data collected at the monitoring stations staff selected as the most representative of the proposed project area.

Air Quality Table 5
Staff Recommended Background Concentrations (µg/m^3)

Pollutant	Averaging Time	Recommended Background	Limiting Standard	Percent of Standard
NO_2	1 hour	117	339	35%
	1 hour Federal	80.8	188	43%
	Annual	7.5	57	13%
PM10	24 hour	**96**	**50**	**192%**
	Annual	14	20	70%
PM2.5	24 hour	13	35	37%
	Annual	4.9	12	41%
CO	1 hour	1,750	23,000	8%
	8 hour	1,333	10,000	13%
SO_2	1 hour	93.6	655	14%
	24 hour	13.1	105	12%
	Annual	2.7	80	3%

Source: AFC Table 5.1-34 (HHSEGS 2011a); updated with ARB 2012.
Note that an exceedance is not necessarily a violation of the standard, and that only persistent exceedances lead to designation of an area as nonattainment.

Where possible, staff prefers that the recommended background concentrations come from nearby monitoring stations with similar land use characteristics. For this project, the monitoring station located in Jean, NV (ozone, PM10, and PM2.5 [up to 2011]) is located reasonably close to the project site and should be representative of the project site. The Barstow (CO) monitoring station is in a more populated area, and should be conservative compared to the project site. The Trona (NO_2 and SO_2) monitoring station, while located in a more remote area, has two very large nearby emission sources of SOx (Searles Valley Minerals and Ace Cogeneration Company) so this monitoring station location should provide representative or conservative SO_2 background concentrations for the project site.

The background 24-hour concentrations for PM10 are above the most restrictive existing ambient air quality standards, while the background concentrations for the other pollutants and averaging times are all below the most restrictive existing ambient air quality standards.

In accordance with applicable EPA modeling protocols, the pollutant modeling analysis includes the pollutants listed above in **Air Quality Table 5**.

PROJECT DESCRIPTION

The proposed HHSEGS would comprise two solar fields and a common area. The applicant has identified the northern solar plant as Solar Plant 1 and the southern plant as Solar Plant 2. Each solar plant would generate 270 megawatts (MW) gross (250 MW net), for a total net output of 500 MW. Each would have a central tower surrounded by distributed field of heliostat (mirror) arrays. The heliostats focus solar energy on the power tower receivers located at the top of the tower. HHSEGS Solar Plants 1 and HHSEGS Solar Plant 2, would occupy approximately 1,483 acres (or 2.3 square miles) and 1,510 acres (2.4 square miles) respectively. Both solar plants would share a common administration building, an operation and maintenance building, and a substation and would cover approximately 103 acres. The HHSEGS total project footprint amounts to approximately 3,097 acres (approximately 4.84 square miles). Another 180 acres would be needed during the construction period for lay down and staging activities. The temporary construction lay down area in addition to the entire HHSEGS site would total 3,277 acres.

Each plant would have five emitting sources, consisting of two natural-gas-fired boilers, two diesel fuel-fired emergency engines, and a wet surface air cooler. Additionally, the common area would contain diesel fuel-fired emergency equipment consisting of a small emergency generator and a fire pump. Two types of boilers would be used at each power block. Each boiler would be equipped with low-NOx burners and flue gas recirculation (FGR) for NOx control; CO would be controlled using good combustion practices; and particulate and VOC emissions would be minimized through the use of natural gas as the fuel. Specifications for the new boilers are summarized in the project operation section of this FSA.

Each plant would use one 249 million British Thermal Units per hour (MMBtu/hr) natural-gas-fired auxiliary boiler to facilitate daily start up by preheating the solar boiler and steam turbine generator piping before sufficient solar energy is available. This would enhance project efficiency by allowing solar flux to maximize output more quickly than if solar heating alone were used to heat the entire system. During cloudy days or in case of an emergency shutdown, these boilers would also keep the system hot to facilitate plant restart.

Additionally, one small (15 MMBtu/hr) natural-gas-fired boiler, called a nighttime preservation boiler, would be used at each plant to provide steam to keep the steam turbine generators and boiler pump gland systems under vacuum overnight and during other shutdown periods when solar heat is not available. Using these small boilers would be more efficient than allowing these systems to cool and then using the larger startup boilers to reestablish the vacuums in the morning.

On an annual basis, heat input from natural gas would be limited to less than 10 percent of the heat input from the sun. To save water in the site's desert environment, each solar plant would use a dry air-cooled condenser for steam condensing. A partial dry-cooling system (wet surface air cooler –WSAC) would provide auxiliary equipment cooling. Groundwater would be drawn daily from three wells located onsite; one at each power block and a third at the administration complex. Groundwater would be treated in an onsite treatment system for use as boiler make-up water and to wash the heliostats.

The HHSEGS would interconnect to the Valley Electric Association (VEA) system[3]. The interconnection would require an approximately 10-mile long generation tie line (gen tie line) from the HHSEGS to the proposed Crazy Eyes Tap Substation[4], where the project would interconnect to the VEA electric grid. The gen tie line would originate at the HHSEGS's onsite switchyard, cross the state line avoiding the mesquite vegetation to the south and continue east for approximately 1.5 miles until reaching Tecopa Road. At Tecopa Road, the route would head northeast paralleling Tecopa Road until it reaches the Crazy Eyes Tap Substation, which would be located immediately east of the Tecopa Road/SR 160 intersection. The Crazy Eyes Tap Substation would interconnect to the existing VEA Pahrump Bob Tap 230 kV line. (CH2 2012q)

A 12-inch diameter natural gas pipeline would be required for the HHSEGS project. Kern River Gas Transmission Company (KRGT) proposes to construct the pipeline from the HHSEGS meter station, to be located in the HHSEGS Common Area, extending 32.4 miles to KRGT's existing mainline system just north of Goodsprings in Clark County, Nevada. The HHSEGS meter station, including pig receiver facilities, would be approximately 300 feet by 300 feet and would be surrounded by a 6-foot tall chain link fence topped with three strands of barbed wire (approximately 7 feet high total). The meter station would be shaded by a canopy to cover the meter runs and associated instrumentation and valves. A data acquisition and control (DAC) building would be located within the meter station. Data acquisition, control, uninterrupted power supply (UPS), and communication equipment would be installed inside the DAC building. Yard lights would be installed on the DAC building and meter building exterior. In addition, the light fixtures would be shielded or hooded and directed downward (CH2 2012q).

The transmission and natural gas pipeline alignments would be located primarily in Nevada on federal land managed by the U.S. Bureau of Land Management (BLM), except for small segments of the transmission line (both options) in the vicinity of the Eldorado Substation located within the city limits of Boulder City, Nevada, which is located south of Las Vegas (see **Project Description Figure 3**). This assessment is limited to include only the portion of the transmission line system and natural gas pipeline linears to be located in California. Environmental aspects of the parts of these

[3] In January 2013, VEA will become a participating transmission owner (PTO) and will turn operational control of its facilities over to the California Independent System Operator (CAISO).

[4] In the HHSEGS Application for Certification, this substation was referred to as the Tap Substation.

linears located in Nevada would be assessed by the U.S. Bureau of Land Management (BLM).

Following completion of project licensing and close of financing, HHSEGS would be constructed in approximately 29 months with the following schedule:

- Begin construction: Second quarter 2013
- Startup and testing: Second quarter 2015 for Solar Plant 1; third quarter 2015 for Solar Plant 2
- Commercial operations: third quarter 2015 for Solar Plant 1; fourth quarter 2015 for Solar Plant 2

Project steam cycle cooling for each solar plant would use an air-cooled condenser (ACC) or dry cooling for each of the plants. Water consumption would be, therefore, minimal—mainly to provide water for washing heliostats and for boiler make up. Process wastewater would be treated onsite. Domestic wastewater would be disposed of in a septic tank and an onsite leach field. Therefore, no industrial wastewater or sewer pipeline would be constructed.

The project would include other operating emission sources for operation and maintenance of the facility. Each plant would include a diesel-fired 200-horsepower (hp) fire pump engine (2 total at the HHSEGS project site) along with a 200-hp fire pump in the common area. One 3,633-hp emergency generator engine would be located at HHSEGS Solar Plant 1 and another at HHSEGS Solar Plant 2, along with one smaller 398-horsepower emergency generator engine at the common area (3 total at the HHSEGS project site). Additionally, the applicant has proposed that the facility would have engines for the mirror washing equipment that would be EPA-certified, non-road or on-road engines[5] to power mirror-washing trailers and dedicated pickup trucks for personnel transport within the plants. These would create both tailpipe and fugitive dust emissions during operation.

PROJECT CONSTRUCTION

Construction of the common area facilities would occur concurrently with the construction of the first solar plant.

There would be an average daily workforce, during the peak 12-month period of approximately 1,749[6] construction craft people, supervisory, support, and construction management personnel onsite. The peak construction site workforce of 2,293 is expected to occur in month 19 (see Updated Workforce Analysis, CH2 2012jj, Section 1.0 page 1-1).

Generally, construction activities would occur from 5:00 a.m. to 3:30 p.m. with a swing shift during heliostat assembly from 6:00 p.m. to 4:30 a.m. Additional hours may be necessary to make up schedule deficiencies, or to complete critical construction activities (e.g., tower construction, foundation pouring, or working around time-critical

[5] Data Response, Set 2A in response to Staff's Data Request Set 2A filed on January 9, 2012

[6] See CH2M 2012jj "Updated Workforce Analysis" Section 2.0 Air Quality Table AQ-1.

shutdowns and constraints). During some construction periods and during the startup phase of the project, some activities would continue 24 hours per day, 7 days per week.

Air Quality TABLE 6
Project Schedule Major Milestones

Activity	Date
Solar Plant 1 and Common Area	
Fencing and tortoise clearance	Second Quarter 2013
Begin construction	Second Quarter 2013
Startup and commissioning	Second Quarter 2015
Commercial operation	Third Quarter 2015
Solar Plant 2	
Fencing and tortoise clearance	Second Quarter 2013
Begin construction	Third Quarter 2013
Startup and commissioning	Third Quarter 2015
Commercial operation	Fourth Quarter 2015

Air Quality Table 7 presents the applicant's estimate of direct onsite and offsite (delivery and employee vehicle) construction emissions for NOx, VOC, SOx, CO, PM10 and PM2.5.

Air Quality Table 7
HHSEGS Construction Emissions

	Daily Emissions (lbs/day) [a, b]					
Solar Facility Construction	NOx	SOx	CO	VOC	PM10	PM2.5
Maximum Daily Onsite Emissions	384.4	0.65	192.3	29.3	190.8	37.7
Maximum Daily Offsite Emissions[C]	313.0	0.6	436.6	58.5	13.4	10.3
Maximum Daily Emissions	697.4	1.25	628.9	87.8	204.2	48.0
	Annual Emissions (tons/year) [a]					
Maximum Annual Onsite Emissions	34.2	0.06	17.5	2.62	12.6	2.7
Maximum Annual Offsite Emissions[d]	11.6	0.01	24.2	3.0	0.6	0.4
Maximum Annual Emissions	45.8	0.07	41.7	5.6	13.2	3.1

Source: AFC (HHSEGS 2011a), supplemental data submitted April 2, 2012 (CH2 2012p) and updated workforce analysis submitted Oct. 2012 (CH2 2012jj)

Notes:
a. Onsite emissions include fugitive dust, construction equipment, and concrete batch plant
b. Max daily onsite emissions occur during month 8 and 9, with the maximum daily offsite emissions occur during Month 19. Values in the table are now representative of the maximum daily emission, which occur during month 8.
c. Maximum Daily Offsite Emissions are from month 8 and 9 of the updated Construction Traffic Assumptions document submitted on October 2, 2012, Air Quality Section 2.2 Table AQ-3.
d. Maximum Daily Annual Offsite Emissions can be found in the updated Construction Traffic Assumptions document submitted on October 2, 2012, Air Quality Section 2.2 Table AQ-4.

On October 1, 2012, staff received applicant document titled, “Updated Workforce Analysis (Air Quality, Socioeconomics, Traffic and Transportation, and Worker Safety & Fire Protection). Staff has reviewed the information, noted the changes to construction emissions, and reflected the new values are in **Air Quality Table 7** above.

These emission estimates appear reasonable in terms of the onsite equipment, fugitive dust, the concrete batch plant and offsite vehicle use and the offsite vehicle fugitive dust emissions. However, staff recommends additional mitigation measures, specifically the use of CEC-approved soil binders on unpaved roads and other inactive disturbed surfaces during construction, to ensure fugitive dust emissions and associated impacts comply with the applicable standards. Please see the **Soil and Surface Water** section of this **FSA** for more details.

PROJECT OPERATION

The HHSEGS facility would be a nominal 500 Megawatt (MW) heliostat mirror and power tower thermal solar electrical generating facility comprising two plants, HHSEGS Solar Plant 1 (250 MW), and HHSEGS Solar Plant 2 (250 MW) (HHSEGS 2011a). The direct air pollutant emissions from solar power generation are minimal; however, the facility would start-up each day with the assist of natural gas-fueled boilers associated with each plant and there are other equipment and maintenance activities necessary to operate and maintain the facility.

The HHSEGS onsite stationary and mobile emission sources are as follows:

- Each solar plant would include two gas-fired boilers.
- One auxiliary boiler (249 MMBtu) would provide steam prior to sunrise to expedite the process of bringing the solar plants online. During cloudy days or in case of an emergency shutdown, this boiler would also keep the solar generating system hot to facilitate plant restart. The boiler would have a nominal steam production rate of 174,000 lb/hr at 770°F and 655 psia.
- One night preservation boiler would provide steam to the steam turbine generator (STG) and boiler feedwater pump and systems overnight and during other shutdown periods when steam is not available from the solar receiver steam generator (SRSG). The night preservation boiler would have a nominal steam production rate of 10,000 lb/hr at 680°F and 145 psia.
- Each auxiliary boiler would have a maximum of no more than 1,208 equivalent full-load hours of use per year and each nighttime preservation boiler would have a maximum of 5,003 equivalent full-load hours of use per year;
- One 200-bhp diesel-fired emergency fire water pump engine (one for each plant) and one 200-bhp diesel-fueled emergency fire pump, to be located in the common area, would operate in a non-emergency mode for no more than 50 hours per year or no more than required by National Fire Protection Association, whichever is greater;
- One 3,633-bhp diesel-fired emergency generator engine (two for the entire HHSEGS project), and one 398-bhp diesel-fueled emergency generator for the common area would operate in non-emergency mode no more than 50 hours per year;

- Onsite diesel-fueled maintenance vehicles used for mirror washing and other maintenance/operation support activities.

The following assumptions were used to develop the hourly, daily, and annual emissions estimate for HHSEGS operation:

A. Maximum Hourly Emissions

- All boilers are operating.
- All diesel engines operate for one-half hour of duration for readiness testing.

B. Maximum Daily Emissions

- The auxiliary boilers operate up to five equivalent full load hours and up to a total of 7.5 hours per day at low loads, including startup.
- The nighttime preservation boilers operate up to 12 equivalent full-load hours per day during summer months and up to 16 equivalent full-load hours per day during winter months, with an additional hour of low-load operation during startup each day.
- Each emergency generator engine operates half an hour per test.
- Each emergency fire pump engine operates half an hour per test

C. Maximum Annual Emissions

- Each auxiliary boiler was modeled assuming 1,100 full-load hours and 865 startup hours of operation per year.
- Each nighttime preservation boiler was modeled assuming 4,780 full-load hours and 345 startup hours of operation per year.
- Each emergency generator engine was modeled assuming it would operate 50 hours per year for readiness testing purposes.
- Each emergency fire pump engine was modeled assuming it would operate 50 hours per year for readiness testing purposes.

The HHSEGS onsite stationary sources, onsite mobile equipment, and offsite vehicle emissions, including fugitive PM10 emissions, are summarized in **Air Quality Table 8**.

Staff has received the applicants document titled, “Updated Workforce Analysis (Air Quality, Socioeconomics, Traffic and Transportation, and Worker Safety & Fire Protection), which was received by Energy Commission staff docketed October 1, 2012. Staff reviewed the information and found that both the air quality impacts discussed in the AFC and boiler optimization emissions are unchanged. The operations phase of the project remains unchanged because the operations workforce would be slightly reduced.

The direct stationary source emissions from this project are well below the PSD and/or nonattainment NSR permitting applicability thresholds; therefore, the U.S. Environmental Protection Agency (U.S. EPA) and GBUAPCD consider the facility to be a minor stationary source and not expected to create significant impacts.

Air Quality Table 8
HHSEGS Operation - Maximum Hourly, Maximum Daily, and Annual Emissions

	Maximum Hourly Emissions (lbs/hr)					
Emission Source	NOx	SOx	CO	VOC	PM10	PM2.5
Boilers	5.8	1.1	10.2	2.8	2.6	2.6
Emergency Generator Engines	39.8	0.04	22.0	1.4	1.3	1.3
Emergency Fire Pump Engines	2.0	0.01	1.7	0.1	0.1	0.1
WSACs	-	-	-	-	-	<0.01
Maintenance Vehicles (mirror washing)	0.2	0.06	0.01	0.01	0.01	0.01
Maintenance Vehicles (fugitive dust)	-	-	-	-	1.7	0.2
Employee and Delivery Vehicles (offsite)	3.62	0.03	19.15	1.88	1.40	0.37
Total Maximum Hourly Emissions	51.42	1.24	53.06	6.19	7.11	4.59
Emission Source	Maximum Daily Emissions (lbs/day)					
Boilers	74.3	7.4	132.5	36.2	19.6	19.6
Emergency Generator Engines	39.8	0.04	22.0	1.4	1.3	1.3
Emergency Fire Pump Engines	2.0	0.01	1.7	0.1	0.1	0.1
WSACs	-	-	-	-	0.4	0.4
Maintenance Vehicles (mirror washing)	4.1	1.1	1.6	1.9	0.1	0.1
Maintenance Vehicles (fugitive dust)	-	-	-	-	34.6	3.5
Employee and Delivery Vehicles (offsite)	20.5	0.2	101.9	10.0	7.4	2.0
Total Maximum Daily Emissions	140.7	8.75	259.7	49.6	63.5	27
Emission Source	Annual Emissions (tons/year)					
Boilers	6.3	0.8	11.8	3.0	2.0	2.0
Emergency Generator Engines	2.0	0.01	1.1	0.07	0.06	0.06
Emergency Fire Pump Engines	0.1	0.01	0.1	0.01	0.01	0.01
WSACs	-	-	-	-	0.03	0.03
Maintenance Vehicles (mirror washing)	0.7	0.2	0.03	0.3	0.02	0.02
Maintenance Vehicles (fugitive dust)					6.3	0.6
Employee and Delivery Vehicles (offsite)	1.8	0.0	17.1	1.7	1.2	0.3
Total Annual Emissions	10.9	1.02	30.13	5.08	9.62	3.02

Source: supplemental data responses submitted April 1, 2012 table 5.1-27R and table 5.1-26R (CH2 2012p)

INITIAL COMMISSIONING

Initial commissioning refers to a period of approximately 60 days prior to beginning commercial operation when the equipment undergoes initial tuning and performance tests. Staff does not expect substantial change of emissions from the facility commissioning compared to that of full operation.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Staff assessed three kinds of primary and secondary[7] impacts: construction, operational, and cumulative. Construction impacts result from the emissions occurring during site preparation and construction of the project. Operational impacts result from the emissions of the proposed project during normal operation, which includes all of the

[7] Primary impacts potentially result from facility emissions of NOx, SOx, CO and PM10/2.5. Secondary impacts result from air contaminants that are not directly emitted by the facility but formed through reactions in the atmosphere that result in ozone, and sulfate and nitrate PM10/PM2.5.

onsite auxiliary equipment (boilers, emergency generator, fire pump engine, etc.) and the maintenance vehicle emissions. Cumulative impacts result from the proposed project's incremental effect, together with other closely related past, present and reasonably foreseeable future projects whose impacts may compound or increase the incremental effect of the proposed project. (Pub. Resources Code § 21083; Cal. Code Regs., tit. 14, §§ 15064(h), 15065(c), 15130, and15355.)

METHOD AND THRESHOLD FOR DETERMINING CEQA SIGNIFICANCE

Energy Commission staff used two main CEQA significance criteria in evaluating this project. First, all project emissions of nonattainment pollutants and their precursors (PM10, NOx, VOC and SO_2) are considered cumulative, CEQA-significant impacts that must be mitigated. Second, any AAQS violation caused by unmitigated project emissions is considered CEQA-significant and must be mitigated. Potentially significant CEQA impacts are deemed to be mitigated to be less than CEQA-significant with the application of appropriate mitigation measures.

For construction emissions, CEQA mitigation is limited to controlling both construction equipment tailpipe emissions and fugitive dust emissions through best practices, to reduce impacts to less than significant.

For operating emissions, when analyzing renewable projects with very low direct criteria pollutant emissions from stationary sources associated with electric generation that: 1) are located in areas with generally good air quality; and 2) are non-attainment of ambient air quality standards primarily or solely due to pollutant transport, the mitigation that is considered is limited to feasible emission controls. These feasible emission controls are applied to both the stationary sources (such as requiring BACT) and the on-site, non-stationary emission sources (such as maintenance vehicles) including associated fugitive dust emission sources.

The ambient air quality standards that staff uses as a basis for determining project CEQA significance are health-based standards established by the ARB and U.S. EPA. They are set at levels to adequately protect the health of all members of the public, including those most sensitive to adverse air quality impacts such as the aged, people with existing illnesses, children, and infants, including a margin of safety.

Impacts from Closure and Decommissioning

Impacts from closure and decommissioning, as a one-time limited duration event, are evaluated with the same methods and thresholds as construction emissions as discussed above.

DIRECT/CUMULATIVE IMPACTS AND MITIGATION

While the emissions are the actual mass of pollutants emitted from the project, the impacts are the concentration of pollutants from the project that reach the ground level. When emissions are released at a high temperature and velocity through a relatively tall stack, the pollutant concentrations would be substantially diluted by the time they reach ground level. The emissions from the proposed project, both stationary source and onsite mobile source emissions, are analyzed by the use of air dispersion models to determine the probable impacts at ground level.

Air dispersion models provide a means of predicting the location and ground level magnitude of the impacts of a proposed new emissions source. These models consist of several complex series of mathematical equations, which are repeatedly calculated by a computer for many ambient conditions to provide theoretical maximum offsite pollutant concentrations short-term (1-hour, 3-hour, 8-hour, and 24-hour) and annual periods. The model results are generally described as maximum concentrations expected outside the project's boundary and are often described as a unit of mass per volume of air, such as micrograms per cubic meter ($\mu g/m^3$).

The applicant has used the U.S. EPA-approved ARMS/EPA Regulatory Model (AERMOD version 1135) air dispersion model to estimate the direct impacts of the project's NOx, PM10, CO, and SOx emissions resulting from project construction and operation. Additionally, boiler emission fumigation impacts during inversion breakup conditions were determined using the U.S. EPA approved SCREEN3 (version 96043) model.

Staff revised the background concentrations provided by the applicant, replacing them with the available highest ambient background concentrations for the last three years from representative monitoring sites show in **Air Quality Table 5**. Staff added the modeled impacts to these background concentrations, then compared the results with the ambient air quality standards for each respective air contaminant to determine whether the project's emission impacts would cause a new violation of the ambient air quality standards or would contribute to an existing violation.

The inputs for the air dispersion models include stack information (exhaust flow rate, temperature, and stack dimensions), specific boiler emission data and meteorological data, such as wind speed, atmospheric conditions, and site elevation. For this project, the meteorological data used as inputs to the model included hourly wind speeds and directions measured at the Pahrump, Nevada, meteorological site during 2006 and 2011, which is the closest complete meteorological data source to the project site, and supplemented cloud cover data to fill missing information was done by using the Henderson Airport meteorological site. Concurrent upper air data from Elko, Nevada was also used.

Additionally, the applicant obtained hourly ozone and NO_2 ambient data from the Jean Nevada and Trona, CA monitoring stations for 2006 through 2011 that was used in a more refined NO_2 impact modeling analysis using the Ozone Limiting Method (OLM), available with AERMOD that integrates with the downwind plume stoichiometry.

Proposed Project

Construction Impacts Analysis

The HHSEGS project would be constructed in two phases over approximately 29 months. Construction generally consists of two major activities: site preparation, and construction and installation of major equipment and structures. In addition to fugitive dust emissions resulting from the site preparation, emissions from construction equipment exhausts, such as vehicles and internal combustion engines, would also occur during the project construction phase.

Using estimated peak hourly, daily, and annual construction equipment exhaust and fugitive dust emissions, the applicant performed a modeling analysis. **Air Quality Table 9** presents the results of the applicant's modeling analysis.

Air Quality Table 9
Maximum Project Construction Impacts

Pollutants	Avg. Period	Impacts ($\mu g/m^3$)	Background [a] ($\mu g/m^3$)	Total Impact[a] ($\mu g/m^3$)	Standard ($\mu g/m^3$)	Percent of Standard
NO_2	1-hr	133.5	117	251	339	74%
	1-hr (98[th] percentile)	88.0	80.8	169	188	90%
	Annual	3.7	7.5	11	57	19%
PM10	24-hr	29.3	96	125	50	250%
	Annual	1.4	14	15.4	20	77%
PM2.5	24-hr[b]	5.1	13	18	35	46%
	Annual[c]	0.3	4.9	5.2	12	43%
CO	1-hr	66.8	1,750	1,817	23,000	8%
	8-hr	28.3	1,333	1,361	10,000	13%
SO_2	1-hr	0.2	93.6	94	196	48%
	3-hr	0.2	23.4	24	1300	2%
	24-hr	0.05	13.1	13.1	105	12.5%
	Annual	0.01	2.7	2.7	80	3.4%

Source: HHSEGS DResponse set 1A table DR8-4 2011.
Note:
a. Total concentrations shown in this table are the sum of the maximum predicted impact and the maximum measured background concentration. Because the maximum impact would not occur at the same time as the maximum background concentration, the actual maximum combined impact would be lower.
b Background concentration shown is the three-year average of the 98th percentile values, in accordance with the form of the federal standard. Table 5.1F-8, footnote c.
c. Background value shown is the three-year average of the annual arithmetic mean, in accordance with the form of the standard.

This modeling analysis indicates that the project would not create new exceedances and, with the exception of 24-hour PM10 impacts, would not contribute to existing exceedances for any of the modeled air pollutants. Staff notes that the maximum local background 24-hour measurements of PM10, which exceed the state 24-hour PM10 standard with or without the proposed project, may be substantially impacted by wind-blown dust. However, in light of the existing PM10 and ozone non-attainment status for the project site area with regard to state standards, staff considers the construction NOx, VOC, and PM emissions to be potentially CEQA significant and, therefore, staff is recommending that the off-road equipment and fugitive dust emissions be mitigated.

The modeling analysis shows that, after implementation of the recommended fugitive dust mitigation measures, the project's construction is not predicted to cause violations of state or federal AAQS.

Construction Impacts Mitigation

To mitigate the impacts due to construction of the facility, the following mitigation measures have been proposed:

A. All unpaved roads and disturbed areas in the project and for the portion of the linear construction sites located in California would be watered until sufficiently wet to ensure that no visible dust plumes leave the project site.

B. Vehicle speeds would be limited to10 miles per hour within the construction site on unpaved non-stabilized roads.

C. All construction equipment vehicle tires would be washed or cleaned free of dirt prior to entering or leaving the project site.

D. Gravel ramps would be provided at the tire washing/cleaning station.

E. All entrances to the construction site would be graveled or treated with water or dust soil stabilization compounds.

F. Construction areas adjacent to any paved roadway would be provided with sandbags to prevent run-off to the roadway.

G. All paved roads within the construction site would be swept twice daily when construction activity occurs.

H. At least the first 500 feet of any paved public roadway, accessed from the construction site or from unpaved roads en route to the construction site and construction staging areas would be swept regularly on days when construction activity occurs.

I. All soil storage piles and disturbed areas that remain inactive for longer than 10 days would be covered or treated with appropriate dust suppressant compounds.

J. All vehicles that are used to transport solid bulk material on public roadways and that have potential to cause visible emissions would be provided with a cover, or the materials would be sufficiently wetted and loaded onto the trucks in a manner to provide at least two feet of freeboard.

K. Wind erosion control techniques such as windbreaks, water, chemical dust suppressants, and vegetation would be used on all construction areas that may be disturbed. Any windbreaks used would remain in place until the soil is stabilized or permanently covered with vegetation.

L. Construction equipment would be shut down when not in use in order to avoid excessive idling emissions.

M. Construction equipment would use low sulfur, low aromatic diesel fuel.

N. Construction equipment would be maintained as specified by OEM (original equipment manufacturers) specifications. .

O. Construction equipment used would meet state and federal emission most current standards when available.

Staff recommends the implementation of mitigation measures contained in conditions of certification **AQ-SC1** to **AQ-SC5**, which incorporate the applicant's proposed measures with revisions and additions recommended by staff to further reduce the impacts from the construction of the proposed project. Specific recommendations from staff include a more aggressive dust control requirement to use CPM approved polymer based, or equivalent, soil stabilizers on the site's unpaved roads and inactive disturbed surfaces during construction.

AQ-SC1 would require the project owner to designate and retain an on-site AQCMM who shall be responsible for directing and documenting compliance with conditions of certification **AQ-SC3**, **AQ-SC4** and **AQ-SC5.**

The AQCMM would have overall responsibility for directing and documenting
The project's compliance with **AQ-SC3** through **AQ-SC5** which are mitigation measures for the site during project construction. Types of actions that can be taken and have been approved by the Energy Commission for other desert projects include but are not limited to:

- Monitoring construction activities for visible dust plumes that have the potential to be transported offsite and within 400 feet of offsite structures not owned by the Owner or 200 feet from the centerline of a linear facility (e.g., pipeline).
- Within 15 minutes of determination of non-compliant dust conditions (associated with construction activity), direct the more intensive application of existing mitigation measures.
- Within 30 minutes of determination of continuing non-compliant dust conditions (associated with construction activity), direct the more intensive application of additional mitigation measures.
- Within 60 minutes of determination of continuing non-compliant dust conditions (associated with construction activities), direct a temporary shutdown of the activity causing the emissions. Activity would not resume until effective mitigation has been implemented or site conditions have changed, such that non-compliant dust conditions would not resume upon restart of the activity.
- Respond to direction from the CPM or BLM Authorized Officer regarding Owner appeals to AQCMM directives.
- Submit related compliance and mitigation measures to the CPM via the Monthly Compliance Report.

The construction of the project would cause particulate matter emissions that would add to existing violations of the state's ambient PM10 air quality standards. Therefore, if unmitigated, the project's construction PM10 emission impacts would be significant. However, staff believes that the implementation of proposed specific mitigation measures during construction of the facility as identified in the conditions of certification would mitigate these short-term impacts of PM10 emissions to a level of less than significant.

Operational Impacts

The following section discusses the project's direct construction/operating ambient air quality impacts, as estimated by the applicant, and evaluated by staff. Additionally, this section discusses Energy Commission staff recommended mitigation measures.

Operational Modeling Analysis

The applicant has provided a modeling analysis using the EPA-approved AERMOD model to estimate the impacts of the project's NOx, PM10, CO, and SOx emissions resulting from project operation and mirror washing activities (CH2 2012p). Similar to the assessment of construction impacts, staff added the modeled impacts to the available highest ambient background concentrations recorded during the previous three years from nearby monitoring stations to assess the project operational impacts. The modeling results, staff recommend backgrounds and total impacts are shown in **Air Quality Table 10**.

This modeling analysis indicates, with the exception of 24-hour PM10 impacts, that the project would not create new exceedances or contribute to existing exceedances for any of the modeled air pollutants. Staff notes that the maximum local background 24-hour measurements of PM10 may be substantially impacted by wind-blown dust. However, in light of the existing PM10 and ozone non-attainment status of state ambient air quality standards for the project site area, staff considers the operating NOx, VOC, and PM emissions to be potentially CEQA significant and, therefore, staff is recommending that the stationary equipment, the off-road maintenance equipment, and fugitive dust emissions be mitigated. The modeling analysis shows that, after implementation of the recommended fugitive dust mitigation measures, the project's operation is not predicted to cause violations of the state or federal AAQS.

Chemically Reactive Pollutant Impacts

The project would have direct emissions of chemically reactive pollutants (NOx, SOx, and VOC), but may also have indirect emission reductions associated with the reduction of fossil-fuel fired power plant emissions due to the project's effect of displacing the need for fossil-fuel power plant operation. The exact nature and location of such reductions are speculative as the overall magnitude and downwind impact of those upwind emission reductions are unknown. Staff's impact analysis has not considered these potential reductions as an offset source for the project's emissions, so the discussion below focuses only on the direct emissions from the project.

Air Quality Table 10
Project Operation with Mirror Washing Emissions Impacts

Pollutants	Avg. Period	Impacts ($\mu g/m^3$)	Background [a] ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Standard ($\mu g/m^3$)	Percent of Standard
NO_2	1-hr	184	--	230[e]	339	68%
	1-hr federal[d]	141	--	166[d]	188	88%
	Annual	0.1	7.5	7.6	57	13%
Pollutants	**Avg. Period**	**Impacts ($\mu g/m^3$)**	**Background [a] ($\mu g/m^3$)**	**Total Impact ($\mu g/m^3$)**	**Standard ($\mu g/m^3$)**	**Percent of Standard**
PM10	24-hr	**1.1**	**96**	**97.1**	**50**	**194%**
	Annual	0.03	14	14	20	70%
PM2.5 [c]	24-hr [b]	1.1	13	14	35	40%
	Annual	0.03	4.9	4.9	12	40%
CO	1-hr	261.7	1,750	2,011	23,000	9%
	8-hr	64.3	1,333	1,397	10,000	14%
SO2	1-hr	19.0	93.6	112	665	17%
	24-hr [b]	0.5	13.1	13.6	105	23%
	Annual	0.01	2.7	2.7	80	16%

Source: supplemental info from CH2 2012p.
Notes:
a Background values have been adjusted per staff recommended background concentrations shown in **Air Quality Table 5**.
b Maximum 24-hour hour PM2.5 and SO_2 concentrations occur under fumigation conditions.
c PM2.5 impacts were not remodeled to include maintenance emissions like the other pollutants, the results presented are stationary source emission only from the original AFC modeling analysis. With the maintenance PM2.5 emission the PM2.5 results would be higher than shown but lower than the PM10 results as the PM2.5 emissions are less than the PM10 emissions. Therefore, the PM2.5 impacts with maintenance emissions would not create new exceedances of the ambient air quality standards.
d The total impact for the 1-hour NO_2 federal standard is calculated based on three-year average of 98th percentile of annual distribution of daily maximum paired-sum of project impact and background.
e From applicant value. Includes concurrent 1-hr NO2 modeled impact which were included in the total impact value. See Table 5.1-38 from supplemental data responses submitted April 1, 2012 (CH2 2012p)

Ozone Impacts

There are air dispersion models that can quantify ozone impacts, but they are used for regional planning efforts where hundreds or even thousands of sources are input into the modeling to determine ozone impacts. There are no regulatory agency models approved for assessing single source ozone impacts. However, because of the known relationship of NOx and VOC emissions to ozone formation, it can be said that the emissions of NOx and VOC from the HHSEGS project do have the potential (if left unmitigated) to contribute to higher ozone levels in the region, which are already designated nonattainment for the state ozone standard.

PM2.5 Impacts

While some PM2.5 would be directly emitted, some PM2.5 forms from precursor emissions and is classified as secondary particulate matter. The process of gas-to-particulate conversion, which occurs downwind from the point of emission, is complex and depends on many factors, including local humidity and the presence of air pollutants. The basic process assumes that the SOx and NOx emissions are converted into sulfuric acid and nitric acid first and then the acids react with ambient ammonia to form sulfate and nitrate. The sulfuric acid reacts with ammonia much faster than nitric acid and converts completely and irreversibly to particulate form. Nitric acid reacts with ammonia to form both a particulate and a gas phase of ammonium nitrate. The particulate phase would tend to fall out; however, the gas phase can revert back to ammonia and nitric acid. Thus, under the right conditions, ammonium nitrate and nitric acid establish a balance of concentrations in the ambient air. There are two conditions that are of interest, described as *ammonia rich* and *ammonia poor*. The term ammonia rich indicates that there is more than enough ammonia to react with all the sulfuric acid and to establish a balance of nitric acid-ammonium nitrate. Further ammonia emissions in this case would not necessarily lead to increases in ambient PM2.5 concentrations. In the case of an ammonia poor environment, there is insufficient ammonia to establish a balance and thus additional ammonia would tend to increase PM2.5 concentrations.

The northeastern San Bernardino County portion of the Great Basin Valleys Air Basin has not undergone the rigorous secondary particulate studies that have been performed in other areas of California, such as the San Joaquin Valley, that have more serious fine particulate pollution problems. However, due to the limited agricultural activity in the area the project site area would likely be characterized as ammonia poor, and the HHSEGS project is not a notable source of ammonia emissions. Therefore, the small amount of operating NOx and SOx emissions generated by this project would have a low potential to create secondary particulate.

Impact Summary

The applicant is proposing to mitigate the project's stationary source NOx, VOC, SO_2, and PM10/PM2.5 emissions through the use of boiler emission controls (Low NOx burner and flue gas recirculation) and natural gas fuel for the boilers, and use emergency engines that meet the highest available EPA/ARB Tier emission standards fueled with California 15 ppm sulfur diesel fuel. Additionally, staff recommends additional mitigation, specified in conditions of certification **AQ-SC6** and **AQ-SC7,** to reduce maintenance vehicle emissions, both tailpipe emission and fugitive dust emissions that could contribute to further ozone and PM10 violations. With the applicant proposed and staff recommended emission mitigation, it is staff's belief that the project would not cause CEQA significant secondary pollutant impacts.

Operations Mitigation

Applicant's Proposed Mitigation

Emission Controls

As discussed in the air quality section of the AFC (HHSEGS 2011a), the applicant proposes the following emission controls on the stationary equipment associated with the HHSEGS operation:

Auxiliary Boilers (Startup Boilers)

The applicant's proposed mitigation for each auxiliary boiler includes Low-NOx burners and 20 percent flue gas recirculation (for NOx), good combustion practices (for CO), and to operate each exclusively on pipeline quality natural gas (for VOC, PM and SOx) to limit boiler emission levels. The AFC (HHSEGS 2011a), and Determination of Compliance (DOC) conditions (GBUAPCD 2012a) provide the following emission limits, for each of the auxiliary boilers:

- NOx: 9.0 ppmvd at 3% O_2 (one-hour average), 2.74 lb/hour
- CO: 25 ppmvd at 3% O_2 (one-hour average), 4.55 lb/hour
- VOC as CH_4: 12.6 ppmvd, 1.34 lb/hour
- PM10/PM2.5: 1.25 lb/hour
- SO_2: 1.7 ppmvd, 0.52 lb/hour

Nighttime Preservation Boilers

The applicant's proposed mitigation for each preservation boiler includes Low-NOx burners and 20 percent flue gas recirculation (for NOx), good combustion practices (for CO), and to operate each exclusively on pipeline quality natural gas (for VOC, PM and SOx) to limit boiler emission levels. The supplemental data responses submitted by the applicant on April 2, 2012 (CH2 2012p), and final FDOC conditions would require the following emission limits for each of the nighttime preservation boilers:

- NOx: 9.0 ppmvd at 3% O_2 (one-hour average), 0.17 lb/hour
- CO: 50 ppmvd at 3% O_2 (one-hour average), 0.55 lb/hour
- VOC: 12.6 ppmvd, 0.08 lb/hour
- PM10/PM2.5: 0.08 lb/hour
- SO_2: 1.7 ppmvd, 0.03 lb/hour

Emergency Backup Engines

The applicant's proposed controls for each emergency generator engine is to purchase a new engine meeting current emission standard requirements (currently, Tier 2) for 3,633 bhp engines. The specific emission levels for the selected engine are currently unknown but they would be no higher than following Tier 2 emission standards:

- NOx: 4.8 grams per brake horsepower
  (including non-methane hydrocarbons - NMHC/VOC)
- CO: 2.6 grams per break horsepower
- VOC: 0.16 grams per break horsepower
- PM10: 0.15 grams per break horsepower
- SO_2: 15 ppm sulfur content fuel

Fire Water Pump Engines

The applicant has proposed use of Tier 3 Engines that would have emission rates no greater than the following standards:

- NOx: 3.0 grams per break horsepower (including NMHC/VOC)

- CO: 2.6 grams per break horsepower
- VOC: (see NOx above)
- PM10: 0.15 grams per break horsepower
- SO_2: 15 ppm sulfur content fuel

Maintenance Vehicles

The applicant has proposed to use on-road or certified off-road vehicles and engines for mirror washing and other maintenance activities to minimize emissions for this emission source.

Delivery and Employee Vehicles

The applicant has not proposed any specific emission controls for this emission source.

Emission Offsets

The applicant has not proposed any emission offsets and the stationary source emissions for HHSEGS as currently proposed by the applicant would be well below District offset thresholds.

Adequacy of Proposed Mitigation

Staff concurs with the District's determination that the project's stationary source proposed emission controls/emission levels for criteria pollutants meet regulatory requirements and that the proposed stationary source emission levels are reduced adequately.

Staff Proposed Mitigation

As mentioned earlier in the discussions of the ozone and PM10 impacts, staff believes that the project's ozone precursors and PM10 emissions, if unmitigated, could cause CEQA significant impacts. Additionally, staff believes a solar renewable project, which would have a 30 to 40-year life, located in an ozone and PM10 nonattainment area and just downwind of other ozone and PM10 nonattainment areas, should address its contribution to the potentially ongoing nonattainment of the PM10 and ozone standards. Therefore, staff recommends the following additional mitigation measures:

- Require the use of new model year vehicles for onsite maintenance, or equivalently low emitting vehicles as long as those vehicles can be demonstrated to have a similar or lower emission profile than new model year vehicles
- Limit vehicle speeds within the facility to no more than ten miles per hour on unpaved areas that have not undergone soil stabilization, and up to 25 miles per hour, or greater with CPM approval as long as there is no conflict with **BIO-7(3)**, on stabilized unpaved roads as long as no visible dust plumes are observed, to address fugitive PM emissions from the site;
- Apply and maintain water or other non-toxic soil binder[8] to the onsite unpaved roads to create a durable stabilized surface;

[8] The soil stabilizer product used will require prior approval by the Energy Commission.

- Additional ongoing operations fugitive dust emissions control techniques such as windbreaks, trackout controls, etc. should be identified in a fugitive dust control plan and used on areas that could be disturbed by vehicles or wind. Any windbreaks used would remain in place until the soil or road is stabilized.

Staff further recommends that onsite maintenance vehicles and ongoing fugitive dust emissions control are subject to conditions of certification **AQ-SC6** and **AQ-SC7**, respectively. Staff also proposes condition of certification **AQ-SC8** to ensure that the license is amended as necessary to incorporate changes to the air quality permits and **AQ-SC9** to require submittal of Quarterly Operation Reports.

Staff believes that the implementation of these recommended additional CEQA mitigation measures would reduce the potential of adverse impacts from the facility on ozone and PM10 to levels less than significant.

Staff has considered the presence of minority populations near to the site (see **Socioeconomics Figure 1**). The demographic analysis indicates no environmental justice population. Moreover, since the staff-proposed mitigation measures reduce the project's air quality impacts to a level that is less than significant, there is no environmental justice issue for air quality.

Closure and Decommissioning Impacts and Mitigation

Eventually the facility would close, either at the end of its useful life or due to some unexpected situation such as a natural disaster or catastrophic facility breakdown. When the facility closes, all sources of air emissions would cease to operate and thus impacts associated with those emissions would no longer occur. The only other expected emissions would be equipment exhaust and fugitive particulate emissions from any dismantling activities. These activities would be of much a shorter duration than construction of the project, equipment are assumed to have much lower comparative emissions due to technology advancement during the intervening years, and fugitive dust emissions would be required to be controlled in a manner at least equivalent to that required during construction. Therefore, while there would be adverse CEQA-related air quality impacts during decommissioning they are expected to be less than significant. At the time of decommissioning, the applicant will be required to obtain Energy Commission approval of a plan to control wind-blown dust emission until a natural crust is developed.

CUMULATIVE IMPACTS

Cumulative impacts are defined as "two or more individual effects which, when considered together, are considerable or . . . compound or increase other environmental impacts." (CEQA Guidelines, § 15355) A cumulative impact consists of an impact that is created as a result of a combination of the project evaluated in the EIR together with other projects causing related impacts." (CEQA Guidelines, § 15130(a)(1).) Such impacts may be relatively minor and incremental, yet still be significant because of the existing environmental background, particularly when one considers other closely related past, present, and reasonably foreseeable future projects.

This air quality analysis is concerned with *criteria* air pollutants. Such pollutants have impacts that are usually (though not always) cumulative by nature. However, a new source of pollution may contribute to existing violations of criteria pollutant standards because of the existing background sources or foreseeable future projects. Air districts attempt to attain the criteria pollutant standards by adopting attainment plans, which comprise a multi-faceted programmatic approach to such attainment. Depending on the air district, these plans typically include requirements for air offsets and the use of Best Available Control Technology (BACT) for new sources of emissions, and restrictions of emissions from existing sources of air pollution.

Much of the preceding discussion is concerned with cumulative impacts. The “Existing Ambient Air Quality” subsection describes the air quality background in southeastern Inyo County portion of the Great Basin Valleys Air Basin, including a discussion of historical ambient levels for each of the assessed criteria pollutants. The “Construction Impacts and Mitigation” subsection discusses the project’s contribution to the local existing background caused by project construction. The “Operation Impacts and Mitigation” subsection discusses the project’s contribution to the local existing background caused by project operation. The following subsection includes two additional analyses:

- a summary of projections for criteria pollutants by the air district and the air district’s programmatic efforts to abate such pollution;
- an analysis of the project’s *localized cumulative impacts*, the project’s direct operating emissions combined with other local major emission sources;

Summary of Projections

The southeastern Inyo County portion of the GBVAB is designated as non-attainment for state PM10 and ozone ambient air quality standards and attainment/unclassified for the federal PM10 and ozone ambient air quality standards. PM2.5, CO, NO_2, and SO_2 are all considered to be attainment or unclassified for the federal and state standards.

Ozone

A portion of Inyo County in the Mojave Desert is non-attainment for the state standard, north and west of the project site. With respect to state standards, the entire GBUAPCD is classified as nonattainment for the 8-hour ozone standard, with the exception of Alpine County; and either unclassified (Alpine and Inyo counties) or nonattainment (Mono County) for the 1-hour state ozone standard.

On May 21, 2012, in the Federal register (Vol 77, No. 98)the US EPA redesignated all of Inyo County as unclassifiable/attainment for the federal 8-hour ozone standard. Thus, currently there is no requirement for the GBUAPCD to prepare a federal attainment plan for the 8-hour federal ozone standard.

Particulate Matter

The District is nonattainment for the state 24-hour PM10 air quality standard. California has adopted standards that are far more stringent than federal requirements for PM10. Currently, virtually all air districts in the state (the lone exception being Lake County) are designated nonattainment of the state PM10 standard. There is no legal requirement for air districts to provide plans to attain the state PM10 standard, so air districts have not developed such plans.

In 1997, the federal government adopted PM2.5 standards, as did the state in 2003. The EPA has determined that the area is unclassified, or attainment for both the annual and the 24-hour federal PM2.5 standard.

As a solar power generation facility, the direct air pollutant emissions from power generation are negligible and the emission sources are limited to auxiliary equipment and maintenance activities. With the mitigation required by the recommended staff conditions and District conditions, the project will not have a CEQA significant impact on particulate matter emissions.

Summary of Conformance with Applicable Air Quality Plans

The applicable air quality plans do not outline any new control measures applicable to the proposed project's operating emission sources. Therefore, compliance with existing District rules and regulations would ensure compliance with those air quality plans.

Localized Cumulative Impacts

Since HHSEGS air quality impacts can be reasonably estimated through air dispersion modeling (see the "Operational Modeling Analysis" subsection) the project's contribution to localized cumulative impacts can be estimated. To represent *past* and, to an extent, *present projects* that contribute to current ambient air quality conditions, the Energy Commission staff recommends the use of ambient air quality monitoring data (see the "Environmental Setting" subsection), referred to as the *background*. The staff takes the following steps to estimate what are additional appropriate "present projects" that are not represented in the background and "reasonably foreseeable projects":

- First, the Energy Commission staff (or the applicant) works with the air district to identify all projects that have submitted, within the last year of monitoring data, new applications for an authority to construct (ATC) or permit to operate (PTO) and applications to modify an existing PTO within six miles of the project site. Based on staff's modeling experience, beyond six miles there is no significant concentration overlap for non-reactive pollutant concentrations between two stationary emission sources.
- Second, the Energy Commission staff (or the applicant) works with the air district and local counties to identify any new area sources within six miles of the project site. As opposed to point sources, area sources include sources like agricultural fields, residential developments or other such sources that do not have a distinct point of emission. New area sources are typically identified through draft or final Environmental Impact Reports (EIRs) that are prepared for those sources. The initiation of the EIR process is a reasonable basis on which to determine what is "reasonably foreseeable" for new area sources.
- The data submitted, or generated from the applications with the air district for point sources or initiating the EIR process for area sources, provides enough information to include these new emission sources in air dispersion modeling. Thus, the next

step is to review the available EIR(s) and permit application(s), then determine what sources must be modeled and how they must be modeled.

- Sources that are not new, but may not be represented in ambient air quality monitoring are also identified and included in the analysis. These sources include existing sources that are co-located with or adjacent to the proposed source (such as an existing power plant). In most cases, the ambient air quality measurements are not recorded close to the proposed project, thus a local major source might not be well represented by the background air monitoring data. When these sources are included, it is typically a result of there being an existing source on the project site and the ambient air quality monitoring station being more than two miles away.
- The modeling results must be carefully interpreted so that they are not skewed towards a single source, in high impact areas near that source's fence line. It is not truly a cumulative impact of the HHSEGS if the high impact area is the result of high fence line concentrations from another stationary source which is not providing a substantial contribution to the determined high impact area.

Once the modeling results are interpreted, they are added to the background ambient air quality monitoring data and thus the modeling portion of the cumulative assessment is complete. Due to the use of air dispersion modeling programs in staff's cumulative impacts analysis, the applicant must submit a modeling protocol, based on information requirements for an application, prior to beginning the investigation of the sources to be modeled in the cumulative analysis. The modeling protocol is typically reviewed, commented on, and eventually approved in the Data Adequacy phase of the licensing procedure. Staff typically assists the applicant in finding sources (as described above), characterizing those sources, and interpreting the results of the modeling. However, the actual modeling runs are usually left to the applicant to complete. There are several reasons for this: modeling analyses take time to perform and require substantial expertise, the applicant has already performed a modeling analysis of the project alone (see the "Operational Modeling Analysis" subsection), and the applicant can act on its own to reduce stipulated emission rates and/or increase emission control requirements as the results warrant. Once the cumulative project emission impacts are determined, the necessity to mitigate the project emissions can be evaluated, and the mitigation itself can be proposed by staff and/or the applicant (see the "Mitigation" subsection).

The applicant, in consultation with the district, has conducted a survey of stationary sources that are either under construction, or have received permits to be built or operate in the near future and that have the potential for emissions of criteria air contaminants within six miles of the project site. The survey results indicate that no such sources exist within 6-miles from the project boundaries[9] of the proposed project site (CH2 2012p).

The Applicant requested information for a cumulative impact analysis from the GBUAPCD, Nevada's Clark County Department of Air Quality and Environmental Management, and the Nevada Division of Environmental Protection, Department of Air Quality Management, Bureau of Air Pollution Control ("Nevada DEP"). The request

[9] Staff assumes that impacts from projects beyond six miles would not affect the modeling analysis on a cumulative basis. This is in the CA Energy Commission's "Siting Rules and Regulations of Practice and Procedure and Power Plant Siting Regulations, April 2007"; Title 20, California Code of Regulations, Chapter 5, Appendix B, section 8, (I)(iii).

letters and any agency responses received before the AFC was filed were included in Attachment 5.1G-1 to Appendix 5.1G of the AFC. To summarize, the GBUAPCD responded that:

> *"[t]here are no facilities in the District, other than the St. Therese project, within 6 miles of the perimeter of the Hidden Hills Ranch project." Nevada DEP responded with a list of active permits in the general project area. Attachment 5.1G-1 includes the list provided by Nevada DEP and a description of the analysis used to determine that none of the projects on the list provided by Nevada DEP is within 6 miles of the project site. The Clark County response to the request for information regarding potential sources to be included in a cumulative impact analysis was received on August 25, 2011, after the AFC had been filed, and was docketed on August 29. Clark County responded: We have five permitted sources in, or near, that hydrographic area, but, none of these are within the 6 miles perimeter of the site you have identified. In fact, it appears the closest permitted source is over 20 miles away. Our search of our records did not indicate any proposed authority to construct projects within the area for which we have received an application.*

No additional cumulative air quality impact modeling analysis was performed, and no CEQA significant cumulative air quality impacts are expected. after implementation of staff's recommended project mitigation measures. However, staff is aware of a tremendous potential development of wind and solar in the desert southwest of the United States, and in the area where HHSEGS would be located. While the number of renewable project filings is much larger than what would eventually be built and operated in the desert southwest, staff believes it is appropriate to construct and operate all desert renewable projects with best practices to reduce any potential cumulative effects, including criteria pollutants and their contributions to region ozone and particulate matter and haze. Staff recommends conditions of certification **AQ-SC1** and **AQ-SC-7** as best practices for the construction and operation of the HHSEGS desert solar project.

Staff has considered the minority population surrounding the site (see **Socioeconomics Figure 1**). Since the project's cumulative CEQA air quality impacts have been mitigated to be less than significant, there is no environmental justice issue for air quality.

COMPLIANCE WITH LORS

The Great Basin Unified Air Pollution Control District issued the Final Determination of Compliance (FDOC) for the HHSEGS on August 1, 2012 and the FDOC was docketed by the Energy Commission on August 8, 2012 (GBUAPCD 2012b). The FDOC finds compliance e with all District rules and regulations. The District's conditions are presented below in the "**AQ-x**" series of conditions of certification.

FEDERAL

The district is responsible for issuing the federal New Source Review (NSR) permit, the federal Title V permit, and has been delegated enforcement of the applicable New Source Performance Standard (Subparts, Dc, Db, and IIII). The applicant would be required to submit a Title V permit application to the district within 12 months of commencing operation. Additionally, this project would not require a PSD permit from U.S. EPA, because the project would be below the 250 tons per year (TPY) threshold for criteria pollutants and less than 100,000 tpy of GHG pollutants.

STATE

The project would comply with Section 41700 of the California State Health and Safety Code, which restricts emissions that would cause nuisance or injury, with the issuance of the District's Final Determination of Compliance and the Energy Commission's affirmative finding for the project. In the FDOC, the district concluded that the project would comply with this requirement as the screening health risk assessment they performed found risks to be below a Prioritization Score of 1.0, or below the need for any additional analysis or action. For additional information on health risks, refer to the Public Health portion of the FSA.

The fire pump and emergency generator engines are also subject to the Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines (17 CCR §93115). This measure limits the types of fuels allowed, established maximum emission rates and establishes recordkeeping requirements. This measure would also limit the engine's testing and maintenance operation to 50 hours per year. The engines would also meet the current Tier standards of 13 CCR, §2423 - Exhaust Emission Standards and Test Procedures: Heavy-Duty Off-Road Diesel Cycle Engines.

LOCAL

The District rules and regulations specify the emissions control and offset requirements for new sources such as the HHSEGS. The emitting equipment would be well controlled; however, Best Available Control Technology (BACT), and emission reduction credits (ERCs) are not required by District rules and regulations based on the permitted stationary source emission levels for this project. Compliance with the District's new source requirements would ensure that the project would be consistent with the strategies and future emissions anticipated under the District's air quality attainment and maintenance plans.

The applicant provided an air quality permit application to the GBUAPCD in September 2011 and the District issued the FDOC on August 1, 2012. This Final Determination of Compliance (FDOC) evaluated whether and under what conditions the proposed project would comply with the District's applicable rules and regulations, as described below.

Regulation II – New Source Review

Rule 216 – New Source Review

This rule requires implementation of BACT for any emission source unit that emits or has the potential to emit 250 lbs/day or more, and emission offsets if total facility emissions exceed annual thresholds. The district permits limit the emissions from each source to less than 250 lbs/day, so BACT is not applicable; and the permits limit the total site annual emission below offset thresholds, so offsets are not required.

Regulation II – Permits

Rule 200 and 209A – Permit to Construct and Permit to Operate

Rule 200 establishes the emission source requirements that must be met to obtain a Permit to Construct. Rule 209A prohibits use of any equipment or the use of which may emits air contaminants without obtaining a Permit to Operate. The applicant has submitted all required applications; therefore, the applicant is in compliance with these rules.

Rule 217 – Federal Operating Permit Requirement

Rule 217 requires certain facilities to obtain Federal Operating Permits. The auxiliary boilers, by providing steam to a steam turbine having a capacity greater than 25 megawatts of electrical output, trigger Title IV – Acid Deposition Control for this project. Title V permitting is thereby also required for the proposed project. The applicant would be required to submit an application for a Title V permit to the district to comply with this rule.

Regulation IV – Prohibitions

Rule 400 - Visible Emissions Opacity Limit

This rule limits visible emissions from emissions sources, including stationary source exhausts and fugitive dust emission sources. Compliance with this rule is expected.

Rule 401 - Fugitive Dust

This rule limits fugitive emissions from certain bulk storage, earthmoving, construction and demolition, and manmade conditions resulting in wind erosion. With the implementation of recommended staff condition **AQ-SC3** and **AQ-SC7,** the facility would comply with this rule.

Rule 402- Nuisance

This rule restricts discharge of emissions that would cause injury, detriment, annoyance, or public nuisance. The facility would comply with this rule (identical to California Health and Safety Code 41700).

Rule 403 - Breakdown

This rule sets forth procedures that must be followed in the event of an unforeseeable failure or breakdown of air pollution control equipment. The facility would comply with this rule.

Rule 404-A - Particulate Matter Concentration

Rule 404.A limits particulate matter (PM) emissions to less than 0.3 grains per standard cubic foot of gas at standard conditions. In the DOC, the District has determined that the estimated PM emission concentrations of the proposed boilers and engines are less than permit limits. These proposed emission rates are well below the limits established by this rule, therefore compliance is expected.

Rule 404-B – Oxides of Nitrogen

This rule applies to fuel-burning equipment with a maximum heat input rate in excess of 1.5 billion Btu/hr (gross) (1500 MMBtu/hr HHV). All of the fuel burning equipment proposed for installation at HHSEGS has a maximum heat input rate below this threshold, so this rule is not applicable to the project.

Rule 416 – Sulfur Compounds and Nitrogen Oxides

This rule prohibits emissions from a single source in excess of the following:

- Sulfur compounds as SO2: 0.2 percent by volume
- NOx, calculated as NO2: 140 lb/hr from any new boiler

These proposed emission rates are well below the limits established by this rule, therefore compliance is expected.

Regulation IX – Standards of Performance for New Stationary Sources

This regulation incorporates the Federal NSPS (40 CFR 60) rules by reference. The district evaluated compliance with Subpart Db that applies to the HHSEGS auxiliary boiler and Subpart Dc that applies to the nighttime preservation boilers and has provided conditions they believe ensure compliance with these regulations.

The requirements of Subpart Db, Standards of Performance for Industrial-Commercial-

Institutional Steam Generating Units, are applicable to the startup boilers. For natural-gas fired units, Subpart Db includes the following emission limits:

- NOx: 0.20 lb/MMBtu (24-hour average basis)
- SO2: 0.20 lb/MMBtu

The requirements of Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units, are applicable to the nighttime preservation boilers. For these small natural-gas-fired units, Subpart Dc includes the following emission limit:

- SO2: 0.5 lb/MMBtu

The PM limits of Subpart Dc do not apply to boilers with a heat input capacity below 30 MMBtu/hr, such as the nighttime preservation boilers.

Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines would be applicable to the emergency engines and the fire pump engines.

Both the proposed Tier II and Tier III Emergency IC Engine (large generators) and the Fire Pump engines, respectively, meet the emission limit requirements of the NSPS ((Subpart IIII).

NOTEWORTHY PUBLIC BENEFITS

Renewable energy facilities, such as the HHSEGS, would help meet California's mandated renewable energy goals. These goals are part of a comprehensive strategy to reduce the state's greenhouse gas emissions by replacing megawatts (mw) from fossil-fueled generation, thereby reducing the contribution of such emissions to climate change.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

There have been public agency comments on staff's air quality section from Inyo County, comments from Intervener Cindy MacDonald and public comments from Basin and Range Watch that were submitted following the publication of the Preliminary Staff Assessment (PSA) in a manner that require a technical response. Some comments resulted in text changes and others are responded to in **Appendix 1 - PSA Response to Comments, Air Quality**. The applicant has also provided comments (CH2 2012q) that have been addressed by staff. Some of these comments resulted in minor text modifications, as staff deemed appropriate. The appendix describes how staff responded to these comments.

CONCLUSIONS

Staff makes the following conclusions about the HHSEGS:

- The project will not exceed PSD emission levels during direct source operation and the facility is not considered a major stationary source with potential to cause significant air quality impacts. However, without adequate fugitive dust mitigation, the project would have the potential to cause localized exceedances of the PM10 NAAQS during construction and operation. Recommended conditions of certification **AQ-SC1** through **AQ-SC4**, for construction, and **AQ-SC7**, for operation, would mitigate these potentially significant impacts.
- The project would comply with applicable district rules and regulations, including New Source Review requirements; staff recommends the inclusion of the Districts DOC conditions as conditions of certification **AQ-1** through **AQ-33** for the Hidden Hills Power Plants, and **AQ-1**, **AQ-3** though **AQ-8** and **AQ-34** through **AQ-44** for the facility's common area.
- Staff concludes the project's construction activities would likely contribute to significant adverse PM10 and ozone impacts without additional mitigation. Staff recommends **AQ-SC1** to **AQ-SC5** to mitigate potential impacts.
- Staff concludes the project's operation would not cause new violations of any NO_2, SO_2, PM2.5 or CO ambient air quality standards; therefore, the project's direct operational NOx, SOx, PM2.5 and CO emission impacts are not significant.
- Staff concludes the project's direct and indirect (or secondary) emissions contribution to existing violations of the ozone and PM10 ambient air quality standards are likely significant if unmitigated. Therefore, staff recommends **AQ-SC6** to mitigate the onsite maintenance vehicle emissions and **AQ-SC7** to mitigate the

operating fugitive dust emissions to ensure that the potential ozone and PM10 CEQA impacts are mitigated to less than significant over the life of the project.

STAFF PROPOSED FINDINGS OF FACT

Based on the staff's analysis, we recommend the following findings:

1. The HHSEGS project would be located in the Great Basin Valleys Air Basin under the local jurisdiction of the Great Basin Unified Air Pollution Control District.

2. The HHSEGS project area is designated as nonattainment for the state ozone standard, attainment/unclassified for federal ozone standards, nonattainment for the state 24-hour PM10 standard, and attainment or unclassified for the state and federal CO_2, NO_2, SO_2, and PM2.5 standards.

3. The project would not cause new violations of any NO_2, SO_2, PM2.5, or CO ambient air quality standards. Therefore, the NO_x, SO_x, PM2.5, and CO emission impacts are not significant.

4. The project's NO_x and VOC emissions could contribute to existing violations of the state's ozone standard during construction and operation. However, the required mitigation would reduce the project's impacts to a level that is less than significant.

5. The project's PM10 emissions could contribute to existing violations of the state 24-hour PM10 air quality standard during construction and operation. However, the required mitigation set forth in conditions **AQ-SC1** though **AQ-SC7** would reduce the project's impacts to a level that is less than significant.

6. The Great Basin Unified Air Pollution Control District has issued a Final Determination of Compliance (FDOC) finding that HHSEGS would comply with all applicable district rules and regulations for project operation. The district's proposed FDOC conditions are included herein as conditions of certification **AQ-1** through **AQ-33** for each of the two Hidden Hills Power Plants and **AQ-1** though **AQ-8**, and **AQ-34** through **AQ-44** for the common area.

7. The cumulative air quality impacts analysis demonstrates that the project would not result in a significant cumulative impact.

8. Implementation of the conditions of certification listed below would ensure that the HHSEGS facility would not result in any significant direct, indirect, or cumulative adverse impacts to air quality.

MITIGATION MEASURES/ PROPOSED CONDITIONS OF CERTIFICATION

STAFF CONDITIONS OF CERTIFICATION

Staff conditions **AQ-SC1** through **AQ-SC9** are all CEQA-only mitigation measures associated with construction and operation of the proposed facility.

AQ-SC1 Air Quality Construction Mitigation Manager (AQCMM): The project owner shall designate and retain an on-site AQCMM who shall be responsible for directing and documenting compliance with conditions of certification **AQ-SC3**, **AQ-SC4** and **AQ-SC5** for the project site and the portions of the linear facility constructed in California. The on-site AQCMM may delegate responsibilities to one or more AQCMM Delegates. The AQCMM and AQCMM Delegates shall have full access to all areas of construction on the project site and linear facilities located in California, and shall have the authority to stop any or all construction activities as warranted by applicable construction mitigation conditions. The AQCMM and AQCMM Delegates may have other responsibilities in addition to those described in this condition. The AQCMM shall not be terminated without written consent of the Compliance Project Manager (CPM).

Verification: At least 60 days prior to the start of ground disturbance, the project owner shall submit to the CPM for approval, the name, resume, qualifications, and contact information for the on-site AQCMM and all AQCMM Delegates.

AQ-SC2 Air Quality Construction Mitigation Plan (AQCMP): The project owner shall provide an AQCMP, for approval, which details the steps that will be taken and the reporting requirements necessary to ensure compliance with conditions of certification **AQ-SC3**, **AQ-SC4,** and **AQ-SC5**.

Verification: At least 60 days prior to the start of any ground disturbance, the project owner shall submit the AQCMP to the CPM for approval. The AQCMP shall include effectiveness and environmental data for the proposed soil stabilizer. The CPM will notify the project owner of any necessary modifications to the plan within 15 business days from the date of receipt.

AQ-SC3 Construction Fugitive Dust Control: The AQCMM shall submit documentation to the CPM in each Monthly Compliance Report (MCR) that demonstrates compliance with the following mitigation measures for the purposes of preventing all fugitive dust plumes from leaving the project boundary. Any deviation from the following mitigation measures shall require prior CPM notification and approval.

A. The main access roads through the facility to the power block areas will be paved prior to initiating construction in the main power block area, and delivery areas for operations materials (chemicals, replacement parts, etc.) will be paved prior to taking initial deliveries.

B. All unpaved construction roads and unpaved operational site roads, as they are being constructed, shall be stabilized with a non-toxic soil stabilizer or soil weighting agent that can be determined to be both as efficient or more efficient for fugitive dust control as ARB-approved soil stabilizers, and shall not increase any other environmental impacts including loss of vegetation. All other disturbed areas in the project and linear construction sites shall be watered as frequently as necessary during grading and stabilized with a non-toxic soil stabilizer or soil weighting agent to comply with the dust mitigation objectives of condition of certification **AQ-SC4**. The frequency of watering can be reduced or eliminated during periods of precipitation.

C. No vehicle shall exceed 10 miles per hour on unpaved areas within the construction site, with the exception that vehicles may travel up to 25 miles per hour on stabilized unpaved roads as long as such speeds do not create visible dust emissions.

D. Visible speed limit signs shall be posted at the construction site entrances and along traveled routes.

E. All construction equipment vehicle tires shall be inspected and washed as necessary to be cleaned free of dirt prior to entering paved roadways.

F. Gravel ramps of at least 20 feet in length must be provided at the tire washing/cleaning station.

G. All unpaved exits from the construction site shall be graveled or treated to prevent track-out to public roadways.

H. All construction vehicles shall enter the construction site through the treated entrance roadways, unless an alternative route has been submitted to and approved by the CPM.

I. Construction areas adjacent to any paved roadway shall be provided with sandbags or other equivalently effective measures to prevent run-off to roadways, or other similar run-off control measures as specified in the Storm Water Pollution Prevention Plan (SWPPP), only when such SWPPP measures are necessary so that this condition does not conflict with the requirements of the SWPPP.

J. All paved roads within the construction site shall be swept at least twice daily (or less during periods of precipitation) on days when construction activity occurs to prevent the accumulation of dirt and debris.

K. At least the first 500 feet of any paved public roadway exiting the construction site or exiting other unpaved roads en route from the construction site or construction staging areas shall be swept at least twice daily (or less during periods of precipitation) on days when construction activity occurs or on any other day when dirt or runoff resulting from the construction site activities is visible on the public paved roadways.

L. All soil storage piles and disturbed areas that remain inactive for longer than 10 days shall be covered, or shall be treated with appropriate dust suppressant compounds.

M. All vehicles used to transport solid bulk material on public roadways and that have potential to cause visible emissions shall be provided with a cover, or the materials shall be sufficiently wetted and loaded onto the trucks in a manner to provide at least one foot of freeboard.

N. Wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) shall be used on all construction areas that may be disturbed. Any windbreaks installed to comply with this condition shall remain in place until the soil is stabilized or permanently covered with vegetation.

Verification: The AQCMM shall provide the CPM a MCR (**COMPLIANCE-6**) to include:

A. a summary of all actions taken to maintain compliance with this condition;

B. copies of any complaints filed with the district in relation to project construction; and

C. any other documentation deemed necessary by the CPM, and AQCMM to verify compliance with this condition. Such information may be provided via electronic format or disk at the project owner's discretion.

AQ-SC4 Dust Plume Response Requirement: The AQCMM or an AQCMM Delegate shall monitor all construction activities for visible dust plumes. Observations of visible dust plumes that have the potential to be transported: (A) off the project site and within 400 feet upwind of any regularly occupied structures not owned by the project owner, or (B) 200 feet beyond the centerline of the construction of linear facilities indicate that existing mitigation measures are not resulting in effective mitigation. The AQCMP shall include a section detailing how the augmented mitigation measures will be accomplished within the time limits specified in steps 1 through 3, below. The AQCMM or Delegate shall implement the following procedures for augmented mitigation measures in the event that such visible dust plumes are observed:

Step 1: The AQCMM or Delegate shall direct more intensive application of the existing mitigation methods within 15 minutes of making such a determination.

Step 2: The AQCMM or Delegate shall direct implementation of augmented methods of dust suppression if Step 1, specified above, fails to result in adequate mitigation within 30 minutes of the original determination.

Step 3: The AQCMM or Delegate shall direct a temporary shutdown of the activity causing the emissions if Step 2, specified above, fails to result in effective mitigation within one hour of the original determination. The activity shall not restart until the AQCMM or Delegate is satisfied that appropriate additional mitigation or other site conditions have changed so that visual dust plumes will not result upon restarting the shutdown source. The owner/operator may appeal to the CPM any directive from the AQCMM or Delegate to shut down an activity, if the shutdown shall go into effect within one hour of the original determination, unless overruled by the CPM before that time.

Verification: The AQCMM shall provide the CPM a MCR (**COMPLIANCE-6**) to include:

A. a summary of all actions taken to maintain compliance with this condition;

B. copies of any complaints filed with the District and provided to the project owner in relation to project construction; and

C. any other documentation deemed necessary by the CPM and AQCMM to verify compliance with this condition.

AQ-SC5 Diesel-Fueled Engine Control: The AQCMM shall submit to the CPM, in the MCR, a table that demonstrates compliance with the AQCMP mitigation measures for purposes of controlling diesel construction-related combustion emissions. Any deviation from the AQCMP mitigation measures requires prior CPM notification and approval.

All off-road diesel construction equipment with a rating of 50 hp or greater used in the construction of this facility shall be powered by the cleanest engines available that also comply with the California Air Resources Board's (ARB's) Regulation for In-Use Off-Road Diesel Fleets (California Code of Federal Regulations Title 13, Article 4.8, Chapter 9, Section 2449 et.seq.) and shall be included in the Air Quality Construction Mitigation Plan (AQCMP) required by **AQ-SC2**. The AQCMP measures shall include the following, with the lowest-emitting engine chosen in each case, as available:

a. All off-road vehicles with compression ignition engines shall comply with the California Air Resources Board's (ARB's) Regulation for In-Use Off-Road Diesel Fleets.

b. To meet the highest level of emissions reduction available for the engine family of the equipment, each piece of diesel-powered equipment shall be powered by a Tier 4 engine (without add-on controls) or Tier 4i engine (without add-on controls), or a Tier 3 engine with a post-combustion retrofit device verified for use on the particular engine powering the device by the ARB or the US EPA. For PM, the retrofit device shall be a particulate filter if verified, or a flow-through filter, or at least an oxidation catalyst. For NOx, the device shall meet the latest Mark level verified to be available (as of January 2012, none meet this NOx requirement).

c. For diesel powered equipment where the requirements of Part “b” cannot be met, the equipment shall be equipped with a Tier 3 engine without retrofit control devices or with a Tier 2 or lower Tier engine using retrofit controls verified by ARB or US EPA as the best available control device to reduce exhaust emissions of PM and nitrogen oxides (NOx) unless certified by engine manufacturers or the on-site AQCMM that the use of such devices is not practical for specific engine types. For purposes of this condition, the use of such devices can be considered “not practical” for the following, as well as other, reasons:

   1. There is no available retrofit control device that has been verified by either the California Air Resources Board or U.S. Environmental Protection Agency to control the engine in question and the highest level of available control using retrofit or Tier 1 engines is being used for the engine in question; or

   2. The use of the retrofit device would unduly restrict the vision of the operator such that the vehicle would be unsafe to operate because the device would impair the operator’s vision to the front, sides, or rear of the vehicle, or

   3. The construction equipment is intended to be on site for 10 work days or less.

d. The CPM may grant relief from a requirement in Part “b” or “c” if the AQCMM can demonstrate a good faith effort to comply with the requirement and that compliance is not practical.

e. The use of a retrofit control device may be terminated immediately provided that: (1) the CPM is informed within 10 working days following such termination; (2) a replacement for the construction equipment in question, which meets the level of control required, occurs within 10 work days following such termination of the use (if the equipment would be needed to continue working at this site for more than 15 work days after the use of the retrofit control device is terminated); and (3) one of the following conditions exists:

   1. The use of the retrofit control device is excessively reducing the normal availability of the construction equipment due to increased down time for maintenance, and/or reduced power output due to an excessive increase in exhaust back pressure.

   2. The retrofit control device is causing or is reasonably expected to cause engine damage.

   3. The retrofit control device is causing or is reasonably expected to cause a substantial risk to workers or the public.

   4. Any other seriously detrimental cause which has the approval of the CPM prior to implementation of the termination.

f. All equipment with engines meeting the requirements above shall be properly maintained and the engines tuned to the engine manufacturer's specifications. Each engine shall be in its original configuration and the equipment or engine must be replaced if it exceeds the manufacturer's approved oil consumption rate.

g. Construction equipment will employ electric motors when feasible.

h. If the requirements detailed above cannot be met, the AQCMM shall certify that a good faith effort was made to meet these requirements and this determination must be approved by the CPM.

All off-road diesel-fueled engines used in the construction of the facility shall have clearly visible tags issued by the on-site AQCMM showing that the engine meets the conditions set forth herein.

Verification: The AQCMM shall include in the MCR the following to demonstrate control of diesel construction-related emissions:

A. A summary of all actions taken to control diesel construction related emissions;

B. A table listing list of all heavy equipment used on site during that month, showing the tier level of each engine and the basis for alternative compliance with this condition for each engine not meeting Part "b" requirements. The MCR shall identify the owner of the equipment and contain a letter from each owner indicating that the equipment has been properly maintained; and

C. Any other documentation deemed necessary by the CPM and AQCMM to verify compliance with this condition. \

AQ-SC6 The project owner, when obtaining dedicated vehicles for mirror washing activities and other facility maintenance activities, shall only obtain new model year vehicles that meet California on-road or EPA non-road vehicle emission standards for the year when obtained.

Other vehicle/fuel types may be allowed assuming that the emission profile for those vehicles, including fugitive dust generation emissions, is comparable to the vehicles types identified in this condition.

Verification: At least 60 days prior to the start of commercial operation, the project owner shall submit to the CPM a plan that identifies the size and type of the on-site vehicle and equipment fleet and the vehicle and equipment purchase orders and contracts and/or purchase schedule. The plan shall be updated every other year and submitted in the Annual Compliance Report (**COMPLIANCE-7**).

AQ-SC7 The project owner shall provide a site operations dust control plan, including all applicable fugitive dust control measures identified in **AQ-SC3** that would be applicable to reducing fugitive dust from ongoing operations; that:

A. describes the active operations and wind erosion control techniques such as windbreaks and chemical dust suppressants, including their ongoing maintenance procedures, that shall be used on areas that could be disturbed by vehicles or wind anywhere within the project boundaries; and

B. identifies the location of signs throughout the facility that will limit traveling on unpaved surfaces to solar equipment maintenance vehicles only. In addition, vehicle speed shall be limited to no more than 10 miles per hour on these unpaved surfaces, with the exception that vehicles may travel up to 25 miles per hour on stabilized unpaved surfaces as long as such speeds do not create visible dust emissions.

The site operations fugitive dust control plan shall include the use of durable non-toxic soil stabilizers on all regularly used unpaved roads and disturbed off-road areas within the project boundaries, and shall include the inspection and maintenance procedures that will be undertaken to ensure that the unpaved roads remain stabilized. The soil stabilizer used shall be a non-toxic soil stabilizer or soil weighting agent that can be determined to be both as efficient or more efficient for fugitive dust control as ARB approved soil stabilizers, and shall not increase any other environmental impacts including loss of vegetation.

The fugitive dust controls shall meet the performance requirements of condition **AQ-SC4**. The performance requirements of **AQ-SC4** shall also be included in the operations dust control plan.

At the time of decommissioning, the applicant is required to obtain Energy Commission approval to control wind-blown dust emissions until a natural crust is developed as part of the project owner's long-term dust control plan.

Verification: At least 60 days prior to start of commercial operation, the project owner shall submit to the CPM for review and approval a copy of the plan that identifies the dust and erosion control procedures, including effectiveness and environmental data for the proposed soil stabilizer, that will be used during operation of the project and that identifies all locations of the speed limit signs. At least 60 days after the beginning of commercial operation, the project owner shall provide to the CPM a report identifying the locations of all speed limit signs, and a copy of the project employee and contractor training material that clearly identifies that project employees and contractors are required to comply with the dust and erosion control procedures and on-site speed limits.

AQ-SC8 The project owner shall provide the CPM copies of all district issued Authority-to-Construct (ATC) and Permit-to-Operate (PTO) documents for the facility.

The project owner shall submit to the CPM for review and approval any modification proposed by the project owner to any project air permit. The project owner shall submit to the CPM any modification to any permit proposed by the district or U.S. Environmental Protection Agency (U.S. EPA), and any revised permit issued by the district or U.S. EPA for the project.

Verification: The project owner shall submit any ATC, PTO, and proposed air permit modifications to the CPM within 5 working days of its submittal either by 1) the project owner to an agency, or 2) receipt of proposed modifications from an agency. The project owner shall submit all approved modified air permits to the CPM within 15 days of receipt.

AQ-SC9 The project owner shall submit to the CPM Quarterly Operation Reports, following the end of each calendar quarter, that include operational and emissions information as necessary to demonstrate compliance with the conditions of certification herein. The Quarterly Operation Report will specifically note or highlight incidences of noncompliance.

Verification: The project owner shall submit the Quarterly Operation Reports to the CPM and APCO no later than 30 days following the end of each calendar quarter.

DISTRICT CONDITIONS OF CERTIFICATION

Conditions Applicable to Hidden Hills Solar 1 Power Plant (GBUAPCD ATC Number 1604-00-11) and Hidden Hills Solar 2 Power Plant (GBUAPCD 1605-00-11) (identical conditions, only equipment ID numbers differ).

References below to the “CPM” mean the Energy Commission’s Compliance Program Manger.

GENERAL CONDITIONS

AQ-1 Facility Startup

The permittee shall notify the District in writing when construction is complete and the equipment is ready for commissioning operations. Operation of this equipment shall be conducted in accordance with all data and specifications submitted with the application under which this ATC is issued unless otherwise noted. Notification shall be given to the District office by email, Postal Service delivery or telephone facsimile transmission at least 72 hours prior to equipment start-up. Operation of this equipment without a written Permit to Operate is a violation of District Rule 200 B, and can result in civil and criminal penalties under California Health & Safety Code (H&SC) § 42400.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or the CPM.

AQ-2 Commissioning Period under Temporary Permit to Operate:

Following a District inspection verifying that the facility is constructed in a manner consistent with the specifications in the application and with this Authority to Construct, a temporary Permit to Operate (TPO) shall be issued. The TPO shall be valid for the duration of the commissioning period defined below and until a Permit to Operate is issued or denied.

A. Commissioning activities are defined as, but not limited to, all testing, adjustment, tuning, and calibration activities recommended by the equipment manufacturers and the construction contractor to ensure safe and reliable steady state operation of the boilers and associated control systems.

B. The commissioning period shall commence when all mechanical, electrical, and control systems are installed and individual system startup has been completed, or when a boiler is first fired, whichever occurs first. The commissioning period shall terminate when the plant has completed initial source testing, completed final plant tuning, and is available for commercial operation.

C. During the commissioning period, the owner or operator shall keep records of the natural gas fuel combusted in the boilers on hourly and daily basis. The natural gas fuel combusted during the commissioning period shall accrue towards the annual fuel use limit.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or CPM.

AQ-3 Right-of-Entry

The "Right of Entry", as defined by California H&SC § 41510 of Division 26, shall apply at all times with respect to the equipment and the Control System. Representatives of the Great Basin Unified Air Pollution Control District shall be permitted to enter the facility to inspect and copy any record required to be kept under the terms of this permit. District staff shall also be permitted to inspect any equipment, work practices, air emission-related activity or method dictated by this permit. If deemed necessary by the District to verify compliance with these conditions, the permittee shall within 7 days notice be available to open any sample extraction port, or exhaust outlet for the purpose of conducting source tests or to collect samples. In enforcing the terms of this permit, any cost incurred in collecting samples, source testing and laboratory analysis fees shall be the responsibility of the project owner. [District Rules 210 and 302 Analysis Fee]

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or CPM.

AQ-4 Copy of Permit Onsite

A copy of the permit shall be maintained readily available at all times on the operating premises. [District Rule 200.D]

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or CPM.

AQ-5 Report Violation of Emission Standard

Any violation of any emission standard to which the stationary source is required to comply, as indicated by the records of the monitoring device, shall be reported by the operator of the source to the district within 96 hours after such occurrence. The district shall, in turn, report the violation to the state board within five working days after receiving the report of the violation from the operator. [Cal H&S § 42706]

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or CPM.

AQ-6 Severability Clause

If any provision of this permit is found invalid, such finding shall not affect any remaining provisions. [District Rule 107]

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or CPM.

AQ-7 Right to Revise Permit

The provisions of this permit may be modified by the District if it determines the stipulated conditions are inadequate. [District Rule 210.C]

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or CPM.

AQ-8 Breakdown (or Emergency) Reporting Conditions

A breakdown condition means an unforeseeable failure or malfunction of: 1) any air pollution control equipment or related operating equipment which causes a violation of any emission limitation or restriction prescribed by this permit or District rules and regulations, or by State law, or 2) any in-stack continuous monitoring equipment.

A. The permittee shall comply with the breakdown requirements of District Rule 403 (Breakdown), which shall include notifying the Air Pollution Control Officer of a breakdown condition within an hour of detection, unless it can be demonstrated that a longer reporting period is necessary -- not to exceed two (2) days.

B. Notification shall identify the time, location, equipment involved, and to the extent possible the cause of the breakdown and steps taken to correct the breakdown condition.

C. Within one (1) week after the breakdown occurrence, the permittee shall submit a written report to the Air Pollution Control Officer which includes: date of correction of the breakdown, determination of the cause of the breakdown, corrective measures to prevent a recurrence, an estimate of the emissions caused by the breakdown condition, and pictures of the failed equipment, if available.

D. Breakdown conditions shall not persist longer than 24 hours or the end of the production run, whichever is sooner, except for continuous monitoring equipment, for which the period shall be ninety-six (96) hours, unless the permittee obtains an Emergency Variance pursuant to District Rule 617. [District Rule 403]

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or CPM.

FACILITY OPERATING CONDITIONS

AQ-9 Visible Emissions Opacity Limit

Visible emissions from any source shall not exceed a Ringelmann 1 (20% opacity) for a period or periods aggregating more than three minutes in any one hour. [District Rule 400]

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or CPM.

AQ-10 Unit Emission Limits

To demonstrate consistency with the ambient air quality modeling and the screening health risk assessment provided in the application for certification to the California Energy Commission, the pound per hour equipment emission rate limits in Table 1 shall apply. Except during the commissioning period, startup/shutdown conditions and standby conditions, the pound per million Btu limits shall also apply. Compliance with these lb/MMBtu limits will also ensure compliance with the limits in the applicable New Source Performance Standards (NSPS).

Table 1: Criteria pollutant emission limits per unit in pounds per hour (pounds per million Btu)

Pollutant	Auxiliary Boiler	Nighttime Preservation Boiler	Emergency Backup Engine	Emergency Fire Pump Engine
NOx as NO_2	2.74 (0.0110)	0.17 (0.0110)	38.4	1.3
CO	4.55 (0.0183)	0.55 (0.0366)	20.8	1.15
VOC as CH_4	1.34 (0.0054)	0.08 (0.0053)	1.3	0.08
PM10/PM2.5	1.25 (N/A)	0.08 (N/A)	1.2	0.07
SO_2	0.52 (0.0021)	0.03 (0.0021)	0.04	0.003

Verification: The project owner shall submit to the CPM data showing compliance with the limits of this condition as part of the Quarterly Operation Report required under **AQ-SC9**.

AQ-11 Combined Plant-wide Daily Emission Limits

A. "Plant-wide" shall mean this Solar 1 Power Plant facility, GBUAPCD № 1604-00-11, plus the adjacent Solar 2 Power Plant and Common Area facilities (permitted separately, GBUAPCD № 1605-00-11 and 1606-00-11, respectively).

B. The total plant-wide combined emissions from the auxiliary and nighttime preservation boilers, emergency and fire pump engines shall not exceed the limits in Table 2.

Table 2: Criteria pollutant emission limits in pounds per day

Pollutant	All Fuel Burning Equipment
NOx as NO_2	116.0
CO	156.1
VOC as CH_4	37.8
$PM_{10}/PM_{2.5}$	21.3
SO_2	7.4

C. Compliance demonstration with these plant-wide limits shall entail the monitoring, recordkeeping and reporting requirements specified later in this permit.

D. Compliance with the NOx limit shall be demonstrated via the use of a plant-wide NOx Predictive Emission Monitoring System (PEMS), in accordance with condition of certification AQ-18, that totals both power plants' boiler emission rates.

Verification: The project owner shall submit a letter annually confirming compliance with this condition, to the CPM. During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or CPM.

AQ-12 Boiler Fuel Use Limits

The total natural gas fuel consumption, expressed as heat input rates, shall not exceed 3,440 MMBtu/day or 746,400 MMBtu/year for combustion in the burners of all auxiliary and nighttime preservation boilers in the Solar 1 facility plus the adjacent Solar 2 facility (permitted separately, GBUAPCD №1605-05-11).

Verification: The project owner shall submit to the CPM the boiler fuel use data demonstrating compliance with this condition as part of the Quarterly Operation Report.

AQ-13 Toxic Hot Spots Program (AB 2588)

In lieu of an emissions inventory plan, the District accepts the screening health risk assessment provided in the Application for Certification to the California Energy Commission. The combined Solar 1 and Solar 2 facilities shall be categorized under AB 2588 as "Intermediate Level" and shall meet the reporting requirements under Section V of the Emission Inventory Criteria and Guidelines for the Air Toxics "Hot Spots" Program.

Verification: During site inspection, the project owner shall make all records and reports available to the District, ARB, U.S. EPA or CPM.

BOILER SPECIFICATIONS AND NSPS STANDARDS

AQ-14 Boiler Specifications

Each 249 MMBtu/hr auxiliary boiler and each 15 MMBtu/hr nighttime preservation boiler shall be equipped with low-NOx burners, 9 ppmvd NOx at 3% O_2 or less at loads exceeding 25% maximum continuous rating (MCR), and flue gas recirculation (FGR). The boilers shall meet all specifications stated in the permit application, including stack dimensions and pollutant emission rates.

Verification: As part of the Annual Compliance Report (**COMPLIANCE-7**), the project owner shall include information on the date, time, and duration of any violation of this permit condition.

AQ-15 New Source Performance Standards (NSPS) for Auxiliary Boiler

Each auxiliary boiler shall comply with the requirements of 40 CFR 60 Subpart Db – NSPS for Industrial-Commercial-Institutional Steam Generating Units. The boiler shall meet the following emission standards at all times except during periods of startup, shutdown, or malfunction:

- NOx: 0.20 lb/MMBtu (30-day average) [40 CFR §60.44b(a)]
- SO_2: 0.20 lb/MMBtu [40 CFR §60.42b(k)]

Verification: The project owner shall complete and submit to the CPM a compliance plan that provides a list of the 40 CFR 60 Subpart Db plans, tests, and recordkeeping requirements and their compliance schedule, dates as applicable for the HHSEGS Boilers 1, and 2 at least 30 days prior to first fire of the boilers or earlier as necessary for compliance with Subpart Db.

AQ-16 New Source Performance Standards (NSPS) for Nighttime Preservation Boiler

Each nighttime preservation boiler shall comply with the requirements of 40 CFR 60 Subpart Dc – NSPS for Small Industrial-Commercial-Institutional Steam Generating Units. The SO_2 emission limit in this subpart does not apply because the unit is rated below 30 MMBtu/hr.

Verification: The project owner shall complete and submit to the CPM a compliance plan that provides a list of the 40 CFR 60 Subpart Dc plans, tests, and recordkeeping requirements and their compliance schedule dates as applicable for the boilers on HHSEGS Solar Plant 1, and HHSEGS Solar Plant 2 at least 30 days prior to first fire of the boilers or earlier as necessary for compliance with Subpart Dc.

BOILER MONITORING CONDITIONS

AQ-17 Fuel Type and Flow Monitoring

A. The burners for the auxiliary and nighttime preservation boilers shall be fueled with natural gas that meets the standards of the California Public Utilities Commission (CPUC).

B. Each boiler shall be equipped with a continuous flow monitoring system to measure and record fuel consumption in million standard cubic feet per hour (MMscf/hr).

Verification: As part of the Annual Compliance Report (**COMPLIANCE-7**), the project owner shall include proof that only pipeline quality natural gas that meets Public Utilities Commission standards are used for the boilers. The Annual Compliance Report shall also report fuel used in each boiler.

AQ-18 Boiler Predictive NOx Emission Rate Monitoring Plan

A. As an element of the PEMS required by condition of certification **AQ-11.D**, the permittee shall estimate the auxiliary boiler emissions by continuously monitoring parameters indicative of emissions and maintaining records of the amount of natural gas combusted. The permittee shall monitor the auxiliary boiler operating conditions and predict NOx emission rates as specified in a plan that shall:

(1) Be submitted to the District within 360 days of initial startup in accordance with 40 CFR Subpart Db §60.49b(c) and §60.49b(g);

(2) Identify the specific operating conditions to be monitored and the relationship between these operating conditions and NOx emission rates (i.e., lb/MMBtu heat input). Steam generating unit operating conditions include, but are not limited to, the degree of staged combustion (i.e., the ratio of primary air to secondary and/or tertiary air) and the level of excess air (i.e., flue gas O_2 level);

(3) Include the data and information that the permittee used to identify the relationship between NOx emission rates and these operating conditions; and

(4) Identify how these operating conditions, including steam generating unit load, will be monitored on an hourly basis by the permittee during the period of operation of the affected facility; the quality assurance procedures or practices that will be employed to ensure that the data generated by monitoring these operating conditions will be representative and accurate; and the type and format of the records of these operating conditions, including steam generating unit load, that will be maintained by the permittee under 40 CFR §60.49b(g). [40 CFR Subpart Db §60.48b(d)]

B. If the permittee elects to estimate NOx emissions from the Nighttime Preservation Boilers using the pound per hour emission limit in Table 1, then the Plan may require continuous monitoring of only operating hours and fuel use for the Nighttime Preservation Boilers.

Verification: This initial plan shall be submitted to the district for approval, and the CPM for review, within 360 days of the initial startup. Any proposed changes to a district-approved plan shall include subsequent test results, operating parameters, analysis, and any other pertinent information to support the proposed changes. The district must approve any emissions estimation plan or revision for estimated NOx emissions to be considered valid.

BOILER TESTING CONDITIONS

AQ-19 Initial Boiler Testing

Initial performance testing shall be completed on each auxiliary and nighttime preservation boiler to demonstrate compliance with the emission limits specified in condition of certification **AQ-10** at each boiler's maximum achievable production rate.

A. The initial performance test is to be scheduled within 60 days after achieving the maximum continuous rating (MCR) at which the affected facility will be operated, but not later than 180 days after initial startup of the facility. [§60.45b and 60.46b]

B. The permittee shall provide safe and accessible sampling ports that comply with California Industrial Safety Orders and Uniform Building Code and 40 CFR 60, Appendix A, Test Method 1.

C. A test protocol must be submitted to the Air Pollution Control District not later than 30 days before the proposed test date. This test protocol shall be approved by the District before testing begins and shall include the following, or other District-approved methods:

- PM10 emissions: EPA Method 5, Methods 201/202 or ARB Method 5
- NOx emissions: EPA Method 7, 7A, 7E
- SO_2 emissions: EPA Method 6, 6A, 6B or 6C
- CO emissions: EPA Method 10
- VOC emissions: EPA Method 25A

D. A copy of the test results shall be submitted to the District within 60 days following test completion. [District Rule 200.C, and Cal H&S Code § 44340]

Verification: The project owner shall notify the District and the CPM within thirty (30) working days before the execution of the compliance test required in this condition. The test results shall be submitted to the district and to the CPM within 60 days of the date of the tests.

DIESEL BACKUP GENERATOR AND FIRE PUMP ENGINE CONDITIONS

AQ-20 Emergency Backup Generator Engine

Each emergency backup generator shall be powered by a Tier 2, diesel-fueled, Caterpillar 3516C SCAC, 3,633 hp at 1,800 rpm, EPA Family ACPXL78.1T2E, ARB Executive Order U-R-001-0398-1, or an equivalent ARB-certified engine that meets the current EPA Tier standards for the given power range.

Verification: The project owner shall submit the emergency generator specifications to the CPM at least 30 days prior to purchasing the engines for review and approval.

AQ-21 Emergency Fire Pump Engine

Each emergency fire pump shall be powered by a Tier 3, diesel-fueled, Cummins CFP7E-F30, 200 hp at 2,100 rpm, EPA Family ACEXL0409AAB, ARB Executive Order U-R-002-0516, or an equivalent ARB-certified engine that meets the current EPA Tier standards for the given power range.

Verification: The project owner shall submit the emergency engine specifications to the CPM at least 30 days prior to purchasing the engines for review and approval.

AQ-22 Airborne Toxics Control Measure (also applies to Hidden Hills Common Area)
The permittee shall operate the diesel emergency backup generator and fire pump engines in compliance with the California Code of Regulations, Title 17 (17 CCR) § 93115.

Verification: The project owner shall submit the engine specifications at least 30 days prior to purchasing the engines for review and approval demonstrating that the engines meet NSPS and ARB ATCM emission limit requirements at the time of engine purchase.

AQ-23 Particulate Matter Limit (also applies to Hidden Hills Common Area)
Each emergency engine shall not discharge into the atmosphere particulate matter in excess of 0.3 grains per dry standard cubic foot of exhaust gas. [Rule 404-A].

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the District, ARB, and the CPM.

AQ-24 ARB Diesel Fuel (also applies to Hidden Hills Common Area)
Each engine shall be fueled with ARB diesel fuel with 15 parts-per-million sulfur content by weight or less, or an alternative diesel fuel that meets the requirements of the Standard of Motor Vehicle Fuel found in Title 13, CCR (13 CCR) § 2281. The amount of sulfur dioxide exhausted to the atmosphere shall not exceed 0.2% by volume. The permittee shall keep records of the composition of purchased fuel. [District Rules 210 and 416; 17 CCR § 93115.5(a)(1)]

Verification: During site inspection, the project owner shall make all records and reports available to the district, ARB, U.S. EPA or CPM.

AQ-25 Hour Meter Required (also applies to Hidden Hills Common Area)
A non-resettable totalizer elapsed time meter shall be installed and maintained on each engine to indicate the cumulative hours of engine operation. [District Rule 210.A, 17 CCR § 93115].

Verification: At least thirty (30) days prior to the installation of the engine, the project owner shall provide the district and the CPM the specification of the hour timer.

AQ-26 Non-Emergency Use Limitation (also applies to Hidden Hills Common Area)

A. Each emergency backup generator engine shall be allowed to operate up to 50 hours per year for maintenance and testing purposes. Operation of the engine beyond the 50 hours shall be allowed only by the events as defined in condition of certification **AQ-27** for what constitutes emergency use. [District Rule 210.A, 17 CCR § 93115.6(a)(3)(A)].

B. Each fire pump engine shall not operate more than the number of hours (up to 30 hours per year) necessary to comply with the testing requirements of the National Fire Protection Association (NFPA). [District Rule 210.A, 17 CCR § 93115.6(a)(4)(A)].

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the district, ARB, and the CPM.

AQ-27 What Constitutes Emergency Use (also applies to Hidden Hills Common Area)

Emergency use of the engines is not limited and is defined in 17 CCR § 93115 as providing electrical power or mechanical work during any of the following events and subject to the following conditions that:

A. the failure or loss of all or part of normal electrical power service or normal natural gas supply to the facility:

(1) which is caused by any reason other than the enforcement of a contractual obligation the permittee has with a third party or any other party; and

(2) which is demonstrated by the permittee to the district APCO's satisfaction to have been beyond the reasonable control of the owner or operator;

B. the failure of a facility's internal power distribution system:

(1) which is caused by any reason other than the enforcement of a contractual obligation the permittee has with a third party or any other party; and

(2) which is demonstrated by the permittee to the district APCO's satisfaction to have been beyond the reasonable control of the owner or operator.

C. the pumping of water for fire suppression or protection;

D. the pumping of water to maintain pressure in the water distribution system for the following reasons:

(1) a pipe break that substantially reduced water pressure; or

(2) high demand on the water supply system due to high use of water for fire suppression; or

(3) the breakdown of electric-powered pumping equipment at sewage treatment facilities or water delivery facilities.

[District Rule 210.A, 17 CCR § 93115].

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the district, ARB, and the CPM.

AQ-28 Required Records for Emergency Engines (also applies to Hidden Hills Common Area)

The permittee shall keep a monthly log of usage that shall list and document the nature of use for each of the following:

A. emergency use hours of operation;

B. maintenance and testing hours of operation;

   a. hours of operation for emission testing to show compliance with the applicable standard;

C. initial start-up testing hours;

D. hours of operation for all uses other than those specified above; and

E. the fuel used.

   (1) For engines operated exclusively on ARB Diesel Fuel, the owner or operator shall document the use of ARB Diesel Fuel through the retention of fuel purchase records indicating that the only fuel purchased for supply to an emergency standby engine was ARB Diesel Fuel; or

   (2) For engines operated on any fuel other than ARB Diesel Fuel, fuel records demonstrating that the only fuel purchased and added to an emergency standby engine or engines, or to any fuel tank directly attached to an emergency standby engine or engines, meets the requirements of section 93115.5(b).

[District Rule 210.A, 17 CCR § 93115.10(g)(1)].

<u>Verification:</u> The project owner shall submit records required by this condition that demonstrating compliance with the sulfur content and engine use limitations of conditions **AQ-24** and **AQ-27** in the Annual Compliance Report, including a photograph showing the annual reading of engine hours. The project owner shall make the site available for inspection of records by representatives of the district, ARB, and the CPM.

AQ-29 Record Retention (also applies to Hidden Hills Common Area)
Log entries shall be retained for a minimum of 36 months from the date of entry. Log entries made within 24 months of the most recent entry shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request. Log entries made from 25 to 36 months from most recent entry shall be made available to District staff within 5 working days from request. [Rule 210.A, 17 CCR § 93115.10(g)(2)].

<u>Verification:</u> The project owner shall submit records required by this condition that demonstrating compliance with the sulfur content and engine use limitations of conditions **AQ-24,** and **AQ-27** in the Annual Compliance Report, including a photograph showing the annual reading of engine hours. The project owner shall make the site available for inspection of records by representatives of the district, ARB, and the CPM.

<u>PARTICULATE MATTER MITIGATION CONDITIONS</u>

AQ-30 Fugitive Dust Mitigation

The permittee shall take reasonable precautions during construction activities to prevent visible particulate matter from being airborne, under normal wind conditions, beyond the HHSEGS property line, in accordance with the requirements for dust control in Rule 401.A. The District deems the California Energy Commission (CEC) staff conditions of certification (HHSEGS) **AQ-SC1** through **AQ-SC5** for construction and operation mitigation methods to be reasonable precautions under Rule 401. The permittee shall submit the Air Quality Construction Mitigation Plan, required by **AQ-SC2** to the District after its approval by the CEC.

Verification: The permittee shall submit the Air Quality Construction Mitigation Plan, required by **AQ-SC2** to the District after its approval by the CEC. The permittee shall make available to the District, upon request, copies of the CEC-required MCR containing documentation of the actions taken to comply with these conditions.

FACILITY RECORDKEEPING & REPORTING CONDITIONS

AQ-31 Natural Gas Heat Input Records

Records for demonstrating compliance with the plant-wide natural gas combustion heat input, required by condition of certification **AQ-12**, shall be presented in MMBtu/day, MMBtu/month and MMBtu per rolling 12-month period.

Verification: The project owner shall submit to the CPM the boiler fuel use data demonstrating compliance with this condition as part of the Quarterly Operation Report.

AQ-32 Plant-wide Emission Records

Emission records for the plant-wide NOx PEMS, required by condition of certification AQ-11, shall be presented in pounds per hour (lb/hr), pounds per day (lb/day) and pounds per million Btu (lb/MMBtu) for each individual boiler in the Solar 1 and Solar 2 facilities. The sum total of NOx for all boilers shall be presented in pounds per day (lb/day) for each calendar day, midnight to midnight. Data obtained to estimate boiler NOx emissions shall be presented as specified in the plant-wide NOx PEMS plan required by condition of certification AQ-18.

Verification: The project owner shall submit to the CPM the boiler fuel use data demonstrating compliance with this condition as part of the Quarterly Operation Report.

AQ-33 Monitoring Record Retention

Required recordkeeping information shall be retained by the permittee in a form suitable for inspection for a period of at least two (2) years from the end of the calendar year of the journal entry. [Rule 206.B, Cal H&S Code § 42705]

Verification: The project owner shall submit records required by this condition that demonstrating compliance with the sulfur content and engine use limitations of conditions **AQ-24,** and **AQ-27** in the Annual Compliance Report, including a photograph showing the annual reading of engine hours. The project owner shall make the site available for inspection of records by representatives of the district, ARB, and the CPM.

AQ-34 Reporting of Monitoring Records

All monitoring records shall be made immediately available to the District staff upon request.

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the district, ARB, and the CPM.

Conditions Applicable to Hidden Hills Common Area (GBUAPCD ATC Number 1606-00-11)

GENERAL CONDITIONS

General conditions **AQ-1** and **AQ-3** to **AQ-8** for Hidden Hills Solar 1 Power Plant and Solar 2 Power Plant are also applicable for the Common Area.

FACILITY OPERATING CONDITIONS

AQ-35 Unit Emission Limits

To demonstrate consistency with the ambient air quality modeling and the screening health risk assessment provided in the Application for Certification to the California Energy Commission, the pound per hour equipment emission rate limits in Table 1 shall apply.

Table 1: Common Area Emission Limits in pounds per hour

Pollutant	Emergency Backup Engines	Emergency Fire Pump Engines
NOx as NO_2	2.6	1.3
CO	2.28	1.15
VOC as CH_4	0.15	0.08
$PM_{10}/PM_{2.5}$	0.13	0.07
SO_2	0.004	0.003

Verification: The project owner shall submit to the CPM data showing compliance with the limits of this condition as part of the Quarterly Operation Report

DIESEL BACKUP GENERATOR AND FIRE PUMP ENGINE CONDITIONS

AQ-36 Visible Emissions Opacity Limit

Visible emissions from each engine shall not exceed a Ringelmann 1 (20% opacity) for a period or periods aggregating more than three minutes in any one hour. [District Rule 400]

Verification: The project owner shall make the site available for inspection of records and equipment by representatives of the district, ARB, and the CPM.

AQ-37 Emergency Backup Generator Engine

The emergency backup generator (Unit EG1C) shall be powered by a Tier 3, diesel-fueled, Caterpillar C9 ATAAC, 398 hp at 1,800 rpm, EPA Family ACPXL08.8ESX, ARB Executive Order U-R-001-0373, or an equivalent ARB-certified engine that meets the current EPA Tier standards for the given power range.

Verification: During site inspection, the project owner shall make all records and reports available to the district, ARB, EPA or CPM.

AQ-38 Emergency Fire Pump Engine

The emergency fire pump (Unit FP1C) shall be powered by a Tier 3, diesel-fueled, Cummins CFP7E-F30, 200 hp at 2,100 rpm, EPA Family ACEXL0409AAB, ARB Executive Order U-R-002-0516, or an equivalent ARB-certified engine that meets the current EPA Tier standards for the given power range.

Verification: During site inspection, the project owner shall make all records and reports available to the district, ARB, EPA or CPM.

Conditions **AQ-22** to **AQ-29** also apply to the Hidden Hills Common Area.

ACRONYMS

AAQS	Ambient Air Quality Standard
ACC	Air Cooled Condenser
AERMOD	ARMS/EPA Regulatory Model
AFC	Application for Certification
AQCMM	Air Quality Construction Mitigation Manager
AQCMP	Air Quality Construction Mitigation Plan
AQMD	Air Quality Management District
ARB	California Air Resources Board
ATC	Authority to Construct
ATCM	Airborne Toxic Control Measure
BACT	Best Available Control Technology
bhp	brake horsepower
BRW	Basin Range and Watch
Btu	British thermal unit
CAA	Clean Air Act (Federal)
CAAQS	California Ambient Air Quality Standard
CCR	California Code of Regulations
CEC	California Energy Commission (or Energy Commission)
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPM	(CEC) Compliance Project Manager
DOC	Determination of Compliance
dscf	dry standard cubic feet
EIR	Environmental Impact Report
ERC	Emission Reduction Credit
FDOC	Final Determination Of Compliance
FSA	Final Staff Assessment (this document)
GBUAPCD	Great Basin Unified Air Pollution Control District
GBVAB	Great Basin Valleys Air Basin
GHG	Greenhouse Gas
gr	Grains (1 gr $\cong$ 0.0648 grams, 7000 gr = 1 pound)
hp	horsepower
H_2S	Hydrogen Sulfide
HSC	Health and Safety Code

HHSEGS	Hidden Hills Solar Electric Generating System (proposed project)
lbs	Pounds
LORS	Laws, Ordinances, Regulations and Standards
MCR	Monthly Compliance Report
mg/m^3	milligrams per cubic meter
MMBtu	Million British thermal units
MW	Megawatts (1,000,000 Watts)
NAAQS	National Ambient Air Quality Standard
NH_3	Ammonia
NMHC	Non-Methane Hydrocarbons
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_3	Nitrates
NOx	Oxides of Nitrogen *or* Nitrogen Oxides
NSPS	New Source Performance Standard
NSR	New Source Review
O_2	Oxygen
O_3	Ozone
OLM	Ozone Limiting Method
PM	Particulate Matter
PM10	Particulate Matter less than 10 microns in diameter
PM2.5	Particulate Matter less than 2.5 microns in diameter
ppm	Parts Per Million
ppmv	Parts Per Million by Volume
ppmvd	Parts Per Million by Volume, Dry
PSA	Preliminary Staff Assessment
PTO	Permit to Operate
PVMRM	Plume Volume Molar Ratio Method
scf	Standard Cubic Feet
SO_2	Sulfur Dioxide
SO_3	Sulfate
SOx	Oxides of Sulfur
SRSG	Solar Receiver Steam Generator
STG	Steam Turbine Generator

U.S. EPA	United States Environmental Protection Agency
μg/m^3	Microgram per cubic meter
VOC	Volatile Organic Compounds

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AIR QUALITY APPENDIX AIR-1
GREENHOUSE GAS EMISSIONS

Jacquelyn Leyva and David Vidaver

SUMMARY AND CONCLUSIONS

The Hidden Hills Solar Electric Generating System (HHSEGS) project is a proposed renewable project addition to the state's electricity system. If built, it would significantly contribute to the State of California's goal of having one-third of its electrical energy produced by renewable power plants by the year 2020. HHSEGS would be a concentrating solar power plant that would comprise fields of heliostat mirror arrays focusing solar energy on the solar receiver located on centralized power towers. As a solar project, it would emit considerably fewer greenhouse gases (GHG) than existing power plants and most other generation technologies, and thus would contribute to continued reduction of the annual average GHG emission rates for both California and the western United States. While HHSEGS would emit some GHG emissions, HHSEGS's contribution to the system build-out of renewable resources in California would result in a net cumulative reduction of energy consumption and GHG emissions from new and existing fossil resources.

Electricity is produced by operation of inter-connected generation resources. Operation of any one power plant, like HHSEGS, affects all other power plants in the inter-connected system. The operation of the HHSEGS would affect the overall electricity system operation and GHG emissions in several ways:

- HHSEGS would displace higher GHG-emitting electricity generation. Because the project's GHG emissions per megawatt-hour (MWh) would be largely based upon renewable solar generation, GHG emissions would be much lower than power plants that the project would displace even with use of natural gas in the auxiliary boilers. Therefore, the addition of the HHSEGS would contribute to a reduction of California and overall Western Electricity Coordinating Council system GHG[10] emissions and GHG emission rate average and would be part of a programmatic approach to meeting GHG emissions reduction goals.
- HHSEGS would facilitate to some degree the replacement out-of-state high-GHG-emitting (e.g., coal) electricity generation that must be phased out in conformance with the State's Emissions Performance Standard.
- HHSEGS could facilitate to some extent the replacement of generation provided by aging power plants and those that use once-through cooling (OTC).

These system effects would result in a net reduction in GHG emissions across the electricity system providing energy and capacity to California. Thus, staff believes that the project would result in a cumulative overall reduction in GHG emissions from power

[10] Fuel-use closely correlates to the efficiency of and carbon dioxide (CO_2) emissions even from renewable power plants. Since CO_2 emissions from fuel combustion dominate greenhouse gas (GHG) emissions from power plants, the terms CO_2 and GHG are used interchangeably in this section.

plants, would not worsen current conditions, and would not result in impacts that are cumulatively significant.

Staff concludes that the short-term, minor emissions of greenhouse gases during construction that are necessary to create this new, very low GHG-emitting renewable power generating facility would be reduced by “best practices” and would, therefore, would not be a significant impact.

The Hidden Hills Solar Electric Generating System project, as a solar project with a nightly shutdown, would operate significantly less than a 60 percent capacity factor and therefore would not be subject to the requirements of SB 1368 (Greenhouse Gases Emission Performance Standard; Title 20, California Code of Regulations, section 2900 et. seq.). However, the HHSEGS would easily comply with the requirements of SB 1368 and the Greenhouse Gas Emission Performance Standard.

AIR QUALITY GHG ANALYSIS - Jacquelyn Leyva Record

INTRODUCTION

The generation of electricity using fossil fuels, even in an auxiliary boiler or back-up generator at a thermal solar plant, produces greenhouse gas emissions in addition to the criteria air pollutants that have been traditionally regulated under the federal and state Clean Air Acts. California is actively pursuing policies to reduce GHG emissions that include adding non-GHG emitting renewable generation resources to the system. The greenhouse gases are carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFC), and perflurocarbons (PFC). CO_2 emissions are far and away the most common of these emissions; as a result, even though the other GHGs may have a greater impact on climate change on a per-unit basis due to their greater global warming potential, GHG emissions are often “normalized” in terms of metric tons of CO_2-equivalent (MTCO2E) for simplicity. Global warming potential is a relative measure, compared to carbon dioxide, of a compound’s ability to warm the planet, taking into account each compound’s expected residence time in the atmosphere.

GHG emissions are not included in the class of pollutants traditionally called “criteria pollutants.” Since the impact of the GHG emissions from a power plant’s operation has global rather than local effects, those impacts should be assessed not only by analysis of the plant’s emissions, but also in the context of the operation of the entire electricity system of which the plant is an integrated part. Furthermore, the impact of the GHG emissions from a power plant’s operation should be analyzed in the context of applicable GHG laws and policies, especially AB 32, California’s Global Warming Solutions Act of 2006.

The state has demonstrated a clear willingness to address global climate change though research, adaptation[11], and GHG emissions reductions. In that context, staff evaluates the GHG emissions from the proposed project, presents information on GHG

[11] While working to understand and reverse global climate change, it is prudent to also adapt to potential changes in the state’s climate (for example, changing rainfall patterns).

emissions related to electricity generation (see “**Electricity System GHG Impacts**” below) and describes the applicable GHG policies and programs.

In December 2009, the U.S. Environmental Protection Agency (EPA) declared that greenhouse gases (GHGs) threaten the public health and welfare of the American people (the so-called “endangerment finding”). Regulating GHGs at the federal level is required by Prevention of Significant Deterioration Program (PSD) for sources that exceed 100,000 tons per year of carbon dioxide-equivalent emissions. Additionally, Federal rules that became effective December 29, 2009 (40 CFR 98) require federal reporting of GHGs. As federal rulemaking evolves, staff at this time focuses on analyzing the ability of the project to comply with existing federal- and state-level policies and programs for GHGs.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS

The following federal, state, and local laws and policies in **Greenhouse Gas Table 1** pertain to the control and mitigation of greenhouse gas emissions applicable to power plants. Staff’s analysis examines the project’s compliance with these requirements.

GLOBAL CLIMATE CHANGE AND CALIFORNIA

There is general scientific consensus that climate change is occurring and that human activity contributes in some measure (perhaps significantly) to that change. Man-made emissions of greenhouse gases, if not sufficiently curtailed, are likely to contribute further to continued increases in global temperatures. Indeed, the California Legislature finds that “[g]lobal warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California” (Cal. Health & Safety Code, sec. 38500, division 25.5, part 1).

In 1998, the Energy Commission identified a range of strategies to prepare for an uncertain climate future, including a need to account for the environmental impacts associated with energy production, planning, and procurement (CEC 1998, p. 5). In 2003, the Energy Commission recommended that the state require reporting of greenhouse gases or global climate change[12] emissions as a condition of state licensing of new electric generating facilities (CEC 2003, IEPR p. 42). In 2006, California enacted the California Global Warming Solutions Act of 2006 (AB 32). It requires the California Air Resources Board (ARB) to adopt standards to reduce statewide GHG emissions to GHG emissions levels that existed in 1990, with such reductions to be achieved by 2020. To achieve this, ARB has a mandate to define the 1990 emissions level and achieve the maximum technologically feasible and cost-effective GHG emission reductions to meet this requirement. Executive Order S-3-05 also requires ARB to plan for further GHG emissions reductions to achieve an 80 percent reduction from 1990 GHG emissions by the year 2050.

[12] Global climate change is the result of greenhouse gases, or air emissions with global warming potentials, affecting the global energy balance and thereby the global climate of the planet. The terms greenhouse gases (GHGs) and global climate change (GCC) gases are used interchangeably.

The ARB adopted early action GHG reduction measures in October 2007, adopted mandatory reporting requirements and the 2020 statewide target in December 2007, and adopted a statewide scoping plan in December 2008 to identify how emission reductions will be achieved from significant sources of GHG via regulations, market mechanisms, and other actions. ARB adopted regulations implementing cap-and-trade regulations on December 22, 2011 and ARB staff continues to develop and implement regulations to refine key elements of the GHG reduction measures to improve their linkage with other GHG reduction programs. Federal and state mandatory reporting and state cap-and-trade requirements all apply to this project.

Greenhouse Gas Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	
40 Code of Federal Regulations (CFR) Parts 51, 52, 70 and 71	This rule "tailors" GHG emissions to PSD and Title V permitting applicability criteria.
40 Code of Federal Regulations (CFR) Parts 51 and 52	A new stationary source that emits more than 100,000 TPY of greenhouse gases (GHGs) is considered to be a major stationary source subject to Prevention of Significant Determination (PSD) requirements. This project would not trigger this 100,000 TPY PSD threshold.
40 Code of Federal Regulations (CFR) Part 98	This rule requires mandatory reporting of GHG emissions for facilities that emit more than 25,000 metric tons of CO_2 equivalent emissions per year. This requirement is triggered by this project.
State	
California Global Warming Solutions Act of 2006, AB 32 (Stats. 2006; Chapter 488; Health and Safety Code sections 38500 et seq.)	This act requires the California Air Resource Board (ARB) to enact standards that will reduce GHG emission to 1990 levels by 2020. Electricity production facilities are regulated by the ARB. A cap-and-trade program became active in January 2012, with enforcement to begin January 2013. Cap-and-trade is expected to achieve approximately 20 percent of the GHG reductions expected under AB 32 by 2020.
California Code of Regulations, Title 17, Subchapter 10, Article 2, sections 95100 et. seq.	These ARB regulations implement mandatory GHG emissions reporting as part of the California Global Warming Solutions Act of 2006 (Stats. 2006; Chapter 488; Health and Safety Code sections 38500 et seq.)
California Code of Regulations, Title 17, Subchapter 10, Article 5, sections 95800 to 96023	These ARB regulations implement mandatory GHG cap-and-trade requirements for "covered entities," which include power plants which emit more than 25,000 metric tons of carbon dioxide equivalent emissions per calendar year. Enforcement begins January 2013.
Title 20, California Code of Regulations, section 2900 et seq.	These regulations prohibit utilities from entering into long-term contracts with any base load facility that does not meet a greenhouse gas emission standard of 0.5 metric tonnes carbon dioxide per megawatt-hour (0.5 MTCO2/MWh) or 1,100 pounds carbon dioxide per megawatt-hour (1,100 lbs CO2/MWh).

The California Climate Action Team produced a report to the Governor (CalEPA 2006) which included many examples of strategies that the state could pursue to reduce GHG emissions in California, in addition to several strategies that had been recommended by the Energy Commission and the Public Utilities Commission. Their third biennial report, published in December 2010 and required by Executive Order S-3-05, is the most recent report addressing actions that California could take to reduce GHG emissions (CalEPA 2010). The scoping plan approved by ARB in December 2008 builds upon the overall climate change policies of the Climate Action Team reports and includes recommended strategies to achieve the goals for 2020 and beyond. Some strategies focus on reducing consumption of petroleum across all areas of the California economy. Improvements in transportation energy efficiency (fuel economy) and land use planning and alternatives to petroleum-based fuels are slated to provide substantial reductions by 2020 (CalEPA 2006). The scoping plan includes a 33% Renewables Portfolio Standard (RPS), aggressive energy efficiency targets, and a cap-and-trade program that includes the electricity sector (ARB 2008). Mandatory compliance with cap-and-trade requirements commenced on January 1, 2012, although enforcement was delayed until January 2013. Senate Bill 2 (Simitian, Chapter 1, Statutes of 2011-12) expresses the intent of the California Legislature to have 33 percent of California's electricity supplied by renewable sources by 2020 and the Hidden Hills Project would contribute to this goal.

It is likely that GHG reductions mandated by ARB will be non-uniform or disproportional across emitting sectors, in that most reductions will be based on cost-effectiveness (i.e., the greatest GHG reduction for the least cost). For example, ARB proposes a 40 percent reduction in GHG emissions from the electricity sector even though that sector currently only produces about 25 percent of the state's GHG emissions.

SB 1368,[13] enacted in 2006, and regulations adopted by the Energy Commission and the Public Utilities Commission pursuant to that bill, prohibits California utilities from entering into long-term commitments with any base load facilities that exceed the Emission Performance Standard (EPS) of 0.5 metric tonnes CO_2 per megawatt-hour[14] (1,100 pounds CO_2/MWh). Specifically, the SB 1368 Emission Performance Standard (EPS) applies to base load power from new power plants, new investments in existing power plants, and new or renewed contracts with terms of five years or more, including contracts with power plants located outside of California.[15] If a project, instate or out of state, plans to sell base load electricity to California utilities, those utilities will have to demonstrate that the project meets the EPS. *Base load* units are defined as units that are expected to operate at a capacity factor higher than 60 percent. Compliance with the EPS is determined by dividing the annual average carbon dioxide emissions by the annual average net electricity production in MWh. This determination is based on capacity factors, heat rates, and corresponding emissions rates that reflect the *expected* operations of the power plant and not on full load heat rates [Chapter 11, Article 1 §2903(a)]. At the January 12, 2012 Business Meeting, the Energy Commission opened an Order Instituting Rulemaking (12-OIR-1) to consider revisions to the EPS.

[13] Public Utilities Code § 8340 et seq.

[14] The Emission Performance Standard only applies to carbon dioxide and does not include emissions of other greenhouse gases converted to carbon dioxide equivalent.

[15] See Rule at http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/64072.htm

In addition to these programs, California is involved in the Western Climate Initiative (WCI), a multi-state and international effort to establish a cap-and-trade market to reduce greenhouse gas emissions in the Western United States and the Western Electricity Coordinating Council (WECC). WCI created a special entity, WCI, Inc. to assist jurisdictions that are moving ahead with cap-and-trade programs. The initial participants are California and the Canadian province of Quebec. Two other Canadian provinces may join in the near future.

Each participating entity is developing their own cap-and-trade program to reduce greenhouse gas pollution, using their own authorities, laws and regulations. These programs will be linked in a larger market if each participating organization finds that such joining of programs creates synergy and can be done without adversely impacting their own system.

WCI timelines are similar to those of AB 32, with full roll-out beginning in 2012. And, as with AB 32, the electricity sector has been a major focus of attention of this group. ARB continues to refine AB32 regulations to mesh California requirements with those of the WCI to minimize leakage of GHG emissions from one geographic area to another. For example, they held a staff workshop on April 9, 2012 to discuss draft amendments to California's cap-and-trade program to better link these two efforts. None of the proposed amendments would change GHG requirements for HHSEGS.

SB1018 (Unfinished Business, Senate Budget and Fiscal Review Committee, for purposes of implementing the Budget Act of 2012) establishes new legislative oversight and controls over the Air Resources Board including: the creation of a separate expenditure fund for proceeds from the auction or sale of allowances pursuant to the market-based compliance mechanism (their cap-and-trade program); the establishment of a separate Cost of Implementation Fee account for oversight and tracking of funds; oversight of actions taken on behalf of the State of California related to market-based compliance and auctions, specific to the Western Climate Initiative and Western Climate Initiative, Incorporated; and provides for return of certain funds to ratepayers of Investor Owned Utilities from funds related to the auction or sale of allowances.

If built, HHSEGS would be required to participate in California's greenhouse gas cap-and-trade program. This cap-and-trade program is part of a broad effort by the State of California to reduce GHG emissions as required by AB32, which is being implemented by ARB. As currently proposed, market participants such as HHSEGS would be required to report their GHG emissions and to obtain GHG emissions allowances (and offsets) for those reported emissions by purchasing allowances from the capped market and offsets from outside the AB32 program. As new participants enter the market, and as the market cap is ratcheted down over time, GHG emission allowance and offset prices will increase, encouraging innovation by market participants to reduce their GHG emissions. Thus, HHSEGS, as a GHG cap-and-trade participant, would be consistent with California's landmark AB 32 Program, which is a statewide program coordinated with a region wide WCI program to reduce California's GHG emissions to 1990 levels by 2020.

ELECTRICITY AND GREENHOUSE GAS EMISSIONS

Electricity use can be as simple as turning on a switch to operate a light or fan. The system to deliver the adequate and reliable electricity supply is complex and variable. But it operates as an integrated whole to meet demand, such that the dispatch of a new source of generation unavoidably curtails or displaces one or more less efficient or less competitive existing sources. Within the system, generation resources provide electricity, or energy, generating capacity, and ancillary services to stabilize the system and facilitate electricity delivery, or movement, over the grid. *Capacity* is the instantaneous output of a resource, in megawatts. *Energy* is the capacity output over a unit of time, for example an hour or year, generally reported as megawatt-hours or gigawatt-hours (GWh). Ancillary services[16] include regulation, spinning reserve, non-spinning reserve, voltage support, and black start capability. Individual generation resources can be built and operated to provide only one specific service. Alternatively, a resource may be able to provide one or all of these services, depending on its design and constantly changing system needs and operations.

Hidden Hills Project GHG Emissions

Project Construction

Construction of industrial facilities such as power plants requires coordination of numerous equipment and personnel. The concentrated on-site activities result in short-term, unavoidable increases in vehicle and equipment emissions that include greenhouse gases. Construction of the HHSEGS project would involve 29 months of activity (not including start-up or commissioning). The project owner provided a GHG emission estimate for the entirety of the construction phase. Construction equipment would be powered with newer, higher air quality-tiered (thus, lower emitting) diesel powered equipment and "best practices" would also be incorporated to minimize criteria pollutant emissions. These mitigation measures are described in the air quality section and would also minimize carbon dioxide emissions because they would inherently require newer engine models. The GHG emissions estimate, presented below in **Greenhouse Gas Table 2**, includes the total emissions for the 29 months of construction activity in terms of CO_2-equivalent. Construction period GHG emissions average 4,175 MTCO2E per

Greenhouse Gas Table 2
HHSEGS, Estimated Potential Construction Greenhouse Gas Emissions

Construction Source [a]	Construction-Phase GHG Emissions over 29 months (MTCO2E) [b]
On-Site Construction Equipment	7,781
Off-Site Worker Travel, Truck Deliveries	2,308
Construction Total	**10,089**

Source: Table 5.1-32R (CH2 2012p)

Notes:
a. Includes emissions from workers commuting to work site.
b. One metric tonne (MT) equals 1.1 short tons or 2,204.6 pounds or 1,000 kilograms.

[16] See CEC 2009b, page 95.

year, compared to annual operating emissions of 61,628 MTCO2E with mirror washing or 40,481 MTCO2E excluding mirror washing. Operating emissions are described more fully below.

Project Operations

The proposed HHSEGS would be a nominal 500-megawatt (MW) solar power tower electrical generating facility located in Inyo County, comprised of two 250 MW units. The primary sources that would cause GHG emissions would be from power block maintenance activities, including mirror cleaning and minimal undesired vegetation removal, weekly testing of the emergency generator and firewater pump, daily operation of each boiler (five hours per day of operation plus additional hours for startup of each auxiliary boiler and twelve to sixteen hours per day of operation plus an hour for startup of each nighttime boiler) and employee commute trips.

Greenhouse Gas Table 3 shows what the proposed project, as permitted, could potentially emit in greenhouse gases on an annual basis. Emissions are also converted to CO_2-equivalent and totaled. Electricity generation GHG emissions are generally dominated by CO_2 emissions from the carbon-based fuels; other sources of GHG are typically small and also are more likely to be easily controlled or reused/recycled, but are nevertheless documented here as some of the compounds have very high relative global warming potentials. Operating emissions are shown both with and without mirror washing.

Natural Carbon Uptake Reduction

This proposed project would cause the clearing of land and removal of vegetation, which would reduce the ongoing natural carbon uptake by vegetation. A study of the Mojave Desert indicated that the desert may uptake carbon in amounts as high as 100 grams per square meter per year (Wohlfahrt et. al. 2008). This would equate to a maximum reduction in carbon uptake, calculated as CO_2, of 1.48 MT of CO_2 per acre, per year, for areas with complete vegetation removal. For this 3,097 acre proposed project, which actually does not require the complete removal of vegetation over most of the project site, the maximum equivalent loss in carbon uptake assuming complete vegetation removal would be 4,582 MT of CO_2 per year, which would correspond to 0.003 MT of CO_2 per MWh generated. Therefore, the natural carbon uptake loss is negligible in comparison with the reduction in fossil fuel CO_2 emissions, which can range from 0.35 to 1.0 MT of CO_2 per MWh depending on the fuel and technology, that is enabled by this proposed project.[17] Given the current approach to minimizing vegetative removal, the impact would be less than significant.

Cumulative Impacts

Cumulative impacts are defined as "two or more individual effects which, when considered together, are considerable or . . . compound or increase other environmental impacts" (CEQA Guidelines § 15355). "A cumulative impact consists of an impact that is created as a result of a combination of the project evaluated in the EIR together with

[17] *Wohlfahrt. et. al. 2008. Georg Wohlfahrt, Lynn F. Fenstermaker, and John A. Arnone III. Large annual net ecosystem CO_2 uptake of a Mojave Desert ecosystem. Global Change Biology, 2008 (14).*

other projects causing related impacts" (CEQA Guidelines § 15130[a][1]). Such impacts may be relatively minor and incremental, yet still be significant because of the existing environmental background, particularly when one considers other closely related past, present, and reasonably foreseeable future projects. This entire assessment is a cumulative impact assessment. The project alone would not be sufficient to measureable change global climate or global inventories. But the project would emit greenhouse gases and therefore has been analyzed as a potential cumulative impact in the context of existing electrical system, the GHG regulatory requirements and GHG energy policies.

COMPLIANCE WITH LORS

Although still being refined as discussed above, ARB's AB 32 regulations will address both the degree of electricity generation sector emissions reductions and the method by which those reductions will be achieved (e.g., through cap-and-trade or command-and-

Greenhouse Gas Table 3
HHSEGS, Estimated Potential Greenhouse Gas (GHG) Emissions

	Maximum Emissions, metric tonnes/yr				
Emitting Source	**CO_2**	**CH_4**	**N_2O**	**SF_6**	**CO_2-equivalent (MTCO2E[a] per year)**
Auxiliary Boilers	31,902	0.60	0.06	--	
Nighttime Preservation Boilers	7,672	0.14	0.01	--	
Power Block Emergency Generator	704	0.03	0.01	--	
Common Area Emergency Generator	41	1.7E-03	3.3E-04	--	
Power Block Fire Pump Engine	49	2.0E-03	4.0E-04	--	
Common Area Fire Pump Engine	24	9.9E-04	2.0E-04	--	
WSACs	0	0.00	0.00	--	
Equipment Leakage (SF_6)	--	--	--	2.0E-03[g]	
Total	40,392	0.77	0.081	2.0E-03	
Global warming potential multiplier	1x	21x	310x	23,900x	
Total Project GHG Emissions – MTCO2E [b]	**40,392**	**16.27**	**25.11**	**47.8**	**40,481**
Mirror washing activities FFT[c] (on-road vehicles)	19,670	17	50	--	19,737
Mirror washing activities NT[d] (off-road vehicles)	1,405	1	4	--	1,410
MTCO2	**61,467**			**MTCO2E [b]**	**61,628**
Facility MWh per year [e]	1,432,000				1,432,000
Facility CO_2 EPS (MTCO2/MWh)	0.043[f]			Facility GHG Performance (MTCO2E/MWh)	0.043[f]

Sources: Revised April 2012 boiler optimization filing App 5.1B and table 5.1B-13R (CH2 2012p)

Notes: a. One metric tonne (MT) equals 1.1 short tons or 2,204.6 pounds or 1,000 kilograms.
b. Annualized basis uses the project owner's assumed maximum permitted operating basis.
c. Far from Tower (FFT)
d. Near Tower (NT)
e. Estimated Gross MWh
f. Value includes mirror washing
g. 2.0 E-03 is derived from 880.4 lbs of maximum onsite SF6, as shown in Hazardous Materials Table 5.5R-1 HHSEGS Chemical Inventory. Please see CEC 2012jj record of conversion.

control or both). However, the exact approach is still under refinement. That regulatory approach will address emissions not only from the newer, more efficient, and lower emitting facilities licensed by the Energy Commission, but also the older, higher-emitting facilities not subject to Energy Commission jurisdiction. This programmatic approach is expected to be more effective and less costly in reducing GHG emissions overall from the entire electricity sector to meet GHG emissions reduction goals.

ARB has adopted cap-and-trade requirements that went into effect in January 2012, although compliance is not required until January 2013. As ARB continues to codify improved GHG inventories and methods, it may become apparent that emission reductions from the generation sector are less cost-effective than other sectors, and that other sectors of sources can achieve reductions with relative ease and cost-effectiveness. However, all information to date suggests that the electricity sector would be affected at least in proportion to its contribution to GHG emissions, and moreso.

This project would be subject to ARB's mandatory reporting requirements and cap-and-trade requirements. How the project would comply with these ARB requirements is speculative at this time, but compliance would be mandatory. Compliance options for cap-and-trade would likely be a combination of purchased allowances and approved GHG emissions offsets, although GHG offsets are limited to no more than 8 percent of total obligations based upon mandatorily-reported GHG emissions. The project may have to provide additional reports and GHG reductions, depending on the future regulations expected from ARB. Similarly, this project would be subject to federal mandatory reporting of GHG emissions.

Reporting of GHG emissions would enable the project to demonstrate consistency with the policies described above and the regulations that ARB adopts and to provide information to demonstrate compliance with any additional, future AB 32 requirements if enacted in the next few years. Since this power project would be permitted for less than a 60 percent annual capacity factor, the project is not subject to the requirements of SB 1368 and the current Emission Performance Standard. However, the HHSEGS's GHG emission performance has been shown to be below the SB 1368 EPS level.

AVENAL PRECEDENT DECISION

The Energy Commission established a precedent in the Final Commission Decision for the Avenal Energy Project. This precedential decision requires all new fossil-fuel fired power plants certified by the Energy Commission to: (a) not increase the overall system heat rate for natural gas plants; (b) not interfere with generation from existing renewable facilities nor interfere with the integration of new renewable generation; and, (c) take into account these factors to ensure a reduction of systemwide GHG emissions and support the goals and policies of AB 32 (CEC 2009, page 111). This proposed, renewable energy project, with its minor amounts of fossil fuel use, would meet all of these conditions.

DIRECT/INDIRECT OPERATION IMPACTS AND MITIGATION

The proposed HHSEGS promotes the state's efforts to move towards a high-renewable, low-GHG electricity system, and therefore reduces both the amount of natural gas used by electricity generation and greenhouse gas emissions. It does this in several ways:

- California's Energy Action Plan Loading Order specifies that electrical energy demand be met first by energy efficiency and demand response, followed by employing renewable energy such as would be provided by HHSEGS.

- The energy produced by the HHSEGS would displace energy from higher GHG-emitting coal- and gas-fired generation resources, lowering the GHG emissions from the western United States, the relevant geographic area for the discussion of GHG emissions from electricity generation.

- The dependable capacity provided by the HHSEGS would facilitate the retirement/divestiture of resources that cannot meet the Emissions Performance Standard or are adversely affected by the SWRCB's policy on once-through cooling (OTC).

- Finally, while the HHSEGS combusts natural gas in onsite boilers for the purposes of improving plants efficiency by facilitating the startup of the solar boiler system and to initiate and sustain output during periods of low solar irradiance, the latter displaces higher-emission generation. In addition, HHSEGS reduces the need for energy and ancillary services from natural gas-fired resources, potentially obviating the need for their construction/operation.

California's Energy Action Plan Loading Order

In 2003, the three key energy agencies in California – the California Energy Commission (Energy Commission), the California Power Authority (CPA), and the California Public Utilities Commission (CPUC) – came together in a spirit of unprecedented cooperation to adopt an "Energy Action Plan" (EAP) that listed joint goals for California's energy future and set forth a commitment to achieve these goals through specific actions. The EAP is a living document meant to change with time, experience, and need. In 2005 the CPUC and the Energy Commission jointly prepared an Energy Action Plan II to identify further actions necessary to meet California's future energy needs (CEC 2005).

The EAP's overarching goal is for California's energy to be adequate, affordable, technologically advanced, and environmentally-sound. Energy must be reliable – provided when and where needed and with minimal environmental risks and impacts. Energy must be affordable to households, businesses and industry, and motorists – and in particular to disadvantaged customers who rely on California government to ensure that they can afford this fundamental commodity. EAP actions must be taken with clear recognition of cost considerations and trade-offs to ensure reasonably priced energy for all Californians.

The EAP accomplishes these goals in the electricity sector by calling for a “loading order” specifying the priority order for how to balance electricity supply and demand. The loading order identifies energy efficiency and demand response as the State’s preferred means of meeting growing electrical energy needs. After cost-effective efficiency and demand response, it relies on renewable sources of power and distributed generation, such as combined heat and power applications. To the extent efficiency, demand response, renewable resources, and distributed generation are unable to satisfy increasing energy and capacity needs, the loading order supports clean and efficient fossil-fired generation.

The Role of the HHSEGS in Energy Displacement

The Renewables Portfolio Standard (RPS) was established by Senate Bill 1078 (Sher, Chapter 516, Statutes of 2002), effective January 1, 2003, with revisions to the law following as a result of Senate Bill 1250 (Perata, Chapter 512, Statutes of 2006), Senate Bill 107 (Simitian, Chapter 464, Statutes of 2006), and Senate Bill X1 2 (Simitian, Chapter 1, Statutes of 2011, First Extraordinary Session). The RPS originally required California’s electric utilities to obtain at least 20 percent of its power supplies from renewable sources by 2010. It now has been expanded to require retail sellers of electricity and local publicly owned electric utilities (POUs) to increase the amount of renewable energy they procure until 33 percent of their retail sales are served with renewable energy by December 31, 2020. Under the law, the Energy Commission is required to certify eligible renewable energy resources that may be used by retail sellers of electricity and POUs to satisfy their RPS procurement requirements, develop an accounting system to verify retail sellers’ and POUs’ compliance with the RPS, and adopt regulations specifying procedures for enforcement of the RPS for the POUs.

As California moves towards an increased reliance on renewable electrical energy by implementing the RPS, non-renewable electric energy resources will be displaced. A 33 percent RPS is forecasted to require California load-serving entities to procure more than 95,600 GWh of renewable electrical energy, an increase of roughly 55,000 GWh over 2010 levels.[18]

Given an RPS, renewable electrical energy displaces electricity that would otherwise be produced from coal- and natural gas-fired generation. The construction and operation of the HHSEGS would not displace other renewable resources as load-serving entities must meet the renewable energy purchase requirements embodied in the RPS. Even in the absence of an RPS, HHSEGS would not replace other renewables. The fuel and other variable costs associated with most forms of renewable generation are much lower than for other resources and, (b) even where this may not be the case (e.g., selected biofuels) the renewable resource will frequently have a “must-take” contract with a load-serving entity requiring that all of electrical energy produced by the project be purchased by the buyer. Hydroelectric generation is not displaced as it has very low variable costs of production; the variable cost of nuclear generation is much lower than for fossil resources as well.

[18] Retail sales requiring renewable procurement are forecasted to be almost 287,000 GWh in 2022 (CEC 2012); purchases of renewable energy are estimated to have been 41,000 GWh (CEC 2011a)

While the HHSEGS would combust some natural gas and thus emit GHGs as part of its operations, it would produce far less GHG emissions (emitting approximately 95 lbs CO2/MWh) than the coal- and natural gas-fired resources it would displace. Coal-fired generation requires the combustion of 9,000 – 10,000 Btu/MWh, resulting in more than 1,800 lbs CO2/MWh. Natural gas-fired generation in California requires an average of 8,566 Btu/MWh, yielding approximately 1,000 lbs CO2/MWh (CEC 2011b).[19]

The Role of the HHSEGS in Capacity Displacement

The HHSEGS would provide up to 500 MW of electrical capacity and associated electrical energy to the grid during early afternoon hours in the summer. Electricity demand in California reaches its peak during mid- to late-afternoon on the hottest weekdays of the summer. Dependable capacity – the amount of capacity that can be counted upon to be available during the peak - is needed to reliably serve loads; the generation fleet, in conjunction with demand response programs, must provide a sufficient amount of dependable capacity to meet demand on the highest load day of the year.[20] Load-serving entities in the California ISO control area, for example, are required by the California ISO to procure dependable capacity in amounts determined by their peak load forecast.

While the HHSEGS's dependable capacity value would depend upon its exact performance, its ability to sustain output even when solar irradiance is reduced due to cloud cover, and thus provide energy during extreme peak hours would mean a higher value than would otherwise be the case.

The dependable capacity provided by the HHSEGS would assist in replacing that lost due to the Emissions Performance Standard (EPS) and the State Water Resources Control Board's (SWRCB) once-through cooling (OTC) policy, both discussed more fully below.

Replacement of High GHG-Emitting Generation

High GHG-emitting resources, such as coal, are effectively prohibited from entering into new long-term contracts for California electricity deliveries as a result of the Emissions Performance Standard adopted in 2007 pursuant to SB 1368. Between now and 2020, 1,549 MW of coal-fired generation capacity will have to reduce GHG emissions or be replaced; these contracts are presented in **Greenhouse Gas Table 5**.

Retirement of Generation Using Once-Through Cooling

The State Water Resource Control Board's (SWRCB) policy on cooling water intake at coastal power plants has led to the retirement and replacement of several plants that use once-through cooling (OTC), numerous others are likely to retire on or prior to

[19] The HHSEGS would displace resources with a higher than average heat rate during most hours, as the most expensive (least efficient) resources would be displaced.

[20] This is usually the hottest weekday in the summer, when residential and commercial cooling loads are at their highest.

assigned compliance dates,[21] some of which will require replacement.[22] The units with compliance dates on or before the end of 2020 are presented in **Greenhouse Gas Table 6**

Greenhouse Gas Table 5
Expiring Long-term Contracts with Coal-fired Generation 2009 – 2020

Utility	Facility	Contract Expiration	MW
Department of Water Resources	Reid Gardner	2013 [1]	213
SDG&E	Boardman	2013	84
SCE [2]	Four Corners	2016	720
Turlock Irrigation District	Boardman	2018	55
LADWP	Navajo	2019	477
		TOTAL	**1,549**

Source: Energy Commission staff based on Quarterly Fuel and Energy Report (QFER) filings.
Notes:
1. Contract not subject to Emission Performance Standard, but the Department of Water Resources has stated its intention not to renew or extend.
2. The sale of SCE's share of Four Corners to Arizona Public Service has been approved by the CPUC and is awaiting FERC approval.

[21] Most of the OTC units are aging facilities, for which extensive retrofits will be uneconomical. While compliance using operational and structural controls is allowed, the ability of units to comply in this manner and still operate in a fashion that yields a sufficient revenue stream is questionable.

[22] The California ISO, CPUC and the Energy Commission are studying amount of OTC capacity that will require replacement.

Greenhouse Gas Table 6
OTC Units with SWRCB Compliance Dates on or before December 31, 2020[23]

Plant, Unit Name	Local Reliability Area	Capacity (MW)
Alamitos 1-6	L.A. Basin	1,970
Contra Costa 6, 7	S.F. Bay	680
El Segundo 3, 4	L.A. Basin	670
Encina 1-5	San Diego	951
Huntington Beach 1, 2	L.A. Basin	430
Huntington Beach 3, 4	L.A. Basin	450
Mandalay 1, 2	Ventura	436
Morro Bay 3, 4	None	600
Moss Landing 6, 7	None	1,404
Moss Landing 1, 2	None	1,080
Ormond Beach 1, 2	Ventura	1,612
Pittsburg 5-7	S.F. Bay	1,332
Redondo Beach 5-8	L.A. Basin	1,343
Total		12,958

Note: Pittsburg Unit 7 (682 MW) does not use once-through cooling but would be required to shut down if Units 5 and 6 retire.

GHG Emissions During Plant Operation

The HHSEGS would produce GHG emissions during operations, combusting natural gas in order to provide assistance in starting the solar boiler and increase or sustain energy output during periods of reduced solar irradiance (early morning and late afternoon hours, periods of high cloud cover)

The ability to produce energy for both station service and transmission to end-users slightly earlier and slightly later than would otherwise be the case without limited supplemental firing, as well as to smooth out fluctuations in output during periods when solar irradiance is interrupted has not only economic value to the owner, but provides reliability to the electricity system. The substantial amounts of solar capacity anticipated for development during the coming decade and beyond, combined with the retirement of perhaps as much as 13,000 MW of gas-fired generation using once-through cooling, is very likely to shift the system peak to late afternoon/early evening when solar resources would produce little if any energy and gas-fired resources would have to be dispatched to provide reserves. Similarly, gas-fired generation would be needed in the early morning when solar resources have yet to ramp up and wind generation is failing. The ability of the HHSEGS to provide energy during early morning and late afternoon/early

[23] Greenhouse Gas Table 6 does not include OTC units that retired prior to January 1, 2012, resources with compliance dates through 2020 that have already been slated for replacement (e.g., LADWP units at Haynes and Scattergood), or units with post-2020 compliance dates (the remaining units at Haynes and Scattergood, LADWP's Harbor combined cycle, and the nuclear facilities at San Onofre and Diablo Canyon)

evening hours using natural gas fueled equipment, as well as to sustain output under less-than-ideal conditions on extreme load days not only reduces the need to dispatch natural gas-fired generation but may, in some cases, obviate the need to build it.

The ability to sustain output levels during periods of extreme loads also reduces the need for regulation services. As the HHSEGS would be able to “ride through” brief periods of reduced irradiance, it would reduce the need for resources to be dispatched solely to adjust output in response to short-term changes in intermittent generation levels. This benefit is in addition to increasing the dependable capacity of the project and thus reducing the need for gas-fired capacity to meet dependable capacity requirements.

PROPOSED CONDITIONS OF CERTIFICATION

No conditions of certification related to greenhouse gas emissions are proposed. The project owner would comply with mandatory ARB GHG emissions reporting regulations (California Code of Regulations, tit. 17, Subchapter 10, Article 2, Sections 95100 et. seq.) and/or future GHG regulations formulated by the U. S. EPA or the ARB, such as GHG emissions cap-and-trade requirements.

CONCLUSIONS

The HHSEGS would emit considerably less greenhouse gases (GHG) than existing power plants and most other generation technologies, and thus would contribute to continued improvement of the overall western United States, and specifically California, electricity system GHG emission rate average. The proposed project would lead to a net reduction in GHG emissions across the electricity system that provides energy and capacity to California. Thus, staff concludes that the proposed project’s operation would result in a cumulative overall reduction in GHG emissions from the state’s power plants and that any short-term impacts would be less than significant.

Staff concludes that the GHG emission increases typical from construction and decommissioning activities would not create significant impacts under CEQA for several reasons. First, the periods of construction and decommissioning would be short-term and not ongoing during the life of the proposed project. Second, the best practices control measures that staff recommends, such as limiting idling times and requiring, as appropriate, equipment that meets the latest emissions standards, would further minimize greenhouse gas emissions since the use of newer equipment would increase efficiency and reduce GHG emissions and be compatible with low-carbon fuel (e.g., bio-diesel and ethanol) mandates that will likely be part of the ARB regulations to reduce GHG from construction vehicles and equipment. Finally, the construction and decommissioning emissions are miniscule when compared to the reduction in fossil-fuel power plant greenhouse gas emissions during project operation. For all these reasons, staff would conclude that the short-term emission of greenhouse gases during construction would be sufficiently reduced and would be offset during proposed project operations and would, therefore, not create a significant impact under CEQA.

The HHSEGS, as a renewable energy generation facility, is determined by rule to comply with the Greenhouse Gas Emission Performance Standard requirements of SB 1368 (Title 20, Greenhouse Gases Emission Performance Standard, Section 2900 et. seq.). The project is not subject to the requirements of SB 1368 (Greenhouse Gasses Emission Performance Standard; Cal. Code Reg., tit. 20, § 2900 et. Seq.) and the Emission Performance Standard; however, it would nevertheless meet the Emission Performance Standard.

STAFF PROPOSED FINDINGS OF FACT

1. GHG emissions from the HHSEGS project construction are estimated to be 10,089 MTCO2E during the 29-month construction period, which is the annual equivalent of 4,175 MTCO2E per year.
2. Construction GHG emissions would be minimal in comparison to the GHG emission reductions that the project would create in its lifetime, with annual GHGs estimated at up to 61,628 MTCO2E per year as shown in **Greenhouse Gas Table 3**.
3. HHSEGS would use best practices to control its construction-related GHG emissions.
4. Construction-related GHG emissions are less than significant if they are controlled with best practices.
5. State government has a responsibility to ensure a reliable electricity supply, consistent with environmental, economic, and health and safety goals.
6. California utilities are obligated to meet whatever electricity demand exists from any and all customers.
7. Under SB 1368 and implementing regulations, California's electric utilities may not enter into long-term commitments with base load power plants with CO_2 emissions that exceed the Emissions Performance Standard ("EPS") of 0.5 MTCO2 / MWh.
8. The maximum annual CO_2 emissions from HHSEGS operation would be 61,628 [24] MTCO2, which constitutes an emissions performance factor of 0.043 [25] MTCO2 / MWh.
9. The HHSEGS is a solar project that would operate at less than a 60 percent capacity factor, and therefore is not subject to the requirements of the SB 1368 Emissions Performance Standard. Nonetheless, the HHSEGS would easily meet the Greenhouse Gas Emission Performance Standard required by SB 1368.
10. AB 32 requires ARB to adopt regulations that will reduce statewide GHG emissions, by the year 2020, to the 1990 level. Executive Order S-3-05 requires a further reduction, by the year 2050, to 80 percent below the 1990 level.
11. The California Renewable Portfolio Standard (RPS) requires the state's electric utilities obtain at least 20 percent of the power supplies from renewable sources, by the year 2010.

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[24] Includes mirror washing – otherwise the maximum emission is 40,481 MTCO2E

[25] Includes mirror washing – otherwise around 0.028 MTCO2.MWh without including mirror washing emission estimates

12. Senate Bill X1-2 increases the RPS target requirement to 33 percent by 2020.
13. California's power supply loading order requires California utilities to obtain their power first from the implementation of all feasible and cost-effective energy efficiency and demand response, then from renewable energy and distributed generation, and finally from the most efficient available fossil-fired generation and infrastructure improvement.
14. Operation of HHSEGS would be consistent with the loading order.
15. HHSEGS would displace generation from higher-GHG-emitting power plants.
16. HHSEGS would replace power from coal-fired power plants that would be unable to enter into new contracts or renew contracts with California utilities under the SB 1368 EPS, and from once-through cooling power plants that must reduce their use of coastal or estuarine water.
17. HHSEGS operation would reduce overall GHG emissions from the electricity system.

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Air Quality / GHG

List of Comment Letters

1	Applicant, BrightSource Energy, Inc.
2	Intervenor Cindy MacDonald
3	Intervenor Center for Biological Diversity
4	Intervenor, Old Spanish Trail Association
5	Inyo County
6	Bureau of Land Management
7	National Park Service
8	The Nature Conservancy
9	Amargosa Conservancy
10	Pahrump Paiute Tribe
11	Richard Arnold, Pahrump Piahute Tribe
12	Big Pine Tribe of Owens Valley
13	Basin & Range Watch

[1] Note - not all comments from the applicants are show in this comments matrix. Only those comments that were have a comment associated explanation rather than a text change within the document of the Final Staff Assessment are listed in this matrix. If there was a text change and CEC staff agrees with the change requested by the applicants the change has been made in the staff analysis.

[2] Note: the GBUAPCD has responses to some of the questions that are an attachment to the Final Determination of Compliance for HHSEGS and will be noted as "GBUAPCD response", CEC staff concur with the responses and have included the responses below for convenience of having all responses in the same location.

Comment	DATE	COMMENT TOPIC	RESPONSE
1	**July 23, 2012**	**[1]APPLICANT -- BrightSource Energy, Inc.**	
1.1		Project Description -- transmission interconnection description modification	Staff agrees. See page 4.1-13 of the FSA.
1.2		Project Description -- Kern River Gas Transmission Company (KRGT) gas line	Staff agrees. See page 4.1-13 of the FSA.
1.3		Project Description -- acreage / footprint	Correct acreage of 3,277 is now reflected throughout FSA
1.4		Project Description -- distance to Pahrump, NV	The distance to site from Pahrump, NV has been corrected throughout the document to reflect the correct distance.
1.5		Conditions requiring a third party review need to incorporate a 2 week limit for review and comment on the required documents.	Staff agrees. See General Conditions.
1.28	Comment 28	Page 4.1 23, Construction Impacts Mitigation, Items L and N: Applicant did not propose these items. Also, “top service shape” (in Item N) is ambiguous, and unenforceable as a practical matter; thus, delete Item N. Revise	Staff has decided to re-word instead of delete as applicant suggests. Text has been changed to say: "N. Construction equipment will be maintained as specified by OEM (original equipment manufacturers)".
1.45	Comment 45. The Applicant requests that changes be made to the following conditions of certification:	AQ-SC2: Applicants have suggested to change 30 days to 15 days.	Staff has changed to: "15 business days from the date of receipt."
	Comment regarding AQ-SC3	Various condition edits to the condition.	Staff does not agree to the proposed changes to staff condition **AQ-SC3**. The wording in **AQ-SC3** is appropriate for the proposed project and is consistent with what has been used on other Energy Commission projects.
Comment	**DATE**	**COMMENT TOPIC AIR QUALITY SECTION 3**	**RESPONSE**
2	**July 21, 2012**	**[2]INTERVENOR -- Cindy MacDonald**	

1. TEMPORARY CONSTRUCTION/COMMON AREA EMISSIONS	Question 1.1	Under which "heading" in Appendix 5.1F, has the applicant included the emissions impacts from construction and development of the temporary construction site and common area?	Construction of the temporary construction site and common area has been included in the emissions estimates of Appendix 5.1F in the Boiler Optimization document. Please find those estimates in the table heading titled "Solar Field Assembly and Installation, Concrete Batch Plant, and Miscellaneous".
2. CONSTRUCTION EQUIPMENT EMISSIONS FACTORS: DEFINING MILES PER HOUR	Question 2.1	In the Construction Equipment Emission Factors, what is the column title, "Tier (Nonroad), Avg. mph (Onroad)", referring too – average miles per hour the vehicle is estimated to travel or average speed of the vehicle?	GBUAPCD Response: The column shows the US EPA/California ARB engine certification tier (mainly Tier 3) for nonroad vehicles, and the average miles traveled per hour of travel for onroad vehicles. The differing units are needed because the conventions for calculating emissions from nonroad and offroad equipment differ. Exhaust emissions from nonroad equipment are typically calculated per unit of operating time (i.e., grams per horsepower per hour); whereas, exhaust emissions from onroad vehicles are calculated per distance the vehicle travels (i.e., grams per mile).
	Question 2.2	If the Construction Equipment Emission Factors in the column titled, "Tier (Nonroad), Avg. mph (Onroad)", is referring to emissions resulting from the speed of the vehicle, how accurate are these emissions when the conditions of the permit authorize speeds up to 10-25 mph, depending on surface type?	GBUAPCD Response: For on-road vehicles, the average miles traveled during an hour of travel (10) is an activity level, not a speed. The distance (in vehicle miles traveled per hour) is multiplied by the emission factors (in grams per vehicle mile traveled) to calculate pounds per hour of emissions from on-road-type vehicles. The speed limit of 25 mph applies to instantaneous speed, while the average miles the vehicle is estimated to travel during an hour reflects the average distance traveled over an entire hour, including stops.
	Question 2.3	If the emissions were calculated for non-road vehicles using a 10 mph vehicle speed, what is the difference (if any) in emissions impacts?	GBUAPCD Response: Emissions from non-road vehicles were not calculated using a 10 mph vehicle speed—they were calculated using Tier-specific emission factors that are not speed-based.
3. SF6 MAINTENANCE, REPLACEMENT AND WITHDRAWAL REQUIREMENTS	Question 3.1	What are the annual anticipated maintenance, replacement and withdrawal requirements of SF6 at the proposed project site as well as over the life of the project?	SF6 recharge (maintenance or replacement) may be required periodically to replace the SF6 lost due to leakage or contamination of the system and this rate of loss has been included in the GHG section of the FSA. Please see GHG Table 3 "HHSEGS Estimated Potential Greenhouse Gas (GHG) Emissions" under column SF6.
	Question 3.2	Where has the applicant disclosed this information in the AFC files or subsequent documents and where has CEC Staff accounted for them in the PSA?	The applicants have estimated an SF6 loss in the revised April 2012 "Boiler Optimization" document found in the Appendix 5.1B, Table 5.1B-13R. California Energy Commission staff has included an estimate in GHG table 3 - "Equipment leakage (SF6)".
4. SWITCHYARD CONTRADICTIONS/CHANGES IN SF6 STORAGE QUANITIES	Question 4.1	Is the new location of the switchyard on public or private land?	The proposed switchyard would be located on private land.
	Question 4.2	If the switchyard is moved outside of the CEC's jurisdiction, does this effectively eliminate the CEC's ability to evaluate and incorporate this portion of the proposed project in their direct, indirect and cumulative emissions and impact analysis?	If the switchyard is moved outside California, it would be outside the jurisdiction of the California Energy Commission. The California Energy Commission only has permitting authority within the state.
	Question 4.3	If the switchyard is moved out of state, will the CPM or any other California based entity or agency have any jurisdiction over its compliance to LORS over the life of the project?	If the switchyard is moved outside of California, it would be outside the jurisdiction of the California Energy Commission. The California Energy Commission only has permitting authority within the state.
	Question 4.4	Given the amount of contradictory information presented, can anyone explain what proposal we are suppose to be analyzing and commenting on?	The current project analyzed in the FSA and PSA is the "Boiler Optimization" configuration submitted April 2012.

	Question 4.5	Why has the amount of onsite SF6 increased if no changes in circuit breaker requirements have been introduced?	Please see the corrected value of SF6 in GHG Table 6.
	Question 4.6	What is the reason(s) for this increase in onsite storage of SF6, especially in light of the fact that the switchyard is supposedly no longer included in the California portion of the proposed project's design?	Staff believes the original value of SF6 was an error; the correct value is seen in GHG Table 3. The switchyard would be located in the California portion of the proposed project.
	Question 4.7	What is the specific emissions factor increase relative to this 400 lb increase in SF6 onsite storage quantities, including annual GHG impacts in terms of pounds/tons?	The SF6 quantity is not expected to change. Please see GHG Table 3 for the emission leakage rate of SF6.
5. CONCRETE BATCH, EMISSIONS CALCULATIONS AND HOURS OF OPERATION	Question 5.1	If the Concrete Batch Plant is estimated to operate for 21 hours per day, why is its associated equipment only projected to operate for 8 and 5 hours a day? Please explain timetables and operating procedures and explain why the California Energy Commission Staff found them acceptable for emissions calculations.	California Energy Commission staff believes the emissions estimate of 21 hours per day is conservative. The analysis assumes that up to two loaders and 20 transmix trucks will each operate up to 8 and 5 hours per day, respectively. This results in a total of 16 loader-hours per day and 100 transmix vehicle-hours per day of operation when the concrete batch plant is in operation. Because the plant operates in batch and not continuous mode, the loaders would not be expected to operate continuously for 21 hours. The five operating hours per day (when loading is not occurring) represents periods of time throughout the day when the plant has an adequate quantity of aggregate stored in its hopper for the current (or next) batch.
	Question 5.2	What are the actual "peak" months the Concrete Batch is projected to operate; September/October of 2013, March, April and May of 2014 or September 2013 through May 2014?	According to Table 5.1F-1 of the Boiler Optimization, the peak construction Max daily emissions would be around Month 8 and 9 due to fugitive dust from the concrete Batch Plant. Depending on the start of construction, month 8 and 9 could be in 2013 or in 2014.
	Question 5.3	Based on the answer to question 2, what are the true cumulative emissions totals that will occur during those months of "peak" Concrete Batch operations?	Please see Table 5.1-F of the Boiler Optimization.
	Question 5.4	How does Staff justify the use of 16 days emissions impacts during Concrete Batch Operations under the "hourly" emissions calculations when they know the Plant is already projected to operate for 21 hours per day and will operate "around the clock" for at least three months?	GBUAPCD Response: The hourly and daily construction equipment activity schedules were developed from the initial annual estimates based on a 16-day-per-month (4 days per week, 10 hours per day) operating schedule in order to conservatively overestimate worst case hourly and daily emissions. If a 5-day-per-week schedule had been assumed, the number of concurrently operating vehicles and/or the number of vehicle operating hours per day (or some combination of the two), would be reduced by 20 percent to accomplish the scheduled weekly construction tasks. For example, with a 5-day work week, daily working hours would be reduced from 10 to 8 (to maintain a 40 hour work week) and peak daily emissions would be 20 percent lower than the emissions analyzed.
6. MAXIMUM BOILER EMISSIONS: CONFLICTING DATA	Question 6.1	1. What are the reasons for these annual operating hour discrepancies?	Rather than limit the operating hours of the individual boilers on a daily, monthly or annual basis, the District also accepted the applicant's estimated

	Question 6.2	What differences do these variations in annual operating hours for boilers make to operating emissions impacts and emission limits in the Permit To Operate?	hours of operation. From the estimates, daily and annual natural gas fuel limits were derived in Table 5.1B-9R of the revised Boiler Optimization tables that will act as emission control limits for ensuring the 24-hour and annual impacts would be below the state and/or federal ambient air quality standards. The total natural gas fuel consumption, expressed as heat input rates, shall not exceed 3,440 MMBtu/day or 746,400 MMBtu/year for combustion in the burners of all auxiliary and nighttime preservation boilers in the Solar 1 facility or the adjacent Solar 2 facility.
7. ANNUAL POWER PRODUCTION	Question 7.1 Question 7.2	Does the applicant's annualized capacity factor of approximately 3,000 full-load hours per year indicate this is the projected annual average of hours the plant will produce power over the course of that year? What is the daily power production potential in terms of hours during the peak summer months of June, July and August, when solarity is the highest due to long summer days?	Refer to the Response to Comments table in the **Efficiency and Facility Design** section of this FSA.
	Question 7.3	Due to potential increased production levels during summer months by possibly a large margin, can the proposed project's emissions qualify as a "seasonal" production facility subject to air pollution reporting requirements for seasonal generation? If not, why not?	The applicant is not requesting to be licensed as a "seasonal" source. Further, the local air district does not have any regulations for seasonal air pollution sources. Staff did not evaluate the project as a seasonal source.
8. HELIOSTAT COMMUNICATIONS SYSTEM: TRENCHING/IMPACTS TO AIR QUALITY & EMISSIONS	Question 8.1	If the applicant chooses to directly wire the heliostats, how many feet/yards/miles of trenching will be required and what does this translate to in terms of acreage disturbance at the project site?	Refer to the Response to Comments table in the **Soils and Surface Water** section of this FSA.

	Question 8.2	If the applicant chooses to directly wire the heliostats, what is the projected increase in heavy equipment required to install it, the projected cumulative increase in construction emissions from equipment and potential traffic impacts and was this accounted for in the AFC files or the PSA? If so, where?	If the applicants choose to directly wire the heliostats, installation would be using vehicles such as the tractors and pickup trucks that are already included in the construction equipment schedule. The construction emissions will be approximately the same as those for a wireless system and no increase in emissions would be expected. In the FSA this is included in Air Quality Table 7 "HHSEGS Construction Emissions" under Maximum Daily onsite and Offsite Emissions.
	Question 8.3	What are the estimated number of additional workers trenching would require during the construction phase, what hours of the day would they trench, what months would this affect during the construction portion of the project, how many feet/yards/miles is projected to be completed each day and was this accounted for in the AFC files or PSA? If so, where?	
9. CONFLICTING DATA ON MAINTENANCE ROAD DESIGNS: IMPACTS TO AIR QUALITY/EMISSIONS	Question 9.1	How many roads circle the power towers for each plant under each design element (20-ft versus 10 ft)?	Refer to the Response to Comments table in the **Soils and Surface Water** section of this FSA.
	Question 9.2	What is the projected total surface in acreage values for each of these maintenance road design elements and what is the difference in values between them? Example, 20-ft roads result in 500 acres of disturbance, 10-ft roads result in 1,000 acres of disturbance.	Refer to the Response to Comments table in the **Soils and Surface Water** section of this FSA.
	Question 9.3	How many miles of roads for each kind of road (paved, fully graded, partially graded) is the completed proposed project projected to have?	When assessing the amount of soil disturbance, staff is concerned with the area of roadway rather than the number of miles. The analysis is calculated by using the acreage of disturbed land.
	Question 9.4	What is the total number of square feet for each kind of road (paved, fully graded, partially graded) that will be incorporated into the proposed project sites operational design?	Refer to the Response to Comments table in the **Soils and Surface Water** section of this FSA.
	Question 9.5	What are the differences (if any) in emissions impacts via fugitive and windblown dust (PM10/PM2.5 particles) between these two variations of designs for the drive zones/maintenance paths surrounding the power towers? If so, were they accounted for in the AFC operational emissions data? If so, where?	All PM10 and PM2.5 emissions were estimated including those from windblown dust and fugitive dust caused by vehicles.
	Question 9.6	What is the projected PM10/PM2/5 fugitive and windblown dust for hourly, daily and annual emissions during the operational portion of the proposed project as a result of the drive zones/maintenance paths without mitigation measures and with mitigation measures?	Please see **AQ Table 7**, in the operational data table, emissions include mitigation measures.
	Question 9.7	What are the maximum hourly, daily and annual emissions limits for fugitive and windblown dust during the operational portion of the proposed project?	
10. MIRROR WASHING MACHINES AND MAINTENANCE SCHEDULE: NOT FEASIBLE	Question 10.1	Approximately, how many mirrors are projected to be included in each zone - Near Tower Zones and the Far From Tower Zones?	The project as a whole would have 170,000 heliostats, or 340,0000 mirrors. This is found in the Project Description section. Information about the number of heliostats and mirrors in each zone was not needed for staff's analysis.

	Question 10.2	How long will is take to clean each mirror per zone?	The applicant proposed washing the mirrors in the near-tower (NT) zone on a 2-week rotating cycle. The water washing would be supplemented with brushing, which would be done on an 8-week cycle. Emissions for the NT Zone were based on 4,000 vehicle miles traveled per power plant per year. Staff feels this is a reasonable estimate for evaluating emissions for NT mirror washing, especially fugitive dust emissions. The result is most likely conservative because staff has estimated VMT as much less than this value, which was submitted by the applicant. See answer to Question 10.4 for the FFT Zone.
	Question 10.3	Based on only employing 1 MWM in the NT Zone, what is the projected length of time it would take to complete one rotating cycle of general maintenance (cleaning, not scrubbing) per solar plant?	
	Question 10.4	Based on only employing 7 MWM's in the FFT Zone, what is the projected length of time it would take to complete one rotating cycle of general maintenance (cleaning, not scrubbing) per solar plant?	The applicant proposed washing the mirrors in the far-from-tower (FFT) Zone on a 2-week rotating cycle. The water washing would be supplemented with brushing, which will be done on an 8-week cycle. Emissions for the FFT Zone were based on 18,900 Vehicle miles traveled per HHSEGS power plant per year. Staff feels this is a reasonable estimate for emissions from mirror washing in the FFT Zone, especially fugitive dust emissions. The result is most likely very conservative because staff has estimated VMT as much less than this value submitted by the applicant.

	Question 10.5	How many additional MWM's would be necessary to keep the applicant's stated 2-week rotating cycle cleaning schedule for each zone and what would be the hourly, daily and annual emissions increases to accommodate these additional MWM's per zone?	Mirror washing emissions are calculated on a hourly, daily, and annual basis. Please see Air Quality Table 8 for all criteria pollutants and GHG Table 3 for Green House Gas emissions estimates for mirror washing activities, which include the Near Tower Zone and the Far From Tower Zone. Emissions were based on vehicle miles traveled (VMT) not on the number of mirror washing machines (MWMs).
	Question 10.6	Will additional MWM's or vehicles be required to complete the projected additional maintenance of mirror "scrubbing"? If not, what changes will be made to the time it takes to complete the regularly rotating schedule per zone? If so, how many additional MWMs or vehicles will be required per zone and what are their additional operational emissions impacts?	California Energy Commission staff believes there may not be a need for additional MWM vehicles necessary for scrubbing. Emissions were based on vehicle miles traveled (VMT), not the number of mirror washing machines (MWMs).
11. OPERATIONAL DUST CONTROL PLAN: INADEQUATE IMPACT ANALYSIS	Scenario 1: Question 11.1	How much medium sized gravel would be required for complete coverage of all fully and partially graded dirt roads required for project operations at a depth of 3" thick?	Alternatives analysis for 3" thick gravel was not included in the staff analysis, and staff does not need to know that in order to recommend issuance of the license. The applicant may be able to provide this information for the commenter. Currently staff has only assumed 1 inch gravel thickness. Please see **Soils and Surface Waters** section for more detailed information.
	Scenario 1: Question 11.2	How many delivery trucks would be required to deliver the proposed gravel in Question 1?	
	Scenario 1: Question 11.3	What would be the additional construction emissions factors for delivery trucks that hauled the proposed gravel in Question 1 to the site?	
	Scenario 1: Question 11.4	If medium sized gravel was applied to all fully and partially graded roads required for the proposed projects operations at a depth of 3" thick, would chemical dust suppressants/soil binders also be required to reduce fugitive and windblown dust?	
	Scenario 1: Question 11.5	If medium sized gravel at a 3" depth was applied to all fully and partially graded roads required for the proposed projects operations at a depth of 3" thick, to what degree would this offset vehicular emissions resulting from chemical dust suppressants/soil binders applications over the life of the project?	
	Scenario 2: Question 11.1	What product will be used?	At this point the soil binder product that would be used is not known. However BrightSource has submitted information for a product called Soil Sement which they have suggested for use on the current Ivanpah project. This product is pre-certified by the ARB and is approved by the California Regional Water Board (Fitz, 1996).
	Scenario 2: Question 11.2	How often must it be reapplied: once a month, once a year?	The rate of reapplication would be as-needed and would be determined by the project owner, during construction and operation of the facilities. The facility owner will be required to use approved suppressants and methods of application.
	Scenario 2: Question 11.3	What methods will the applicant apply these chemicals with: by hand or by vehicle?	The applicants would need to submit this information in the Air Quality Construction Mitigation Plan (AQCMP) at least 60 days prior to the start of any ground disturbance. The applicant would need to include the VMT and emissions as part of this plan.
	Scenario 2: Question 11.4	If vehicles are used, (which given the amount of coverage it appears will be needed, this is the most reasonably foreseeable choice), what kind of vehicles will they be?	

	Scenario 2: Question 11.5	What are their daily, monthly and annual emissions during the operational portion of the project?	Please see Air Quality Table 10.
	Scenario 2: Question 11.6	What limitations will apply and/or mitigation measures will reduce the introduction of these additional vehicle emissions impacts over the life of the project?	**AQ-SC6** requires the facility owner to submit to the CPM a plan that identifies the size and types of the on-site vehicles and equipment fleet, and the vehicle and equipment purchase orders and contracts and/or purchase schedules. The plan must be updated every other year and submitted in the Annual Compliance Report (**COMPLIANCE-7**). In addition, **AQ-SC7** requires the facility owner to submit to the CPM for review and approval a plan that identifies dust and erosion control procedures that will be used during operation of the project. The required information includes effectiveness and environmental data for the proposed soil stabilizer all locations of speed limit signs.
	Scenario 2: Question 11.7	Will the application and dispersal of these chemical dust suppressants/soil binders be prohibited during days where there is wind to prevent accidental application on native vegetation and inappropriate air dispersal? If not, what will be the wind speed limitation: 5 mph, 10 mph, etc.?	Staff is not proposing a condition of certification on the application and dispersal of the chemical dust suppressants. However, the facility owner would be required to use ARB and District approved dust suppressants and methods of application.
	Scenario 2: Question 11.8	How long will it take the applicant to reapply these substances (daily, weekly, monthly, annually?)	This would depend on the scheduling by the project owners and would be part of the air quality mitigation plan requiring approval by California Energy Commission staff.
	Scenario 2-A: Question 11.1	Based on the application requirements, precautions and effectiveness for two CARB precertified chemicals listed above, what are the site-specific limitations, requirements, direct, indirect and cumulative impacts to the proposed project site and surrounding environment for each of these products individually during both the construction and operational phase as well as over the life of the project?	This would depend on the scheduling by the project owners, and would be part of the air quality mitigation plan requiring approval by California Energy Commission staff. The facility owner will be required to use approved suppressants and methods of application.
	Scenario 2-A: Question 11.2	How does the grading and surface requirements for effective application of these two CARB precertified products affect the applicant's intent to implement a Low Impact Design to preserve natural washes and drainages throughout the proposed project site?	
	Scenario 2-A: Question 11.3	What is the estimated number of acres any of these products will be applied to during the construction and operational phase of the proposed project?	The applicants estimates during construction are: (1) fully graded dirt roads (12' & 20' width) at 18.2 acres and (2) partially graded dirt roads (10' width) at 171 acres.
	Scenario 2-A: Question 11.4	What are the estimated daily, monthly and annual vehicle passes per kind of road (fully graded and partially graded) that will be required for both the construction and operational phase of the proposed project?	Please see Air Quality Table 8 under "Maintenance Vehicles" and "Employee and Delivery Vehicles" for estimates of daily, monthly, and annual emissions.

	Scenario 2-A: Question 11.5	How much in terms of acres (if any) of the proposed project site could be classified as "not suitable" for application of either of the two CARB precertified dust suppressants/soil binders?	Soil stabilizers would be used for "unpaved, and minimally used roads". These are to be used only for dust suppressant, and are not meant to be in place of gravel or paving. The facility owner would be required to use approved suppressants and methods of application.
	Scenario 2-A: Question 11.6	What are the public health implications (if any) if any of these considerations increase fugitive and windblown dust (PM10/PM2.5 particles) due to lack of site suitability (soils, road surface, aggregate, natural drainage) in terms of applying either of these two CARB precertified products?	Refer to the Response to Comments table in the **Public Health** section of this FSA.
	Scenario 2-A: Question 11.7	What evidence is available that supports the effectiveness and dust control rates of these two CARB precertified dust suppressants/soil binders with respect to heavy-duty equipment such as will be used during both the construction and operational phase at the proposed project site?	Information on available soil stabilizers is at: http://www.avaqmd.ca.gov/Modules/ShowDocument.aspx?documentid=2705
	Scenario 2-A: Question 11.8	Do any of these considerations trigger significant impact thresholds to air quality? If so, what is the level (in terms of percentage) of the significance and by what degree do the proposed mitigation measures individually (by percentage) reduce those impacts?	No, they do not trigger significant impact thresholds to air quality. Soil stabilizers could potentially reduce fugitive dust emissions by up to 80%.
	Scenario 2-A: Question 11.9	Since PennzSuppress® D is not recommended for multiple areas related to water and water drainage, what are the projected direct, indirect and cumulative impacts to water, ground water, waters of the state and biological resources at and around the project site? if this product is approved of in the dust control plans currently scheduled to be formulated after the CEQA equivalency process is closed?	This product has not been submitted in a dust plan and has not been reviewed nor evaluated by California Energy Commission staff. Before any dust suppressant is approved for use, it will be evaluated and only approved materials would be allowed.
	Scenario 3: Question 11.1	If the applicant uses water trucks to control fugitive and windblown dust over the life of the project, what are the additional water annual water requirements and can they be met with the currently proposed water limitations?	Refer to the Response to Comments table in the **Water Supply** section of this FSA.
	Scenario 3: Question 11.2	If the applicant uses water trucks to control fugitive and windblown dust over the life of the project, what are the additional emissions impacts the water trucks will add to operations on a daily, monthly and annual basis?	This has been taken into consideration in emission estimates in Air Quality Table 8 - row "Maintenance Vehicles (mirror washing)".
	Scenario 3: Question 11.3	Given the significant difference in emissions resulting from the applicant's change of use to on-road heavy duty engines for the Mirror Washing Machines versus the original AFC plans of using tractor trailers, will California Energy Commission Staff propose as a Condition of Certification that if water trucks are used over the life of the project as part of the dust control plant that they also be equipped with on-road heavy duty engines to reduce emissions impacts?	For all dedicated vehicles, including those for mirror washing, **AQ-SC6** requires the facility owner to obtain new model year vehicles that meet California on-road vehicle emission standards for the model year when obtained.
	Scenario 3: Question 11.4	How can the 200,000 to 400,000 gallons of recycled water be counted on for dust control if its discharge depends on the fluid sample levels of contamination?	Refer to the Response to Comments table in the **Soils and Surface Water** section of this FSA.
	Scenario 3: Question 11.5	What happens to this recycled water if it fails to register as "clean"? How will it be disposed of?	Refer to the Response to Comments table in the **Soils and Surface Water** section of this FSA.
	Scenario 3: Question 11.6	Will the applicant just dilute the recycled water until it registers as "clean"? If so, how much additional water would this require?	Refer to the Response to Comments table in the **Soils and Surface Water** section of this FSA.

	Scenario 3: Question 11.7	If the fluid samples fail to register as "clean" and the applicant dilutes it with additional water until it can register as clean enough for discharge, isn't the same amount of "nonclean" chemicals being discharged into the environment? If so, what is the cumulative affect of this discharge to soil, water and biological resources over the life of the proposed project?	
General Questions: Dust Control Plan for Operations	Question 1	Are there alternative dust control methods for the operational portion of the proposed project that have not been included here? If so, what are they and what are their potential direct, indirect and cumulative impacts?	The project owner would need to submit the dust control plan according to AQ-SC7. California Energy Commission staff would assess the Dust Control Plan for the operational portion of the project once construction is completed. The Energy Commission does not propose or recommend alternative dust control plans. The facility owner would be required to use approved suppressants and methods of application.
	Question 2	Why does Staff believe it is appropriate to exclude these issues, impacts and decisions relevant to the Dust Control Plan for both the construction and operational phase of the proposed project and should only be vetted after the California Energy Commission CEQA equivalency process has closed?	Staff believes we have evaluated the AQ issues and impacts from the project to less than significant with all associated mitigation measures. Siting regulations Section 1742.5 states the staff are to assess the environmental effects of the applicant's proposal and make a recommendation whether this project would or would not cause a CEQA significant impact.
	Question 3	Of the three scenarios outlined above to be used for fugitive and windblown dust control during operations, which of them would rank as the environmentally preferred alternative over the life of the project?	Refer to the Response to Comments table in the **Alternatives** section of this FSA.
12. REQUIRED EARTHMOVEMENT: FINAL GEOTECHNICAL REPORT	Question 12.1	What are the reasons Staff failed to request a Final Geotechnical Report be performed and completed by the applicant during the discovery period for purposes of siting and CEQA analysis?	Refer to the Response to Comments table in the **Paleontological** section of this FSA.
	Question 12.2	How has Staff determined the proposed project site is suitable to support the current design over the life of the project without significantly altering the native soils, landscape and environmental?	Refer to the Response to Comments table in the **Soils and Surface Water** section of this FSA. Please see the **Biology** section for response for "wildlife abundance and distribution"
	Question 12.3	Why does Staff believe it is possible to adequately determine construction and operational impacts, levels of significance and appropriate mitigation measures for the proposed project absent the results of the Final Geotechnical Report with respect to air quality, additional construction emissions, and additional traffic impacts for trucks that will be required to haul in or haul out soil stabilizing agents?	Refer to the Response to Comments table in the **Paleontological** section of this FSA.
13. FINAL GEOTECHNICAL REPORT: COMPLIANCE WITH RULE 502. 3.16	Question 13.1	Since the determinations of the Final Geotechnical Report has yet to be revealed, how can the proposed project's approval comply with the necessity to regulate fugitive and windblown dust as defined by Rule 502.316 regarding earthmovement?	The Final Geotechnical Report is not finalized until just before construction of a project, and is not required in order for California Energy Commission staff to make a recommendation on significance of a project. California Energy Commission staff believes we have enough information in the Preliminary Geotechnical Report to make findings and require adequate mitigation.
	Question 13.2	What is California Energy Commission Staff's definition of "emissions caused by the movement of soil" as defined in Rule 502.3.16 and how does it apply or not apply with respect to potential emissions resulting from the movement, replacement and/or stabilizing of soil as outlined in the applicant's Preliminary Geotechnical Report?	Because this is a district rule, we defer to the districts definition. GBUAPCD Response: District Rule 502 applies to agricultural operation sites (see Section 2.0 of the rule), and the purpose of the rule "is to limit fugitive dust emissions from agricultural operation sites…"(Section 1.0) The rule does not apply to activities or emissions from facilities other than agricultural operation sites.

	Question 13.3	Wouldn't including the findings of the Final Geotechnical Report impact the emissions analysis of the projects emissions compliance as well as insuring appropriate dust mitigation measures that are tailored for the soil types of the area in the Conditions of the Permit versus the current generic "one-size-fits-all" approach that was deemed inadequate for the Owen's Valley mitigation measures?	Staff does not believe it is necessary to have a Final Geotechnical Report or to prepare a more detailed analysis of potential fugitive dust emissions to ensure that appropriate dust mitigation measures are imposed for this project. The District and the California Energy Commission have proposed performance-based mitigation requirements. GBUAPCD Response for inadequacy of the Owens's Valley Mitigation: The District requires more sophisticated monitoring techniques at Owens Lake because Owens Lake has a severe and longstanding PM10 fugitive dust problem that has been the subject of extensive study. Fugitive dust from construction projects are an entirely different and, in many respects, a much simpler class of fugitive dust problem and can be addressed through enforcement of Rule 401 (Fugitive Dust), which is intended to minimize the formation and transport of fugitive dust from anthropogenic activity, and Rule 402 (Nuisance), which is intended to minimize emissions that would cause injury, and through the imposition of the mitigation measures required by PDOC Condition 30.
	Question 13.4	Since the proposed project requires a variety of vehicles and roads in order to operate over its lifetime, why has issuing daily, monthly and annual limits on fugitive dust created by the daily operations of the solar plants so far evaded criteria pollutant emissions limits?	All criteria pollutant emission levels were included in the California Energy Commission staff's Preliminary Staff Assessment and are included the Final Staff Assessment. Please see Air Quality Table 8 for "Operations", and Table 7 for "Construction" for all criteria pollutant emissions. The table includes onroad and offroad construction and operations vehicles, and non construction "worker" vehicles, traveling both onsite and offsite.
	Question 13.5	Will California Energy Commission Staff require PM10/PM2.5 limits for the operational phase of the proposed project just like other criteria air pollutants will be limited by Conditions of the Permit and the GBUAPCD's Permit to Operate?	Both PM10 and PM2.5 are regulated criteria pollutants and the applicants are required to mitigate so that their impacts are less than significant. Yes there are conditions of certification (i.e.. **AQ-SC6**, **AQ-SC7, AQ-10** & **11**) that will limit emissions during both Construction and Operational phases of the project.
14. DUST MITIGATION MEASURES: "NORMAL" VERSUS WORST-CASE SCENARIOS	Question 14.1	What are the wind speeds California Energy Commission Staff defines as "normal" and what are the wind speeds that meet the criteria of "non-normal" that the proposed dust mitigation measures won't cover?	"Normal" wind speeds are those that occur under meteorological conditions typical of the project site. The meteorological data set used in evaluating fugitive dust emissions from the project included wind speeds above 11.1 meters per second (25 mph). There are no wind speeds that the dust mitigation plan won't cover.
	Question 14.2	What mitigation measures, if any, does the CEC Staff propose for dust impacts in "worst-case scenarios" that result from construction and operational activities such as wind events resulting in wind speeds in excess of 25 mph?	Please see **AQ-SC4**, Dust Plume Response Requirements. .
	Question 14.3	What mitigation measures does the CEC Staff recommend to protect public health during the construction and operational phases of the proposed project to insure air quality standards don't exceed significant thresholds of PM10/PM2.5 fugitive and windblown dust emissions for wind speeds occurring in the project area outside the currently undefined definition of "normal"?	Staff imposes conditions of certification that are intended to ensure air quality impacts are reduced to less than significant. Staff has recommended AQ-SC1 to AQ-SC5 during construction and AQ-SC6 to AQ-SC9 during operations. Also refer to the Response to Comments table in the **Public Health** section of this FSA.

	Question 14.4	How will the CEC or the GBUAPCD monitor fugitive and windblown dust levels during the operational portion of the proposed project to detect levels and frequency of PM10/PM2.5 emissions exceeding significant thresholds and posing threats to public health?	Refer to the Response to Comments table in the **Public Health** section of this FSA.
15. VALLEY FEVER	Question 15.1	Which regulatory agencies is CEC Staff referring to that recognize this is an appropriate mitigation measure the public can take to protect themselves from Valley Fever?	Refer to the Response to Comments table in the **Public Health** section of this FSA.
	Question 15.2	Where have these regulatory agencies posted this policy and does it supersede laws aimed at protecting public health from known infections such as those produced by the fungus responsible for inducing Valley Fever?	
	Question 15.3	How will tourists passing through and those visiting the area for recreational purposes protect themselves from air borne fungus resulting from project site disturbances as they have no place to go indoors?	
	Question 15.4	How will customers at the St. Theresa Mission and Front Site Training Institute protect themselves from exposure due to the proposed projects volume of site disturbance during both the construction and operational phase of the proposed project?	
	Question 15.5	What is the feasibility of local residents and others in the area “staying indoors” during times when wind events last for longer than 1 day as is known to occur in the area?	
	Question 15.6	How does the currently proposed mitigation measure of staying indoors during potential exposure times comply with Nuisance Regulation H&SC §41700?	
	Question 15.7	Considering the proposed project site will experience continued soil disturbance over the project’s lifetime due to critically required maintenance activities, is this the only mitigation plan that can be utilized to protect public health for the next 25-30 years if the project is approved?	
16. CONSTRUCTION AND OPERATIONAL DUST: T&E SPECIES	Question 16.1	Are there any studies that have analyzed the impacts of construction emissions, fugitive dust, or chemical dust suppressants in relation to respiratory trends and impacts to Desert Tortoise that the CEC Staff is aware of and might apply to the proposed project?	California Energy Commission staff relies on the federal primary and secondary ambient air quality standards to protect against adverse impacts to humans, animals and plants. Please see the **Biology** section for response regarding Desert Tortoise.
	Question 16.2	What is the projected zone of impact to Desert Tortoise and other special status species from project emissions (construction and operational), fugitive dust and onsite chemical use (such as dust suppressants/soil binders) if the proposed project is approved?	

17. FOOD PRODUCTION/PRODUCE EXPOSURE PATHWAYS	Question 17.1	While it is acknowledged that serpentine habitat containing specialized soils and adaptive plant species related to those soils may be adversely affect from NOx emissions, could the NOx emissions and their cumulative impacts over the life of the project effect the wide variety of fruits and vegetables currently grown in the area for local food production?	GBUAPCD Response: Ambient air quality standards are set at levels that are protective of public health and welfare. CEC and Air District staff are responsible for evaluating the compliance of proposed stationary sources with these ambient air quality standards. The ambient air quality impact assessment submitted for the HHSEGS project demonstrates that project impacts will be below the most stringent state and federal NO2 standards, even when combined with existing background ambient NO2 levels. On this basis, we have concluded that NOx emissions from the proposed project will not result in NO2 concentrations that would cause damage to fruits, vegetables, or other crops or vegetation in the area. Secondary, Federal AAQS are intended to address these effects.
	Question 17.2	Are there species of fruits, vegetables or alternative types of vegetation that may be highly sensitive to nutrient absorption via roots or leaves as described in the "serpentine habitats" that may also be affected by annual or cumulative emissions from the proposed project? If so, what are they and what are the emissions impact levels that could trigger adverse effects?	Energy Commission and Air District staff are not aware of any specific species of fruits, vegetables or alternative types of vegetation that may be highly sensitive to nutrient absorption via roots or leaves. Secondary, Federal AAQS are intended to address these issues. Please see the **Biology** section for response for "vegetative species".
	Question 17.3	As NOx builds within the soils in the area as well as other criteria and non criteria pollutants and PAH's, (i.e., diesel particulate matter, VOC's, etc.), over the life of the project, can these cumulative impacts cause our fruit trees or vegetable gardens from obtaining the nutrients they need to grow and/or produce fruit via the root systems, clog the leaves thereby preventing adequate photosynthesis, or potentially impact flower production that may in turn cause reductions in product yield or plant death?	Oxides of nitrogen (NOx) emissions are comprised of nitric oxide (NO) and nitrogen dioxide (NO2), both of which are gases at standard conditions. These convert to secondary aerosols that eventually deposit on soils, but this occurs at great distances downwind and nitrogen deposition occurs more from automobile traffic. Air Quality Staff if unaware of any such studies. Please see the **Biology** section for response for "Nitrogen Deposition" questions.
	Question 17.4	Are there models for air emissions impacts on species-specific fruit/vegetable production and yield that could tell those in the community that produce food more about the potential direct, indirect and cumulative impacts to our food production over the life of the project?	Nitrogen deposition models could be used, but they are not specific to crop type. No modeling of nitrogen deposition impact is needed because it is not expected to be a problem for HHSEGS, given the expected annual NOx emissions rate. Please see the **Biology** section for response for "Nitrogen Deposition".
	Question 17.5	If agricultural production on a commercial scale were to be initiated surrounding the proposed project site over the life of the project, what impacts will emissions have to those commercial crops?	As stated above by the local air district (see 17.1) secondary National Ambient Air Quality Standards (NAAQS) protect against these effects. The project will not cause or contribute to an exceedance of a NAAQS, so the project is not expected to cause an adverse impact on commercial crops, should they be planted around the facility site.
	Question 17.6	If these models on food production exist, would the CEC Staff recommend the applicant perform a modeling analysis for direct, indirect and cumulative impacts to community food production over the life of the project? If not, why not?	No, nitrogen deposition is not expected to be a problem for HHSEGS. See response to 17.4
	Question 17.7	Are there other sources of air pollution, such as the fugitive dust example given by the Charpied's who claim they lost 30% of their crops through false pollination, which may also adversely impact local food production if the proposed project is approved?	California Energy Commission staff relies on the federal primary and secondary ambient air quality standards to protect against adverse impacts to humans, animals and plants.
	Question 17.8	What does the CEC Staff define as a "significant impact" on food production? 10% loss of crops/vegetation? 20% loss of crops/vegetation? 50% loss of crops/vegetation?	California Energy Commission staff does not assess significant impact on food production and therefore does not use such a threshold.

	Question 17.9	Can single source emissions, cumulative emissions or other impacts from the proposed project reduce local pollinators (insects) to a significant degree that in turn would cause a reduction and/or prevent of pollination of food crops?	California Energy Commission staff does not believe there are any indications of potential concentrations in excess of state or federal ambient air quality standards. Staff does not believe the impacts from the proposed project would be sufficient to cause any loss of crops or vegetation in the area. This is the basis for staff's conclusion that the project will have no significant impact on food production in the area. Also see response to 17.4
18. COMMUNITY HEALTH RISK ASSESSMENT	Question 18.1	What does this chart reflect and model besides cancer risks?	Refer to the Response to Comments table in the **Public Health** section of this FSA.
	Question 18.2	What chemicals (by specific component) and emissions does this chart represent under “Acute Health Hazard Index” and “Chronic Health Hazard Index”?	
	Question 18.3	Does it incorporate just carcinogenic risks exclusively or does it incorporate other health risks such as respiratory conditions? If so, which ones?	
	Question 18.4	Did the applicant model or provide any Health Risk of Diesel Exhaust assessment for potential respiratory impacts or other health impacts to workers or local populations resulting from diesel emissions besides cancer? If not, why not?	
	Question 18.5	Did the CEC Staff request any additional Health Screening Risks of Diesel Exhaust from the applicant besides the supplied cancer risk assessment or consult with the applicant in any way prior to the applicant initiating the parameters for the Health Screening Risk modeling? If not, why not?	
	Question 18.6	Where is the “produce ingestion pathway” referred to in the GBUAPCD’s response or in the AFC files or subsequent documents?	
19. ALL TERRAIN VEHCILES: EVADING ENVIRONMENTAL IMPACT ANALYSIS?	Question 19.1	Is the Great Basin Unified Air Pollution Control District unaware of how the applicant intends to utilize the all-terrain vehicles at the proposed project site?	The GBUAPCD evaluated all traffic associated with construction and operation as did staff. The all-terrain vehicles at the proposed site are not expected to operate excessively on active disturbed surfaces, and therefore would not contribute significantly to onsite fugitive PM10 and PM2.5 emission.
	Question 19.2	How can the soil disturbance of installing 170,000 heliostat/mirror assemblies be considered “negligible”?	GBUAPCD Response: In the construction industry, disturbed area or soil disturbance area typically means an area that is altered as a result of clearing, grading, and/or excavation. Staff use of "negligible" in describing heliostat installation in the field (vehicle driving, vegetation mowing, and foot traffic) reflected that no grading would be required. Staff changed the description to “Area of Land Grading and Excavation” to avoid confusion. Please see Total Soil Disturbance discussion in the Soils & Surface Water section.
	Question 19.3	Where is the site-specific data located that describes how the heliostat/mirror assemblies will be installed, how many will be installed per day per ATV and how long this process is expected take?	The general installation procedure for heliostats is found in the Project Description section. Information about the number of heliostats installed per day is not included, and staff does not need to know that in order to recommend issuance of the license. The applicant may be able to answer this question for the commenter.

15. Traffic and Transportation	Question 15.1	Will CEC Staff provide any mitigation measures, such as requiring waiting trucks to turn off their engines if they must wait longer than three minutes for site entry in order to control air emissions and 5:00 am noise pollution to Charleston View residents located merely 5 acres away from the Old Spanish Trail Highway?	Staff has included in staff condition AQ-SC5(j): All diesel heavy construction equipment shall not idle for more than 5 minutes. Vehicles that need to idle as part of their normal operation (such as concrete trucks) are exempted from this requirement. Please also see **Traffic and Transportation** and **Noise** technical section regarding time duration of construction related activity.
5	**July 17, 2012**	**Inyo County**	
Inyo County General Plan Goal or Policy	**Identified by PSA as LORS?**	**Consistency clause made by Inyo County**	**Response by Energy Commission Staff**
Goal AQ-1: "Provide good are quality for Inyo County to reduce impacts to human health and the economy."	No	"Compliant. Mitigation has been developed for impacts to air quality that will decrease them to less than significant levels."	Change has been made to the LORS Air Quality Table 1 and in AQ section Compliance with LORS, and is expected to also be consistent with GBUAPCD Rule 400 and 401, 402 and 404.
Policy AQ-1.2/Attainment Programs: "Participate in the GBUAPCD's attainment programs."	No		
Policy AQ-1.3/ Dust Suppression During Construction: "Require dust-suppression measures for grading activities."	No		
Policy AQ-1.5/Monitor Regional Development: "Publicly object to development proposals within the region that do not adequately address and mitigate air quality impacts, especially fugitive dust."	No		
Comment	**DATE**	**COMMENT TOPIC**	
13	**Pre-PSA comment letter posted July 3, 2012**	**Basin & Range Watch**	
	Concern No. 1	"We are worried that industrial construction in the region will compromise the air quality to the point where not only visual resources, but public health will be impacted."	A section has been included in the FSA to address these concerns by the Basin and Range Watch Group. Please see the subtopic "Construction Impacts Mitigation" section of the FSA on page 4.1-25 of the Air Quality section. Also please see **AQ-SC1** through **AQ-SC6** for staff-recommended conditions of certification for construction of the project.
	Concern No. 2	"Construction should not be permitted during days of high winds. Wind speeds of 15 MPH and higher should be determining factors that limit construction. Construction should also be limited during the hottest months of the year. Evaporation rates will be greatest during the months of June, July and August."	

BIOLOGICAL RESOURCES

Carol Watson, Chris Huntley, and Carolyn Chainey-Davis

INTRODUCTION

This section provides the California Energy Commission (Commission) staff's analysis of potential impacts to biological resources from the construction and operation of the Hills Solar Electric Generating System project (HHSEGS or project) as proposed by BrightSource Energy, Inc. (applicant). This analysis addresses potential impacts to special-status plant and animal species, desert washes, common and rare natural communities, groundwater-dependent ecosystems, and other areas of critical biological concern. Information contained in this document includes a detailed description of the existing biotic environment, an analysis of potential impacts to biological resources and, where necessary, specifies mitigation measures (conditions of certification) to reduce potential impacts to less than significant levels. Additionally, this analysis assesses compliance with applicable laws, ordinances, regulations, and standards (LORS).

This analysis is based, in part, on information provided in the HHSEGS Application for Certification (AFC) – Volumes 1 and 2 (HHSG 2011a), two supplements to the AFC (HHSG 2011b and HHSG 2011c) responses to data requests, staff's observations during field visits on November 8, 2011, January 18, 2012, April 6, 2011, April 12, 2012, June 5 and 6, 2012, July 30 to August 3, 2012, and December, 2012. Information was also obtained through discussions with representatives of the U.S. Fish and Wildlife Service (USFWS) from Nevada and California, California Department of Fish and Game (CDFG), representatives from the U.S. Bureau of Land Management (BLM) from both Nevada and California, and staff workshops for the project conducted in October, November, and December of 2011, and January, February, March, April, June, August, and December of 2012.

SUMMARY OF CONCLUSIONS

The Hidden Hills Solar Electric Generating System project (HHSEGS or project) would have significant direct and indirect impacts on biological resources. The proposed project, which is located on private land, features minimal grading onsite; however, mowing of vegetation and fencing of the site would result in the functional loss of Mojave Desert scrub, shadscale scrub, ephemeral desert washes, and habitat for a variety of special-status species that occur within the approximately 3,277- acre site. Without mitigation the project would contribute to cumulatively significant impacts to biological resources within Pahrump Valley, a broader area encompassed by the Northern and Eastern Mojave Desert Planning Area (NEMO)[1], and extending into the Pahrump, Nevada environs. Staff has proposed impact avoidance and minimization measures as well as compensatory mitigation, through habitat acquisition, to offset

[1] The NEMO plan serves as the primary land use control document for the U.S. Bureau of Land Management (BLM), and therefore is solely applicable to public lands. Because this plan encompasses the regional landscape and natural features surrounding the proposed project site, staff believes the NEMO plan to be an appropriate reference document for the project.

direct, indirect, and cumulative impacts to the state-listed threatened desert tortoise and other special-status wildlife species, special status plant species, and desert washes. These measures are necessary to ensure compliance with state and federal laws, as well as other applicable ordinances.

SUMMARY OF IMPACTS TO SPECIAL-STATUS WILDLIFE

Common Wildlife and Nesting Birds: Construction and operation of the HHSEGS project will adversely affect common wildlife and nesting birds from the construction and operation of the facility. Wildlife will also be affected from the installation of permanent exclusion fencing around the perimeter of the site. Species that are not capable of dispersing to surrounding areas would be confined within the project boundaries and subjected to increased risk of road kill and repeated disturbance during construction and operation of the facility. The project exclusion fencing will also exclude species from the site which will result in the loss of foraging and breeding habitat and may disrupt wildlife movement. Implementation of Conditions of Certification **BIO-1** through **BIO-8** would reduce project-related direct and indirect impacts to common wildlife and nesting birds to less than significant levels. These conditions require a project Biologist, and prescribe a variety of minimization measures and best management practices to reduce wildlife mortality, protect nesting birds, control fugitive dust, and reduce the potential for wildfires. Conditions of Certification **BIO-15** (Avian Bat & Golden Eagle Protection Plan) and **BIO-16** (Pre-construction Nesting Bird Surveys, see discussion of impacts to sensitive birds) include conducting pre-construction nesting surveys, and establishing limited disturbance buffers for nesting birds. Condition of Certification **BIO-18** requires the preparation and implementation of a Weed Management Plan to prevent the spread of invasive plants and to protect wildlife from weed management activities. Habitat loss for common wildlife would be mitigated by the implementation of Condition of Certification **BIO-12** (Desert Tortoise Compensatory Mitigation).

Desert Tortoise: Construction and operation of the HHSEGS project will result in direct, indirect, and operational impacts to desert tortoise (federally and State listed as a threatened species). Implementation of the project would also result in the permanent loss of approximately 3,197 acres of occupied desert tortoise habitat. Desert tortoises are present on the project site and their distribution varies based on habitat conditions and proximity to intact desert scrub communities. The project site is expected to support an estimated six to 33 adult/subadult tortoises, three to 34 juvenile tortoises, and 46 to 158 desert tortoise eggs. The estimated numbers of desert tortoise that may occur on the project site were calculated using applicant survey data, formulas recommended by the USFWS, and published scientific literature. These numbers represent a conservative approach and the actual number of desert tortoise detected on the project site may vary. In order to construct the facility desert tortoises would need to be translocated outside of the project site. The translocation of tortoises and other construction related impacts of the proposed project pose substantial effects to this species. At the high end of known mortality rates for translocation (45 percent, see "Impacts to Special-Status Wildlife") for translocated animals, project construction and translocation may result in the mortality of 46 to 158 eggs and 11 to 65 desert tortoise if mortality rates are reached. If mortality rates are lower or fewer desert tortoise are detected there would be a corresponding reduction in mortality figures. Implementation of Conditions of certification **BIO-1** through **BIO-9** require the protection of desert tortoise and other biological resources that occur in and near the project area, and Conditions of Certification **BIO-10** through **BIO-12**, which are specific to desert tortoise, would reduce impacts to desert tortoise.

To reduce project effects from the large-scale loss of desert tortoise habitat of the large scale land use conversion, staff has proposed the acquisition of compensatory mitigation lands. This compensatory mitigation is designed to fully mitigate impacts to this species as required under the California Endangered Species Act (CESA). Energy Commission staff proposes compensation at a 3:1 ratio for the loss of desert tortoise habitat that occurs in creosote bush scrub vegetation and a 1:1 ratio for areas dominated by shadscale scrub vegetation. Staff has not required compensatory mitigation for impacts to heavily disturbed lands such as dirt roads, a fallow orchard or graded areas. Currently, the applicant contends that this approach should be further refined to reflect the physical characteristics of the site and provided an alternative approach to determining compensatory mitigation ratios for the site. These ratios varied from a low of 0.5:1 for areas characterized as weed infested to 1.5:1 for areas considered more intact habitat. Staff reviewed the proposal in coordination with the CDFG and determined the approach had merit but failed to accurately characterize habitat conditions at the site. Staff proposed to workshop this issue further to gain resolution, however the applicant declined this offer.

Implementation of the proposed Conditions of Certification, including the acquisition, management, and enhancement of mitigation lands would achieve full mitigation under CESA for habitat loss and other significant impacts to desert tortoises.

Burrowing Owl: Implementation of the proposed HHSEGS project will result in the direct loss of foraging habitat for the burrowing owl (a state species of special concern). Construction of the proposed project may also displace resident wintering or breeding birds. Burrowing owl and their sign (i.e., white wash, pellets, and feathers) was observed on the project site. Depending on the timing of construction and if burrowing owls are present on the project site the applicant will be required to implement passive relocation actions to avoid the direct loss of the birds. With implementation of Conditions of Certification **BIO-1** through **BIO-8**, **BIO-12** (Desert Tortoise Compensatory Mitigation), and **BIO-17**(Burrowing Owl Impact Avoidance and Minimization Measures); the project’s impacts to burrowing owls would be mitigated to less-than-significant under CEQA. Condition of Certification **BIO-17** identifies survey requirements, eviction guidelines, and provides for compensatory requirements. Staff considered the recently published 2012 Staff Report on Burrowing Owl Mitigation (CDFG 2012) to provide the most relevant guidance addressing impacts and mitigation development to this species.

Operational impacts would be reduced through Condition of Certification **BIO-15** (Avian, Bat, and Golden Eagle Protection Plans). This requires development of a monitoring and reporting program under the oversight of USFWS, CDFG, and the Energy Commission, that would document and report potential collision and heat flux exposure within the proposed solar fields, and provide compensation if necessary.

Golden Eagle & Migratory Birds: Golden eagle, a California Fully Protected species, are known to nest within the adjacent mountain ranges and have been routinely observed over the project site. Numerous migratory birds are also known to utilize the site for forage, nesting, and breeding, and are protected by federal laws as well as CDFG code. The large scale land use conversion for the HHSEGS project would result in the loss of approximately 3,277 acres of foraging habitat for golden eagle and migratory birds. The USFWS considers that foraging habitat loss may be interpreted as take under the Bald and Golden Eagle Protection Act (BGEPA) if it causes territory abandonment or reduced productivity. Staff believes that these effects, would be difficult at best to attribute to any given land use. However, staff concludes that the loss of foraging habitat would be significant under CEQA and require compensatory mitigation. Staff does not consider the habitat loss to constitute take under state or federal LORS. To address potential impacts from the loss of foraging habitat, solar flux, and collision concerns (discussed below under operational effects) staff has proposed Condition of Certification **BIO-15** (Avian, Bat, and Golden Eagle Protection Plans). This requires a monitoring and reporting program that would document and report potential collision and flux exposure within the proposed solar fields, and implement conservation measures if deemed necessary. The plan also calls for the implementation of actions that reduce threats to eagles in the region such as placing anti perching devices and reducing existing risks to known nest sites. However, staff believes significant residual impacts to avian species would remain even after the implementation of the proposed conditions of certification.

Nelson's Bighorn Sheep: Nelson's bighorn sheep, a State Fully Protected Species, is known to occur in the Nopah, Kingston, and Clark Mountains which border the Pahrump Valley. Bighorn sheep were not detected during surveys however a partial horn fragment and potential pellets (scat) were identified on the project site. Anecdotal observations of bighorn sheep have also been provided by the public during a workshop for the proposed project. However, the proposed project is not located in a designated movement or linkage corridor for this species and while periodic use of the site may occur; bighorn sheep are not expected to frequent the area. Construction and operation of the proposed project is not expected to result in significant impacts to bighorn sheep foraging habitat or interfere with intermountain movement. Bighorn sheep could be subject to construction disturbance if moving or foraging near the site or attempting to cross existing highways. Implementation of **BIO-8** (General Impact Avoidance & Minimization Measures) would reduce these impacts to less than significant levels.

Potential significant impacts to seasonal watering holes for bighorn sheep would be reduced through the implementation of Condition of Certification **BIO-23** (Groundwater-dependent Vegetation Monitoring) and **WATER SUPPLY-4** which requires groundwater monitoring. Condition of Certification **BIO-23** will protect groundwater-dependent ecosystems (GDEs) within the influence of the project pumping wells from the impacts of project-related groundwater drawdown.

American Badger and Desert Kit Fox: Implementation of the proposed HHSEGS project will result in the direct loss of foraging habitat for American badger and desert kit fox. These species were detected on the HHSEGS project site and are expected to be present during the initial phases of construction. Desert kit fox are a protected furbearing mammal and have been the focus of concern for the CDFG, BLM, and USFWS after outbreaks of canine distemper were documented near existing solar facilities. American badger is a state species of special concern and occurs in low densities throughout the desert. Construction of the proposed project is expected to result in direct effects to badgers and kit fox. Because of the large size of the project badgers or kit foxes may be confined within the desert tortoise exclusion fence and subject to mortality from road kill, loss or alteration of foraging habitat, overlapping territories or barriers to dispersal. In order to construct the proposed project the applicant will be required to passively relocate badgers and kit foxes form the project site. State regulations (Fish and Game code) currently prohibit trapping of these species.

Staff's proposed Conditions of Certification **BIO-1** through **BIO-8** provide general avoidance and minimization measures for these and other wildlife species. In addition, Condition of Certification **BIO-14** (American Badger and Kit Fox Management Plan) requires that prior to ground disturbance, a qualified biologist perform a preconstruction survey for badger and kit fox dens in the project area, including areas within 250 feet of all project facilities, and access roads. If present, the applicant will flag and avoid occupied badger and kit fox dens during ground-disturbing activities and establish a buffer to avoid loss of maternity dens. Should the applicant need to work in an area with occupied badger dens, the applicant will slowly excavate the den in accordance with Condition of Certification **BIO-14**. The plan also includes an adaptive management approach emphasizing flexibility in the methods employed for passive relocation; the timing of ground-disturbance; monitoring; and the treatment or testing in the event of an outbreak of distemper. Staff's proposed Condition of Certification **BIO-12**, the compensatory mitigation plan for desert tortoise habitat, would also offset the loss of habitat for these species and reduce the impact from habitat loss to less-than-significant levels under CEQA.

SUMMARY OF IMPACTS TO SPECIAL-STATUS PLANTS, COMMON AND SENSITIVE PLANT COMMUNITIES, DESERT WASHES, AND GROUNDWATER-DEPENDENT ECOSYSTEMS

Invasive Weeds: Project-related soil disturbance, increased vehicle traffic, and the movement of equipment and materials onsite and offsite are expected to spread invasive non-native species from the project to uninfested areas, and introduce new species into the vicinity from contaminated vehicles, equipment, and materials during construction and operation. Invasive weeds adversely affect wildlife and sensitive plants by causing destructive changes in ecosystem processes, increasing the flammability of vegetation and altering fire frequency intervals. Some weed species are toxic to wildlife. The project's contribution to the spread of weeds, when combined with similar effects from past, present, and foreseeable future projects, would contribute to a cumulatively considerable effect. These impacts would be minimized to a level less than cumulatively considerable through implementation of Condition of Certification **BIO-18** (Weed Management Plan). **BIO-21** (Qualified Botanist) requires the Weed Management Plan be prepared by a qualified botanist or vegetation ecologist. Prevention measures to address the increased risk of fire from the proliferation of non-native annual grasses onsite and potentially offsite are included in **BIO-8** (General Impact Avoidance and Minimization Measures) and **BIO-18.** Condition of Certification **BIO-6** (Worker Environmental Awareness Program) requires worker training in fire prevention and minimizing the spread of weed. **BIO-18** includes measures for protecting offsite biological resources from collateral or non-target harm from herbicide drift.

Special-status Plants: Twenty-eight occurrences of 11 special-status plant species were found on the project site. Occurrences that are not destroyed directly by grading and construction are expected to decline and perish during operation as a result of vegetation mowing, herbicide spraying, altered surface drainage patterns and geomorphic processes, shading, disrupted dispersal pathways, and other factors.

Two years of *offsite* surveys were conducted to determine if the special-status species were more common than currently understood because the area is generally under-surveyed and some species were only recently added to the California Natural Diversity Database (CNDDB) (2012). Many new occurrences were found for some species; no new occurrences were found for others.

Direct impacts to four of the 11 species are significant because the project would eliminate a substantial portion of their range in California and because the affected species exist in such small numbers in California that all or a significant portion of the species' California distribution may become endangered. For the remaining species, the population or range in California is larger or more stable, the proportion affected by the project less is substantially less, and/or the local population is robust.

Condition of Certification **BIO-20** (Special-status Plant Compensatory Mitigation) requires compensatory mitigation for four species – gravel milk-vetch, Wheeler's skeletonweed, Torrey's joint, and Preuss' milk-vetch – through acquisition and preservation or restoration. Mitigation ratios are based on the degree of extinction risk; three offsite occurrences shall be protected for every S1 ("critically imperiled") species affected and two offsite occurrences protected for every S2 ("imperiled") species affected.

Nine occurrences of special-status plants are located offsite in very close proximity to the project boundary. Potential indirect impacts to these occurrences during operation from fugitive dust, herbicide drift, and the proliferation of invasive plants would be avoided or minimized through measures in **BIO-19** (Special-status Plant Avoidance & Minimization). Potential impacts to plants from the increased risk of fire are addressed in fire prevention measures added to **BIO-8** (General Impact Avoidance & Minimization Measures), **BIO-18** (Weed Management Plan)**,** and **BIO-6** (Worker Environmental Awareness Program). **BIO-21** (Qualified Botanist) was added to ensure a qualified specialist implement tasks requiring the expertise of a botanist or vegetation ecologist. Combined with the compensatory mitigation required in **BIO-20**, these measures would minimize the project's impacts to special-status plants to a level less than significant. Integration of special-status plant compensation lands with desert tortoise or other habitat compensation lands is acceptable only if the mitigation lands meet all selection criteria required in **BIO-20**.

Desert Washes:

A total of 23.21 acres of jurisdictional Waters of the State, including single-thread channel and braided ephemeral streams, were delineated on the project site (CH2 2012mm). Of these 23.21 acres, 0.42 acres are also Waters of the United States. Six of the features are depicted as blue line features on the U.S. Geological Survey (USGS) topographic maps. During an August 2, 2012 field verification of the applicant's state waters delineation (URS 2012b), an additional nine ephemeral streams were identified within the project boundary. The delineation map was subsequently revised and the total state jurisdictional area adjusted to 23.21 acres (CH2 2012mm).

The applicant will minimize obstructions of the natural surface drainage patterns where possible but staff concluded the biological functions and values of the streams will be lost due to perimeter exclusion fencing, partial grading, road construction and maintenance, vegetation maintenance, herbicide spraying, and human disturbance. These impacts are significant because they would cause a loss of the beneficial functions and values that these state waters provide to wildlife.

Condition of Certification **BIO-22** (State Waters Compensatory Mitigation and Avoidance and Minimization Measures) requires compensatory mitigation for impacts to desert washes by acquiring, preserving, and enhancing ephemeral streams of comparable or better quality within the local watershed, or adjacent watersheds. This mitigation could be integrated with the desert tortoise mitigation requirement for acquisition and enhancement of suitable desert tortoise habitat if the desert tortoise mitigation lands meet the selection criteria described in **BIO-22**. With implementation of this proposed condition of certification, and erosion control measures required in **SOIL-1**, impacts to the project's ephemeral streams would be reduced to less-than-significant levels.

<u>Groundwater-Dependent Ecosystems</u>: Project-related groundwater pumping during construction and operation could result in a drawdown of the water table within the zone of influence of the project pumping wells. Groundwater pumping could have significant indirect and cumulative impacts to biological resources if it lowers the water table in areas where groundwater-dependent ecosystems occur. Approximately 4,000-acres of groundwater-dependent mesquite habitats occur within the cone of depression identified by the applicant in the AFC (**Biological Resources Figure** 1and 2; CH2 2011g, Figure DR48-1), including several seeps, and the Nevada Bureau of Land Management Stump Spring Area of Critical Environmental Concern (ACEC). These resources have exceptional values to wildlife in the project vicinity including special-status species (Crampton et al. 2006; Beedy pers. comm.).The Stump Spring area and mesquite habitats throughout Pahrump Valley are identified as conservation priorities by BLM and the BLM-sponsored Clark County Mesquite-Acacia Conservation Management Strategy adopted by the Multiple Species Habitat Conservation Plan.

Condition of Certification **BIO-23** (Groundwater-dependent Vegetation Monitoring Plan) and groundwater elevation monitoring required in **WATER SUPPLY-6**, would ensure that a significant drawdown would be detected before it resulted in adverse impacts to the groundwater-dependent ecosystems, and will protect groundwater-dependent ecosystems (GDEs) within the influence of the project pumping wells from the impacts of project-related groundwater drawdown. The plans require monitoring to track the impacts of pumping to groundwater levels as they develop during the life of the project, and define triggers for adaptive management to be implemented if data indicate impending adverse effects. With implementation of these mitigation measures, significant impacts to Stump Springs ACEC and the mesquite washes and dunes within the influence of the project pumping wells would be avoided.

The **Water Resources** section of FSA contains an analysis of the project's potential to impact the Amargosa River and local groundwater resources. **Water Resources** staff concluded the project is not expected to have a measurable impact on the Amargosa River or its tributaries. Condition of Certification **WATER SUPPLY-2** requires compensation for the project's contribution to overdraft conditions in the Pahrump Valley groundwater basin through the acquisition and retiring of local active, senior water rights.

<u>Common and Sensitive Plant Communities</u>: Construction would eliminate the habitat functions and value of 1580.5 acres of shadscale scrub and 1,616.5 acres of Mojave Desert scrub (creosote bush scrub) within the project disturbance area. Although common and widespread plant communities, they nevertheless provide important breeding and foraging habitat for a variety of special-status species, including desert tortoise. To achieve full mitigation under CESA for desert tortoise, and to mitigate to less than significant under CEQA for habitat loss and other significant impacts to desert tortoises, compensation at a 3:1 ratio is proposed for the loss of Mojave Desert scrub habitat and a 1:1 ratio for the loss of shadscale habitat. This compensation would also minimize foraging and breeding habitat losses to other wildlife resulting from the loss of Mojave Desert scrub and shadscale scrub.

Sensitive plant communities indirectly affected by the project include mesquite coppice dunes and mesquite washes. Significant impacts to these groundwater-dependent habitats would be avoided through the monitoring, performance standards, and triggers for adaptive management required in **BIO-23** and **WATER SUPPLY-4**. The project would also impact 1.2 acres of creosote bush/galleta grass association, a rare natural community with a CNDDB state rank of 3. Because the community is more common off the project site, and ranked "S3" (vulnerable but not imperiled), the 1-acre impact is less than significant.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

The following laws, ordinances, regulations, and standards (LORS) are applicable to project construction and operation, as listed in **Biological Resources Table 1**.

Biological Resources Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
Federal	
Endangered Species Act (Title 16, United States Code, section 1531 et seq., and Title 50, Code of Federal Regulations, part 17.1 et seq.)	Designates and protects federally threatened and endangered plants and animals and their critical habitats.
Clean Water Act (Title 33, United States Code, sections 1251 through 1376, and Code of Federal Regulations, part 30,	Requires the permitting and monitoring of all discharges to surface water bodies, including some desert washes. Section 404 requires a permit from the U.S. Army Corps of Engineers (USACE) for a discharge of dredged or fill materials into Waters of the U.S., including wetlands. Section 401 requires a permit from a regional water quality control board (RWQCB) for the discharge of pollutants.

Applicable LORS	Description
section 330.5(a)(26))	By federal law, every applicant for a federal permit or license for an activity that may result in a discharge into a California water body, including wetlands, must request state certification that the proposed activity will not violate state and federal water quality standards.
Eagle Act (Title 50, Code of Federal Regulations, section 22.26)	Would authorize limited take of bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) under the Eagle Act, where the taking is associated with, but not the purpose of activity, and cannot practicably be avoided.
Eagle Act (Title 50, Code of Federal Regulations, section 22.27)	Would provide for the intentional take of eagle nests where necessary to alleviate a safety hazard to people or eagles; necessary to ensure public health and safety; the nest prevents the use of a human – engineered structure, or; the activity, or mitigation for the activity, will provide a net benefit to eagles. Only inactive nests would be allowed to be taken except in the case of safety emergencies.
Bald and Golden Eagle Protection Act (Title 16, United States Code section 668)	This law provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the take, possession, and commerce of such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations issued pursuant thereto and strengthened other enforcement measures. Rewards are provided for information leading to arrest and conviction for violating the Act.
Northern and Eastern Mojave Desert Management Plan (NEMO)	A regional amendment to the CDCA Plan approved in 2002, NEMO protects and conserves natural resources while simultaneously balancing human uses in the northern and eastern portion of the Mojave Desert.
California Desert Protection Act of 1994 (CDPA)	An Act of Congress which established 69 wilderness areas, the Mojave National Preserve, expanded Joshua Tree and Death Valley National Monuments and redefined them as National Parks. Lands transferred to the National Park Service were formerly administered by the BLM and included substantial portions of grazing allotments, wild horse and burro Herd Management Areas, and Herd Areas.
Migratory Bird Treaty (Title 16, United States Code, sections 703 through 711)	Makes it unlawful to take or possess any migratory nongame bird (or any part of such migratory nongame bird) as designated in the Migratory Bird Treaty Act.
Executive Order 11312	Prevent and control invasive species.
California Desert Conservation Area Plan	The California Desert Conservation Area (CDCA) comprises one of two national conservation areas established by Congress at the time of the passage of the Federal Land and Policy Management Act (FLPMA) in 1976. The FLPMA outlines how the BLM will manage public lands. Congress specifically provided guidance for the management of the CDCA and directed the development of the 1980 CDCA Plan.
Desert Tortoise (Mojave Population) Recovery Plan (USFWS 2011)	Describes a strategy for recovery and delisting of the desert tortoise.
Wild and Scenic Rivers Act (Public Law	Created by Congress in 1968, this act designates certain rivers or portions of rivers to be preserved in free-flowing condition, in order to

Applicable LORS	Description
90-542; 16 U.S.C. 1271 et seq.)	conserve scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values for the public good.
State	
California Endangered Species Act of 1984 (Fish and Game Code, sections 2050 through 2098)	Protects California's rare, threatened, and endangered species.
Definition of "Take" (Fish and Game Code section 86)	Defines take as to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill.
Protected furbearing mammals (California Code of Regulations, Title 14, section 460)	Fisher, marten, river otter, desert kit fox, and red fox may not be taken at any time.
California Code of Regulations (Title 14, sections 670.2 and 670.5)	Lists the plants and animals of California that are declared rare, threatened, or endangered.
Fully Protected Species (Fish and Game Code, sections 3511, 4700, 5050, and 5515)	Designates certain species as fully protected and prohibits the take of such species or their habitat unless for scientific purposes (see also California Code of Regulations Title 14, section 670.7).
Nelson's bighorn sheep (Fish and Game Code section 4902)	Regulates adoption of sound biological management practices, including sport hunting, of the Nelson's bighorn sheep.
Nest or Eggs (Fish and Game Code section 3503)	Protects California's birds by making it unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by code or regulation.
Birds of Prey (Fish and Game Code section 3503.5	Unlawful to take, possess, or destroy any birds in the orders Falconiformes and Strigiformes or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by code or regulation.
Migratory Birds (Fish and Game Code section 3513)	Protects California's migratory birds by making it unlawful to take or possess any migratory nongame bird as designated in the Migratory Bird Treaty Act or any part of such migratory nongame birds except as otherwise provided by code or regulation.
Nongame mammals (Fish and Game Code section 4150)	Makes it unlawful to take or possess any non-game mammal or parts thereof except as provided in the Fish and Game Code or in accordance with regulations adopted by the commission.
Migratory Birds (Fish and Game Code section 355-357)	The commission may, annually, adopt regulations pertaining to migratory birds to conform with or to further restrict the rules and regulations prescribed pursuant to the Migratory Bird Treaty Act except as otherwise provided by code or regulation.
Lake and Streambed Alteration Agreement (Fish and Game Code	Regulates activities that may divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake in California, including desert washes designated by CDFG in which

Applicable LORS	Description
sections 1600 and following)	there is at any time an existing fish or wildlife resource or from which these resources derive benefit. Impacts to vegetation and wildlife resulting from disturbances to waterways are also reviewed and regulated during the permitting process.
California Native Plant Protection Act of 1977 (Fish and Game Code section 1900 and following)	Designates state rare, threatened, and endangered plants.
California Desert Native Plants Act of 1981 (Food and Agricultural Code section 80001 and following and California Fish and Game Code sections 1925-1926)	Protects non-listed California desert native plants from unlawful harvesting on both public and private lands in Imperial, Inyo, Kern, Los Angeles, Mono, Riverside, San Bernardino, and San Diego counties. Unless issued a valid permit, wood receipt, tag, and seal by the commissioner or sheriff, harvesting, transporting, selling, or possessing specific desert plants is prohibited.
Porter-Cologne Water Quality Control Act	Defines waters of the state and regulates discharges of waste and fill material to waters of the state, including “isolated” waters and wetlands.
Local	
Inyo County Renewable Energy Ordinance(Title 21)	Provides comprehensive, long-range plans, policies, and goals to guide the physical development of the county. Specifically, Title 21 requires restoration and revegetation of the site, along with posting financial security to accomplish same.

DESERT RENEWABLE ENERGY CONSERVATION PLAN – INTERIM PLANNING

In addition to the federal, state, and local LORS summarized above, federal and state agencies are currently collaborating to establish joint policies and plans to expedite development of California’s utility-scale renewable energy projects. On October 12, 2009, the State of California and the U.S. Department of Interior entered into a Memorandum of Understanding (MOU) on renewable energy, building on existing efforts by California and its federal partners to facilitate renewable energy development in the state. The MOU stems from California and Department of Interior energy policy directives, and California’s legislative mandate to reduce greenhouse gases to 1990 levels by 2020, and meet the goal of 33 percent of California’s electricity production from renewable energy sources by 2020.

The California-Department of Interior MOU expands on several MOUs issued in 2008 to establish the activities of the California Renewable Energy Action Team (REAT). The REAT was established with California Executive Order S-14-08 (issued November 18, 2008), to “*establish a more cohesive and integrated statewide strategy, including greater coordination and streamlining of the siting, permitting, and procurement processes for renewable generation* ….”

The Energy Commission and CDFG are the primary state collaborators in the REAT, operating under a November 18, 2008 MOU between the two agencies to create a “one-stop process" for permitting renewable energy projects under their joint permitting authority. The BLM and the USFWS also participate in the REAT under a separate MOU signed in November 2008, which outlines the state and federal cooperation of the group. The October 12, 2009 MOU between California and the Department of Interior reiterates several tasks of the REAT provided for in S-14-08 and the Energy Commission-Fish and Game MOU.

The REAT's primary mission is to streamline and expedite the permitting processes for renewable energy projects in the Mojave and Colorado Desert ecoregions within the State of California, while conserving endangered species and natural communities at the ecosystem scale. To accomplish this goal the REAT Agencies are developing a Desert Renewable Energy Conservation Plan (DRECP), a science-based process for reviewing, approving, and permitting renewable energy applications in California. Once the DRECP is complete, anticipated in late 2012, the plan will provide tools to expedite coordination of federal and state endangered species act permitting. The DRECP will also offer a unified framework for state and federal agencies to oversee mitigation actions, including land acquisitions, for listed species.

The REAT Agencies recognize that some renewable energy projects are scheduled to be approved prior to completion of the DRECP. Section 8.9 of the October 2009 Draft Planning Agreement for the DRECP < http://www.energy.ca.gov/2009publications/REAT-1000-2009-034/REAT-1000-2009-034.PDF> directs the REAT Agencies to ensure that permitting for these projects is consistent with the preliminary conservation objectives for the DRECP; would not compromise successful completion and implementation of the DRECP; would facilitate Federal Endangered Species Act, California Endangered Species Act, National Environmental Policy Act, and California Environmental Quality Act compliance; and would not unduly delay permitting during preparation of the DRECP.

SPECIAL CONSIDERATIONS

Special permitting issues arise from the proposed project, and stem from the inter-state nature of the project elements. Electric grid connection (i.e., transmission) and natural gas lines cross into public land in Nevada, and therefore are subject to the review of the BLM, pursuant to the National Environmental Policy Act (NEPA). The Nevada BLM is the federal lead agency and is preparing an Environmental Impact Statement (EIS), which will analyze the whole of the action, including those impacts which occur in California. Pursuant to the Endangered Species Act (ESA), the BLM also has undertaken formal consultation with the USFWS for a Section 7 incidental take statement for the federally listed endangered desert tortoise (*Gopherus agasizzii*). The incidental take statement, if granted by the USFWS, would supplement the analysis and conditions recommended in the FSA proposed to fully mitigate project effects to the desert tortoise in California. The incidental take statement would provide additional language dictating the methods and location for all translocation activities; provide guidance on husbandry topics; and recommend a suite of protective measures that would be implemented from the onset of ground disturbance through project decommissioning and post-project monitoring. See the "Special-Status Plants and Wildlife Species" subsection of this FSA section for more information.

The Energy Commission does not provide CEQA analysis for project features that are located in Nevada such as the electrical transmission and gas lines. These elements will be analyzed by the BLM, and available for public review in the draft EIS. However, effects of the California project to biological resources that may occur in Nevada are considered in the FSA where the project is demonstrated to pose a potential direct, indirect, or cumulative impact. Energy Commission staff have prepared impact assessments for plants, significant natural features, wildlife and other protected biological resources based on the regional factors that contribute to conserving and protecting that feature through applicable LORS. These regional factors were considered in staff's analysis, and extend into Nevada in varying degrees. Further explanation of rationale and geographical extent of analysis is provided in the "Assessment of Impacts and Discussion of Mitigation" subsection of this FSA section. The cumulative impact analysis includes projects in Nevada likely to contribute incrementally to cumulative impacts to biological resources. These cumulative impacts would affect resources in California and Nevada. Refer to the "Cumulative Impacts" subsection of this FSA section for further information and conclusions.

SETTING

PROJECT AREA AND VICINITY DESCRIPTION

The proposed project is located in southeastern Inyo County, immediately adjacent to the Nevada-California border, in the Pahrump Valley. Charleston View, an unincorporated community, is immediately south of the site, and the closest incorporated city is the town of Pahrump, located eight miles to the northwest, in Nevada. The proposed project site is located on privately-owned land, and private land borders the project site to the south and west. The BLM manages public lands to the north and east of the proposed project site, which is bordered to the east by Nye, and Clark counties. The area is sparsely populated and BLM is the major land holder in the county. The California Desert Conservation Area (CDCA) and the Northern and Eastern Mojave Planning Area (NEMO) encompass the BLM lands in the project vicinity.

Proposed Project Facilities

The proposed project would be composed of two solar fields, each one containing approximately 85,000 heliostats and each capable of generating 270 megawatts (MW). Solar plant 1 is 1,483 acres, solar plant 2 is 1,510 acres, and collectively, the solar fields and other project features would occupy approximately 3,277 acres and would produce 500 MW. The proposed project components related to the generation and transmission of electricity are described below. For further information about the elements of the project, please see the **Project Description** and **Soil and Surface Water** sections of this **FSA.**

REGIONAL SETTING

The proposed project is located within the Amargosa Desert-Pahrump Valley ecological subregion of the Mojave Desert (Goudey & Smith 1994). The subregion includes the alluvial plains of the Amargosa Desert, Sarcobatus Flat, Stewart Valley, Pahrump Valley, Sandy (Mesquite) Valley, and California Valley.

The boundary of the Pahrump Valley Wilderness Area is located in the Kingston Range three miles south of the project site. The Nopah Wilderness Area boundary is approximately four miles to the northwest. The BLM Southern Nevada District administers lands to east of the site, including the Stump Spring Area of Critical Environmental Concern (ACEC). The boundary of the ACEC is located approximately two and a half miles east of the project's southeastern corner. BLM lands north and west of the project are in the California BLM Barstow District. The NEMO planning area encompasses BLM lands on the California and Nevada side of the project.

The California portion of the Mojave Desert occupies the northern two-thirds of the California Desert floristic province (Baldwin et al. 2002). It is characterized by hot, dry summers, warm and dry winters, and exhibits greater temperature ranges and topographical relief than the Sonoran Desert region of California in eastern Riverside and Imperial counties. The mean annual precipitation is approximately four to six inches, and in the project vicinity is influenced by two distinct storm patterns: one occurring in winter and the other in summer. Winter precipitation tends to be of low intensity and long duration, and covers greater areas. In contrast, most summer rains, resulting from local convective thunderstorms, are of high intensity and short duration (Belcher & Sweetkind 2010), and frequently patchy but can stimulate late season plant germination and growth. Some native annual plants, including special-status plants, germinate only in response to these warm monsoonal rain events.

The project site is located in the western (California) portion of the bi-state Pahrump Valley and Pahrump watershed. Elevations on the valley floor range from 2,515 feet at the Pahrump Playa to about 2,655 feet in the southwestern part of the basin along Tecopa Road. The project site is located between the middle position and the toe of an alluvial fan complex (bajada) on the western flank of the Spring Mountains (in Nevada) that drain into the Pahrump Playa. The project site is gently sloping with the highest point in the southeast corner, at 2,685 feet elevation, and the lowest along the northwest boundary closest to the playa at 2,590 feet.

The shallow aquifer from which the project and all of Pahrump meets its water needs, and the deeper, more laterally-extensive regional aquifer that underlies the shallow aquifer, occur within the Death Valley Regional Groundwater Flow System (DVRFS). The DVRFS is exceptionally rich in springs and other groundwater-dependent ecological resources. At least 30 groundwater-dependent fish, invertebrate and plant species are found in the region that exist nowhere else in the world, primarily in adjacent basins, such as the Amargosa River and Ash meadows areas. No groundwater-dependent resources occur within the project boundary; however, Pahrump Valley supports a 9,000-acre complex of mesquite washes and coppice dunes arranged linearly along the stateline fault zone where groundwater is forced to or nearer the surface by juxtaposed Pleistocene lake deposits and basin-fill deposits. **Biological Resources Figure 1** shows the distribution of the mesquite east of the project, and **Figure 2a-b** contains photos of groundwater-supported habitats in southern Pahrump Valley.

All surface waters on and adjacent to the project site are ephemeral, i.e., they flow only during storm events, and in the terminal reaches water persisted a day or more following a moderate storm event. All features are presumed to be supported by precipitation (not groundwater) due to their ephemeral hydrology. The washes enter the site from the east and southeast, and trend northwest towards the playa. A few of the project streams originate as single-thread channels from the more steeply sloped fan terrace to the east but most of the delineated desert washes onsite are characteristic of alluvial fan distributary channel networks, characterized by multiple low-flow meandering and braided channels, nested within a larger but less conspicuous watercourse defined by a frequently shifting channel network. Flow volume decreases due to seepage into the unconsolidated sediments of the fan, and transitions into unconfined sheet flood areas in the western half of the project site. The channels increase in number and density but decrease in size as they flow down the alluvial fan, where the resulting habitat is more diverse and spatially variable than the single-thread portion upstream. **Biological Resources Figure 3a-c** contains photos of characteristic stream forms on the project.

The surface hydrology of the site has been somewhat altered by the network of roads, which diverts and redistributes a portion of the runoff from smaller channels; however, the hydrology of the features delineated as Waters of the State (23.21 ac. total) is intact, based on site visits conducted after small-to-medium size storm events.

Habitat quality in the western portion is highly variable, ranging from small areas of densely weedy, historically disturbed habitat of low native diversity to saltbush scrubs and creosote bush scrubs of moderate-to-high native species diversity but with a moderate-to-high component of non-native annual weeds. Three special-status plant species -- Pahrump Valley buckwheat, Torrey's joint-fir, and Goodding's phacelia occur across the western and eastern portion of the project. A total of 77 acres were mapped as disturbed habitat in the western portion of the project site (areas with a significantly disturbed topography) but topographic disturbance in the remainder of the western portion is limited to unpaved roads and a few areas that appear to have been disked historically and are degraded but in varying stages of recovery. Transitional creosote bush and saltbush scrubs occur near the center of the project site and creosote bush scrubs of good quality and high diversity dominate the eastern third of the project site. **Biological Resources Figure 4a-f** contains photos of the habitats contained on the project site, and **Figure 5** shows the location of the photo points.

SPECIAL-STATUS PLANT AND WILDLIFE SURVEYS

The following description of biological resources presents the results of the applicant's botanical and wildlife surveys of the project site and vicinity, including delineations of desert washes and groundwater-dependent vegetation, summarized from data presented in the Application for Certification (AFC) and responses to staff's data requests. This assessment also represents staff's independent review of the data, including: observations from staff's multiple site visits (representing a minimum of 144 person hours in the field); consultation with recognized experts and resource agencies; and independent research (review of literature and databases).

Resources affected only by the construction of project components in Nevada are not included in this assessment.

NATURAL COMMUNITIES

Natural communities documented within the project area and one-mile buffer surrounding the project are described below, followed by a discussion of desert washes and groundwater-dependent ecosystems found on or near the site. “Natural Communities”, as used here, includes plant communities, desert washes, seeps and springs, and habitats defined by their geology, such as dunes.

Two plant communities were mapped on the project site during the spring 2011 surveys: Mojave Desert scrub (creosote bush scrub) and shadscale scrub. In summer of 2012, staff documented a small (1.2 acre) polygon of a rare natural community along the eastern boundary: creosote bush/big bush galleta grass association. No groundwater-dependent vegetation or springs occur on the project site.

The western half of the project site occurs at the toe of the alluvial fan and edge of the basin sink in silty, fine-textured, Pleistocene lakebed sediments inhabited by a shadscale-dominant saltbush scrub. The eastern half of the project, toward the middle portion of the alluvial fan, on gravelly, well-drained soils, supports a Mojave Desert scrub of creosote bush and white bursage on coarser, gravelly, well-drained soils. The project site also contains approximately 77 acres of topographically disturbed habitat, including dirt roads, a graded area, and a fallow orchard.

Mojave Desert scrub and shadscale scrub also dominate the one-mile buffer surrounding the project site. The groundwater-dependent communities within an approximate five-mile radius of the project are generally restricted to the Nevada side of the state line, and include honey mesquite-dominated coppice dunes and washes. The stabilized mesquite coppice dunes (dunes formed by the entrapment and accumulation of blowing sand at the base of shrubs) are generally confined to the fault zone east of the project site that parallels the California-Nevada stateline, and apparently supported by shallower groundwater forced to the surface by juxtaposed lake and basin-fill deposits (Belcher & Sweetkind 2010).

Plant communities are discussed in more detail below. **Biological Resources Figures 3**, and **4** contain photos of the habitats characteristic of the project site. The total estimated area occupied by each community is provided in **Biological Resources Table 2**.

Biological Resources Table 2
Natural Communities within the HHSEGS Project Site

Natural Community Types within Study Area	Project Site (Acres)
Mojave Desert scrub	1,580.5*
Shadscale scrub	1,616.5*
Disturbed (excluding roads)	77
Total upland, State and federal waters	3,277
Desert Washes/Waters of the US**	0.4
Desert Washes/Waters of the State**	23.21
Creosote bush/big bush galleta grass association	<1 ac.

* Comments on the PSA provided by the applicant included revised estimates of disturbed habitat. This included an additional 61 acres of dirt roads. Estimates did not include revised vegetation estimates; therefore staff decreased the acreages of Mojave Desert Scrub and Shadscale scrub by 30.5 acres each.
** The total acreage of waters is a subset of existing vegetation acreages.

Mojave Desert Scrub

A total of 1,580.5 acres of Mojave Desert scrub occurs within the project site (HHSEGS 2011a). Mojave Desert scrub occurs on well-drained, alluvial soils of slopes, fans, and valleys below 4,000 feet elevation (Holland 1986). In the project area it consists of evergreen and drought-deciduous shrubs one to four feet in height, dominated by creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Common associated shrubs include rabbit-thorn (*Lycium pallidum var. oligospermum*) and shadscale (*Atriplex confertifolia*). This community also supports a large variety of mostly native herbaceous forbs and bunchgrasses, and provides valuable habitat for a wide variety of common and special-status wildlife. Eleven species of special-status plants were also documented within this community-type.

Creosote bush and white bursage-dominant communities have a CNDDB Element Rank (NatureServe state-rank) of five, meaning they are “demonstrably widespread, abundant, and secure” (Master et al. 2009). Their extinction risk in California is low. Some variations of the creosote-bursage alliance are rare, including the creosote bush/big galleta grass association, described in more detail below under “Sensitive Natural Communities”.

Shadscale Scrub

A total of 1,616.5 acres of shadscale scrub occurs within the project site (HHSEGS 2011a). Shadscale scrub comprises of low-growing, salt-tolerant shrubs that are widely spaced and often have lower overall species diversity; however, shrub species diversity is very good in some areas. Most shrubs are less than two feet in height. This plant community typically occurs on poorly-drained flats with fine-textured, somewhat alkaline soils between 3,000 and 6,000 feet elevation (Holland 1986). Common plant associates include winterfat (Kraschenninikovia lanata), desert allysum (*Lepidium fremontii*), Anderson’s boxthorn (*Lycium andersonii*), rabbit-thorn, Emory’s globemallow (*Sphaeralcea emoryi*), and prince’s plume (*Stanleya pinnata*).

Fewer special-status plant species were found in the shadscale scrub; most of which prefer the more gravelly, better-drained and less alkaline soils farther up the alluvial fan; however, three rare species are nevertheless abundant in the shadscale scrub: (Pahrump Valley buckwheat, Torrey’s joint-fir, and Goodding’s phacelia. Special-status wildlife are also found in lower abundance in this area. The western half of the site is somewhat more disturbed and the invasive weeds halogeton (*H. glomeratus*) and red brome (*Bromus madritensis* ssp. *rubens*) are abundant in many areas (HHSEGS 2011a).

Shadscale-dominant natural communities have a CNDDB Element Rank (Nature Serve state-rank) of 4.2, meaning they are “not rare and apparently secure, but with cause for long-term concern; this rank is clearly lower than G3 but factors exist to cause some concern; i.e., there is some threat, or it has a somewhat narrow habitat” (Master et al. 2009).

Disturbed

A total of 77 acres of disturbed habitat occurs on the project site (HHSEGS 2011a). This includes roads, and sparsely vegetated weedy areas that were previously graded. A fallow peach orchard is located on the project site at the corner of Silver Street and Old Spanish Trail Highway. Additional disturbed areas were mapped along the Old Spanish Trail Highway on the south side of the project site. Non-native annuals and cultivated species are characteristic of this mapping unit, with few-to-no native shrubs present. Tumbleweed (*Amaranthus albus*) and the invasive weed Russian knapweed *(Acroptilon repens*) are common in the disturbed areas.

SENSITIVE NATURAL COMMUNITIES

Vegetation mapping was conducted in spring 2011 and classified according to Holland (1986) vegetation descriptions (AFC Figure 5.2-3, HHSG 2011a; see also **Biological Resoures Figure 5**). Surveys for rare natural communities, based on the classification system described in *Manual of California Vegetation* (Sawyer et al. 2009), were conducted in spring 2012. The applicant also mapped groundwater-dependent vegetation within an approximate four-mile radius of the project (CH2 2011g, Figure DR48-1). Staff's independent review included a reconnaissance-level survey of the Pahrump Lake playa margins and other mesquite-habitats and springs beyond the four-mile boundary, including the Tecopa area, the stabilized dunes east of the project, and an onsite field verification of the applicant's delineation of state waters and desert tortoise habitat (CH2 2011c; **Biological Resources Figure 6**).

The Mojave Desert scrub and shadscale scrub communities described above are common and widespread habitats; their vulnerability to extinction in California is low at this time. Sensitive natural communities, however, are usually locally and regionally scarce and therefore vulnerable to elimination. Such habitats may be sensitive because they are regulated and protected (such as streams, wetland and riparian habitat, and other state or federal jurisdictional waters), or they are identified in local plan policies or ordinances. Sensitive natural communities often support unique or biologically important plant or wildlife species, or perform important ecological functions (e.g., the bank stabilization or water filtration functions of riparian vegetation). Communities that are not regulated under California Fish and Game Code or the state or federal Clean Water Act or other LORS may still be recognized by agencies and the scientific community as rare and sensitive (CNDDB 2003; Sawyer et al. 2009).

The CDFG Vegetation Program's *Manual of California Vegetation* [2nd ed.](Sawyer et al. 2009) provides a valuable measure of a community's vulnerability through the CNDDB Element Rank (synonymous with the NatureServe state rank). Communities with a state or global rank of 1, 2, or 3 are considered vulnerable to extinction within their range in California. Some of these communities are also globally at-risk. The global and state ranks do not reflect other concerns, *e.g*., whether the habitat is designated critical habitat for a listed species. Some *alliances* (a description of the community based on its dominant species) that are common have rare *associations* (a finer level of classification), such as those with high levels of diversity in the shrub layer, associations of galleta grass or with an important component of stem succulents like Mojave yucca or various cacti (Sawyer et al. 2009).

Sensitive natural communities found onsite include:

- Ephemeral desert washes (Waters of the State)
- Creosote bush/big galleta grass association

The desert washes on the project site are described in the subsection "Desert Washes", following the discussion of mesquite communities, invasive weeds, special-status plants, and groundwater-dependent ecosystems.

Sensitive natural communities documented or observed *offsite* within the one-mile study area surrounding the project site include:

- Honey mesquite alliance (a groundwater-dependent species)
- Coppice dunes
- Ephemeral desert washes

Mesquite Alliance

Honey mesquite-dominant habitats, their importance to area wildlife, and conservation status are described in more detail under "Groundwater-dependent Ecosystems". Over 4,000 acres of mesquite-dominant habitats were documented within the five- to six-mile radius of the project study area in the applicant's mapping of groundwater-dependent vegetation (CH2 2011g, Figure DR48-1; **Biological Resources Figure 1**). With the exception of a small area along lower Stump Spring Wash in the Charleston View area, all mesquite habitats within the study area occur on the Nevada side of the state line. No mesquite habitats occur within the project boundary, with the exception of a few scattered shrubs. This was confirmed by staff during the field verification of the state waters delineation. The nearest mesquite-dominant habitats in California occur 13 to 20 miles west of the project site in the Tecopa area at springs, around playa margins, and along the Amargosa River and its tributaries.

The mesquite-dominated habitats within the study area occur in two forms: 1) coppice dunes of low-growing shrubs, less than six feet tall, on sandy, hummocky stabilized dunes, and 2) as stringers of lush, taller stands along the deeply incised canyons and ephemeral washes that dissect the alluvial fan surface east of the project. In these settings, they occur as very dense stands of taller shrubs and single- or multi-trunked small trees up to approximately eight inches diameter and 15 feet in height. **Biological Resources Figure 1** contains photos of the mesquite habitats characteristic of the incised washes east of the project site. The ephemeral washes do not flow frequently enough to support this obligate phreatophyte (groundwater-dependent) species; the mesquite are presumed to be supported by one or a combination of shallow groundwater forced to the [near] surface along the fault zone, groundwater flow from the Spring Mountains, and in a few small areas by discharging seeps and springs.

Like the dunes (described below), the mesquite associated with the dunes are arranged linearly along the fault zone, between approximately 600 and 2,500 feet east of the project boundary. The mesquite associated with the dunes, spring, and washes at Stump Springs Area of Critical Environmental Concern (ACEC) occur between two and four miles of the project's southeast corner. The mesquite washes occur as close as one-half mile of the eastern project boundary and extend up to five miles or more east toward the Spring Mountains.

All mesquite-dominant communities are rare in California and Nevada (Crampton et al. 2006; Sawyer et al. 2009). The total mesquite-dominant woodland area in southern Nevada, northwestern Arizona, and southeastern California is 24,669 acres (Crampton et al. 2006). Mesquite-dominant habitats are also rare in California and occurrences are threatened by a variety of factors, predominantly groundwater pumping and urbanization (Sawyer et al. 2009; Crampton et al. 2006).

Classification of the Mesquite Habitats

Staff chose not to include an academic discussion about vegetation classification in the PSA; the issue of the mesquite classification is included here to address concerns expressed by the applicant during workshops and in the PSA comments.

At the applicant's request, the CDFG Vegetation Program was consulted for information on the conservation status and classification of mesquite in California. The Senior Vegetation Ecologist (Keeler-Wolf pers. comm.) affirmed that the mesquite-dominant habitats in California are classified as "Honey Mesquite Alliance"; not "thickets", "bosque" or "woodland". The state and national standard for classification is based on dominant species, not on habitat structure. Under the U.S. National Vegetation Classification system (USNVC), a system still in development, honey mesquite alliances fall under several different "Ecological Systems" including "North American Warm Desert Riparian Low Bosque & Shrubland Group" (Keeler-Wolf pers. comm.). This might explain why BLM uses the term "bosque" to describe the mesquite habitats east of the project.

In the BLM-sponsored Mesquite-Acacia Conservation Management Strategy (CMS) (Crampton et al. 2006), prepared for and adopted by the Clark County Multiple Species Habitat Conservation Plan, the mesquite habitats throughout the study area (that includes southern Nye County) are consistently referred to as "woodlands. The management plan also notes that the southern portion of the Pahrump "Metapatch" (aggregation of smaller patches) known as Stump Spring is "...distinct from the rest of the region in topography, hydrology, soils and mesquite growth form...Many of these woodland patches are comprised of shrubby dune mesquite; however, larger shrubs and trees grow along the deeply eroded wash." (Crampton et al. 2006)

Regardless of the terminology used, the conservation status and ecological importance of Stump Spring ACEC, the mesquite-dominant habitats north of the ACEC and east of the project, and the value of mesquite to wildlife, are undisputed; the ACEC and the entire Pahrump Valley metapatch are identified conservation priorities in the Mesquite-Acacia Conservation Management Strategy (Crampton et al. 2006), and BLM is in the process of developing an additional ACEC that would encompass the mesquite habitats just east of the project (Poff pers. comm.).

The importance of mesquite communities to wildlife are described in more detail under "Groundwater-dependent Ecosystems". **Biological Resources Figure 2** contains photos of the mesquite habitats characteristic of the incised washes east of the project site.

Coppice Dunes

The mesquite coppice dunes are arranged linearly along the fault zone as a discontinuous system of stabilized (inactive) dunes. Most occur within one-half mile of the eastern boundary, occur on BLM lands, and extend southeast of the project to the Stump Spring ACEC, approximately two and one-half miles east of the project's southeast corner

Coppice dunes form as a result of the trapping of aeolian silts and fine sands by shrubs adapted to sand burial. Any shrub (or other obstacle) standing in the airborne stream of sand is an impediment to wind-sand transport, and the resulting turbulence and speed losses cause sand grains to settle out on the downwind side of the shrub and around its base. Only certain kinds of plants are associated with coppice dunes, because only those "edifying" species adapted to sand burial by forming new roots and shoots from buried branches can continue to grow as the sand accumulates around them.

Honey mesquite (*Prosopis glandulosa* var. *torreyana*) is the clear dominant on the coppice dunes. Other shrubs associated with coppice dunes in the project vicinity include creosote bush, Mormon tea (*Ephedra* spp.), and four-wing saltbush (*Atriplex canescens*). The stabilized dunes provide ideal sites for burrowing fauna due to the lack of stones, abundant coarse material, and shade provided by the shrubs (Huang et al. 2011). The vertical structure of the vegetation provides wildlife with nesting and foraging habitat.

Creosote Bush/Big Galleta Grass Association

Some *alliances* (a description of the community based on its dominant species) that are common, such as creosote bush, have rare *associations* (a finer level of classification). The creosote bush/galleta grass *association* found onsite is one example (Sawyer et al. 2009). Only 1.2 acres of this plant community occurs onsite (**Biological Resources Figure 5**). This community extends to the east toward the fault zone coppice and is more abundant off the project site. This association has been observed by staff and others in different locations throughout the eastern Mojave and Colorado Desert regions of California (Sawyer et al. 2009, Evens pers. comm.). This rare natural community has a CNDDB (NatureServe) state rank of 3, meaning it is "vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation." (Master et al. 2009)

In the small stand documented in the project area, the big galleta grass (*Pleuraphis rigida*) is the co-dominant in the creosote bush-white bursage alliance. Overall shrub diversity is very good at the site but only the galleta grass and white bursage dominate (31 percent and 38 percent relative cover, respectively).

Blackbrush communities (a habitat of upper bajadas) in southern Nevada that contain a major component of big galleta are heavily utilized by bighorn sheep and are referred to as 'preferred habitat' (Matthews 2000). It also provides fair cover for small mammals and small nongame birds (*ibid.*).

INVASIVE WEEDS

Target lists of invasive non-native plants potentially occurring in the project area were developed from the lists of the California Department of Food & Agriculture (CDFA), California Invasive Plant Council (Cal-IPC), and the Nevada Department of Agriculture (NDA). Because the surveys were floristic, i.e., all plants encountered were identified to at least species level, any new weed species not on the target lists would have been detected, if present. Non-native invasive weed species were mapped in spring 2011, and their abundance was estimated by size classes.

Invasive weeds are species of non-native plants included on the weed lists of the California Department of Food and Agriculture (CDFA 2010), the California Invasive Plant Council (Cal-IPC 2006) and the Mojave Weed Management Area (MWMA 2011). They are of particular concern in wildlands because of their potential to degrade habitat and disrupt the ecological functions of an area (Cal-IPC 2006). Specifically, invasive weeds can alter habitat structure, increase fire frequency and intensity, decrease forage (including for special-status species, such as desert tortoise), exclude native plants, and decrease water availability for both plants and wildlife.

A digest of California's weed laws is available on the CDFA website: http://www.cdfa.ca.gov/plant/ipc/encycloweedia/winfo_weedlaws.htm. The website ("Encycloweedia") also provides fact sheets on weed species management.

Thirteen species of invasive weeds of varying abundance and distribution were mapped in the project area during the 2010/2011 floristic surveys (HHSEGS 2011a). Weeds are most abundant in the western two-thirds of the project area, or the portion of the project most disturbed by grading for the now abandoned residential subdivision (predominantly along roads), areas with an agricultural history, and seasonally moist areas. The species documented onsite are described below, as well as two additional weed species of particular concern to local agricultural commissioner INYO 2012a).

Invasive Weeds on the Project Site

Russian knapweed (Acroptilon repens)

Russian knapweed was found in two locations on the project site; the fallow orchard and along an interior site road. Russian knapweed occurs in the Great Basin, Mojave Desert, and northern California mainly on agricultural lands and roadsides. Russian knapweed is a deep-rooted perennial and established stands are more difficult to control than other knapweeds. Russian knapweed can invade and persist in numerous ecosystems, including rangeland, pastures, agricultural fields, riparian areas, and wildlands. It has been found in saline, alkaline, low lying areas. It most readily invades disturbed areas, forming dense single-species stands. Once established, Russian knapweed uses a combination of adventitious shoots and allelopathic chemicals (toxic to other plants) to spread outward into previously undisturbed areas. On agricultural land, it has caused serious reductions in yields, crop value, and may devalue the land. CDFA recommends avoiding driving vehicles or equipment through mature patches as seed heads can become attached and spread over long distances (CDFA 2012). It is a CDFA A-rated pest; a priority for eradication.

Red brome (Bromus madritensis ssp. rubens)

Red brome is abundant and widespread in the project area, occurring at 218 widely scattered locations. It is an introduced Eurasian grass adapted to microhabitats and was frequently found at the base of desert shrubs and moist places. Red brome is widespread throughout the Mojave Desert and the seeds from this species can disperse readily and across large distances. Cal-IPC has declared this plant highly invasive (Cal-IPC 2006). Because of its widespread distribution, red brome is not considered feasible for general control.

Cheat grass (Bromus tectorum)

Cheat grass was found at 21 scattered locations on the project site. It is among the most widely distributed invasive plant species in the western U.S. Closely related to red brome, it is adapted to colder steppe and woodland habitats. Cal-IPC has declared this plant highly invasive (Cal-IPC 2006). Because of its widespread distribution, cheat grass is not considered feasible for general control.

Purple mustard (Chorispora tenella)

Purple mustard was found in low abundance in two locations in wetter, low-lying areas. This species is uncommon to California and is commonly associated with heavily disturbed agricultural lands. It is primarily a problem in winter annual cereal crops and may cause extensive yield losses at moderate infestations. Densities as low as three plants per square foot have reduced wheat yields by over 50 percent. Purple mustard may also infest roadsides, non-crop areas, and disturbed rangeland. Additionally, dairy animals grazing purple mustard produce milk with a bitter taste and foul odor. It is still somewhat limited in its distribution in California and infestations frequently tend to spread along roads and field edges. Populations should be mapped and aggressively controlled to prevent the continued increase of this weed in cereals (CDFA 2012). It is a B-rated pest plant, meaning it is a known economic or environmental detriment and of currently limited distribution. At the discretion of the individual county agricultural commissioner they are subject to eradication, containment, suppression, control, or other holding actions.

Field bindweed (Convolvulus arvensis)

Field bindweed was found in low abundance at one location in the 250-foot buffer. Field bindweed is considered one of the most noxious weeds of agricultural fields throughout temperate regions of the world. Plants typically develop large patches and are difficult to control. Heavy infestations in grain crops can reduce harvest yields 30-40 percent or more. It can also spread certain plant viruses, and the foliage contains tropane alkaloids and can cause intestinal problems in horses grazing on heavily infested pastures. It is a C-rated by the state, meaning it is a pest of known economic or environmental detriment and, if present in California, it is usually widespread. If found in the state, they are subject to regulations designed to retard spread or to suppress at the discretion of the individual county agricultural commissioner but there is no state enforced action.

Halogeton (Halogeton glomeratus)

Halogeton is abundant and widespread on the western two-thirds of the project site south to the Old Spanish Trail Highway and corresponding 250-foot buffers. Halogeton often grows in areas of disturbance such as burned-over areas, overgrazed areas, dry lakebeds, abandoned dry farms, along roads, and in places where the soil has been disturbed. It is tolerant of saline soils of colder semiarid regions, especially where native plant cover is thin. Halogeton competes poorly with established perennial vegetation. It is a prolific seed producer and seeds may remain viable in the soil for 10 years or longer. Seeds disperse with wind, water, human activities, seed-gathering ants, animals, and when dry plants break off at ground level and tumble with the wind. It is poisonous to livestock, especially sheep. Though common in Nevada, halogeton is not as widespread in California. CDFA (2012) has assigned it an “A” rating, meaning that eradication is a priority by the state. However, the site is infested over very large areas (at varying densities); containment may be the only realistic management approach.

African mustard (Malcolmia africana)

African mustard is abundant and widespread on the northern two-thirds of the project site, the corresponding 250-foot buffers, and along Old Spanish Trail Highway. It is currently widespread throughout the Southwest and is considered invasive in Nevada and Utah. African mustard can be effectively controlled with herbicide in priority areas. It is not currently rated by the state but because it has been recorded in only a few locations in California, this species should be eradicated if observed.

Mediterranean grass (Schismus arabicus)

Mediterranean grass was observed on the project site and on the 250-foot buffer. Cal-IPC has determined that this plant has a limited invasiveness rating in California (Cal-IPC 2006). BLM and other agencies recognize that because of the widespread distribution of Mediterranean grass, this species is not considered feasible to control.

Russian thistle (Salsola spp.)

Russian thistle, also known as tumbleweed, is more common in the northern half of the project and is abundant along the Old Spanish Trail Highway near the southern boundary of the site. They are strongly competitive in semiarid areas and are heavily favored by disturbance. Tumbleweeds disperse seed over long distances as they are carried along the ground by the wind. Frequently, new infestations appear as a "trail" of tumbleweed seedlings across fields. Skeletons also often collect along fencerows, and subsequent populations can become very dense. One of the keys to preventing spread of Russian thistle is controlling seedlings along both sides of fence rows and along field borders, where tumbleweed skeletons accumulate. Additionally, areas "downwind" of infested areas are most likely to be invaded. In many cases, it is impossible to prevent tumbleweed movement and sensitive areas should be monitored each year for new plants (CDFA 2012). It is a CDFA C-rated pest.

Tumble mustard (Sisymbrium altissimum)

Tumble mustard was mapped mainly in sandy soil in the eastern third of the site and the corresponding 250-foot buffer. Tumble mustard is more common in the Great Basin, but occurs in the Mojave Desert invading roadsides and overgrazed rangelands. It is not currently rated by the state and its impact to wildlands is unknown (CalIPC 2006).

London rocket (Sisymbrium irio)

London rocket is widespread throughout the warm deserts of North America. It was widely scattered throughout the project site and especially abundant along the Old Spanish Trail Highway. It matures earlier in the year than native species, allowing it to out-compete them. It is not currently rated by the state but Cal-IPC has declared this plant moderately invasive in wildlands (Cal-IPC 2006).

Mediterranean tamarisk or saltcedar (Tamarix ramosissima)

Salt cedar was observed near the project site to the south across Tecopa Road within the 250-foot buffer. It appears that the tamarisk has been planted near rural residences. It is a riparian plant and is therefore restricted to habitats where there is perennial saturation such as springs and seeps, or runoff from poorly maintained water pipelines or well pumps. Cal-IPC has declared this plant highly invasive (Cal-IPC 2006).

Filaree or storksbill (Erodium cicutarium)

Filaree is a widespread annual species common in disturbed habitats, and was detected at the project site and in the 250-foot buffer. It can form dense, transient populations when conditions are suitable. It has a limited overall rating by Cal-IPC, generally because the ecological impacts of the species are minor. Because of its widespread distribution, eradication of filaree is not considered feasible.

Other Invasive Weeds of Concern

The Inyo-Mono County Agricultural Commissioner expressed concern about the potential introduction of two additional species, camelthorn and Malta starthistle. Contaminated vehicles and equipment of employees and contractors coming from the Las Vegas area, where there are known infestations may act as a vector for the introduction of these species in the Pahrump Valley (Inyo 2012a). These highly invasive species are not currently documented on the project site.

Camelthorn (*Alhagi pseudalhagi*)

Camelthorn is a highly invasive perennial shrub that invades agricultural lands and riparian areas. Its strongly competitive and rapid aggressive growth allows it to out-compete both native vegetation and cultivated crops. It has been eliminated from all but four California counties due to eradication efforts but large infestations remain in arid parts of Nevada, Arizona, and Washington. In Arizona dense thickets have formed along the Colorado River in the Grand Canyon and along the Little Colorado River. It reproduces by seed and vegetatively by rhizomes that send up shoots and often spreads through contaminated hay, straw, and livestock. CDFA (2010) has assigned it an “A” rating, meaning that eradication is a priority. It was not found on the project but infestations are known from surrounding communities in southern Nevada (Inyo County 2012b).

Malta starthistle (*Centaurea melitensis*)

Malta starthistle was not found on the project but it is another concern and identified priority for eradication by the local agricultural commissioner. Similar to yellow starthistle (*Centaurea solstitialis*), it readily invades disturbed and open areas. Infestations of Malta starthistle displace native plants and animals, threatening natural ecosystems and nature reserves. It has been documented to significantly reduce seed production in at least one endangered plant (Cal-IPC 2006). It is also toxic to horses. While Malta star-thistle is less invasive than yellow starthistle, it still spreads quickly by producing great quantities of seed that is easily carried on tires and it is often spread by contaminated straw (straw is commonly used on construction sites for erosion and sediment control).

COMMON WILDLIFE

The HHSEGS project is located in the Pahrump Valley within the eastern Mojave Desert. This area consists of a broad open valley supporting a mosaic of desert scrub communities that intergrade depending on the local topography, hydrology, and soil structure. Dry lakebeds, seeps, ephemeral drainages, and complexes of mesquite thickets and woodlands provide a range of conditions that support a complex assemblage of wildlife. The valley is bordered by a series of steep rocky mountain ranges which provide habitat for numerous reptiles, birds, and large mammals.

Habitat on the HHSEGs project site is utilized by a broad suite of common and sensitive wildlife. The distribution of wildlife on the site appears to be a function of the level of historic disturbance, soil type, and existing vegetative cover. Areas characterized by more intact native plant communities such as the northern and eastern portions of the site appear to support higher native species diversity.. More disturbed areas including graded roads, former staging areas along roads, the fallow orchard and other areas heavily colonized by weedy annuals provide lower habitat value and tend to support lower species diversity than otherwise intact native plant communities. Nevertheless, many areas with a moderate to high weed component still had good to excellent diversity in the shrub layer.

Invertebrates

Desert ecosystems are known to support a broad group of invertebrate life. As in all ecosystems, invertebrates play a crucial role in a number of biological processes. Insects serve as the primary or secondary food source for a variety of bird, reptile, and mammal predators; they provide important pollination vectors for plant species; they act as efficient components in controlling pest populations; and, they support the naturally occurring maintenance of an area by consuming detritus and contributing to necessary soil nutrients. The project site likely supports a wide variety of common and non-native invertebrates. Some of the orders identified in the project area included Hemiptera (true bugs), Coleoptera (beetles), and Diptera (flies). Various insects were routinely observed on the project site by staff during surveys conducted to verify and document biological resources.

Desert fairy shrimp are known from saline lakes in the region and various species of gastropods can be associated with desert seeps and springs. In arid climates, such as that found in the Mojave desert, fairy shrimp inhabit pools that may last from as little as three days to as long as four months, with much more variable levels of dissolved salts than found in pools in more humid climates (Brown and Carpelan 1971). It is possible that during periods of heavy or prolonged rainfall that small depressions, road ruts or gullies may support conditions that allow for the presence of common fairy shrimp. It is also likely that fairy shrimp occur in the dry lake west of the project site and that portions of the project are periodically inoculated with cysts inadvertently carried by mammals or shorebirds. Therefore it is possible small pooled areas could support fairy shrimp during extremely wet years.

A review of existing literature did not find any comprehensive study describing the species of fairy shrimp expected to occur in the Pahrump Valley. However, approximately 23 species of fairy or brine shrimp are known to occur in California (Bauder et al. 1998) and five species are known from within 100 miles of the project site (Eriksen and Bell, 1999). These include, ranging from farthest to closest, the giant fairy shrimp (*Branchinecta gigas*), Colorado fairy shrimp (*B. coloradensis*), San Francisco brine shrimp (*Artemia franciscana*), versatile fairy shrimp (*B. lindahli*), and the alkali fairy shrimp (*B. mackini*). Tadpole fairy shrimp (*Lepidurus lemmoni*) are also known from Nevada and are common in playas across the great basin. None of these species have California or federal status. Based on the known distribution and habitat requirements of sensitive fairy shrimp; sensitive species are not likely to occur on or near the proposed project site. Native harvester ants (*Pogonomyrmex spp.*) were also detected on the project site and although not detected during surveys, the proximity to rural residents may increase the potential for the introduction of non-native Argentine ants (*Linepithema humile, formerly Iridomyrmex humile*). The introduced Argentine ant is abundant in urban and agricultural lands throughout much of California and invades into relatively mesic natural habitat such as along river courses and in some coastal lowlands (Ward 2005). Desert areas are likely more resilient to invasion due to the low levels of soil moisture that are occur in those locations.

During an August,28, 2012 staff workshop, Intervenor Center for Biological Diversity requested more information on special status butterflies be provided, and provided a reference website (Warren et al 2012). A review of this database indicated that three butterflies are known from the Pahrump Valley: silvery blue (*Glaucopsyche lygdamus deserticola*), small checkered-skipper (*Pyrgus scriptura apertorum*), and Mormon metalmark (*Apodemia mormo autumnalis*). None of these species have special status (CDFG 2011a).

Reptiles and Amphibians

The applicant observed a wide diversity of snakes on the project site. This included three species of rattlesnake; sidewinder (*Crotalus cerastes*), speckled rattlesnake (*C. mitchellii*) and northern Mojave rattlesnake (C*. scutulatus scutulatus*). Great basin gopher snake (*Pituophis catenifer ssp. deserticola*), coachwhip (*Masticophis flagellum ssp. flagellum*), and glossy snake (*Arizona elegans*) were also observed on the HHSEGS site. Although not observed on the project site it is possible that common desert amphibians are also present. Red spotted toad (*Anaxyrus punctatus*) is known from the Kingston Range and may occur in areas supporting ponded water and at Stump Spring. However, investigations of the site conducted by staff following extensive summer storms detected only small pools and road ruts that were often dry within 24 hours.

Mammals

Mammals were well represented on the HHSEGS project site and a variety of species were observed by the applicant. Vegetation on the project site such as the creosote bush scrub, shadscale scrub, and native annuals provide foraging and breeding habitat for many mammalian species including pocket mouse (*Perognathus longimembris*), white-tailed antelope squirrel (*Ammospermophilus leucurus*), and Merriam's kangaroo rat (*Dipodomys merriami*). Desert cottontail (*Sylvilagus audubonii*) and black tailed jack rabbit (*Lepus californicus*) were observed by staff and the applicant across the project site. In addition, high burrow densities of Botta's gophers (*Thomomys bottae*) were noted along many of the access roads and within portions of the more disturbed vegetation communities. Small carnivores including desert kit fox (*Vulpes macrotis*), coyote (*Canis latrans*), and American badger (*Taxidea taxus*) also appear to commonly use the site. Numerous kit fox complexes were detected on the project site and badger sign was evident in many areas. Wide ranging carnivores such as bobcat (*Felis rufus*) may also use the site. Nelson's big horn sheep (*Ovis Canadensis nelsoni*) are known from the adjacent mountain ranges and likely cross the site during periodic intermountain movement events. The partial fragment of a horn was observed by the applicant during surveys of the project site.

A number of bats are known from desert regions and these species may periodically forage in and near the project area. The presence of stored trailers, vehicles, and other structures on lands east of the site may provide potential roost sites for bats. Standing water does not routinely occur on the project site which reduces the potential for many bats to actively forage in the area. However, due to the proximity of the project site to suitable habitat for foraging and roosting (e.g. Stump Spring ACEC and scattered mesquite thickets along the California-Nevada Stateline), the applicant was requested to install an Anabat station on the HHSEGS site. This technology records bat echolocation calls which are then interpreted by a skilled mammalogist. Data collection began December 21, 2011, and the applicant has committed to providing quarterly reports until December 2012. Preliminary data provided by the applicant indicate the site supports low level use by a variety of common and at least one sensitive bat species. Some of these species include the California myotis (*Myotis californicus*), big brown bat (*Eptesicus fuscus*), western pipistrelle (*Pipistrellus hesperus*), Mexican free-tailed bat (*Tadarida brasiliensis*), and pallid bat (*Antrozous pallidus*). Bat roosts were not detected on the HHSEGS project site but may occur in adjacent off-site areas including old trailers and structures.

Exotic Species

Cattle and sheep grazing are permitted activities within portions of the Pahrump Valley and the project site has been subject to historic grazing. The sign of domestic cattle (*Bos taurus*), sheep (*Ovis aries*), and free ranging burrow (*Equus asinus*) was present on the HHSEGS site. Because of the proximity to residential communities at Charleston View the HHSEGS site also likely experiences periodic use by domestic dogs (*Canis domesticus*).

Avian Species

The Pahrump Valley and Mojave Desert support a wide range of both resident and migratory bird species. The site is located within the Pacific Flyway, a very broad corridor stretching along the Pacific Coast from Mexico north to Alaska and into Siberia, Russia. The states of California and Nevada lie entirely within this large corridor (CDFG, accessed April 19, 2012). Bird use on the site includes resident breeding birds, periodic migrants, and wintering species. For some species of birds, including many large raptors, the site does not support nesting habitat; however the abundance of small mammals and reptiles provide foraging opportunities for these species. Over 60 species of birds were identified by the applicant in AFC (HHSEGS 2011a).

There are a number of factors that affect the type and the distribution of birds that occur in any given area. Some of these include the type and composition of habitat, the time of year, existing levels of anthropogenic disturbance, and the projects proximity to areas that support high quality or important habitat types including areas mapped as important bird areas (IBAs). IBA's can yield further information on the migrants that would typically be expected to move over the site.

The HHSEGS project site is not located in an IBA. The closest IBA is the East Mojave Peak IBA, located approximately five and a half miles south of the project site in the Kingston Mountain range. Joshua tree woodlands and pinyon-juniper vegetation characterize the habitat in this IBA which support s various species such as Bendire's thrasher (*Toxostoma bendirei*), juniper titmouse (*Baeolophus ridgwayi*), and Scott's oriole (*Icterus parisorum*). Only the Bendire's thrasher was reported onsite, however the applicant believes the bird may have been misidentified (HHSEGS 2011a). The Shoshone-Tecopa IBA, associated with the Amargosa River and Grimshaw Lake are located approximately 18 miles from the project site and provides riparian woodlands, wetlands, and alkali marsh habitat. It also is home to a very rare population of endangered yellow-billed cuckoo (*Coccyzus americanus occidentialis*). The East Mojave Springs IBA is approximately 14 miles from the HHSEGS site, and Horsethief Springs, is a major attractant for all wildlife, including migratory birds. A complex of two other above-ground springs, the Piute and Cornfield Springs, provide rare riparian vegetation in what is otherwise arid desert habitat. Bell's vireo (*Vireo bellii*), crissal thrasher (*T. crissale*), least bittern (*Ixobrychus exilis*), northern harrier (*Circus cyaneus*), and snowy plover (*Charadrius nivosus*) use this area for foraging, breeding, and nesting.

The Stump Spring ACEC, other area springs, and the associated greater metapatch of mesquite thickets located in washes and on coppice dunes east of the project provide unique and important habitat to wildlife. The system of mesquite thickets along the state border in Nevada are believed to be crucially important to the greater desert ecosystem and over 30 species of migratory birds are known from these areas. One locally important species, phainopepla (*Phainopepla nitens*), forages on the berries of mistletoe, a hemi-parasitic species common to mesquite and other trees. Recently, phainopepla have been the focus of the Clark County, Nevada, Section 10 Multiple Species Habitat Conservation Plan. This plan contains regional management conservation strategies for a host of special-status plant and wildlife species.

A variety of resident and migratory birds have been detected on and adjacent to the site. Some of these include burrowing owl (*Athene cunicularia*), lesser nighthawk (*Chordeiles acutipennis*), horned lark (*Eremophila alpestris*), western meadowlark (*Sturnella neglecta*), and sage sparrow (*Amphispiza belli canescens*). Possible migrant or wintering Brewer's sparrow (*Spizella breweri*), chipping (*Spizella passerina*), and white crowned sparrows (*Zonotrichia leucophrys*) were also observed. Other species identified on the project site included LeConte's thrasher (*T. lecontei*), black-throated sparrow (*Amphispiza bilineata*), California quail (*Callipepla californica*), cactus wren

(*Campylorhynchus brunneicapillus*), northern mockingbird (*Mimus polyglottos*), Scott's oriole and purple martin. Raptors were well represented and were observed by applicant and staff. Common raptors included red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), Cooper's hawk (*Accipiter cooperii*), and ferruginous hawk (*B. regalis*). Golden eagles (*Aquila chrysaetos*) were detected in flight above the site and in adjacent areas. Golden eagles were also noted perching in areas adjacent to the proposed project.

SPECIAL-STATUS PLANT AND WILDLIFE SPECIES

Pre-field research conducted by the applicant to assess the potential presence for special-status plants and animals included a review of literature, databases, and other sources of biological resource information. These include the California Natural Diversity Database (CNDDB 2012), California Native Plant Society (CNPS) *Online Inventory of Rare and Endangered Plants of California* (CNPS 2012), Consortium of California Herbaria (CCH 2012), and the U.C. Riverside Herbarium. Staff independently reviewed the databases and herbarium records, and consulted recognized experts in the rare plant flora of the project vicinity (Silverman pers. comm.; Bagley pers. comm.).

Surveys for special-status plants were consistent with recommended guidelines for botanical surveys of the California Department of Fish and Game (CDFG 2009), the U.S. Fish and Wildlife Service (USFWS 1996), and the California Native Plant Society (CNPS 2001). They were floristic in nature; i.e., all plants encountered were identified to a level necessary for detecting special-status species, if present. Special-status plant surveys of the project site were conducted over a three-year period that included a normal rainfall season and a dry season. Surveys onsite, including a 250-foot buffer around the site, were conducted in spring and fall (spring 2010 and 2011; fall 2010 and 2011). A one-mile buffer surrounding the site was surveyed at a reconnaissance-level in spring 2011.

Because the area is generally under-surveyed, the applicant also conducted extensive offsite surveys to determine if special-status plants were more common than previously understood. Offsite surveys were conducted in several locations in California and Nevada during the spring of 2011 and 2012. Cacti occur in very low numbers in the project area, and no individuals of any species of Yucca are present; thus, cacti and stem succulents were not mapped.

"Special-Status Species" is a universal term used in the scientific community for species that are considered sufficiently rare that they require special consideration and/or protection and should be, or have been, listed as rare, threatened or endangered by the Federal and/or State governments. The applicant has objected to the use of the term, which it dismissed as a "non-legal colloquialism sometimes assigned by other parties".

Special-status Plant Species Definition

In *Protocols for Surveying and Evaluating Impacts to Special-Status Native Plant Populations and Natural Communities* (CDFG 2009), CDFG defines "special-status plant species" to include all plant species that meet one or more of the following criteria:

- Listed or proposed for listing as threatened or endangered under ESA or candidates for possible future listing as threatened or endangered under the ESA (50 CFR §17.12);

- Listed or candidates for listing by the State of California as threatened or endangered under CESA (Fish and Game Code §2050 et seq.). A species, subspecies, or variety of plant is endangered when the prospects of its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, disease, or other factors (Fish and Game Code §2062). A plant is threatened when it is likely to become endangered in the foreseeable future in the absence of special protection and management measures (Fish and Game Code §2067);
- Listed as rare under the California Native Plant Protection Act (Fish and Game Code §1900 et seq.). A plant is rare when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens (Fish and Game Code §1901);
- Meet the definition of rare or endangered under CEQA §15380(b) and (d). Species that may meet the definition of rare or endangered include the following:
  - Species considered by the California Native Plant Society (CNPS) to be “rare, threatened or endangered in California” (Lists 1A, 1B and 2);
  - Species that may warrant consideration on the basis of local significance or recent biological information;
  - Some species included on the California Natural Diversity Database’s (CNDDB) Special Plants, Bryophytes, and Lichens List (California Department of Fish and Game 2008);
  - Considered a locally significant species, that is, a species that is not rare from a statewide perspective but is rare or uncommon in a local context such as within a county or region (CEQA §15125 (c)) or is so designated in local or regional plans, policies, or ordinances (CEQA Guidelines, Appendix G). Examples include a species at the outer limits of its known range or a species occurring on an uncommon soil type.

The term “Special-Status Plants” is also used by BLM in their botanical survey guidelines (BLM 2009b). The BLM guidelines and definitions are also contained in the Energy Commission document Best Management Practices & Guidance Manual: Desert Renewable Energy Projects (CEC 2009).

Biological Resources Table 3 identifies the special-status plant species that were reported to occur, or potentially occur within ten miles of the proposed project area, based on surveys of the proposed project area and vicinity, and searches of the California Natural Diversity Database (CNDDB) and California Native Plant Society’s (CNPS) Inventory of Rare and Endangered Plants. The table also includes species identified in public comments as having at least low potential to occur based on the presence of general habitat preferences or known distribution in the region; and species not contained in **Biological Resources Table 3** of the PSA (Basin & Range 2012x).

Biological Resources Table 3
Special-status Plant Species Known to Occur or Potentially Occurring in the HHSEGS Project Area

Common Name	***Scientific Name***	**Status[1]** **State/Fed/CRPR/CNDDB/BLM**
Mormon needle grass	*Achnatherum aridum*	__/__/2.3/S2?
Ivory-spined agave	*Agave utahensis* var. *eborispina*	__/__/1B.3/S2/S
Clark Mountain agave	*Agave utahensis* var. *nevadensis*	__/__/4.2/S3.2
Desert ageratina	*Ageratina herbacea*	__/__/2.3/S2

Smallest aliciella	*Aliciella humillima*	__/__/Proposed/__
Ripley's aliciella	*Aliciella ripleyi*	__/__/2.3/S2
Coyote gilia	*Aliciella triodon*	__/__/2.2/S2
Inyo onion	*Allium atrorubens* var. *cristatum*	__/__/4.3/S2
Nevada onion	*Allium nevadense*	__/__/2.3/S2
Small-flowered androstephium	*Androstephium breviflorum*	__/__/2.2/S2S3
White bear poppy	*Arctomecon merriamii*	__/__/2.2/S2.2
Mojave milkweed	*Asclepias nytaginifolia*	__/__/2.1/S2
Geyer's milk-vetch	*Astragalus geyeri* var. *geyeri*	__/__/2.2/S2
Borrego milk-vetch	*Astragalus lentiginosus* var. *borreganus*	__/__/4.3/S3.3
Curved-pod milk-vetch	*Astragalus mohavensis var. hemigyrus*	__/__/1B.1/S1
Providence Mountain milk-vetch	*Astragalus nutans*	__/__/4.3/S3.3
Nye milk-vetch	*Astragalus nyensis*	__/__/1B.1/S1
Preuss' milk-vetch	*Astragalus preussii* var. *preussii*	__/__/2.3/S1
Gravel milk-vetch	*Astragalus sabulonum*	__/__/2.2/S2
Tidestrom's milk-vetch	*Astragalus tidestromii*	__/__/2.2/S2
Scaly cloak fern	*Astrolepis cochisensis* ssp. *cochisensis*	__/__/2.3/S2.3
Pahrump silverscale	*Atriplex argentea* var. *longirichoma*	__/__/1B.1/S2/S
Three-awned gramma	*Bouteloua trifida*	__/__/2.3/S2?
Pine Creek evening-primrose	*Camissonia boothii* ssp *alyssoides*	__/__/4.3/S3.3
Booth's evening-primrose	*Camissonia boothii* ssp *boothii*	__/__/2.3/S2
Booth's hairy evening-primrose	*Camissonia boothii* ssp. *intermedia*	__/__/2.3/S2.3
Wheeler's skeleton weed	*Chaetadelpha wheeleri*	__/__/2.2/S2
Parry's spurge	*Chamaesyce parryi*	__/__/2.3/S1.3
California sawgrass	*Cladium californicum*	__/__/2.2/S2.2
Small-flowered bird's-beak	*Cordylanthus parviflorus*	__/__/2.3/S1S2
Tecopa bird's-beak	*Cordylanthus tecopensis*	__/__/1B.2/S1.2/S
Desert pincushion	*Coryphantha chlorantha*	__/__/2.1/S2
Hall's meadow hawksbeard	*Crepis runcinata* ssp. *hallii*	__/__/2.1/S1S2
Ribbed cryptantha	*Cryptantha costata*	__/__/4.3/S3.3
Las Vegas cryptantha	*Cryptantha insolita*	__/__/Proposed?
Gilman's cymopterus	*Cymopterus gilmanii*	__/__/2.3/S2.2
Purple-nerve spring parsley	*Cymopterus multinervatus*	__/__/2.2/S2
Panamint daisy	*Enceliopsis covillei*	__/__/1B.2/S2?/S
Ash Meadows daisy	*Enceliopsis nudicaulis* var. *corrugata*	__/**FT**/3.3/S1/S
Torrey's joint-fir	*Ephedra torreyana*	__/__/2.1/S1
Harwood's eriastrum	*Eriastrum harwoodii*	__/__/1B.2/S3/S
White-flowered rabbitbrush	*Ericameria albida*	__/__/4.2/S3.2
Narrow-leaved yerba santa	*Eriodictyon angustifolium*	__/__/2.3/S2?
Pahrump Valley buckwheat	*Eriogonum bifurcatum*	__/__/1B.2/S3/S

Reveal's buckwheat	*Eriogonum contiguum*	__/__/2.3/S2/S
Robust Hoffmann's buckwheat	*Eriogonum hoffmannii* var. *robustius*	__/__/1B.3/S2.3
Juniper sulphur-flowered buckwheat	*Eriogonum umbellatum* var. *juniporinum*	__/__/2.3/S1S2
Hairy erioneuron	*Erioneuron pilosum*	__/__/2.3S2S3
Copperwort	*Euphrosyne acerosa* (syn=*Iva acerosa*)	__/__/4.2/S3.2
Hot springs fimbristylis	*Fimbristylis thermalis*	__/__/2.2/S2.2
Kingston Mountains bedstraw	*Galium hilendiae* ssp. *kingstonense*	__/__/1B.3/S2.3/S
Desert bedstraw	*Galium proliferum*	__/__/2.2/S2
Golden-carpet gilmania	*Gilmania luteola*	__/__/1B.3/S2
Ash Meadows gumplant	*Grindelia fraxinipratensis*	__/**FT**/1B.2/S2/S
Prickle-leaf	*Hecastocleis shockleyi*	__/__/3/S3S4
Kingston Mountains ivesia	*Ivesia patellifera*	__/__/1B.3/S1.3/S
Cooper's rush	*Juncus cooperi*	__/__/4.3/S3.3
Depressed standing-cypress	*Loeseliastrum depressum*	__/__/4.3/S3?
Inyo blazing star	*Mentzelia inyoensis*	__/__/1B.3/S2.3/S
Wing-seed blazing star	*Mentzelia pterosperma*	__/__/2.2/S1.2
Spiny-hair blazing star	*Mentzelia tricuspis*	__/__/2.1/S2
Red four-o'clock	*Mirabilis coccinea*	__/__/2.3/S2
Utah mortonia	*Mortonia utahensis*	__/__/4.3/S3
crowned muilla	*Muilla coronata*	__/__/4.2/S3.2?
Amargosa nitrophila	*Nitrophila mohavensis*	**SE**/**FE**/1B.1/S1/S
Cave evening-primrose	*Oenothera cavernae*	__/__/2.1/S1
Beaver dam breadroot	*Pediomelum castoreum*	__/__/1B.2/S2
Spiny cliff-brake	*Pellaea truncata*	__/__/2.3/S2
Two-color beardtongue	*Penstemon bicolor* ssp. *bicolor*	__/__/Proposed?
Rosy two-toned beardtongue	*Penstemon bicolor* ssp. *roseus*	__/__/1B.1/S1
Armagosa beardtongue	*Penstemon fruticiformis* var. *amargosae*	__/__/1B.3/S2.3/S
Stephen's beardtongue	*Penstemon stephensii*	__/__/1B.3/S2/S
Utah beardtongue	*Penstemon utahensis*	__/__/2.3/S2
Desert rock daisy	*Perityle megalocephala* var. *intricata*	__/__/CBR
Death valley sandpaper plant	*Petalonyx thurberi ssp. gilmanii*	__/__/1B.3/S2.3
Spine-noded milk-vetch	*Peteria thompsoniae*	__/__/2.3/S1.3?
Sky-blue phacelia	*Phacelia coerulea*	__/__/2.3/S1.3
Clarke phacelia	*Phacelia filiae*	__/__/Proposed?
Death Valley round-leaved phacelia	*Phacelia mustelina*	__/__/1B.3/S1.3/S
Parish's phacelia	*Phacelia parishii*	__/__/1B.1/S1/S
Goodding's phacelia	*Phacelia pulchella* var. *gooddingii*	__/__/2.3/S2
Lobed ground-cherry	*Physalis lobata*	__/__/2.3/S1.3?
Desert popcorn-flower	*Plagiobothrys salsus*	__/__/2.2/S1.2?
Notch-beaked milkwort	*Polygala heterorhyncha*	__/__/S1.3?
Death Valley sage	*Salvia funerea*	__/__/4.3/S3.3
Johnson's bee-hive cactus	*Sclerocactus johnsonii*	__/__/2.2/S2.2

Desert wing-fruit	*Selinocarpus nevadensis* *(syn.= Acleisanthes nevadensis)*	__/__/2.3/S1
Desert winged-rockcress	*Sibara deserti*	__/__/4.3/S3.3
Rusby's desert-mallow	*Sphaeralcea rusbyi* var*. eremicola*	__/__/1B.2/S2/S
Small-flowered rice grass	*Stipa divaricata* (syn=*Piptatherum micranthum*)	__/__/2.3/S2S3
Small-flowered sand-verbena	*Tripterocalyx micranthus*	__/__/2.3/S1.3
Plummer's woodsia	*Woodsia plummerae*	__/__/2.3/S1.3?

Status Codes: [1]

Federal: **FE** = Federally listed endangered: species in danger of extinction throughout a significant portion of its range
FT = Federally listed, threatened: species likely to become endangered within the foreseeable future

State **SE** = State listed as endangered: native species or subspecies in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, or disease.
ST = State listed as threatened: native species or subspecies that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by this chapter.
SC = State Candidate: that the commission has formally noticed as being under review by the department for addition to either the list of endangered species or the list of threatened species, or a species for which the commission has published a notice of proposed regulation to add the species to either list.
SR = State listed Rare: although not presently threatened with extinction, it is in such small numbers throughout its range that it may become endangered if its present environment worsens.

California Rare Plant Rank (CRPR)(formerly CNPS List)
In March, 2010, DFG changed the name of "CNPS List" or "CNPS Ranks" to "California Rare Plant Rank" (or CRPR). This was done to reduce confusion over the fact that CNPS and DFG jointly manage the Rare Plant Status Review groups (300+ botanical experts from government, academia, NGOs and the private sector) and that the rank assignments are the product of a collaborative effort and not solely a CNPS assignment. The old name gave the false impression that CNPS solely assigned the ranks and had excessive influence on the regulatory process. We did this in consultation and agreement with the CNPS Executive Director and the CNPS Board of Directors. Nothing about the actual process of rare plant review or rank assignment has changed and the same committee of experts from many organizations in addition to DFG and CNPS still review each change and ultimately assign the ranks.

1B = Rare, threatened, or endangered in California and elsewhere
2 = Rare, threatened, or endangered in California but more common elsewhere
3 = Plants which need more information
4 = Limited distribution – a watch list
CBR = Considered But Rejected
0.1 = Seriously threatened in California (high degree/immediacy of threat)
0.2 = Fairly threatened in California (moderate degree/immediacy of threat)
0.3 = Not very threatened in California (low degree/immediacy of threats or no current threats known)

CNDDB Element Rank (NatureServe State Rank)
The state rank (S-rank) is assigned much the same way as the global rank, but state ranks refer to the imperilment status only within California's state boundaries.

S1 = Critically Imperiled—Critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
S2 = Imperiled—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
S3 = Vulnerable—Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5 = Secure—Common, widespread, and abundant in the state.

Bureau of Land Management (BLM)
S = BLM Sensitive; Species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. BLM Sensitive species also include all Federal Candidate species and Federal Delisted species which were so designated within the last 5 years and CNPS List 1B plant species that occur on BLM lands.

Special-status Wildlife Species Definition

From the CDFG Special Animals List (CNDDB 2011) "*Special Animals"* is defined as a general term that refers to all of the taxa the CNDDB is interested in tracking, regardless of their legal or protection status. This list is also referred to as the list of "species at risk" or "special-status species". The Department of Fish and Game considers the taxa on this list to be those of greatest conservation need. The species on this list generally fall into one or more of the following categories:

- Officially listed or proposed for listing under the State and/or Federal Endangered Species Acts;
- State or Federal candidate for possible listing;
- Taxa which meet the criteria for listing, even if not currently included on any list, as described in Section 15380 of the California Environmental Quality Act Guidelines. (More information on CEQA is available at http://ceres.ca.gov/topic/env_law/ceqa/guidelines/;
- Taxa considered by the Department to be a Species of Special Concern (SSC);
- Taxa that are biologically rare, very restricted in distribution, declining throughout their range, or have a critical, vulnerable stage in their life cycle that warrants monitoring. There may be taxa that fall into this category but are not included on this list because their status has not been called to our attention;
- Populations in California that may be on the periphery of a taxon's range, but are threatened with extirpation in California;
- Taxa closely associated with a habitat that is declining in California at an alarming rate (e.g., wetlands, riparian, old growth forests, desert aquatic systems, native grasslands, vernal pools, etc.);
- Taxa designated as a special-status, sensitive, or declining species by other state or federal agencies, or non-governmental organization (NGO).

Biological Resources Table 4 identifies the special-status wildlife that were reported to occur, or potentially occur within ten miles of the proposed project area, based on surveys, and searches of the California Natural Diversity Database (CNDDB 2012).

Biological Resources Table 4
Special-status Wildlife Known to Occur
or Potentially Occurring in the HHSEGS Area

Common Name	*Scientific Name*	Status[1] State/Fed/BLM
Insects		
Death Valley Agabus diving Beetle	*Agabus rumppi*	C2/__/__
Death Valley June beetle	*Polyphylla erratica*	SC/__/__
Amargosa naucorid bug	*Pelocoris shoshone*	SC/__/__
Carole's silverspot	*Speyeria zerene carolae*	FE/__/__
Fish		
Amargosa pupfish	*Cyprinodon nevadensis amargosae*	CSC __/ S/__
Pahrump poolfish	*Empetrichthys latos latos*	/_ FE _/__
Amargosa Canyon speckled dace	*Rhinichthys osculus ssp. 1*	__/CSC/__
Reptiles		
Desert tortoise	*Gopherus agassizii*	ST/FT/__
Banded Gila monster	*Heloderma suspectum cinctum*	__/SC/S
Birds		
Purple martin	*Progne subis*	CSC/__/__

Prairie falcon	*Falco mexicanus*	WL/_/CSC
Northern Harrier	*Circus cyaneus*	__/CSC/__
Western Burrowing owl	*Athene cunicularia hypugaea*	CSC/FSC/__
Short-eared owl	*Asio flammeus*	CSC/__/__
Golden eagle	*Aquila chrysaetos*	FP/BCC/__
Northern harrier	*Circus cyaneus*	CSC /__/__
Vaux's swift	*Chaetura vauxi*	CSC/__/__
Western yellow-billed cuckoo	*Coccyzus americanus occidentialis*	FPE/SE/__
Prairie falcon	*Falco mexicanus*	WL//SC
Gray-headed junco	*Junco hyemalis caniceps*	WL/FSC/__
Loggerhead shrike	*Lanius ludovicianus*	CSC/FSC/__
Brown-crested flycatcher	*Myiarchus tyrannulus*	__/CSC/__
Phainopepla	*Phainopepla nitens*	__/__/
Hepatic tanager	*Piranga flava*	WL/__/__
Summer tanager	*Piranga rubra*	CSC/__/__
Vermilion flycatcher	*Pyrocephalus rubinus*	CSC/__/
Brewer's sparrow	*Spizella breweri*	__/BCC/__
Bendire's thrasher	*Toxostoma bendirei*	CSC/BCC/S
Crissal thrasher	*Toxostoma crissale*	CSC/BCC/__
Le Conte's thrasher	*Toxostoma lecontei*	WL/BCC/S
Virginia's warbler	*Vermivora virginiae*	WL/BCC/__
Least Bell's vireo	*Vireo bellii pusillus*	FE**/SE/__
Gray vireo	*Vireo vicinior*	CSC/BCC/S
Mammals		
Townsend's big-eared bat	*Corynorhinus townsendii*	CSC/__/S
Pallid bat	*Antrozous pallidus*	CSC/__/S
Long-legged myotis	*Myotis volans*	CSC/__/__
Mexican free-tailed bat	*Tadarida brasiliensis*	CSC/__/__
California myotis	*Myotis californicus*	__/__/__
Big brown bat	*Eptesicus fuscus*	__/__/__
Western pipistrelle=Parastrelle	*Parastrellus hesperus*	__/__/__
Western small-footed myotis	*Myotis ciliolabrum*	__/__/S
Amargosa vole	*Microtus californicus scirpensis*	FE/SE/_
Kingston Mountain chipmunk	*Neotamias panamintinus acrus*	__/__/S
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	__/__/S
American badger	*Taxidea taxus*	CSC/__/__
Kit fox	*Vulpes macrotis*	FM/__/__

Status Codes:

Federal: FE - Federally listed endangered: species in danger of extinction throughout a significant portion of its range
FT - Federally listed, threatened: species likely to become endangered within the foreseeable future
BCC: Fish and Wildlife Service: Birds of Conservation Concern: Identifies migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent highest conservation priorities <www.fws.gov/migratorybirds/reports/BCC2002.pdf>
**: USFWS Migratory non-game birds of management concern

State CSC = California Species of Special Concern. Species of concern to CDFG because of declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.
SE - State listed as endangered
ST = State listed as threatened

WL = State watch list
FM: Protected furbearing mammal

BLM: Sensitive: Bureau of Land Management

BLM Manual §6840 defines sensitive species as"…those species that are (1) under status review by the FWS/NMFS; or (2) whose numbers are declining so rapidly that Federal listing may become necessary, or (3) with typically small and widely dispersed populations; or (4) those inhabiting ecological refugia or other specialized or unique habitats." www.blm.gov/ca/pdfs/pa_pdfs/biology_pdfs/SensitiveAnimals.pdf

Special-status Plants

No state or federally listed plant species occur within the project area, but 11 special-status plant species were found onsite that have a California Rare Plant Rank (CRPR, formerly CNPS List) of 1B or 2. The ranks are assigned under a collaborative effort between CDFG, CNPS, and the Rare Plant Status Review groups.

Plants with a California Rare Plant Rank of 1B are rare throughout their range with the majority of them endemic to California. Most of the plants that are ranked 1B have declined significantly over the last century.

Except for being common beyond the boundaries of California, plants with a California Rare Plant Rank of 2 would have been ranked 1B. From the federal perspective, plants common in other states or countries are not eligible for consideration under the provisions of the Endangered Species Act. Until 1979, a similar policy was followed in California. However, after the passage of the Native Plant Protection Act in 1979, plants were considered for protection without regard to their distribution outside the state.

From the *Inventory of Rare and Endangered Plants of California* (CNPS 2012)

> "With California Rare Plant Rank 2, we recognize the importance of protecting the geographic range of widespread species. In this way we protect the diversity of our own state's flora and help maintain evolutionary processes and genetic diversity within species. All of the plants constituting California Rare Plant Rank 2 meet the definitions of Sec. 1901, Chapter 10 (Native Plant Protection Act) or Secs. 2062 and 2067 (California Endangered Species Act) of the California Department of Fish and Game Code, and are eligible for state listing. It is mandatory that they be fully considered during preparation of environmental documents relating to CEQA."

The applicant conducted extensive offsite surveys to determine if the special-status plants found onsite were more common than previously known; the area is generally under-surveyed and several species had only recently been added to the California Natural Diversity Database (CNDDB 2012) and the California Native Plant Society *Inventory of Rare and Endangered Plants of California* (CNPS 2012). The effort included surveys in the following areas: Pahrump Valley, Stewart Valley, Chicago Valley, California Valley, the Ash Meadows area, Shadow Valley (north and south of I-15), Mesquite Valley, Mesquite Mountains, southern Nopah Range, Kingston Wash, Silurian Valley, Salt Spring Hills, Dumont Dunes area, and the Shoshone- Tecopa area. Many additional previously undocumented occurrences were found of several species, particularly the Pahrump valley buckwheat; however, no or few new occurrences were found for most of the 11 species.

The status, distribution, range and habitat preferences of the special-status plant species found onsite are described below. The CNDDB Element Rank (formerly NatureServe rank) is also provided in the species accounts below. The CNDDB Element Rank is an index of extinction risk within the state based on an internationally recognized methodology (Master et al. 2009). The numeric rank reflects several factors of rarity, threats, and population trend, which are scored and weighted, and include: range & extent; area of occupancy; population size; number of occurrences; number of occurrences or percent area with good viability/ecological integrity; environmental specificity; long- and short-term trend; threats (severity, scope, impact, and timing); intrinsic vulnerability, and other considerations (*ibid.*).

The rank definitions are provided below, as summarized in CDFGs *Special Plants List* (CNDDB 2012b).

> **S1** = *Critically Imperiled* — Critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province;
>
> **S2** = *Imperiled* — Imperiled in the state because of rarity due to very restricted range, very few populations(often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province;
>
> **S3** = *Vulnerable* — Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation;
>
> **S4** = *Apparently Secure* — Uncommon but not rare; some cause for long-term concern due to declines or other factors;
>
> **S5** = *Secure* — Common, widespread, and abundant in the state.

CNDDB re-assessed and updated all the Element Ranks for each of the 11 species to reflect all new occurrence data, including new occurrences found by the applicant during the spring 2012 surveys.

Small-flowered androstephium (*Androstephium breviflorum)*

Small-flowered androstephium is a perennial herb (bulb) with a California distribution represented by over 100 occurrences in Riverside and San Bernardino counties. Due to the project's survey efforts, it is now also documented in Inyo County. It has been on the CNPS Inventory since 1974 and has a CRPR rank of 2, meaning it is rare, threatened, or endangered in California but more common outside California. It has a CNDDB Element Rank of S2S3, meaning the numeric rank is somewhere between an S2 and S3 rank (see definitions above).

Small-flowered androstephium also occurs in Arizona, Nevada, Utah, Wyoming, Colorado, and New Mexico. It blooms March to April in dry, loose sandy to rocky soils and on sand dunes and alluvial fans from about 700 to 4,800 feet elevation.

This species was mapped along the eastern half of the project site and in the 250-foot buffer along the California-Nevada border in Mojave Desert scrub habitat. The applicant also found new occurrences offsite in southern Pahrump Valley and California Valley. Many new occurrences have been found in recent years and the project area includes only a very small portion of its total distribution in California. Some occurrences are threatened by solar energy development (CNPS 2012).

During the spring 2012 offsite surveys suitable habitat was found and surveyed but no additional occurrences of small-flowered androstephium were found.

Nye milk-vetch (*Astragalus nyensis)*

Nye milk-vetch was not known to occur in California until it was discovered onsite during the project surveys. During the 2011 offsite surveys, additional new occurrences were found offsite in southern and central Pahrump Valley, and a single individual found in Stewart Valley. Four new occurrences were found in Nevada. Larger occurrences were found north and south of the site. A total of 19 occurrences are now documented in California, one of which occurs on the project site.

Nye milk-vetch was added to the CNPS Inventory in December 2011. It has a CNDDB Element Rank of S1 and a CRPR Rank of 1B.1. In Nevada, this annual species occurs in the foothills of desert mountains on calcareous outwash fans and gravelly flats, sometimes in sandy soils or alkaline soils from 1,500 to 5,600 feet elevation. According to the Nevada Natural Heritage Program (NNHP 2010a), there are documented occurrences of Nye milk-vetch in Nye, Clark, and Lincoln counties, Nevada. Nye milk-vetch also occurs in Utah. In the project area, it was mapped in Mojave Desert scrub along the eastern half of the project site in the 250-foot buffer paralleling the California-Nevada border, and at several locations along the transmission line corridor in Nevada that would serve the project.

During spring 2012 offsite surveys, no additional occurrences of Nye milk-vetch were found; however, the applicant noted precipitation was well below normal for the season.

Preuss' milk-vetch (*Astragalus preussii* var. *preussii)*

Preuss' milk-vetch is a perennial herb now known from seven occurrences in Inyo and San Bernardino counties, two of which occur on the project site. There are two additional historic collections, including one in Panamint Valley that has not been observed since 1937. Preuss' milk-vetch is a CRPR List 2.3; it was added to the CNPS Inventory in 1988. Prior to the project surveys, it was known in California from only three locations: the Mesquite Lake and Mesquite Valley areas in San Bernardino County, and northwest of Panamint Valley in Inyo County (CCH 2012).Seven individuals were mapped on the project site during 2011 surveys and two additional localities of Preuss' milk-vetch, each consisting of a few plants, were found onsite near the eastern site boundary during 2012 surveys.

During the 2011 offsite surveys, Preuss' milk-vetch was found in several new locations in Inyo County and along the transmission line corridor in Nevada. In addition, during spring 2012 offsite surveys, one new occurrences of Preuss' milk-vetch was mapped in Mesquite Valley, representing approximately 20,000 plants. A new, but considerably smaller occurrence was mapped in Pahrump Valley. Preuss' milk-vetch also occurs in Arizona and Utah (CNPS 2012).

Preuss' milk-vetch grows in openings in shadscale scrub or Mojave Desert scrub, often in clayey or silty soils, between 2,460 to 2,560 feet elevation. Based on observations of *Astragalus* spp. fruits on the windward side of shrubs, the inflated, papery fruits of some *Astragalus* species may likely be dispersed by wind and also moved in washes when they are flowing.

Gravel milk-vetch (*Astragalus sabulonum)*

Gravel milk-vetch is an annual to short-lived perennial herb that blooms February to June in the eastern Mojave and Sonoran Deserts. Its range in California is restricted to Imperial, Riverside, San Diego, and Inyo counties. No new occurrences were found in Nevada during the surveys of the transmission alignment. In Arizona, Nevada, New Mexico, Utah, and Sonora, Mexico it is reported to also grow as a perennial, and occur in different habitats (Silverman pers. comm. 2012); in California it grows as an annual. It is most often found on sandy sites from 200 to 3,050 feet elevation. Gravel milk-vetch was mapped in Mojave scrub habitat near the center of the project site and along the southeastern portion as well as the 250-foot buffer paralleling the California-Nevada border. Offsite, it was also found in southern Pahrump Valley.

Gravel milk-vetch has a CNDDB Element Rank of S2, and a CRPR Rank of 2.2. It did not have conservation status at the time that the 2011 HHSEGS site survey, the offsite surveys, and the transmission corridor surveys were conducted; consequently, there were no focused surveys for the species in the earlier surveys. It was detected because the surveys were floristic; all species were identified to a level necessary to detect new or rare species, if present. Gravel milk-vetch was added to the CNPS Inventory in October 2011. It is now documented in California from eight recent occurrences, including four on the project site and one extirpated occurrence in the Coachella Valley. There are 11 additional historic occurrences in Calexico, Blythe, the Salton Sea basin, and Coachella Valley that have not been observed within the last 20 years.

No additional occurrences of gravel milk-vetch were found during the spring 2012 offsite surveys.

Tidestrom's milk-vetch (*Astragalus tidestromii)*

Tidestrom's milk-vetch is a perennial herb that blooms April to July on gravelly limestone slopes from 1,968 to 5,200 feet elevation in the San Bernardino, Clark, Kingston, and Ivanpah mountains of San Bernardino County. It has also been found in sandy washes and sandy-silty substrates in valley bottoms in Mojave Desert scrub. Tidestrom's milk-vetch has a CNDDB Element Rank of S2, and a CRPR Rank of 2.2. It also occurs in the Spring Mountains and other locations in Nevada. On the project site, it occurs predominantly in Mojave Desert scrub on the eastern half of the project site and in the adjacent 250-foot buffer paralleling the California-Nevada border.

During the 2011 project surveys, several new occurrences were found in Inyo County and along Tecopa Road in the project's proposed transmission corridor in Nevada. The applicant reports that it can be locally common on roadsides and grows along unpaved, infrequently used roads. Offsite surveys in 2012 mapped approximately 10 new localities of Tidestrom's milk-vetch in Shadow Valley, the Mesquite Mountains, and other locations. It was also found in southern and central Pahrump Valley and California

Valley. It can be misidentified with *Astragalus layneae*; many of the UC Riverside specimens for Layne's milk-vetch were misidentified specimens of Tidestrom's milk-vetch (HHSEGS 2011a, Appendix 5-2G), to which it resembles but differs in several fruit characters. A specimen of *Astragalus layneae* collected in 1991 on Santa Rosa Flat in Inyo County by Mary DeDecker (UCR141695) was recently annotated to *Astragalus tidestromii* by the U.C. Riverside herbarium Director (Andrew Sanders) (Consortium of California Herbaria 2012). This occurrence is distant from others known in Inyo County, and it may constitute an additional new CNDDB occurrence.

It was added to the CNPS Inventory in January 2009 and now has 59 documented occurrences, including two on the project site, and eight historical occurrences that have not been observed in 20 years or more. It is reported to be threatened by solar energy development, mining, road maintenance, and non-native plants (CNPS 2012).

Wheeler's skeletonweed (*Chaetadelpha wheeleri*)

Wheeler's skeletonweed is a perennial herb with a California range represented by 28 documented occurrences in Inyo, Lassen, and Mono Counties, five of which occur on the project site. Seven additional historic collections are documented in Eureka Valley, the foothills of the White Mountains, and Benton and Chalfant valleys in Mono County. Wheeler's skeletonweed has a CRPR Rank of 2.2; it also occurs in Nevada and Oregon. It has a CNDDB Element Rank of S1S2, meaning the numeric rank calculated somewhere between an S1 and S2 rank (see rank definitions in the introduction to this subsection).

Wheeler's skeletonweed occurs in sandy soils on desert dunes, Mojave Desert scrub, and Great Basin scrub from 2,788 to 6,234 feet elevation. Seeds are of Aster family species are ordinarily dispersed intact with the fruiting body (cypsela). Wind dispersal is common (anemochory), assisted by a hairy pappus. Another common dispersal agent is epizoochory, in which the dispersal unit sticks to the fur or plumage of an animal by hooks or barbs.

Wheeler's skeletonweed was added to the CNPS Inventory in January 2001. Prior to the project surveys, it was known in California mainly from the Death Valley region, and the nearest known occurrence to the project site was approximately 50 miles north (CCH 2012).

During 2011 surveys, Wheeler's skeletonweed was found in sandy-gravelly soils in Mojave Desert scrub in the eastern portion of the site, and within the 250-foot buffer. Wheeler's skeletonweed was also found in several locations within the project's proposed offsite transmission line corridor. During offsite surveys conducted in 2011 for this project, Wheeler's skeletonweed was found in several additional new locations in southern Pahrump Valley. During offsite surveys in 2012, one new occurrence (represented by a single plant) was observed in the BLM Pahrump Valley Wilderness.

Purple-nerve spring parsley (*Cymopterus multinervatus)*

Purple-nerve spring-parsley is a perennial herb with 22 documented occurrences in Inyo and San Bernardino Counties, one of which occurs in the southeastern portion of the project site. There are also nine historic collections in and around Joshua Tree National

Park and the Mojave National Preserve. It was added to the CNPS inventory in November 2008. It is has a CRPR Rank of 2.2; this species also occurs in Nevada, Arizona, New Mexico, Utah, Texas, and Baja California. It has a CNDDB Element Rank of S2.

Purple-nerve spring-parsley blooms March to April in sandy or gravelly soils in Mojave Desert scrub and pinyon-juniper woodland from 2,067 to 5,906 feet elevation. Fruits of desert cymopterus are fairly large and do not seem well adapted for dispersal over long distances. Fruits generally seem to fall relatively close to the parent plant. However, the fruits have a marginal wing that may facilitate dispersal by wind (NatureServe 2010). A single individual was mapped in Mojave Desert scrub habitat near the northeastern corner of the proposed southern solar field. Prior to project surveys, the nearest known occurrence was about 25 miles south in the vicinity of Clark Mountain. No individuals of this species were observed within the 250-foot buffer but several additional new offsite occurrences were discovered during 2011 surveys in the Pahrump Valley in Inyo County, California, and in Nye County, Nevada.

During offsite surveys in 2012, reference sites for this species were checked, and no plants were observed. Suitable habitat for this species was surveyed in Shadow Valley and Pahrump Valley but no new occurrences were found.

Pahrump Valley buckwheat (*Eriogonum bifurcatum)*

Pahrump Valley buckwheat is abundant in the southern and western portion of the project site in shadscale scrub. Numerous individuals were found offsite in southern, central, and northern Pahrump Valley, Stewart Valley, and Chicago Valley during the 2011 offsite surveys.

Pahrump Valley buckwheat is a late summer/early fall blooming annual herb found in San Bernardino and Inyo Counties. This species also occurs in Nevada. It occurs in sandy soils in chenopod scrub vegetation from 2,296 to 2,657 feet elevation. The seeds of *Eriogonum* species are dispersed by wind, rain, streams, and animals (Stokes 1936). Due to their high oil content, the seeds float and are readily moved by sheet flow during heavy rains. Stokes (1936) also cites birds and vehicles as likely dispersal vectors, particularly for annual species of *Eriogonum*. Wind is an effective dispersal agent for many species of *Eriogonum*.

Pahrump Valley buckwheat is a BLM Sensitive species and a CRPR Rank 1B.2; it has a global distribution restricted to Pahrump, Stewart, Mesquite and Sandy valleys, but it is also locally abundant, and common near the project site. Population census information from Nevada (NNHP 2010a) report 18 occurrences in Nevada representing approximately 1,609 or more acres (*ibid.*). It has a CNDDB Element Rank of S3, reflecting its narrow range but local abundance (see the description below of new occurrences found during the 2012 surveys).

Pahrump Valley buckwheat was mapped during the October 2010 and October 2011 (late season) surveys and the spring 2011 survey within the site and in the 250-foot buffer. The offsite surveys in California and Nevada confirmed the existence of large populations of Pahrump Valley buckwheat in previously known locations and new locations in Stewart Valley, northern and southern Pahrump Valley, and Chicago Valley.

The Chicago Valley occurrence is on the west side of the Nopah Range and represents an extension of this species into a new watershed west of its previously known range.

During offsite surveys performed in 2012, 20 new occurrences of Pahrump Valley buckwheat, an annual species, representing approximately 7.3 million plants were mapped in Pahrump, Stewart, Chicago, California and Mesquite valleys. Some of the 54 new localities consist of very large populations with millions of individuals. The new occurrences found in California Valley are the first records for Pahrump Valley buckwheat from this valley. Large areas of potentially suitable habitat in the center of California Valley were not surveyed due to access limitations, and this species may also occur there.

During 2012 offsite surveys, one existing population, CNDDB Element Occurrence No. 9 could not be relocated and is believed to be a misidentification of a similar appearing buckwheat (*Eriogonum deflexum* var. *rectum)*.

Goodding's phacelia (*Phacelia pulchella* var. *gooddingii*)

Goodding's phacelia is an annual herb with 16 documented recent occurrences, one of which is on the project site, and three older historic occurrences. It has a CRPR Rank of 2.3 and a CNDDB Element Rank of S2. It occurs in Inyo and San Bernardino counties in California, and in Nevada, Arizona, and Utah. It inhabits clayey, often alkaline soils in Mojave Desert scrub from 2,624 to 3,281 feet elevation. Goodding's phacelia has been on the CNPS inventory since 1994. Prior to the project surveys, it was known in California only from Mesquite Valley and Salsberry Pass in the Amargosa Mountains, south of Death Valley.

Within the study area, Goodding's phacelia is widespread and abundant. It was observed in Mojave Desert scrub and shadscale scrub in silty to sandy-gravelly soil and on gravelly flats onsite and in the 250-foot buffer. Goodding's phacelia was also found in a number of locations along the transmission line corridor in Nevada that would service the project, and at several additional new offsite locations in California in central Pahrump Valley, Stewart Valley, Chicago Valley, and California Valley. No new occurrences were found during the 2012 surveys.

Desert Wing-Fruit (*Acleisanthes nevadensis*)

Desert wing-fruit is a perennial herb that was previously known in California from a single location in Mesquite Valley near the California-Nevada border in Inyo County. Desert wing-fruit has a CRPR Rank of 2.2; it also occurs in Nevada, Arizona, and Utah. It blooms June to September and occurs in typically rocky soils in Mojave Desert scrub and Joshua tree woodland habitats from 3,805 to 4,100 feet elevation. It has been on the CNPS Inventory since 1984. Note that "*Selinocarpus*" (the former name) was recently changed to *Acleisanthes;* the name *Selinocarpus* still appears in some databases.

Seven new occurrences were found in California during the surveys of the project site, one of which occurs in the southwestern portion of the project site in both shadscale scrub and Mojave Desert scrub habitats. No individuals of this species were observed in the 250-foot buffer but several new occurrences were found along the proposed transmission line corridor in Nevada that would serve the project. During offsite surveys conducted in 2011, desert wing-fruit was found in several new locations in southern and central Pahrump Valley in Inyo County, and along Excelsior Mine Road in San Bernardino County. Five new occurrences were found offsite in 2012.

Torrey's joint-fir (*Ephedra torreyana*)

Torrey's joint-fir is an evergreen shrub that grows from Texas south to Chihuahua, Mexico, and as far west as California's Great Basin Desert (NatureServe 2011). It was not known to occur in California until it was found in Inyo County in the silty soils northwest of the project in May of 2011. It was added to the CNPS inventory on February 8, 2012. It has a CRPR Rank of 2.1, and a CNDDB Element Rank of S1. Torrey's joint-fir is also found in Arizona, Colorado, Nevada, New Mexico, Texas and Utah, and is not ranked in any of those states (NatureServe 2012).

Five occurrences of Torrey's joint-fir were recorded in California on BLM lands along the California-Nevada border during the project surveys in 2011. A total of seven new occurrences of Torrey's joint-fir were mapped in 2012, including occurrences onsite in the southwest quarter of the site, near the eastern boundary, and offsite in Pahrump Valley. Suitable habitat in Stewart Valley, Mesquite Valley, Chicago Valley, California Valley and the Amargosa Valley/Ash Meadows areas were surveyed in spring 2012 but no new occurrences were found.

E*phedra* with dry, winged cone bracts are dispersed by wind (*E. torreyana* and *E. trifurca*); those with small, dry cone bracts and large seeds are dispersed by seed-caching rodents (e.g., *E. viridis* and *E. californica*) (Hollander, Wall & Baguley 2009).

Groundwater-dependent Ecosystems

Groundwater-dependent ecosystems (GDEs) are an important component of biological diversity in a desert region. Because they are rare or limited in distribution, they often support rare or special-status plants and animals. All GDEs depend upon groundwater for all or part of their survival. Characteristic GDEs include playa margin habitats, such as alkali sink scrubs and some saltbush scrubs, seeps and springs, spring pools, mesquite woodlands, riparian or "microphyll" woodlands, desert wash scrubs dominated by phreatophytes, palm oases, alkali meadows, and spring mounds.

GDEs are dominated or defined by "phreatophytes". Phreatophytes have deep roots that extend down to, and extract water from a periodically stable water supply, including the capillary fringe, *i.e.*, the zone just above the water table that is not completely saturated, where water is lifted up by capillary action, or surface tension (Brown et al 2007). Even though the groundwater may never be visible at the ground surface, as it is in a wetland or spring, phreatophytic ecosystems can still be groundwater-dependent (Naumberg et al 2005).

The use of groundwater may not be year-round by phreatophytes. In these instances, other water sources are used during the rainy season but groundwater is used in the dry season (Froend & Loomes 2004). In the project vicinity, for example, phreatophytes may utilize precipitation, stormwater runoff, or temporary ponding during storm events, but use and depend on groundwater the remainder of the year.

No GDEs occur on the project site, with the exception of a few widely scatted honey mesquite shrubs. The applicant documented approximately 4,000 acres of mesquite-dominant habitats *offsite* within an approximate five-mile radius of the project (CH2 2011g, Figure DR48-1; **Biological Resources Figure 1**). All of these occur in Nevada with the exception of a small area of mesquite and the non-native salt cedar along Stump Springs Wash in California. The nearest mesquite woodlands in California are located approximately 13 to 20 miles west of the project in the Tecopa area.

Other known phreatophytes documented to occur in the project vicinity during the surveys of the one-mile buffer include four-wing saltbush (*Atriplex canescens*), a common associate of the mesquite in the dune areas; allscale (*A. polycarpa*); bush seep-weed (*Suaeda moquinii*); desert baccharis (*Baccharis sergiloides*), and alkali goldenbush (*Isocoma acradenia*). With the exception of the mesquite, these are "facultative" phreatophytes.

Obligate versus Facultative Phreatophytes

Desert phreatophytes are a complex group of species with varied adaptive mechanisms to tolerate or avoid drought. They should not be considered simply as a group of species that avoid desert water stress by utilizing deep ground water unavailable to other desert species (Nilsen et al 1984). There are two types of phreatophytes:

1) *Obligate phreatophytes* are deep rooted plants that only inhabit areas where they can access groundwater, via the capillary fringe, to satisfy at least some proportion of their environmental water requirement. Access to groundwater is critically important to their presence in a landscape. Mesquite are facultative phreatophytes in regions of higher rainfall (Arizona, New Mexico, etc.) but in California and Nevada they are considered obligate phreatophytes.

2) Facultative phreatophytes are deep rooted plant species that tap into groundwater, via the capillary fringe, to satisfy at least some portion of their environmental water requirement, but will also inhabit areas where their water requirements can be met by soil moisture reserves alone. That is, the species will be groundwater dependent in some environments, but not in others.

Characteristics of the Groundwater Basin that Supports the GDEs

The groundwater resources of the project area are located within the Pahrump Valley groundwater basin, one of several smaller basins that overlie the deeper and more laterally extensive regional aquifer known as the Death Valley Regional Flow System (DVRFS). Groundwater flow in the DVRFS is composed of several interconnected, complex groundwater flow systems (Belcher & Sweetkind 2010); groundwater flow occurs in relatively shallow and localized flow paths (herein referred to as the "local aquifer" or "local basin") underlain by the deeper, regional flow paths (the "regional aquifer"). Regional groundwater flow is predominantly through a thick Paleozoic carbonate rock sequence (also referred to as the *carbonate aquifer*). The regional aquifer sustains numerous springs, primarily in adjacent basins, such as the Amargosa Valley to the west, that are home to many threatened and endangered species.

Pahrump Valley is a topographically closed bi-state basin bounded by the Spring Mountains, Nopah ranges, and the Kingston Range). The 650 square mile basin is filled with alluvium to a depth of about 2,000 feet. Groundwater associated with the Pahrump Valley basin-fill aquifer – the aquifer from which the project will pump groundwater -- supports a 9,000-acre system of groundwater-dependent mesquite woodlands, seasonal and permanent seeps and springs.

The aquifers are affected by complex geologic structures from faulting and fracturing that can enhance or impede flow (*ibid.*). The DVRFS regional groundwater flow system includes several large valleys that contain playas that act as catchments for surface water runoff. Some of the playas (former Pleistocene lakes) have been deformed by Quaternary faulting and contain springs where groundwater is forced to the surface by juxtaposed lake and basin-fill deposits (Belcher & Sweetkind 2010).

In the project area, the “Stateline Fault”, also known as the “Pahrump-Stewart Valley Fault Zone” runs parallel to the California-Nevada state line and appears to divide the Pahrump Valley into two groundwater sub-basins (see **WATER SUPPLY Figure 2**). In the northwest, limited water levels measured in basin-fill aquifer wells suggest that the fault zone does not impede groundwater flow through that portion of the valley (Comartin, 2010). In the southwest, where the project site is located, the fault may impede groundwater flow from the Spring Mountains west across the fault into the project area. However, it is likely that the fault represents a partial barrier to flow; not a complete barrier (belcher pers. comm.).

The mesquite woodlands and coppice dunes east of the project are arranged linearly along or within the fault zone; no mesquite habitats are located west of the fault, with the exception of a few small stands around Pahrump Playa and along a few of the dry washes that intercept the dunes and extend west toward or into the project area.

The basin-fill aquifer is the primary groundwater supply and the sole source of water for Pahrump Valley; very few wells tap the deeper, regional aquifer (HHSEGS 2011a, Appendix 5.15D). Approximately 10,000 groundwater wells in Pahrump Valley pump from the basin-fill aquifer (Comartin 2010).

Seeps and Springs

Seven active or recently active springs are documented to occur within five miles of the project area: Brown’s Spring, Monica Spring, Cottonwood Spring, Mound Spring, Hidden Hills Ranch Spring, Stump Spring, and a fifth unnamed spring (USGS 2012; Malmberg 1967; Harrill 1986; Poff pers. comm. 2012). Manse Spring and several other large and small springs occur just beyond the five-mile radius study area. Malmberg (1967), Harrill (1986), and others indicate that most or all of these springs ceased to flow as a result of heavy groundwater pumping during the last century.

BLM reports that Stump Spring is discharging and supports three shallow, seasonal pools that range between 30 and 70 feet long, and one to two feet deep (Poff pers. comm.). BLM Southern Nevada District hydrologist conducted a reconnaissance-level survey in May 2012 to determine if there were any additional active seeps or springs that could potentially be affected by the project pumping. BLM found that three active *seasonal* seeps within an approximate five-mile radius of the project. Two of these supported healthy wetland-riparian vegetation; the third spring appears to have at least minor intermittent flow that was significantly greater historically. Other sites were suspected to contain seeps or springs, based on aerial photo signatures or documented historic spring sites, but were not ground-truthed or re-visited because they occur on private land (Poff 2012).

Geographic Scope of the Analysis

Groundwater in the local Pahrump Valley basin aquifer is recharged from the Spring Mountains, located 13 miles east in Nevada. Groundwater in Pahrump Valley that is not discharged in the valley (e.g., through springs or playas) is believed to flow southwest through the Nopah Mountains into basins at lower elevations (HHSEGS 2011a, Appendix 5.15D; Belcher & Sweetkind 2010).

The focus of staff's groundwater analysis is the basin-fill aquifer from which the project will pump groundwater for mirror-washing, boiler make-up, and construction needs, and the cone of depression (drawdown zone) surrounding the project wells (see the **Water Supply** section of the FSA). The hydraulic connections and effects of groundwater pumping on flow paths between Pahrump Valley, the Amargosa River, and more distant springs supported by discharge from the deeper, more laterally extensive carbonate aquifer (or regional aquifer) are not well understood. Although the applicant has stated that project pumping will not affect the Amargosa River or the groundwater-dependent resources of area springs (CH2 2011f, DR-82), the applicant's groundwater assessment acknowledges that the hydrogeology of the Pahrump Valley groundwater basin is complex and the project site's connectivity to the larger basin is not fully understood (HHSEGS 2011a). The groundwater assessment adds that the project's use of groundwater may result in offsite impacts on existing domestic pumpers south of the project site and potentially throughout the larger groundwater basin (HHSEGS 2011a, Section 5.15). Therefore, the geographic scope of this analysis also includes a discussion of more distant groundwater-dependent species and habitats connected to or supported by the larger, regional groundwater basin (DVRFS). Water Resources staff analysis of impacts to local groundwater resources, and the Amargosa River, located 20 miles west, is contained in the **Water Supply** section of this FSA.

Local Groundwater-dependent Ecosystems - Stump Spring ACEC, Unnamed Seasonal Springs, and Associated Mesquite Habitats

This subsection describes the groundwater-dependent resources documented to occur within the cone of depression identified by staff in its independent analysis of the project's pump test data (see the Water Supply section of the FSA). Springs, mesquite habitats, and other GDEs associated with the broader or more laterally extensive regional aquifer, or beyond the five to seven mile radius of the project, are discussed under "Regional Groundwater Resources", following this subsection.

The "Pahrump-Stewart Valley Fault Zone, or Stateline Fault zone, which runs along the eastern project boundary at the California-Nevada state line, supports a broad but discontinuous zone of groundwater-dependent habitats that extend north to Pahrump, south toward the Kingston Range, east to the medial position of the Spring Mountains alluvial fan, and west to the California-Nevada state line. Over 4,000 acres of groundwater-dependent mesquite habitats occur within the five mile study area (CH2

2011g, Figure DR48-1; **Biological Resources Figure 1**). These occur in two forms: shrubby mesquite thickets on coppice dunes, and taller, lush and dense mesquite woodlands up to 15 feet in height along the deeply incised washes. The position of the wash thalweg 10 or 20 feet below the base of the dunes, in some examples, may afford these habitats better access to groundwater and account for their taller habit; the ephemeral hydrology of the washes is not adequate to support the mesquite, which require year-round access to either groundwater or soil moisture. The coppice dunes and associated shrubby mesquite habitats occur in very close proximity to the project boundary, as little as 600 feet from the project boundary and less than a mile from the proposed project pumping wells.

Groundwater-dependent vegetation was not found around the playa perimeter with the exception of a few widely scattered, very small stands of mesquite and bush seepweed scrubs located approximately 5 to 7 miles from the project site.

The depth to the groundwater table is unknown except at a few widely scattered well sites across the southern portion of the valley. No previous studies have been conducted in the mesquite habitats east of the project; nor has the applicant provided any direct evidence of the depth to groundwater at these sites. The project pump tests were located in dry desert scrubs on the west side of the fault zone and thus provide no reliable data on groundwater elevations at the GDEs. The Stump Spring monitoring well is located approximately one mile from the site of the spring and may not represent the groundwater elevation at the spring, in the washes, or along the coppice dunes of mesquite associated with the fault zone. Because of the geologic and hydrogeologic complexity of the area and because of the historic groundwater decline in the northern portion of the valley (i.e., near the northern portion of the project), it is likely that the depth the groundwater may be quite variable. Thus, the position of the groundwater table relative to the effective rooting depth of the mesquite can *only* be determined through groundwater monitoring and/or examination of soil cores excavated at the GDEs.

At least four active seeps and springs also occur within five to seven miles of the project (Stump Spring and three unnamed seeps). All occur within the fault zone, or east of the fault zone, in Nevada. Stump Spring, one of the four active springs within the study area, is located south of Tecopa Road approximately two and a half miles east of the project's southeastern corner, and is contained within a BLM Area of Critical Environmental Concern (ACEC) of the same name. Stump Spring is described as having "significant wildlife value" and was designated as a conservation priority in the BLM-Clark County Mesquite-Acacia Conservation Management Strategy (CMS) for the Clark County Multiple Species Habitat Conservation Plan (MSHCP) (Crampton et al. 2006). Stump Spring supports several seasonal pools along the largest wash that provide critical open water habitat during a period that persists from December to July in normal rainfall years.

The proximity of these seeps and springs to the mesquite habitats significantly increases the value of the mesquite to wildlife; however, even in the absence of surface water, mesquite have exceptional value to wildlife (Beedy pers. comm.; Crampton et el. 2006). Many special-status wildlife species have moderate to strong associations with mesquite (Crampton et al. 2006); some of which have been observed in the project vicinity and others that have potential to use these significant desert resources, at least seasonally. Common and special-status wildlife associated with mesquite habitats in southern Nevada (Crampton et al. 2006) are discussed in detail below.

Mesquite Value to Wildlife

Mesquite woodlands have exceptional ecological importance in an arid region otherwise lacking a tree-dominated habitat, providing nesting opportunities for many bird species and other structural elements of food, cover, nesting and breeding habitat that are quite distinct from the surrounding uplands of sparse, dry desert scrubs. The dense, shrubby mesquite on the dunes just east of the project also provide cover, food sources, and other habitat values that are quite distinct from the surrounding sparse desert scrub, and distinct from the taller mesquite woodlands that occur along the washes.

The stabilized dunes provide ideal sites for burrowing fauna due to the lack of stones, abundant coarse material, and shade provided by the shrubs (Huang et al. 2011). Bioturbation by burrowing animals is extensive at the base of the mesquite on coppice dunes, but the lush, dense, and taller woodlands along the area washes may be more valuable to avian species requiring taller trees of a larger stem diameter.

Mesquite and acacia woodlands occupy less than one percent of the land area in Clark, southern Nye, and southern Lincoln counties, yet these habitats support a disproportionately greater number of wildlife species than the surrounding desert scrub (Crampton et al. 2006). At least 30 common and special-status species of birds have been found breeding in southern Nevada mesquite habitats, including several Clark County MSHCP covered and evaluation species (*ibid.*) and BLM Sensitive species. Among these species, phainopeplas are the most dependent on mesquite; their diet consists almost exclusively of the berries of desert mistletoe which only grows on mesquites and acacias.

The butterflies Western Great Purple Hairstreak(*Atlides halesus*) and Western Palmer's Metalmark (*Apodemia palmeri*)] and several species of bees (*e.g*. *Perdita ashmeadi simulans* and *Perdita dificilis*) are specialists on the nectar of mesquite or its mistletoe and/or use these plants as larval host plants (Crampton et al. 2006). A rare, Inyo County-endemic wasp (*Bembix inyoensis*), known from only two other sites in Death Valley and Panamint Valley, occurs on habitat (stabilized mesquite dune scrubs) identical to that found just off the project's eastern boundary and is "highly likely to occur there" according to the species' author (Kimsey pers. comm.; Kimsey & Kimsey 1981; Kimsey, Kimsey & Toft 1981). Ant abundance and species richness tend to be greater in mesquite-dominated sites, and mesquite dunes also harbor more rare ant species than inter-dune areas. Termites are also more abundant in mesquite dunes (Crampton et al. 2006). These habitats may also support additional species with restricted habitat requirements such as LeConte's thrasher, desert kangaroo rat, and desert pocket mouse (CEC 2011w).

Mesquite habitats also provide important breeding, foraging, and protection for a wide variety of common wildlife species. The fruit of honey mesquite is valuable forage for wildlife; it is quite predictable, even in drought years, providing an abundant and nutritious food source annually for numerous wildlife species such as kangaroo rats, mice, ground squirrels, quail, black-tailed jackrabbit, mule deer, and others (Steinberg 2001).

More than 40 plant and animal species have been identified as being associated with, or dependent on mesquite and/or acacia habitats in southern Nevada for foraging, breeding, resting, and refuge (Crampton et al. 2006). **Biological Resources Table 5**, below, lists wildlife described in the Mesquite-Acacia Conservation Management Plan as having a moderate to strong affinity to (and in some cases dependence on) mesquite. Systematic surveys of the mesquite habitats for the species listed below were not conducted; however, some species below were incidentally observed during the project surveys for other special-status species (HHSEGS 2011a); others have potential to occur based on the presence of suitable habitat. Desert tortoises have also been observed using the mesquite dune scrub habitat adjacent to the project (Poff pers. comm.).

Biological Resources Table 5
Wildlife Species with a Moderate-to-Strong Association with Mesquite in Southern Nevada (Crampton et al. 2006)[1]

Common Name (Scientific name)	Species Population Trend[2]	Status[3] Fed/State/Other
Species with Strong Association with Mesquite		
Birds		
Ash-throated flycatcher(*Myiarchus cinerascens*)	Stable in Nevada, Mojave	__/__/NV PIF
Bendire's thrasher(*Toxostoma bendirei*)	Declining in US range	__/__/ CC Evaluation Species.
Black-tailed gnatcatcher (*Polioptila melanura*)	Nearly significant decline in US range	__/__/__
Crissal's thrasher (*Toxostoma crissale*)	Not known; possible decline in western US	__/__/BLM
Phainopepla (*Phainopepla nitens*)	Declining in Mojave, western US	__/__/BLM/ CC Covered Species
Verdin (*Auriparus flaviceps*)	Declining in US range	__/__/__
Abert's towhee (*Pipilo abertii*)	Endemic to the desert southwest	__/__/__
Vermillion flycatcher (*Pyrocephalus rubinus*	US range stable	__/__/__ CC Covered Species
Lucy's warbler (*Vermivora luciae*)	Stable across range but declining locally	__/__/BLM Sensitive/ NV PIF
Insects (Butterflies)		
Western great purple hairstreak (*Atlides halesus*)	Host plant, nectar	__/__/__
Leda hairstreak (*Ministrymon leda*)	Host plant, nectar	__/__/__
Western Palmer's hairstreak (*Apodemia palmeri*)	Host plant, nectar	__/__/__
Insects (Bees)		

Common Name (Scientific name)	Species Population Trend[2]	Status[3] Fed/State/Other
Perdita spp.(12 species)	Pollen specialist	__/__/__
Colletes algarobiae	Pollen specialist	__/__/__
Hyaleus sejunctus	Pollen specialist	__/__/__
Megachile odontostoma	Pollen specialist	__/__/__
Ashmeadiella prospidis	Pollen specialist	__/__/__
Bembix inyoensis	Mesquite dune scrubs	Rare Inyo Co. endemic[4]
Species with Moderately Strong Association with Mesquite		
Arizona Bell's vireo (*Vireo bellii arizonae*)	Declining throughout US range	__/__/__ CC Covered Species
Black-throated sparrow (*Amphispiza bilineata*)	Significant decline in US range	__/__/__
Ladder-backed woodpecker (*Picoides scolaris*)	Declining in US, including the western US	__/__/__
LeConte's thrasher (*Toxostoma lecontei*)	Declining in the Sonora & Mojave Deserts	__/__/BLM Sensitive
Ladder-backed woodpecker (*Picoides scolaris*)	Declining in US, including the western US	__/__/__
Summer tanager (*Piranga rubra*)	Increasing in the US	__/__/__ CC Covered Species
Verdin (*Auriparus flaviceps*)	Declining in US	__/__/__
Long-eared owl (*Asio otus*)	Stable to declining	__/__/BLM Sensitive
Western screech owl (*Otus kennicottii*)	Not known (stable or declining)	__/__/BLM Watch
Western bluebird (*Stalia mexicana*)	Significant decline in western US	__/__/NEV PIF
Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*)	Not known	__/__/BLM Sensitive CC Evaluation Species NV Div. Wildlife
California leaf-nosed bat (*Macrotus californicus*)	Not known	__/__/BLM Sensitive NV Div. Wildlife

[1] Cramton, L., Krueger, J. and D. Murphy. 2006. *Conservation Management Strategy for Mesquite and Acacia Woodlands in Clark County, Nevada*. Bureau of Land Management, Las Vegas Field Office. March 2006. Information on rarity of *Bembix inyoensis* provided by Lynn Kimsey, UCD Entomology Department (Kimsey pers. comm. 2012)
[2] Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2011. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2010*. Version 12.07.2011 USGS Patuxent Wildlife Research Center, Laurel, MD
[3] BLM = BLM Sensitive; CC = Covered or Evaluation species under Clark County MSHCP; NV PIF = Nevada partners in Flight
[4] Information on rarity of *Bembix inyoensis* provided by Lynn Kimsey, UCD Entomology Department (Kimsey pers. comm. 2012)

Cultural Significance of the Mesquite

Mesquite habitats have significant cultural importance (UMICH 2012). The seeds of all three species were ground by indigenous people into a meal that was baked into cakes, and the honey from nectar produced by the plants was also an important staple. The bark and leaves have a variety of medicinal uses. The wood was used for structures, carving and fuel, and the leaves and seeds are important livestock and wildlife forage. The significance of the Stump Spring cultural resources are discussed in the Cultural Resources section of this FSA and in a May 18, 2012 submittal by the applicant on the area paleobotanical resources (CH2 2012ii).

Potential for Ancient Mesquite Clones

The applicant's paleo botanical consultant speculated that the mesquite associated with the dunes may be clones of great antiquity; as much several thousand years old, assuming the mesquite pre-date the dunes (CH2 2012ii)

The coppice dunes are estimated to have developed along the fault zone as the Pleistocene lake retreated, and the exposed sands, and sands eroded from the sparsely vegetated hill slopes that developed under the new arid climate accumulated around the mesquite associated with the fault-induced springs (Brady pers. comm. 2012). Mesquite are adapted to sand burial by forming new roots and shoots from buried branches that continue to grow as the sand accumulates around them. The development of coppice dunes may have fostered the development of mesquite clones, or off-shoots from a single parent that are genetically identically and connected to the older, original, and now dead parent plant at the base of the dunes, but this has not been established by DNA testing or radiocarbon analysis. Given that mesquite seedlings are very unlikely to germinate in sand dunes (Keeler-Wolf pers. comm. 2012), and layer readily in sand, which allows them to continue vegetatively without successful seedling recruitment, it is possible, or likely, that the mesquite pre-date the dunes (*ibid.*), which are estimated in the paleo resource report to be several thousand years old or older. In similar settings (coppice dunes), creosote clones reach ages of several thousand years (McAuliffe et al. 2007).

Regional Groundwater Resources - Amargosa Wild and Scenic River and the Amargosa Area of Critical Environmental Concern

This section describes, briefly, resources that occur beyond the cone of depression, or potential drawdown area estimated by staff in **Water Supply Figures 19** and **20** but are believed to be supported by the deeper, regional flow paths (the "regional aquifer") that underlie the basin-fill aquifer (shallow aquifer) from which the project will pump groundwater.

The Amargosa Area of Critical Environmental Concern (ACEC) covers approximately 21,552 acres of BLM-managed public lands on the Amargosa River in southeastern Inyo County, and is managed pursuant to an Implementation Plan (BLM 2007) and the BLM's NEMO plan (BLM 2001; BLM 2002). The ACEC is composed of three distinct geographic units. The 15,964 acre Central Amargosa Unit includes the Amargosa Canyon, Grimshaw Lake Natural Areas, and lands in China Ranch Wash and the Tecopa area. The Central Amargosa Unit is located approximately 20 miles west of the project site. A spring-fed tributary to the Amargosa River occurs in California Valley approximately 11 miles southwest of the project site.

Twenty-six miles of the Amargosa River, from Shoshone to State Dumont Dunes, is a federally designated Wild and Scenic River. Designation of a river puts certain constraints on development. These constraints prohibit activities and uses that may adversely affect the potential suitability of the river segment at the recommended level of protection (wild, scenic or recreational).

The Amargosa River is believed to be wholly supported by groundwater discharge in the form of seeps and springs. The tributary to the Amargosa River located in California

Valley 11 miles west of the project is also assumed to be supported by groundwater. The river begins near Beatty, Nevada, and terminates in Death Valley National Park at Bad Water.

The region has exceptional ecological values, as year-round water flow on some spring-supported reaches feeds wetlands and riparian habitat that support wildlife species unable to exist in a typical arid desert setting. The Amargosa is a unique aquatic system; most of its course is underground. Where it surfaces it supports ecologically rich oases such as Ash Meadows and the Oasis Valley in Nevada, and Tecopa, Shoshone and the Amargosa Canyon in California. As a result of their isolation, each oasis contains species and natural communities that exist nowhere else on earth:

- Seven listed species, five species of special concern and three BLM sensitive species reside in habitat created by waters from the Amargosa;
- A lush riparian zone is located along the Amargosa River that supports federally listed species such as the southwestern willow flycatcher (*Empidonax traillii extimus*)and least Bell's vireo(*V. bellii pusillus*), as well as numerous avian species listed by the CDFG as Species of Special Concern;
- The yellow-billed cuckoo, a federal candidate for listing has been found within the riparian areas of Amargosa Canyon;
- Other emergent wetland habitats adjacent to the river in the Tecopa Hot Springs area support the endemic Amargosa vole (*Microtus californicus scirpensis*). Critical habitat for this subspecies of the California vole has been established within the Grimshaw Basin and northern end of the Amargosa Canyon;
- Unique, alkali flats (at lower Carson Slough) located about five miles northeast of Death Valley Junction support populations of the federally endangered Amargosa niterwort (*Nitrophila mohavensis*). This species has also been found on similar habitats in the Tecopa Hot Springs area in Grimshaw Basin. The lower Carson Slough is located in an area that receives surface and subsurface flows from springs in Ash Meadows, Nevada. The slough serves as the point where surface and subsurface flows from Ash Meadows, and flows from the main Amargosa River come together. Wet salt grass meadows located in the lower Carson Slough also support populations of the federally endangered Ash Meadows gumplant (*Grindelia fraxinipratensis*), and possibly populations of the federally threatened spring-loving centaury (*Centaurium namaphilum*);
- Other groundwater-dependent species, listed by the BLM as sensitive, include populations of the Amargosa River speckled dace (*Rhinichthys osculus* ssp. 1) and the Amargosa pupfish (*Cyprinodon nevadensis amargosae*) in the Amargosa Canyon. Populations of Tecopa bird's beak (*Cordylanthus tecopensis*) have been found in the Grimshaw Basin and at Lower Carson Slough;

Additional groundwater-dependent resources are found at China Ranch Spring, Resting Spring, and Willow Spring in the Tecopa area, located between 13 and 20 miles west of the project in California. They support exceptional stands of mesquite and a variety of special-status species.

In California, all mesquite habitats are considered rare and sensitive natural communities (Sawyer et al. 2009; CDFG 2003); they are also rare in Nevada (Crampton et al. 2006).

Desert Washes

The project is located in the Pahrump Hydrologic Unit, a 140,196-acre watershed in Pahrump Valley. Waters on the project site drain the alluvial fan on the western flank of the Spring Mountain in Nevada, approximately 13 miles east of the project site. The watershed is a closed basin (i.e., it has no outlet); the receiving basin for the project waters and all other surface runoff in the watershed is the Pahrump Playa located approximately three miles northwest of the project site. It is a “dry playa” meaning groundwater is not shallow; however, the playa (and the washes that normally terminate before reaching the playa) periodically flood during larger storm events.

Regulatory Setting

The U.S. Army Corps of Engineers (USACE), the CDFG, and the Regional Water Quality Control Board have a shared, and somewhat overlapping, regulatory responsibility for the protection of surface waters. Desert washes have more limited protection under Section 404 of the Federal Clean Water Act, where the lateral limit of jurisdiction under Section 404 of the Clean Water Act ends at the *ordinary high water mark* (OHWM) of the stream. Waters of the State are defined by and regulated under the Porter-Cologne Water Quality Control Act. In addition, some Waters of the State are regulated under California Fish and Game Code (FGC), Sections 1600-1616 and implemented by CDFG through its Lake and Streambed Alteration (LSA) Program.

Porter-Cologne was the authorizing legislation for the Water Quality Control Act (California Water Code Division 7, Water Quality Act). The Porter-Cologne Water Quality Control Act regulates discharges of waste and fill material to Waters of the State including "isolated" waters and wetlands; thus, features delineated as “non-jurisdictional” Waters of the U.S. may be subject to regulation by the Regional Water Quality Control Board (RWQCB) under the Porter-Cologne Water Quality Act. Waters of the State defined in Porter-Cologne (Section 13050(e)) include “any surface water or ground water, including saline waters, within the boundaries of the state.” Water quality issues are addressed in the Clean Water Act Section 401 Water Quality Certification and would apply for placement of fill in any non-federal waters regardless of size or properties of the drainage (see **Water Resources** section of this FSA).

Water quality issues for Waters of the U.S. will be addressed in the Clean Water Act Section 401 Water Quality Certification; the RWQCB will coordinate with the Energy Commission to address placement of fill in any non-federal waters regardless of size or properties of the drainage (see Water Resources section of this FSA).

California Fish and Game Code Policy and Practice

Fish and wildlife resources are held in trust for the people of the state by and through the CDFG (Fish and Game Code Section 711.7). CDFG is responsible for conserving, protecting, and managing fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of these species (Fish and Game Code Section 1802).

Fish and Game Code Chapter 6, Fish and Wildlife Protection and Conservation, Section 1600 *et seq* was enacted to provide for the conservation of fish and wildlife resources associated with stream ecosystems. The Fish and Game Code further defines fish and wildlife to include: "...*all wild animals, birds, plants, fish, amphibians, invertebrates, reptiles, and related ecological communities, including the habitat upon which they depend for continued viability."* (Fish and Game Code Division 5, Chapter 1, section 45, and Division 2, Chapter 1, section 711.2(a), respectively). "*Fish means wild fish, mollusks, crustaceans, invertebrates, or amphibians, including any part, spawn or ova thereof."* (FGC, Division 5, Chapter 1, section 45).

While Fish and Game Code sections 1600 e*t seq*. do not include a definition for "stream", it has been the practice of the Lake and Stream Bed Program to define a stream as: a body of water that flows perennially, intermittently, or ephemerally. Streams include a channel, banks, bed, and floodplains where present (Vyverberg pers. comm.).

Fish and Game Code jurisdiction is not predicated on: the size of a stream; the morphology of a stream or how well-defined the banks area; the cross-sectional area occupied by particular flow events; the time period between flow events; nor the consistency of flow (Vyverberg 2010b). Streams that are afforded protection under FGC Section 1600 et seq are those bodies of water associated with a local biological community, or that contribute to the chemical, physical, or biological integrity of downstream waters or ecosystems. Whether flow is ephemeral, intermittent or perennial, streams, their sources (e.g., swales, springs, ponds, lakes, marshes, wetlands, or other such features), floodplains, and associated ecosystems (i.e., the living flora and fauna, and physical processes that sustain their habitats) are all considered integral parts of a stream system and are extended protection accordingly.

Waters of the U.S. Delineated on the Project Site

Sixty-nine ephemeral streams totaling 13.92 acres were documented in the Jurisdictional Delineation Report for Waters of the U.S. (HHSEGS 2011a, Appendix 5-2E) based on federal delineation guidelines (USACE 2008). A total of six of the 69 features are blue line streams as depicted on the USGS topographic maps of the project area. However, in a December 14, 2011 correspondence from the USACE Ventura Regulatory Field Office, the Corps determined that only two of the 69 features were subject to USACE jurisdiction (URS 2012b). The applicant's delineation estimated 0.42 acres of Waters of the U.S. within the project boundary.

On March 23, 2012, the applicant submitted a Preliminary Delineation of Jurisdictional Waters of the State (URS 2012b) regulated under Fish and Game Code Section 1600 *et seq*. The delineation report concluded that 23.21 acres of state jurisdictional waters are located within the project boundary, including 80 single-thread streams. An additional 5.85 acres of braided streams were delineated. The report also identified other areas as non-jurisdictional features, including "pooled areas" that inundate only during storm events and include depressions in roads or along road edges, the outlet of washes, and the large clay pans (identified on the delineation maps as "problematic alkaline sink areas"), and "relicts from previous hydrological events or manmade disturbance." Representative photos of the delineated features are provided in the Preliminary

Delineation of Jurisdictional Waters of the State (URS 2012b). No features were delineated downstream of the project except for one drainage adjacent to Avenue D.

Staff disagreed with the applicant's delineation of jurisdictional Waters of the State. During a field verification of the delineation conducted by staff and a representative from CDFG Regional Office in Bishop, several additional, previously unmapped streams were documented; features that are functionally and morphologically identical to features that were delineated by the applicant. The delineation map and total acres was accordingly revised by the applicant and is provided as **Biological Resources Figure 7.** The total revised area for the jurisdictional delineation does not include portions of streams located outside the state.

Characteristic hydrology indicators, fluvial indicators and other geomorphic features used in staff's identification of state waters include: channel morphology; inundation or saturation (the site received one-quarter-inch of rain the day before the site visit); recent deposition; ripples; changes in vegetation species composition, structure or density (relative to the adjacent creosote uplands); wrack; mud drapes; changes in sediment texture; sediment sorting; scour or shelving; gravel ramps; and a change in soil color. Photos were taken of many of the indicators and features.

Characteristics of the Project Waters

Desert washes may be ephemeral, intermittent, or perennial, although ephemeral streams are the most common stream type in the desert region of California (Vyverberg 2010a). All features delineated on the project site are ephemeral. Ephemeral streams only flow during and shortly after rainfall events; intermittent streams flow continuously only in places where they receive water from a groundwater source (*ibid.*).

Waters on the project site are characteristic of alluvial fan distributary channel networks, where braided, sometimes discontinuous channels and single-thread channels occur in combinations and in a distinctive pattern reflective of the depositional processes active on alluvial fans. Photos of characteristic stream forms found on the project site are provided in **Biological Resources Figure 3**. The sparse vegetation on alluvial fans, lack of soil, high erosion rates, localized runoff, and downstream decreases in stream flow lead to closely spaced, smaller channels in high drainage density (Bull & Kirkby 2002), unlike the single thread channels found farther upstream. Channel migration, or avulsions are common—a response to channels blocked by sediment accumulations from previous small flows—and produce the divergent channel networks that decrease in density at the headwaters. In general, alluvial fan channels become increasingly less defined as they flow down the fan (Vyverberg 2010), confinement is lost and the channels dissipate. Undefined features (sheetflow) were not included in the delineation of state waters.

Desert washes are important to groundwater recharge; for example, the contribution of alluvial fan stream flow to groundwater from transmission losses in the unconsolidated sediment of the channel bed accounts for 90 percent of the recharge to the groundwater aquifer in the Amargosa River basin above Shoshone (Osterkamp et al. 1994).

During the field verification of state waters, staff and CDFG noted the washes offer habitat functions and values distinct from the surrounding upland. Where there are concentrations of water, the vegetation is denser, more robust, which in turn provides more shade, escape cover, seed and other food sources, including insects. The washes also have greater plant species diversity; germination of rattlesnake weed (*Chamaesyce albomarginata*), a preferred desert tortoise food, was abundant in the lower reaches of many channels, particularly at the terminus of the streams where soils remain saturated longer. Bunchgrasses (*Sporobolus airoides, Pleuraphis rigida*) are more abundant on some washes. The terminus of these streams held water longer and thus provided sources of temporary pooling and access to water. Staff noted higher mammal density on the streams and their active floodplains, evidenced by greater bioturbation and more abundant coyote scat. These observations are consistent with descriptions of desert washes habitat values in the literature; literature representing decades of observations and surveys (Levick et al. 2008; Baxter 1988; Kirkpatrick et al. 2007; Kubick & Remsen 1977; Tomoff 1977; Daniels & Boyd 1979, and others).

Special-status Wildlife Species

The applicant conducted several focused or protocol based surveys of the project site in 2010, 2011, and 2012. These included protocol surveys for the desert tortoise and burrowing owl; focused surveys for the golden eagle; point counts for migratory birds, and acoustic surveys for bats (electronic and monitoring and acoustic recording). Some of the species detected or that have the potential to occur in the project area are described further below.

Special-status Wildlife Species - Reptiles

Desert Tortoise

Desert tortoises are present on the proposed project site and are known to occur in adjacent habitat. Protocol surveys conducted by the applicant in 2011 detected two desert tortoises within the project footprint and six desert tortoises within 150 meters of the project boundary (HHSEGS 2011a). An additional seven animals were identified along the (Zone of Influence) ZOI transects. The desert tortoise was California state-listed as threatened on August 3, 1989. The Mojave population was federally listed as threatened on April 2 1990. Critical habitat for this species was established February 8, 1994 (55 FR 12178).

The desert tortoise is a large slow growing herbivorous reptile that is well adapted to a variable and often harsh desert environment (USFWS 2011). In the United States the desert tortoise's range includes portions of the Mojave and Sonoran desert regions of southern California, southern Nevada, southwestern Utah, and western Arizona. In Mexico, the species is found throughout most of Sonora and into portions of Sinaloa. Based on genetic differences there are two recognized populations of desert tortoise in the United States; these are the Mojave and Sonoran populations (USFWS 2011). Recently, genetic data suggest these groups are unique species. Although the species often look similar, the differentiation between the Mojave and Sonoran assemblages of the desert tortoise are supported via multiple forms of evidence, including morphology, ecology, and genetics (Weinstein and Berry 1987; Lamb et al. 1989; Lamb and Lydehard 1994; Berry et al. 2002; Van Devender 2002a; 2002b; Murphy et al. 2007). The Mojave population includes those animals living north and west of the Colorado River in the Mojave Desert of California, Nevada, Arizona, southwestern Utah, and in the Colorado Desert in California (a division of the Sonoran Desert).

The Mojave population is further classified by Recovery Units. The USFWS 2011 Recovery Plan identifies five recovery units for the Mojave population of desert tortoise. These include the Upper Virgin River; Northeastern Mojave; Eastern Mojave; Western Mojave; and Colorado Desert. Although the Recovery Unit designation does not provide special legal protection, the USFWS defines recovery units as special units that are geographically identifiable and are essential to the recovery of the entire listed population; that is recovery units are individually necessary to conserve the genetic, behavioral, morphological, and ecological diversity necessary for long-term sustainability of the entire listed population (USFWS 2011a). The proposed project is located in the Eastern Mojave Recovery Unit.

Range wide, desert tortoises occupy a variety of physical locations including alluvial fans, washes, canyon bottoms, rocky hillsides, and bajadas. In the Mojave population desert tortoises are most commonly observed in desert scrub communities dominated by creosote bush, burrobush (*Hymenoclea salsola*), Mojave yucca (*Yucca schidigera*), and blackbrush (*Coleogyne ramosissima*). At higher elevations, Joshua tree (*Yucca brevifolia*) and big galleta grass are common indicators of tortoise habitat (USFWS 1994b). However, the species is also known to occur in a variety of desert scrub communities and microphyll woodlands (USFWS 1994b).

An important functional component that characterizes desert tortoise habitat is the availability of preferred forage particularly annual forbs, native grasses, and succulents (i.e., cactus). While many species of plants are taken forbs are preferred over grasses and green vegetation is preferred over dry (Zeiner et al. 1988). Some of the preferred forage species for desert tortoises in the Mojave Desert include various species of milk-vetch (*Astragalus* spp.) primrose (*Camissonia* spp.), spurges (*Euphorbia* spp.), lotus (*Lotus* spp.) and wishbone (*Mirabilis* sp.) (Jennings 1993). Jennings (1997) noted that about 70 percent of the bites taken by observed tortoises were on annual plants. Friable soils, such as sand and fine gravel, are an important habitat component, particularly for burrow excavation and nesting. The presence of soil suitable for digging burrows is considered a limiting factor to desert tortoise distribution (USFWS 2011a). Burrows provide shelter from predators and thermal stress in areas where ground temperatures may range from below freezing to over 140° F. Depending on the location desert tortoises can construct and maintain a series of single-opening burrows, and may use between seven to 12 burrows at a given time (Barrett 1990; Bulova 1994).

Desert tortoises in the Mojave Desert are generally active between April and June, with a secondary activity period from September through October. Desert tortoises in the Eastern Recovery Unit, which includes the project area, are also active during the late summer months in response to seasonal rainfall. Because up to 40 percent of the annual precipitation falls in response to summer monsoons; the region supports two distinct annual floras on which tortoises can feed (USFWS 2011a).

During inactive periods, tortoises hibernate, aestivate, or rest in subterranean burrows or caliche caves, spending as much as 98 percent of their time underground (Marlow 1979; Nagy and Medica 1986). During active periods, they usually spend nights and the hotter portion of the day in their burrow. However, desert tortoise activity is seasonally variable and peak adult and juvenile activity typically coincides with the greatest annual forage availability during the early spring and summer. Studies conducted at Fort Erwin in 2010-2011 detected that desert tortoises can also be active during winter months. In this study 9.8 percent (37 of 377) of desert tortoises displayed some winter activity, and 11 were active on more than one occasion. Desert tortoises were identified above ground in small numbers equally between December and January and January and February, typically the coldest months of the year (USGS 2011).

Tortoise activities are primarily concentrated in core areas or home ranges. Although adult males can be aggressive toward each other during the breeding season, there can be a great deal of overlap in individual home ranges (USFWS 2011a). Annual home ranges have been estimated between 10 and 450 acres and are age, sex, seasonal, and resource density dependent (USFWS 2011a). More than 1.5 square miles of habitat may be required to meet the life history needs of a tortoise and individuals have been known to travel more than 7 miles at a time (BLM 2001). In drought years, the ability of tortoises to drink while surface water is available following rains may be crucial for tortoise survival. During droughts, tortoises may be required to forage over larger areas, increasing the likelihood of encounters with sources of injury or mortality including humans and other predators.

The desert tortoise is a long lived species that requires 13-20 years to reach sexual maturity. The species has low reproductive rates during a long period of reproductive potential, and individuals experience relatively high mortality early in life (USFWS 2011a). Copulation typically begins in late March or early April but can occur during the spring, summer, or fall (Black 1976; Rostal et al. 1994). Eggs are laid in late May to July and hatch after approximately three to four months (Stebbins 1985; Zeiner et al. 1988). Multiple clutches (two or rarely three) occur in favorable years (Stebbins 1985). Failure of rainfall and consequent scarcity of plants may result in reproductive failure for desert tortoise (Zeiner et al. 1988).

Desert tortoise have several natural predators including common ravens, desert kit foxes (*Vulpes macrotis*), American badgers (*Taxidea taxus*), roadrunners (*Geococcyx californianus*), and coyotes (*Canis latrans*). Bobcats and mountain lions are also known to prey on this species. A variety of birds prey on desert tortoise including red-tailed hawks, golden eagles, loggerhead shrikes (*Lanius ludovicianus*), American kestrels (*Falco sparvarius*), and burrowing owls (Boarman 1993). Birds typically prey upon two to three-inch long juveniles, which have a thin, delicate shell (USFWS 1994). In addition, non-native species including dogs are a known source of mortality for desert tortoise (USFWS 2011a).

The decline of desert tortoise populations have been attributed to a number of factors including habitat loss or degradation from grazing, housing, mining, infrastructure, energy development, and the conversion of native habitat to agriculture purposes. Off highway vehicle use and the acquisition of lands for military training has also degraded habitat for this species. Also cited as threatening the desert tortoise's continuing existence were illegal collection, upper respiratory tract disease (URTD), and predation on juvenile desert tortoises by common ravens *(Corvus corax)*. Fire is an increasingly important threat to desert tortoise habitat. Over 500,000 acres of desert lands burned in the Mojave Desert in the 1980’s. An additional 404,685 hectares (1,000,000 acres) of Mojave Desert vegetation burned in wildfires in 2005 and 2006, fueled largely by invasive, non-native grasses (USFWS 2011a). Fires in Mojave Desert scrub degrade or eliminate habitat for desert tortoises (USFWS 1994, Appendix D). Drought and subsidized predation have also been recognized to be sources of mortality for this species.

Critical Habitat

The nearest designated desert tortoise critical habitat for this species is located approximately 20 miles south of the project site within the Shadow Valley Unit.

Banded Gila Monster

The banded Gila monster (*Heloderma suspectum cinctum*) is considered rare in California with only 26 credible records of the species documented within the past 153 years (Lovich and Beaman 2007). This large and distinct lizard is difficult to observe even in areas where they have been recently recorded. As a result, little is known about this species' distribution, population status, and life history in California. Most of the historical observations in California occurred in mountainous areas of moderate elevations with rocky, incised topography, in large and relatively high ranges as well as riparian areas (*ibid.*). Despite the widespread distribution of potential habitat throughout the California desert, the few documented observations suggest the California populations may be confined to the eastern portion of the California desert (*ibid.*), and the current distribution is apparently a function of summer rainfall. As reported by Lovich and Beaman (2007), all California Gila monster observations except one (Mojave River) occurred east of the 116° longitude in areas that received at least 25 percent of their annual precipitation during the summer months. Throughout their range, Gila monsters appear to be most active during or following summer rain events.

The species is known from Nevada in nearby Clark and Nye Counties and from the Kingston Mountain Range in Inyo County (Lovich and Beaman 2007). Banded Gila monsters were not detected onsite during surveys and are expected to have a low potential to occur on the project site.

Mojave Fringe-Toed Lizard

Mojave fringe-toed lizards (*Uma scoparia*) are known almost exclusively from California, primarily in San Bernardino and eastern Riverside Counties, but are also found to the north in southeastern Inyo County and historically to the west in eastern Los Angeles County (Jennings and Hayes 1994). Murphy et al. (2007) identified two maternal lineages of this species; the northern lineage is associated with the Amargosa River drainage system, and the southern with the Mojave River drainage system, Bristol Trough, Clark's Pass (including Palen Lake and Pinto Wash), and the Colorado River sand transport systems.

The Mojave fringe-toed lizard is found in arid, sandy, sparsely vegetated habitats and is associated with creosote scrub throughout much of its range (Norris 1958; Jennings and Hayes 1994). This species is restricted to habitats containing fine, loose, aeolian sand, typically with sand grain size no coarser than 0.375 mm in diameter (Turner et al. 1984; Jennings and Hayes 1994; Stebbins 1944). It burrows in the sand to avoid predators and to thermoregulate (Stebbins 1944), though it will also seek shelter in rodent burrows. Sand dunes provide the primary habitat for this species, although it can also be found in the margins of dry lakebeds and washes and isolated pockets against hillsides (BLM 2005). The most important factor in this species' habitat is the presence of fine sands.

The Mojave fringe-toed lizard is widespread geographically across the Mojave and northern Colorado deserts, but its distribution is highly fragmented because it is restricted to habitats containing loose sand, which is patchily distributed (Murphy et al. 2007). Many local populations of this species occur on small patches of sand and are quite small. This fragmented pattern of distribution leaves the species vulnerable to local extirpations from additional habitat disturbance and fragmentation as well as stochastic events (*ibid.*). The loose wind-blown sand habitat, upon which the Mojave fringe-toed lizard is dependent, is a fragile ecosystem requiring the protection against both direct and indirect disturbances (Weaver 1981; Beatley 1994; Barrows 1996). Environmental changes that stabilize sand, affect sand sources, or block sand movement corridors will also affect this species (Turner et al. 1984; Jennings and Hayes 1994). Threats to this species include habitat loss or damage from urban development, off-highway vehicles, and agriculture. Aside from the direct loss of land, development can also increase access by predators, such as the common raven. Potential indirect disturbances are associated with the disruption of the dune ecosystem, sand sources, wind transport, and sand transport corridors

Potential habitat for this species has been mapped along portions of the California Nevada border (DRECP 2012). However, habitat for this species does not appear to occur on the project site. The soils associated with the project area are primarily silty sand and generally lack the depth to support this species. Therefore this species is not expected to occur on the project site.

Special-status Wildlife Species - Mammals

American Badger

American badgers were once fairly widespread throughout open grassland habitats of California. They are now uncommon, permanent residents throughout most of the state, with the exception of the northern North Coast area. Known to occur in the Mojave Desert, they are most abundant in the drier open stages of most shrub, forest, and herbaceous habitats that support friable soils. Cultivated lands have been reported to provide little usable habitat for this species however staff has observed badgers along the margins of agricultural fields that border natural lands. They feed mainly on small mammals, especially ground squirrels, pocket gophers, rats, mice, and chipmunks. This species captures some of its prey above ground including birds, eggs, reptiles, invertebrates, and carrion. Its diet will shift seasonally and yearly depending upon prey availability. Badgers are fossorial, digging large burrows in dry, friable soils and will use multiple dens/cover burrows within their home range. They typically use a different den every day, although they can use a den for a few days at a time (Sullivan 1996). Cover burrows are an average of 30 feet in length and are approximately 3 feet in depth. Natal dens are larger and more complex than cover dens. In undisturbed, high-quality habitat, badger dens can average 0.64 dens per acre, but are usually at much lower density in highly disturbed areas (*ibid.*).This species can be somewhat tolerant of human activities that do not disrupt their burrows. The applicant identified approximately 11 badger burrows in fair to good condition on the project site (HHSEGS 2011a). Another burrow was found in the ZOI. There were no live animals observed.

Desert Kit Fox

Desert kit fox is an uncommon to rare permanent resident of arid regions of the southern portion of California. The species occur in annual grasslands, or grassy open, arid stages of vegetation dominated by scattered herbaceous species. Kit fox occur in association with their prey base which is primarily cottontail rabbits, ground squirrels, kangaroo rats and various species of insects, lizards, or birds (Zeiner et al. 1990). Kit foxes are primarily nocturnal and friable soils are necessary for the construction of dens, which are used throughout the year for cover, thermoregulation, water conservation, and rearing pups. Kit foxes typically produce one litter of about four pups per year, with most pups born February through April (Ahlborn 2000). While the desert kit fox is not listed as a special-status species by the State of California or the USFWS, it is protected under Title 14, California Code of Regulations, Section 460. The California Fish and Game Code (§§ 4000 - 4012) defines kit fox as a furbearing mammal and restricts take of this species.

The applicant identified 46 desert kit fox burrow complexes (i.e., numerous burrows within a 3 to 250 square meter area used by a family group) on the project site. Nineteen burrow complexes appeared to be active in the season when the surveys were performed. Two young kit fox were seen at one of the active burrow complexes. Twenty-seven burrow complexes did not appear to be active however kit fox routinely occupy historic burrows. In addition to the kit fox burrow complexes, 30 single canid burrows (isolated and not associated with a burrow complex) were found. Of these, eight were identified as kit fox based on the presence of scat and/or tracks, two of which appeared to be active.

Nelson’s Bighorn Sheep

The Nelson’s bighorn sheep is a BLM Sensitive species and is considered fully protected by the State of California. The Nelson’s bighorn sheep includes bighorns from the Transverse Ranges through most of the desert mountain ranges of California and adjacent Nevada and northern Arizona to Utah. Desert bighorn sheep is a term often used to refer to all the bighorn subspecies inhabiting the arid, sparsely vegetated desert environment of the extreme western and southwestern parts of the U.S. and northern Mexico. Three subspecies of bighorn sheep exist and include the Rocky Mountain, Sierra Nevada, and desert bighorn (National Wildlife Federation, accessed September 14, 2012). This species is widely distributed from the White Mountains in Mono County south to the Chocolate Mountains in Imperial County (CDFG 2012b). Locally, Nelson’s bighorn sheep occur in mountain ranges surrounding the project site, including the Kingston Range to the south, Nopah Range to the west, and the Clark and Spring Mountains in Nevada (CDFG 2012b). The CDFG has further stated that genetic connectivity among these sheep populations is well known and supported by a rare, all white form of sheep, that are known to occur in each of those mountain ranges (Bleich pers. comm. 2012).

Bighorn sheep are typically found on open, rocky, steep areas used for escape cover with available water and herbaceous or shrubby vegetation for forage. Bighorn sheep are extremely agile in this type of habitat, allowing them to escape predators such as coyotes, eagles, and cougars (Wehausen 1992). So important is rugged habitat that a commonly used metric for predicting bighorn sheep occupancy is the slope of the habitat. Habitat with a slope of 15 percent or greater is considered within the range of preferred habitat for this species (Dr. Wehausen, personal communication, August 2012).

Threats to Nelson's bighorn sheep include predation by mountain lions (*Felis concolor*) on bighorn sheep in Kingston, Clark, and Granite Mountains (Jaeger 1994; Wehausen 1996). In some areas, such as Granite Mountains, this has been documented to effect drastic population declines (Wehausen 1996). In fact, over the past 140 years, many bighorn sheep populations have disappeared over much of their California range (Buechner 1960; Wehausen et al. 1987a). While there is no single cause for these losses, pneumonia contracted from domestic sheep probably has been the greatest factor (Wehausen 2005).

Bighorn sheep graze on grasses and browse shrubs, particularly in fall and winter, and seek minerals at natural salt licks. Bighorn sheep have a large rumen, relative to body size, which allows digestion of grasses, even in a dry state (Hanly 1982). This gives them flexibility to select diets that optimize nutrient content from available forage. Consequently, bighorn sheep feed on a large variety of plant species and diet composition varies seasonally and among locations. While diet quality in the Mojave Desert varies greatly among years, it is most predictably high in late winter and spring (Wehausen 1992), and this period coincides with the peak of lambing. Desert bighorn have a long lambing season that can begin in December and end in June in the Mojave Desert, and a small percentage of births commonly occur in summer as well (*ibid.*).

High rainfall and abundant forage are a good time for sheep, usually males, to make long-distance dispersal movements, which are important to maintaining genetic connectivity of metapopulations as well as colonizing new habitat. This intermountain travel can be as important to the long term viability of populations as are the mountain ranges themselves (Schwartz et al. 1986, Bleich et al. 1990). Radio telemetry studies of bighorn sheep in various southwestern deserts, including the Mojave Desert of California, have found considerable movement of sheep between mountain ranges (Bleich et al. 1990). Consequently, intermountain areas of the desert floor that bighorn traverse between mountain ranges can be as important to the long term viability of populations as are the mountain ranges themselves (Schwartz et al. 1986, Bleich et al. 1990). However, this movement is typically constrained by perennial water sources (Turner et al 2004).

Proximity to perennial water has been found to be the best predictor of bighorn sheep presence (Turner et al, 2004), found that 97 percent of sheep observations were within three kilometers of perennial water sources. This study was conducted in the Santa Rosa Mountains, in less arid climate. In the desert region, few perennial water sources exist, and local sources become more important. Interestingly, male and female bighorn sheep inhabiting desert ecosystems can survive without consuming surface water (Krausman et al. 1985), and males appear to drink infrequently in many situations (Jaeger et al., 1991; Bleich et al., 1996); however, there are no known large populations of bighorn sheep in the desert region that lack access to surface water.

Of the locally known populations of bighorn sheep, known perennial water sources are primarily found within mountain ranges and consist of surface flow. Perennial water in the Nopah Range is known to be limited although water sources in the Kingston ranges are somewhat more plentiful (Glenn Sudemeier, personal communication). The placement of three artificial guzzlers, or watering systems, has been noted to expand occupied sheep habitat in the southern Nopah Range (ibid).

Stump Spring, located eight miles from the Kingston Range is approximately two and a half miles east of the project site and provides surface water from December to July. However, because sheep are known to avoid deeply incised washes where visibility is poor and vulnerability to predation is high, valley floor water sources such as Stump Spring and the mesquites located east of the project within Nevada are not expected to be frequented by bighorn sheep (Dr. Wehausen, personal communication).

Bighorn sheep pellets and a horn fragment were found on the site during late-season plant surveys (HHSEGS 2011a). In addition the Nopah Range to the west and the Kingston Range to the south contain large herds of sheep (Vern Bleich, pers. comm. 2012). During helicopter surveys conducted by the applicant to identify golden eagle nests, biologists noted 11 bighorn sheep at three mountain locations, ranging from seven to ten miles south and southwest of the project site (CH2 2012c). Although bighorn sheep are not expected to be present year round on the project site, the project area is likely periodically used for intermountain movement or foraging. Cover habitat for bighorn sheep is not present on the project site.

Pallid Bat

The pallid bat is a light brown or sandy colored, long-eared, moderate-sized bat that occurs throughout California with the exception of the northwest corner of the state and the high Sierra Nevada (Zeiner et al. 1990b). Pallid bats are most commonly found in oak savannah and in open dry habitats with rocky areas, trees, buildings, or bridges for roosting. These bats are frequently found around rock outcrops and water, but also in areas devoid of these features (O'Farrell and Bradley 1970; Findley et al. 1975). Roosting in rock crevices and man-made structures, males and female pallid bats are gregarious with members of the same sex (Hermanson and O'Shea 1983). Colonies can range from a few individuals to over a hundred (Barbour and Davis 1969) and usually this species occurs in groups larger than 20 individuals (Wilson and Ruff 1999). Although crevices are important for day roosts, night roosts often include open buildings, porches, garages, highway bridges, and mines. Pallid bats may travel up to several miles for water or foraging sites if roosting sites are limited. This bat prefers foraging on terrestrial arthropods in open habitats and regional populations and individuals may show selective prey preferences (Johnston and Fenton 2001). Pallid bat roosts are very susceptible to human disturbance, and urban development has been cited as the most significant factor contributing to their regional decline (Miner and Stokes 2005). Pallid bat is known to occur on the project site; detected using Anabat acoustic technology during monitoring during March, April, July, and September 2012 (CH2 2012nn).

Townsend's Big-eared Bat

The Townsend's big-eared bat is a colonial species that feeds primarily on moths and other soft-bodied insects. Females aggregate in the spring at nursery sites known as maternity colonies. Although the Townsend's big-eared bat is usually a cave-dwelling species, many colonies are found in anthropogenic structures such as the attics of buildings or old, abandoned mines. Roost sites in California include limestone caves, lava tubes, mine tunnels, buildings, and other structures (Williams 1986). This species is found throughout Nevada, from low desert to high mountain habitats. This species is often concentrated in areas offering caves or mines as roosting sites and preferring caves and mines where the temperature is 54 degrees F. (12 degree C.) or less but usually above freezing Chung-MacCoubrey 1995. Radiotracking studies suggest that movement from a colonial roost during the maternity season is confined to within nine miles of the nursery. Townsend's big-eared bats are very susceptible to human disturbance, and females are known to completely abandon their young when disturbed. The loss of maternity and hibernation roosts has been cited as the most significant factor contributing to their decline throughout their range (Miner and Stokes 2005).

Townsend's big-eared bat was not detected over the project by the applicant during recent acoustic surveys. Roosting habitat does not exist on the project site.

Western Small Footed myotis

In the western United States, these bats are inhabitants of the deserts, semideserts, and desert mountains. Their daytime roosts may be in crevices and cracks in canyon walls, caves, mine tunnels, behind loose tree bark, or in abandoned houses. These bats hibernate in suitable caves or mine tunnels within the range occupied in summer. Bats observed in winter are often found wedged deeply into narrow cracks and crevices in the rock ceilings of old mines. When probed from these crevices they are able to fly, which indicates they do not go into a deep winter sleep. This species was detected on the project site in April and May of 2012, and again in September (CH2 2012nn).

Long-legged myotis

Long-legged myotis prefers to roost in abandoned buildings, cracks in ground, cliff face and other crevices including under the los bark of trees (Chung and Macaoubrey 1995). This species has not been detected on the project site.

Mexican free tailed bat

Mexican free-tailed bats are common in habitat that ranges from pinyon juniper woodlands, to desert grasslands, to arid desert. Preferred roosting for this species includes caves, mines, bridges, and occasionally buildings (Chung and Macaoubrey 1995). This species is uniquely adapted for fast and long distance flight. Hoffmeister (1986) reports these bats travel up to 50 miles to forage in a single night. Other features within grasslands provide additional types of roosting and foraging habitat. This species has been detected on the project site in February through September, and was not detected in December, 2011 or January, 2012.

Special-Status Bird Species

Golden Eagle

Throughout most of the western United States golden eagles are mostly year-round residents, breeding from late January through August with peak activity in March through July (Kochert et al. 2002). Migratory patterns are usually fairly local in California where adults are relatively sedentary, but dispersing juveniles sometimes migrate south in the fall. This species is generally considered to be more common in southern California than in the northern part of the state (USFWS 2008).

Golden eagles need open terrain for hunting and prefer grasslands, deserts, savanna, and early successional stages of forest and shrub habitats. Golden eagles primarily prey on lagomorphs and rodents but will also take other mammals, birds, reptiles, and some carrion (Kochert et al. 2002). This species prefers to nest in rugged, open habitats with canyons and escarpments, with overhanging ledges and cliffs and large trees used as cover. Golden eagles were detected foraging over the project site; however nesting habitat does not occur near the site.

The applicant's January 2012 Golden Eagle Use Survey Report (CH2 2012g) presented the results of wintering golden eagle surveys, conducted to supplement pedestrian surveys originally performed in 2011. These surveys were conducted from December 20, 2011 to January 11, 2012. Biologists visited eight onsite observational points. A total of 13 eagle observations (12 during avian point counts or mid-day eagle surveys and one incidental observation) were recorded on five separate days. Eagles were mostly noted in flight, foraging over the site, and were observed perching on power poles.

Surveys that rely on single year nest observations may provide inaccurate data on eagle use. Aerial surveys for golden eagles were conducted by the applicant, in coordination with resource agencies between October 3rd to 7th, 2011 and from November 9th to 11th, 2011. Surveys were conducted by a qualified raptor biologist familiar with aerial survey protocol (CH2 2012c). Nineteen confirmed golden eagle nests were observed within 10 miles of the site, along with six unidentified raptor nests. Of these, none were determined by the applicant to be active nests. Nests were described as in poor to excellent condition, or as alternate locations.

Golden eagles are a long lived species and may use from three to 14 nests per territory. However, breeding may not occur every year depending on available forage and nests that appear inactive in a given year may be occupied the following year by breeding birds. This species is present in the region and although the applicant indicated the nests were not active, a single survey cannot be used to make this determination.

Western Burrowing Owl

Western burrowing owls, a California Species of Special Concern, inhabit arid lands throughout much of the western United States and southern interior of western Canada (Haug et al. 1993). In the Mojave Desert this species has declined because of human-induced causes such as loss and/or fragmentation of habitat, diminished prey base, and high populations of species that prey on burrowing owl eggs and young. In this portion of its range, some owls are migratory, while some are year-round residents.

Burrowing owls are unique among the North American owls in that they nest and roost in abandoned burrows, especially those created by California ground squirrels, kit fox, desert tortoise, and other wildlife. Burrowing owls have a strong affinity for previously occupied nesting and wintering habitats. They often return to burrows used in previous years, especially if they were successful at reproducing there in previous years (Gervais et al. 2008). The breeding season in southern California generally occurs from February to August with peak breeding activity from April through July (Haug et al. 1993).

In the Mojave Desert, burrowing owls generally occur at low densities in scattered populations, but they can be found in much higher densities near agricultural lands where rodent and insect prey tend to be more abundant (Gervais et al. 2008). Burrowing owls tend to be opportunistic feeders. Large arthropods, mainly beetles and grasshoppers, comprise a large portion of their diet, along with small mammals such as mice and voles (*Microtus*, *Peromyscus*, and *Mus* spp.).Larger prey consumed includes reptiles and amphibians, young cottontail rabbits, bats, and birds. Consumption of insects increases during the breeding season (Haug et al. 1993).

Burrowing owl sign was detected during desert tortoise protocol surveys of the project site conducted from March 13, 2011 to May 18, 2011 (HHSEGS 2011a). The applicant detected eight burrows with burrowing owl sign (feathers, whitewash droppings, and/or pellets) on the project site. Section 5.2.6.7.2 of the AFC (HHSEGS 2011a) indicated that burrowing owls were observed in the proposed project site boundary, in the northwestern quarter of Section 16, and immediately west of the site. Burrowing owl sign was also detected adjacent to the project and within the 150 meters survey boundary. The exact number of owls observed was not quantified. The AFC (HHSEGS 2011a, Table 5.2-7) confirms burrowing owls were observed in 2010 and spring of 2011.

Short eared Owl

The short-eared owl is designated as a California Species of Special Concern. This species is a widespread winter migrant, found primarily in the Central Valley, the western Sierra Nevada foothills, and along the coastline. Short-eared owls typically occur as an uncommon winter migrant in southern California. This bird has also been periodically identified in the Pahrump and Amargosa River Valley. Primary habitats for this species include open areas with few trees, including annual and perennial grasslands, prairies, dunes, meadows, irrigated lands, and saline and fresh water emergent wetlands. Short-eared owl numbers have declined over most of the species' range due to destruction and fragmentation of grassland and wetland habitats. Nesting short-eared owls require open country that supports concentrations of microtine rodents and herbaceous cover sufficient to conceal their ground nests from predators (Holt and Leasure 1993). A single short eared owl was observed on the site by staff in April 2012; the bird was likely a migrant.

Loggerhead Shrike

Loggerhead shrikes are uncommon residents throughout most of the southern portion of their range, including southern California. In southern California they are generally much more common in interior desert regions than along the coast (Humpel 2008). In the Mojave Desert this species appears to be most numerous in flat or gently sloping deserts and desert/scrub edges, especially along the eastern slopes of mountainous areas (*ibid.*). Loggerhead shrikes initiate their breeding season in February and may continue with raising a second brood as late as July; they often re-nest if their first nest fails or to raise a second brood (Yosef 1996).

This species can be found within lowland, open habitat types, including creosote scrub and other desert habitats, sage scrub, non-native grasslands, chaparral, riparian, croplands, and areas characterized by open scattered trees and shrubs. Fences, posts, or other potential perches are typically present. In general, loggerhead shrikes prey upon large insects, small birds, amphibians, reptiles, and small rodents over open ground within areas of short vegetation, usually impaling prey on thorns, wire barbs, or sharp twigs to cache for later feeding (Yosef 1996). Loggerhead shrike were observed on the project site in several locations during April and May of 2011 site surveys.

Prairie Falcon

The prairie falcon inhabits dry environments in the North American west from southern Canada to central Mexico. It is They are rare in the arid southeast open habitat from annual grasslands to alpine meadows at all elevations up to 3,350 meters, but is associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. They require cliffs or bluffs for nesting though will sometimes nest in trees, on power line structures, on buildings, or inside caves or stone quarries. Ground squirrels and horned larks are the primary food source, but prairie falcon will also prey on lizards, other small birds, and small rodents.

Prairie falcon was observed on the project site and in adjacent areas in 2011. Two birds were observed in December, 2011, and January, 2012(CH2 2012g).

Crissal Thrasher

In California, the crissal thrasher is a year-round resident within very limited regions of the Mojave and Colorado deserts. In the greater vicinity of the project site, the species is known to occupy the New York, and Clark mountains, the Kingston Range, and Mesquite Lake, San Bernardino County; and north to the vicinity of Tecopa and Shoshone, Inyo County (Shuford and Gardali 2008). This species prefers dense, low scrubby vegetation, often riparian scrub or woodland at lower elevations and the low, dense scrub associated with arroyos at higher elevations in the Mojave Desert (Garrett and Dunn 1981, Cody 1999). No crissal thrashers have been observed on site to date (HHSEGS 2011a).

Le Conte's Thrasher

Le Conte's Thrasher is a permanent resident of the deserts of the southwestern U.S. and northwestern Mexico. The Le Conte's thrasher population densities are among the lowest of passerine (perching) birds, estimated at less than five birds per square kilometer in optimal habitats (Fitton 2008). This low population density decreases the probability of their detection during field surveys. An uncommon and hard-to-find bird, it characteristically exists only in low densities; in good habitat for the bird there may be only 10 adults per square kilometer (American Bird Conservancy 2012). This bird prefers a nest site of cholla cactus or dense, thorny desert shrub such as saltbush or shadscale, typically occupying sparsely vegetated habitat such as desert flats, dunes, or gently rolling hills.

An important habit component is accumulated leaf letter, since this species feeds almost entirely on arthropods taking shelter in this substrate. Le Conte's Thrasher also consumes plant seeds, and will take small snakes, lizards, and bird's eggs. Since this species inhabits an environment where surface water is rare, all its basic water requirements are met through its diet. This bird was observed onsite during spring of 2011 (HHSEGS 2011a).

Bendire's Thrasher

Bendire's thrashers are known in California from scattered locations in Kern, Inyo, San Bernardino, and Riverside counties, and one documented outlier in San Diego County (Sterling 2008). In the Mojave Desert, this species favors Mojave Desert scrub, primarily in areas that contain large cholla, Joshua tree, Spanish bayonet, Mojave yucca, or other succulents (*ibid.*). The status of populations of this species is poorly understood, but threats are believed to be loss of habitat due to urbanization and agricultural development, harvesting of yuccas and cholla cacti, and off-road vehicle activity (*ibid.*). Bendire's thrasher is migratory to an unknown degree. Given the secretive nature of this species, much remains to be learned about feeding, breeding, and migratory behavior, as well as its range (American Bird Conservancy 2010). This species withdraws from the northern part of its range in the winter, and distribution during breeding is inconsistent. Bendire's Thrasher forages principally on the ground, feeding on arthropods, seeds and berries. This bird was observed onsite in spring of 2010 (HHSEGS 2011a). The applicant has indicated the observation of this species was incorrect and believes it may have been a misidentification. This species is more strongly associated with vegetation communities not present on the project site such as areas supporting large Joshua trees, cholla and other cacti. This species has not been observed on site during subsequent surveys conducted since 2010.

Northern Harrier

In western North America, the northern harrier breeds from northern Alaska south to Baja California, Mexico. This species does not commonly breed in desert regions of California, where suitable habitat is limited, but winters broadly throughout California in areas with suitable habitat. Northern harriers forage in open habitats including deserts, pasturelands, grasslands, and old fields. Because northern harriers rely on hearing to locate prey, they have unusual stiff feathers around the face, making them appear distinctly "owlish" (Cornell Lab of Ornithology 2012). Northern harriers were observed during spring 2011 surveys of the project site, and another 21 were observed during surveys for golden eagle, performed between December 20, 2011 and January 11, 2012 (CH2 2012g).

Phainopepla

This species in not considered rare in California and it is commonly found in southern California deserts and foothills. However, phainopepla is a covered species in the Clark County Multiple Species Habitat Conservation Plan. Phainopepla prefer open woodlands of oaks and other small trees, shrubs and chaparral; it is often associated with mistletoe berries. This species seems to thrive best in palm oasis, desert wash, and desert riparian habitats. In southern deserts, it has been noted that some individuals may leave from early May through September, moving to more western and northern parts of range. It is not known if phainopepla in the vicinity of the project site are year-round residents. Evidence suggests that some individuals may nest first on southern deserts and again in summering area in the same year (Hoffmann 1927; Grinnell and Miller 1944; McCaskie et al. 1979; Garrett and Dunn 1981; Ehrlich et al.

1988). This species has been observed onsite (HHSEGS 2011a), and is also known from the Stump Spring Area of Critical Environmental Concern in Nevada, and the Amargosa River in portions of both Nevada and California.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

The threshold for determining significance is based on the biological resources present or potentially present within the proposed project area in consideration of the proposed project description.

CEQA requires a list of criteria that are used to determine the significance of identified impacts. A significant impact is defined by CEQA as "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project" (State CEQA Guidelines Section 15382).

Thresholds for determining CEQA significance in this section are based on Appendix G of the CEQA Guidelines (CCR 2006) and performance standards or thresholds identified by the Energy Commission staff. The determination of whether a project has a significant effect on biological resources is based on the best scientific and factual data that could be reviewed for the project. In this analysis the following impacts to biological resources are considered significant if the project would result in:

- a substantial adverse effect to plant species considered by the California Native Plant Society (CNPS), CDFG, or USFWS to be rare, threatened, or endangered in California or with strict habitat requirements and narrow distributions; a substantial impact to a sensitive natural community (i.e., a community that is especially diverse; regionally uncommon; or of special concern to local, state, and federal agencies);
- a substantial adverse effect to wildlife species that are federally-listed or state-listed or proposed to be listed; a substantial adverse effect to wildlife species of special concern to CDFG, candidates for state listing, or animals fully protected in California;
- substantial adverse effects on habitats that serve as breeding, foraging, nesting, or migrating grounds and are limited in availability or that serve as core habitats for regional plant and wildlife populations;
- substantially interferes with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- a substantial adverse effect on important riparian habitats or wetlands and any other "Waters of the U.S." or state jurisdictional waters; or
- conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

ASSESSING DIRECT AND INDIRECT IMPACTS AND MITIGATION

Consistent with the requirements of CEQA and relevant regulations, the significance of potential impacts is evaluated through the application of the significance criteria described above. The objective of the biological resources analysis is to identify potential adverse effects and/or significant impacts on biological resources.

Construction of the HHSEGS project includes the installation of heliostats, two power towers, electrical generation components as well as energy collection systems, access roads, and control buildings. Project construction would also require ancillary facilities including a water and gas pipeline and a 125-acre storm water retention area. The construction and operation of this large-scale solar generation facility includes a number of impacts to biological resources. The nature and type of the impact can depend on a number of factors including species life history characteristics, type of use of the habitat, and hydrology that is present at and near the project site. The following discussion provides an overview of the direct, indirect, and operational impacts that are expected to occur with the development of the proposed HHSEGS facility.

The California Environmental Quality Act (CEQA) Guidelines define “direct” impacts as those impacts that result from the project and occur at the same time and place. These include but are not limited to the removal of vegetation, disturbance to wildlife from construction activities, noise, lighting, dust, or the crushing of burrows. Indirect impacts are caused by the project, but can occur later in time or farther removed in distance while still reasonably foreseeable and related to the project. Indirect impacts can include the disruption of the native seed bank, the spread of invasive plant species, alterations in light regimes (i.e., shade from solar panels), or changes to soil or hydrology that adversely affect native species overtime. Indirect impacts may also include increased traffic and human disturbance. Operational impacts include both direct and indirect impacts that occur during the life of project operation, including maintenance activities.

Significance of impacts is generally determined by compliance with applicable LORS; however, guidelines adopted by resource agencies may also be used. This section analyzes the potential for direct and indirect impacts to biological resources from the construction and operation of the proposed project and provides mitigation, as necessary, in an effort to reduce the severity of potentially adverse impacts. If a significant impact is identified, appropriate mitigation to reduce impacts to below significance is then developed, in conformance with LORS. Within this section, if and where an adverse significant impact is identified appropriate mitigation and concomitant proposed condition of certification immediately follow, including supporting rationale for the effectiveness of the mitigation. The complete mitigation recommendations are found in the subsection entitled Proposed Conditions of Certification (COCs).

APPLICANT PROPOSED MEASURES

In order to reduce or avoid impacts to biological resources the applicant has proposed a series of Applicant Proposed Measures (APMs) that would be implemented during the construction and operation of the proposed project. The APMs are presented in Section 5.2.9 of the AFC and include a range of actions from broad general measures designed to protect biological resources to specific actions regarding survey requirements or plan development. APMs or mitigation strategies designed by the applicant are discussed, and if considered appropriate, are incorporated into the COCs recommended in the FSA. Where necessary, supplementary conditions are also introduced and recommended where APMs do not meet the criteria identified by CEQA as a defensible, enforceable mitigation measure. For example, measures would be considered inadequate if they lack specificity regarding the timing of an action; do not contain clearly identified performance standards; do not identify the expected goals of a specific plan; or do not identify reporting standards.

SUMMARY OF IMPACTS

Biological Resources Table 6 summarizes the direct, indirect, and cumulative impacts to biological resources resulting from the proposed project, and includes suggested COCs to mitigate these impacts.

BIOLOGICAL RESOURCES Table 6
Overview of Significant Impacts and Conditions of Certification (COCs)

Impact	Conditions of Certification	Determination
Mojave Desert scrub **Direct Impacts:** Permanent loss of 1,580.5 acres, including 3,197 acres desert tortoise habitat, 1,580.5 golden eagle foraging habitat, and habitat for other special-status wildlife; fragmentation of adjacent wildlife habitat and native plant communities. Habitat common and widespread but impacts dependent wildlife, including special-status species. **Indirect Impacts:** Spread of non-native invasive plants; changes in drainage patterns downslope; increased risk of fire; disturbance (noise, lights) to adjacent wildlife; fugitive dust. **Cumulative Impacts:** Contributes to cumulatively considerable loss of habitat, fragmentation, and indirect effects from past, present, and foreseeable future projects in the California Desert region for dependent wildlife.	**BIO-12** requires offsite habitat acquisition and enhancement. **BIO-8** requires implementation of impact avoidance and minimization measures. **BIO-7** BRMIMP ensures implementation of all conditions of certification. **BIO-7** includes measures for dust control and fire prevention. **BIO-18** requires implementation of weed management plan to prevent spread into adjacent habitat. **BIO-21** requires a Designated Botanist to oversee measures for botanical resources for life of project.	Less than significant with conditions of certification
Shadscale Scrub **Direct Impacts:** Permanent loss of 1,616.5 acres, including 3,197 acres desert tortoise habitat, 1,616.5 golden eagle foraging habitat, and habitat for other special-status wildlife; fragmentation of adjacent wildlife habitat and native plant communities. Habitat common and widespread but impacts dependent wildlife, including special-status species. **Indirect Impacts:** Spread of non-native invasive plants; changes in drainage patterns downslope; erosion and sedimentation of disturbed soils; increased risk of fire; disturbance (noise, lights) to adjacent wildlife; fugitive dust. **Cumulative Impacts:** Contributes to cumulatively considerable loss of habitat, fragmentation, and indirect effects from past, present, and foreseeable future projects in the California Desert region for dependent wildlife.	**BIO-12** requires offsite habitat acquisition and enhancement. **BIO-8** requires implementation of impact avoidance and minimization measures, including fugitive dust control. **BIO-6, BIO-8,** and **BIO-18-** include measures for fire prevention. **BIO-18** requires implementation of weed management plan to prevent spread into adjacent habitat. **BIO-7** BRMIMP ensures implementation of all COCs. **BIO-21** requires Designated Botanist to oversee measures for botanical resources for life of project.	Less than significant with conditions of certification
Desert Washes (Waters of the State/Waters of the US) **Direct Impacts:** Permanent loss of habitat function and values for 23.21 acres of state waters (including 0.42 acres Waters of the US). Portion of hydrologic and geomorphic function maintained onsite and reflected in reduced mitigation ratio (from 3:1 to 2:1) **Indirect Impacts:** Onsite, altered surface drainage	**BIO-22** requires acquisition of compensation lands within Pahrump Valley or adjacent valleys at a 2:1 ratio. **BIO-22** also includes measures for minimizing impacts to hydrologic and geomorphic functions onsite and to adjacent offsite streams. **BIO-18** requires implementation of weed	Less than significant with conditions of certification

Impact	Conditions of Certification	Determination
patterns and groundwater recharge; upstream, noise, lighting, glare, human disturbance, potential head-cutting along pipeline trench through washes, diminished habitat value near the project on 0.4 ac. of washes delineated upstream and within California. **Cumulative Impacts:** Contributes to cumulatively considerable loss of desert wash habitat function and values, fragmentation, erosion/sedimentation, altered surface drainage and groundwater recharge patterns, and the spread of invasive weeds into desert washes from past, present, and foreseeable future projects in the Pahrump watershed. .	management plan that would prevent spread of invasive weeds into offsite washes (washes are a common vector for weeds). **BIO-7** BRMIMP ensures enforcement of all COCs. **SOIL-1** includes measures for erosion and sediment control.	
Groundwater-dependent Ecosystems **Direct Impacts:** None. Effects of pumping indirect (may take several-to-many years to propagate to the project boundary), sensitive resources located between one-half and five miles from the project wells. **Indirect Impacts:** Potential for significant indirect impacts to groundwater-dependent ecosystems (GDEs) from project pumping, from habitat loss to impaired habitat function and value for dependent wildlife, including special-status species; reduced cover of mesquite facilitated invasion of weeds and deflation of dunes; loss of a rare plant community; conflicts with BLM ACEC management goals and Clark County conservation management strategy for Stump Spring and Pahrump Valley area mesquite reduced plant cover which increases wind erosion, weedy species, increased risk of area fire from increase in vehicle traffic, etc.; impacts to special-status species inhabiting the GDEs. **Cumulative Impacts:** Even minor impacts cumulatively considerable due to ecological significance of habitat and its importance to BLM.	**WATER SUPPLY-4** requires groundwater elevation monitoring with triggers to stop, reduce, or modify pumping if trigger exceeded. **WATER SUPPLY-1** requires the acquisition and retirement of water rights to offset the project's contribution to the basin imbalance. **BIO-6, BIO-8, and BIO-18** include measures for fire prevention to protect adjacent mesquite washes and coppice dunes. **BIO-7** BRMIMP ensures enforcement of all conditions of certification. Under **BIO-21**, tasks requiring the expertise of a botanist must be conducted or supervised by a qualified botanist or vegetation ecologist. **BIO-23** requires monitoring to track the impacts of pumping to groundwater levels as they develop during the life of the project, and defines triggers for adaptive management to be implemented if data indicate impending adverse effects.	Less than significant with conditions of certification
Special-status Plants **Direct Impacts:** Loss of significant portion of California range of 4 species from project construction and operation. Potential accidental impacts to nine offsite occurrences in close proximity to project boundary during constructio**n.** **Indirect Impacts:** Potential indirect impacts to nine offsite occurrences in close proximity during operation from introduction and spread of non-native invasive plants; increased risk of fire; altered drainage patterns downstream of site; erosion and sedimentation of disturbed soils; accidental chemical and herbicide drift; disruption of photosynthesis and other metabolic processes from dust, disrupted reproductive process (pollination & dispersal). **Cumulative Impacts:** Contributes to cumulatively considerable direct and indirect effects from past, present, and foreseeable future projects in the California range of species and local population.	**BIO-20** requires compensatory mitigation for impacts to four species (gravel milk-vetch, Wheeler's skeletonweed; Preuss' milk-vetch, and Torrey's joint-fir) through acquisition and preservation offsite. Three offsite occurrences shall be protected for every S1 ("critically imperiled") species affected and two offsite occurrences protected for every S2 ("imperiled") species affected. Includes option to mitigate through restoration of at-risk offsite occurrences. **BIO-19** requires avoidance and minimization measures during life of project to protect nine offsite occurrences located in close proximity to the project boundary. **BIO-21** requires a qualified botanist conduct or supervise specific duties.	Less than significant with conditions of certification

Impact	Conditions of Certification	Determination
	BIO-22 requires compensation of washes in Pahrump Valley or adjacent valleys (washes are important dispersal pathways for rare plants). **BIO-18** requires implementation of weed management plan to prevent spread into offsite occurrences. **BIO-6, BIO-8, and BIO-18** include measures for fire prevention. **BIO-8** includes measures for fugitive dust control. **BIO-7** BRMIMP ensures enforcement of all COCs.	
Common Wildlife and Nesting Birds **Direct Impacts:** Potential mortality or disturbance during construction and operation, loss or fragmentation of habitat, displacement, and disruption of movement, and exposure to concentrated solar flux (nesting birds and flying insects). **Indirect Impacts:** Fragmentation of local population; introduction and spread of non-native invasive plants; increased risk of fire; noise, and light. Disruption of nesting and foraging behaviors. **Cumulative Impacts:** Contributes to cumulatively considerable loss of habitat, fragmentation, and indirect effects from past, present, and foreseeable future projects in the Pahrump Valley.	**BIO-1 through BIO-8** requires avoidance and minimization measures during life of project, construction monitoring, worker training, fugitive dust control, fire prevention and weed management. **BIO-16** requires pre-construction monitoring and avoidance for nesting birds. **BIO-15** the development of Avian, Bat, and Golden Eagle Protection plans.	Less than significant with conditions of certification, but see conclusions for **Migratory/ Special-Status Resident Avian Species** within this table.
Desert Tortoise **Direct Impacts:** Loss of 3,197 acres of desert tortoise habitat, potential mortality or disturbance during construction and operation, loss or fragmentation of habitat, displacement, and disruption of movement. Potential disturbance from translocation including mortality and the spread of disease. **Indirect Impacts:** Fragmentation of local population; introduction and spread of non-native invasive plants; increased risk of fire; noise, and light. Predation by ravens, road kill and fire. **Cumulative Impacts:** Contributes to cumulatively considerable loss of habitat, fragmentation, and indirect effects from past, present, and foreseeable future projects in the Eastern Mojave Recovery Unit.	**BIO-1 through BIO-8** requires avoidance and minimization measures during life of project, construction monitoring, worker training, fugitive dust control, fire prevention and weed management. **BIO-9** requires desert tortoise fencing and preconstruction clearance surveys. **BIO-10** requires the capture and translocation of desert tortoise and the development and implementation of a prescriptive translocation plan. **BIO-12** requires the acquisition of 6,358 acres of compensatory mitigation for the long term management of the species. **BIO-13** requires the development of a Raven Management Plan and the payment of a raven fee. **BIO-25** provides for an in-lieu fee and advanced mitigation option that the applicant may elect to implement as a form of mitigation.	Less than significant with conditions of certification
Kit Fox and American Badger **Direct Impacts:** Loss of 3,277 acres of desert habitat, potential mortality or disturbance during construction and operation, loss or fragmentation of habitat, displacement, and disruption of movement. Potential disturbance from passive relocation including mortality and the spread of disease. **Indirect Impacts:** Fragmentation of local population;	**BIO-1 through BIO-8** requires avoidance and minimization measures during life of project, construction monitoring, worker training, fugitive dust control, fire prevention and weed management. **BIO-9** requires desert tortoise fencing which will exclude badgers and kit fox from the project site.	Less than significant with conditions of certification.

Impact	Conditions of Certification	Determination
introduction and spread of non-native invasive plants; increased risk of fire; noise, and light. **Cumulative Impacts:** Contributes to cumulatively considerable loss of habitat, fragmentation, and direct loss of these species from past, present, and foreseeable future projects in the Pahrump Valley.	**BIO-12** requires the acquisition of 6,358 acres of compensatory mitigation for desert tortoise; however land acquisition and management will reduce impacts to these species. **BIO-14** requires that prior to ground disturbance, a qualified biologist perform a preconstruction survey for badger and kit fox dens in the project area, including areas within 250 feet of all project facilities, utility corridors, and access roads. Requires the development of Management Plan to address concerns related to passive relocation. **BIO-22** requires compensatory mitigation for state waters which will reduce habitat loss to these species. **BIO-18** requires a weed management plan be developed to minimize the spread of invasive plant species. **BIO-23** requires monitoring to track the impacts of pumping to groundwater levels as they develop during the life of the project, and defines triggers for adaptive management to be implemented if data indicate impending adverse effects.	
Nelson's bighorn sheep **Direct Impacts:** No direct loss of important spring foraging habitat. Potential disruption of habitat periodically used for intermountain movement. No direct impacts to known dispersal corridors. **Indirect Impacts:** Fragmentation of local population; introduction and spread of non-native invasive plants; increased risk of fire; and degradation of off-site springs or seeps. **Cumulative Impacts:** Contributes to cumulatively considerable loss of habitat, fragmentation, and direct loss of these species from past, present, and foreseeable future projects in the Pahrump Valley.	**BIO-1** through **BIO-8** requires avoidance and minimization measures during life of project, construction monitoring, worker training, fugitive dust control, fire prevention and weed management. **BIO-12** requires the acquisition of 6,358 acres of compensatory mitigation for desert tortoise; however land acquisition and management may preserve habitat for bighorn sheep. **BIO-22** requires compensatory mitigation for state waters which will reduce habitat loss for this species. **BIO-18** requires a weed management plan be developed to minimize the spread of invasive plant species. **BIO-23** requires monitoring of ground water to ensure impacts to ground water dependent vegetation does not result in habitat degradation for these species.	Less than significant with conditions of certification.
Special Status Bats **Direct Impacts:** No direct loss of maternity, day roosts, or hibernacula. Loss of foraging habitat. Bats that forage near the ground, such as the pallid bat, would also be subject to crushing or disturbance by vehicles driving at dusk, dawn, or during the night. Collision with facility structures. **Indirect Impacts:** the loss of foraging habitat due to type conversion, night time lighting that exposes bats	**BIO-1 through BIO-8** requires avoidance and minimization measures during life of project, construction monitoring, worker training, fugitive dust control, fire prevention and weed management. **BIO-16** the development of an avian and bat plan. **BIO-23** requires monitoring to track the impacts of pumping to groundwater levels	Less than significant with conditions of certification.

Impact	Conditions of Certification	Determination
to predation, and alteration in prey base. Degradation to Stump Spring AEC and associated mesquite thickets in Nevada. **Cumulative Impacts:** Contributes to cumulatively considerable loss of habitat, fragmentation, and direct loss of these species from past, present, and foreseeable future projects in the Pahrump Valley.	as they develop during the life of the project, and defines triggers for adaptive management to be implemented if data indicate impending adverse effects.	
Migratory/Special-Status Resident Avian Species **Direct Impacts:** Loss of 3,277 acres of desert habitat, potential mortality or disturbance during construction and operation, loss or fragmentation of habitat, displacement, and disruption of movement. Collision, electrocution, glare and exposure to solar flux. **Indirect Impacts:** Fragmentation of local population; introduction and spread of non-native invasive plants; increased risk of fire; and degradation of off-site springs or seeps. Weed abatement, mirror washing and maintenance. Glare or heat associated with the heliostats may also adversely affect bird's use of the site. **Cumulative Impacts:** Contributes to cumulatively considerable loss of habitat, fragmentation, and direct loss of these species from past, present, and foreseeable future projects in the Pahrump Valley.	**BIO-1** through **BIO-8** requires avoidance and minimization measures during life of project, construction monitoring, worker training, fugitive dust control, fire prevention and weed management. **BIO-8** also requires transmission lines and all electrical components to be designed, installed, and maintained in accordance with the Avian Power Line Interaction Committee guidelines. **BIO-15** the development of Avian, Bat, and Golden Eagle Protection plans. **BIO-16** requires pre-construction monitoring and avoidance for nesting birds. **BIO-23** requires monitoring to track the impacts of pumping to groundwater levels as they develop during the life of the project, and defines triggers for adaptive management to be implemented if data indicate impending adverse effects.	Potentially significant and unavoidable even with conditions of certification
Golden Eagle **Direct Impacts:** Loss of 3,277 acres of desert habitat, potential mortality or disturbance during construction and operation, loss or fragmentation of habitat, displacement, and disruption of movement. Collision, electrocution, glare and exposure to solar flux. **Indirect Impacts:** Fragmentation of local population; introduction and spread of non-native invasive plants; increased risk of fire; and degradation of off-site springs or seeps. Weed abatement, mirror washing and maintenance. Glare or heat associated with the heliostats may also adversely affect bird's use of the site. **Cumulative Impacts:** Contributes to cumulatively considerable loss of habitat, fragmentation, and direct loss of this species from past, present, and foreseeable future projects in the Pahrump Valley.	**BIO-1** through **BIO-8** requires avoidance and minimization measures during life of project, construction monitoring, worker training, fugitive dust control, fire prevention and weed management. **BIO-8** also requires transmission lines and all electrical components to be designed, installed, and maintained in accordance with the Avian Power Line Interaction Committee guidelines. **BIO-15** the development of an avian, bat, and golden eagle plan. **BIO-16** requires pre-construction monitoring and avoidance for nesting birds. **BIO-23** requires monitoring to track the impacts of pumping to groundwater levels as they develop during the life of the project, and defines triggers for adaptive management to be implemented if data indicate impending adverse effects.	Potentially significant and unavoidable even with conditions of certification
Wildlife Movement **Direct Impacts:** Placement of physical structures such as the solar arrays, buildings, or other facilities that block or impede movement. No direct impacts to	No specific conditions proposed.	Less than significant.

Impact	Conditions of Certification	Determination
known dispersal corridors. **Indirect Impacts:** Fragmentation of local population; introduction and spread of non-native invasive plants; increased risk of fire; and degradation of off-site springs or seeps. **Cumulative Impacts:** Contributes to cumulatively considerable loss of habitat, fragmentation, and direct loss of wildlife movement from past, present, and foreseeable future projects in the Pahrump Valley. Less than significant with COCs.		

SUMMARY OF FINANCIAL SECURITY AND NESTING MITIGATION REQUIREMENTS

Several of the recommended Conditions of Certification require the project owner to mitigate the project's impacts to biological resources by acquiring comparable lands and protecting them in perpetuity under a conservation easement. These conditions are referred to as compensatory mitigation and include:

- **BIO-12** (Desert Tortoise Compensatory Mitigation);
- **BIO-17** (Burrowing Owl Impact Avoidance, Minimization, and Compensatory Measures);
- **BIO-20** (Special-Status Plant Compensatory Mitigation); and
- **BIO-22** (State Waters Compensatory Mitigation and Avoidance & Minimization Measures).

Biological Resources Table 7 provides an estimate of the financial security deposit required prior to the start of ground-disturbing activities, and includes the estimated costs associated with the purchase, transaction, appraisal, escrow, and title insurance including mineral, oil, and gas rights. The estimate also addresses costs of initial enhancement (e.g., signs, fencing, and boundary/property line surveys); or restoration actions (e.g. removal of exotic species, debris, or decommissioning roads), management for ongoing activities (e.g., managing public access and enforcement); and monitoring the implementation, effectiveness, and compliance with the conservation goals and objectives of the mitigation.

For those projects using the Renewable Energy Action Team (REAT) National Fish and Wildlife Foundation (NFWF) Mitigation Account the budget includes the costs of administration of contracts and reporting. For all conditions of certification requiring habitat compensation, the estimated land acquisition costs and amount of the financial security shall be calculated based on the estimated cost per acre for Desert Tortoise mitigation (Condition of Certification **BIO-12**) as a best available proxy.

A number of comments were received from the public regarding the ability of the project owner to nest mitigation requirements. For example, impacts to desert tortoise, burrowing owls, and State waters require the acquisition and management of compensatory mitigation lands to reduce impacts to less than significant levels. As described in **Biological Resources Table 7,** individually these conditions require the acquisition of lands to minimize project effects to less than significant levels. Although the project owner is required to provide a security deposit for each of the compensatory land requirements, it may be possible to achieve the mitigation for a number of resources through the acquisition of a single parcel (nesting). For the purposes of the FSA, staff considers the nesting of mitigation to be appropriate where the acquisition of lands for one species (i.e., desert tortoise) can be demonstrated to effectively reduce impacts for a different species or resource (i.e., desert washes or burrowing owls). Similar to conditions identified on the proposed project site, the potential compensation lands may support more than one of the affected resources. Therefore the project owner may fulfill the compensatory mitigation obligations for multiple species or resources on all or any portion of the proposed mitigation lands providing they meet all the selection criteria required in each applicable condition of certification. The separate financial security deposit for each compensatory mitigation obligation is required in the event that compensation lands cannot be found that meet the criteria for multiple species or habitats.

Biological Resources Table 7
Biological Resources Compensatory Mitigation
Summary of Compensation Lands Costs[1, 11]

	Desert tortoise compensation	Burrowing owl compensation	State Waters compensation
Number of acres	6,358	600	23.21
Estimated number of parcels to be acquired, at 40 acres per parcel[2]	159	15	1
Land cost at $1000/acre[3]	$6,358,000.00	$600,000.00	$23,210.00
Level 1 Environmental Site Assessment at $3000/parcel	$476,850.00	$45,000.00	$1,740.75
Appraisal at no less than $5,000/parcel	$794,750.00	$75,000.00	$2,901.25
Initial site clean-up, restoration or enhancement, at $250/acre[4]	$1,589,500.00	$150,000.00	$5,802.50
Closing and Escrow Cost at $5000/parcel[5]	$794,750.00	$75,000.00	$2,901.25
Biological survey for determining mitigation value of land (habitat based with species specific augmentation) at $5000/parcel	$794,750.00	$75,000.00	$2,901.25
3rd Party Administrative Costs (Land Cost x 10%)[6]	$635,800.00	$60,000.00	$2,321.00
Agency cost to accept land[7] [(Land Cost x 15%) x 1.17] (17% of the 15% for overhead)	$1,115,829.00	$105,300.00	$4,073.36
Subtotal - Acquisition and Initial Site Work	$12,560,229.00	$1,185,300.00	$45,851.36
Long-term Management and Maintenance Fund (LTMM) fee at $1450/acre[8]	$9,219,100.00	$870,000.00	$33,654.50
Financial Security Requirement Subtotal if the application-directed compensatory	**$21,779,329.00**	**$2,055,300.00**	**$79,505.85**

	Desert tortoise compensation	Burrowing owl compensation	State Waters compensation
mitigation option			
NFWF Fees			
Establish Project Specific Account[9]	$12,000.00	$12,000	$12,000.00
Call for and Process Pre-Proposal Modified RFP or RPF[10]	$30,000.00	$30,000.00	$30,000.00
NFWF Management fee For Acquisition and Enhancement Actions (Subtotal x 3%)	$376,806.87	$35,559.00	$1,375.54
NWFW Management Fee for LTMM account (LTMM x 1%)	$92,191.00	$8,700.00	$336.55
Subtotal of NFWF Fees if NFWF option selected	$510,997.87	$86,259.00	$47,712.09
TOTAL Estimated cost for deposit in project specific REAT-NFWF Account	**$22,290,326.87**	**$2,141,559.00**	**$123,217.94**

1. All costs are best estimates as of summer 2010. Actual costs will be determined at the time of the transactions and may change the funding needed to implement the required mitigation obligation. Note: regardless of the estimates, the developer is responsible for providing adequate funding to implement the required mitigation.
2. For the purposes of determining costs, a parcel is defined at 160 acres, recognizing that some will be larger and some will be smaller, but that 160 acres provides a good estimate for the number of transactions anticipated (based on input from CDD).
3. Generalized estimate taking into consideration a likely jump in land costs due to demand, and an 18-24 month window to acquire the land after agency decisions are made. If the agencies, developer, or 3rd party has better information on land costs in the specific area where project-specific mitigation lands are likely to be purchased, that data overrides this general estimate. Note: regardless of the estimates, the developer is responsible for providing adequate funding to implement the required mitigation.
4. Based on information from CDFG.
5. Two transactions at $2500 each: landowner to 3rd party; 3rd party to agency. The transactions will likely be separated in time.
6. Includes staff time to work with agencies and landowners; develop management plan; oversee land transaction; organizational reporting and due diligence; review of acquisition documents; and assembling acres to acquire.
7. Includes agency costs to accept the land into the public management system and costs associated with tracking/managing the costs associated with the donation acceptance, including 2 physical inspections; review and approval of the Level 1 ESA assessment; review of all title documents; drafting deed and deed restrictions; issue escrow instructions; and parcel mapping.
8. Estimate for purposes of calculating general costs. The actual long term management costs will be determined using a Property Assessment Report (PAR) tailored to the specific acquisition. Includes land management; enforcement and defense of easement or title [short and long term]; monitoring.
9. Each renewable energy project will be a separate sub-account within the REAT-NFWF account, regardless of the number of required mitigation actions per project.
10. If determined necessary by the REAT agencies if multiple 3rd parties have expressed interest; for transparency and objective selection of 3rd party to carryout acquisition.
11. Compensatory mitigation for special-status plants, as described in **BIO-20**, is based on the number of occurrences affected, to be replaced on an occurrence-for-occurrence basis--not acres of 'habitat' affected--mitigation lands must be occupied by the affected species. For example, under a 3:1 mitigation ratio for CNDDB S1-ranked species, three occurrences must be acquired and. CNDDB S2-ranked species are mitigated at a 2:1 ratio, that is, two occurrences must be acquired and protected for S2-ranked species affected.

Project Impacts to Common Wildlife and Wildlife Habitat

Construction of the HHSEGS facility would result in large scale direct, indirect and operational impacts to common wildlife and would result in the permanent or long-term land use conversion of primarily native vegetation and wildlife habitat.

TEMPORARY AND LONG-TERM IMPACTS

Impact analyses typically characterize effects to vegetation and wildlife habitat as either temporary or permanent. Permanent impacts are generally considered disturbances or land use conversion that would preclude most natural wildlife habitat function throughout the life of a project or longer. Temporary disturbance is generally understood as construction disturbance occurring on a site that may return to a more natural condition or may be actively revegetated or enhanced, returning to natural conditions within approximately five years. In desert ecosystems, the interpretation of permanent and temporary impacts needs to reflect the slow recovery rates of native plant communities and the subsequent loss of value to native wildlife. Natural recovery rates from disturbance in desert ecosystems depend on the nature and severity of the impact. Temporary habitat impacts such as vegetation removal and soil disturbance can take from 50 to 300 years for partial recovery and complete ecosystem recovery may require over 3,000 years (Lovich and Bainbridge, 1999). During this time the value of the habitat to wildlife is reduced and in some cases can no longer supports species that existed in those areas preceding the disturbance. In this analysis, an impact that might be considered temporary in other parts of California will be considered long-term or permanent due to these very slow natural recovery rates.

Permanent and long-term habitat loss, as defined by staff, includes any impacts that would not recover within five years. Staff considers that project impacts to habitat persisting throughout the life of the project and beyond are, for purposes of this analysis, permanent. In addition, staff considers that temporary project impacts to habitats that persist longer than five years are long-term. Construction and operation of the HHSEGS would have permanent impacts throughout the solar generator site and on any permanent new or widened access routes. In addition, the project would have long-term impacts where habitat is disturbed for temporary construction areas.

DIRECT IMPACTS TO WILDLIFE HABITAT

The term “habitat” refers to the environmental and ecological conditions where a species is found. Wildlife habitat is generally described in terms of vegetation, though a complete explanation often must encompass further detail, such as availability or proximity to water; suitable nesting or denning sites; shade; foraging perches; cover sites to escape from predators; soils that are suitable for burrowing or hiding; limited noise and disturbance; and many other factors that are unique to each species. Vegetation itself provides many aspects of habitat, physical structure, and biological productivity and food resources for many wildlife species. Further, vegetation often reflects other habitat components such as regional climate, soil productivity and texture, elevation, and topography. Thus, vegetation is a useful overarching descriptor for habitat and it is the primary factor in this analysis of impacts to wildlife habitat.

Native vegetation would be cleared and grubbed (i.e., shrubs and roots removed) for construction of permanent access roads, heliostat support installation, construction of solar towers, and other project facilities throughout much of the proposed solar generator site. Outside of access roads and maintenance tracks, vegetation would be cut to 12-18 inches to provide clearance for heliostat function, but would leave the root structure intact (HHSEGS 2011a). Similarly, grading plans have been designed to promote sheet flow and maintain natural features, with one notable exception, the 125-acre retention area which would impound water for approximately 24 hours following large storm events. Specific details addressing the proposed retention pond is discussed further below under the subsection entitled Retention Pond.

Although the project proposes to utilize a “low impact design” which substitutes mowing for grading wherever possible, and maintains natural drainage features as much as possible; functional habitat values on the project site for most species of wildlife will be lost. Outside of access roads and maintenance tracks, vegetation may be cut to ground level as needed for construction but roots would be left intact, allowing for some regrowth. During project operations, vegetation would be cut or removed as needed to provide clearance for heliostat function and manage potential fire hazard. Native shrubs undergoing repeated mowing would be weakened and diminished in size, degrading or eliminating their value as wildlife habitat. Overall impacts of these construction, operation, and maintenance procedures would cause substantial degradation to native vegetation and wildlife habitat. However, to the extent that native shrubs persist on the site, they may have some benefit to soils and hydrology, by reducing likely soil erosion throughout the heliostat fields.

Construction of the proposed project would result in the direct loss of foraging habitat for a variety of wildlife from construction and operation of the facility and the permanent conversion of open space. How the project would affect individual species depends on many factors including how a species tolerates disturbance and the ability of a species to adapt to features such as the heliostat arrays, access roads, noise from electrical transformers and human presence. For some common species including small reptiles, mice, rabbits, ground squirrels, and some disturbance tolerant birds, the project would not lead to a substantial loss of foraging habitat and may in fact provide additional perches, refugia, and increased access to some prey. However, for other species, the project would likely eliminate foraging opportunities due to the presence of the project facilities. These species include animals excluded by the perimeter fencing such as coyotes, deer, desert kit fox, or badgers. Large aerial foragers such as golden eagles and various raptors are also expected to have reduced foraging opportunities on the project site both during construction and operation of the facility.

INDIRECT IMPACTS TO WILDLIFE HABITAT

Indirect impacts to foraging habitat could include alterations to existing topographical and hydrological conditions, increased erosion and sedimentation, and the establishment of noxious weed colonies. Indirect impacts may also result in the alteration of soils, such as compaction that could reduce burrowing opportunities for small mammals and degrade existing habitat. The placement of perimeter fencing will also degrade existing habitat value for some wildlife by providing roosting opportunities for some disturbance tolerant birds such as ravens which can result increased predation risk in adjacent lands. Trash left on the project site could also attract predators such as the common raven and coyote (Boarman, 2002).

Conclusions and Discussion of Mitigation for Wildlife Habitat

Construction of the proposed project would occur over a period of approximately 29 months and result in the disturbance to approximately 3,277 acres of wildlife habitat (including dirt roads and disturbed areas). This vegetation and habitat provides cover, denning or nesting sites, foraging areas, and other habitat functions for wildlife species, including special-status species, throughout the area. In some cases, habitat use is seasonal (e.g., for migratory birds) or is limited to foraging but not nesting (e.g., for golden eagles or other wide-ranging cliff-nesting raptors). Remnant vegetation and habitat that remain post construction and throughout the operational life of the facility may be suitable for some common species, such as side-blotched lizard, house finch, and desert cottontail. However, during construction and operations, the remnant or recovering vegetation and habitat would be unsuitable for most species, particularly species with specific habitat requirements, including most special-status wildlife. The project's direct impacts to native vegetation and wildlife habitat would be significant and require compensatory mitigation. Staff recommends measures below to reduce, minimize, or offset these impacts. Implementation of Condition of Certification **BIO-12** (Desert Tortoise Compensatory Mitigation), described below under Impacts to Special-Status Species, requires the acquisition, protection and enhancement of desert tortoise habitat. Implementation if this condition would reduce impacts to wildlife habitat to less than significant levels.

DIRECT IMPACTS TO WILDLIFE

Project level effects to wildlife depend on many factors that include but are not limited to the species use of the site (i.e. home range); behavioral factors that result in wildlife seeking refuge rather than dispersing (i.e., site fidelity, behavior); a given species dispersal ability; ecological characteristics (i.e., fossorial, aerial dispersal, highly mobile); and the ability of the species to evade or disperse from the construction activity. Project level effects to wildlife are further influenced by factors such as the seasonal use of the site. For example some species including small mammals and many reptiles are year round residents with small or restricted home ranges while other species including foxes, badgers, and some birds may be periodic visitors or have large or overlapping home ranges. Other species such as large raptors limit their activity on the site to foraging. Likewise, many species of birds may be semi-permanent dwellers or seasonal residents (i.e., migratory birds) that are present either as breeding pairs or rely on the site for winter foraging.

Direct impacts to wildlife could include mortality from trampling or crushing; increased noise levels due to heavy equipment use; light impacts from construction during low-light periods; increased vehicular and human presence along existing access roads; displacement due to habitat modifications, including vegetation removal, alterations of existing soil conditions; fugitive dust; and increased erosion and sediment transport. Wildlife could also become entombed in burrows or be subject to increased risk of predation when flushed from cover by equipment or construction workers. Fires that occur as a result of construction activities can quickly spread to vegetation and displace or kill native wildlife.

Noise from clearing, grading and construction activities could also affect wildlife in adjacent habitats by interfering with breeding or foraging activities and movement patterns, causing animals to temporarily avoid areas adjacent to the construction zone. Refer to the **Noise** section of the FSA for more information. Nocturnal wildlife would be affected less by construction than diurnal species since construction would occur primarily during daylight hours. However, construction may also occur during dusk and dawn when many species are highly active. More mobile species such as birds and larger mammals would likely disperse into adjacent habitat areas during the land clearing and grading phases of solar array and road construction. However, smaller animals would be less able to disperse. Additional information regarding project effects from noise and lighting is presented under the section entitled Project Operation Impacts and Mitigation, below. **Biological Resources Table 8** summarizes direct impacts to wildlife from construction activities.

Biological Resources Table 8
Examples of Direct Effects to Wildlife

Construction Activity	Type of Effect
Direct	
Grading, excavation, mowing, vegetation removal	Loss of foraging, sheltering, or breeding habitat Direct mortality to small and/or less mobile species Entombment or entrapment in pipes or excavations Increased risk of predation when flushed from cover Loss of small nests or young
Noise and Vibration	Interference with breeding, foraging and movement Avoidance of areas adjacent to the construction zone Temporary threshold shifts in hearing sensitivity and related loss of hearing resulting increased subjection to predation. Abandonment of burrows
Man-made sources of light	Increased risk of predation Avoidance of light areas Disturbance to nests and young
Vehicle Traffic	Direct mortality from road kill Avoidance of areas adjacent to traffic routes Disruption of breeding, foraging, and movement of bird species resulting in nest, roost, or territory abandonment and subsequent reproductive failure (during breeding season)
Fire	Habitat loss, degradation or vegetation type conversion Direct mortality Abandonment of habitat
Fugitive Dust	Adverse physiological effects, stress, reduced fitness Avoidance of project area
Perimeter Fence Construction	Restrict wildlife movement Disrupt home ranges or territories Trap wildlife within the enclosure

INDIRECT IMPACTS TO WILDLIFE

Indirect impacts can include the disruption of the native seed bank, the spread of invasive plant species, alterations in light regimes (i.e., shade from solar panels), or changes to soil or hydrology that adversely affect native species overtime. Indirect impacts may also include increased traffic and human disturbance and the disruption of prey base or increased predation through alterations of the physical landscape from project features (i.e., fencing, heliostats, or power poles) that provide perch sites or shelter for predators.

Conclusions and Discussion of Mitigation for Wildlife

Construction-related effects to common wildlife are typically not considered significant under the CEQA. However, staff concludes that the scale and duration of construction (i.e., over 3,277 acres of land conversion over a period of 29 months); the variety of wildlife present at the project site; and the use of perimeter fencing, which will prevent many species from dispersing, would result in significant effects to common wildlife without implementation of mitigation measures.

By design, the project facility would include perimeter fencing to prevent desert tortoise and other species from entering the work area. Prior to construction, tortoises and other species (i.e. desert kit fox, American badger, and burrowing owl) inhabiting the project site would be relocated/translocated to suitable receptor sites (See impacts to desert tortoise below for a detailed discussion of desert tortoise relocation). With the exception of birds, this barrier would exclude or entrap wildlife at the project site. Therefore, during construction, terrestrial wildlife trapped within the perimeter fence would have limited dispersal ability. This would subject any trapped wildlife to repeated disturbance from construction and the use of roads to support maintenance activities. While many species of wildlife can tolerate human disturbance to some degree; implementation of the proposed project would result in an ongoing loss of wildlife from mowing, vehicle traffic, nest failure, and alteration of foraging habitat. The most likely long term effect of the project on wildlife trapped within the project by perimeter fencing is mortality from road traffic and the loss of habitat functions and value due to vegetation management.

The applicant has recommended general impact avoidance and minimization measures to reduce construction related impacts to common wildlife. These recommendations have been incorporated into conditions of certification, and enhanced where deemed necessary to reduce effects to common wildlife. These conditions of certification are designed to educate workers of the presence and sensitivity of wildlife that may occur in the project area; provide limitations on the work that may occur during the breeding season; require inspection for wildlife under vehicles; reducing or controlling fugitive and vehicle speeds; monitoring construction to reduce direct wildlife mortality; and the control of noxious weeds. The conditions also reduce impacts to common wildlife from the effects of noise and lighting.

The following conditions of certification would avoid or reduce impacts to general wildlife to less-than-significant levels: **BIO-1** (Designated Biologist Selection) which requires the designation of a lead project biologist ; **BIO-2** (Designated Biologist Duties) which outlines the duties performed during any site mobilization, ground disturbance, grading, construction, operation, closure, and restoration activities; **BIO-3** (Biological Monitor Qualifications); **BIO-4** (Biological Monitor Duties) in which the Biological Monitor assists the Designated Biologist during any site mobilization, ground disturbance, grading, construction, operation, closure, and restoration activities; **BIO-5** (Designated Biologist and Biological Monitor Authority) in which the Designated Biologist and Biological Monitor can call a halt to any activities that would be an adverse impact to biological resources; **BIO-6** (Worker Environmental Awareness Program) in which workers on the project site or any related facilities are informed about sensitive biological resources; **BIO-7** (Biological Resources Mitigation Implementation and Monitoring Plan) which identifies all biological resources mitigation, monitoring, compliance measures, conditions of certification, and permits; **BIO-8** (Impact Avoidance and Minimization Measures) in which all feasible measures which avoid or minimize impacts to the local biological resources are incorporated in any modification or finalization of project design; **BIO-9** (Desert Tortoise Clearance Surveys and Fencing).

Potential impacts from the spread of invasive plant species and effects to locally important ground water dependent vegetation and seeps including the mesquite bosque located east of the project site and Stump Spring ACEC would be reduced to less than significant levels through the implementation of Conditions of Certification **BIO-18** (Weed Management Plan) and **BIO-23** (Ground Water-Dependent Vegetation Monitoring Plan. Implementation of these measures would reduce impacts of the proposed project to less-than-significant levels under CEQA.

Lighting may also be required to facilitate nighttime construction activities, which might disrupt the activities and affect behavior of nocturnal wildlife. As discussed in the Visual Resources section, construction lighting must be consistent with worker safety codes, directed toward the center of the construction site, shielded to prevent light from straying offsite, and task-specific. Condition of Certification **VIS-2** requires temporary lighting measures during construction activity and on the laydown area. See the Visual Resources analysis in this FSA for more details about proposed Condition of Certification **VIS-2**. With implementation of this measure, impacts to wildlife from construction lighting at the HHSEGS project would be reduced to less-than-significant levels under CEQA.

IMPACTS TO NESTING AND MIGRATORY BIRDS

The project site provides foraging, cover, and/or breeding habitat for a variety of resident and migratory birds. Localized water sources such as Stump Spring and other seasonal seeps and springs, private residences south of the site, and mesquite thickets east of the site also provide resources used by many species of birds. Bird species potentially affected include ground nesting species such as quail, night hawks and horned larks. Songbirds and several species of raptor are also known to forage at or near the project site. During surveys of the project site the applicant identified approximately 60 species of birds in the project area including a number of special-status bird species. Some of the known or expected species that may be impacted by the project include ground nesting species such as night hawks, poorwills, roadrunners, and horned lark, and various shrub nesters. The project's impacts to special-status birds are discussed under Special-Status Wildlife, below.

DIRECT IMPACTS TO NESTING AND MIGRATORY BIRDS

Direct impacts to nesting birds or raptors would be similar to those described for common wildlife and are identified in **Biological Resources Table 8**. This includes the loss of foraging and nesting habitat and disturbance from construction activities. Construction during the breeding season could also result in the displacement of breeding birds and the abandonment of active nests. Small well hidden nests could also be subject to loss during construction of the proposed project. Similarly, increased noise levels from heavy equipment, increased human presence, and exposure to fugitive dust could displace native birds. Habitat fragmentation, degradation and shifts in vegetative structure will also directly affect nesting birds. In addition, noise and lighting effects have been demonstrated to adversely affect behavior, reproduction, and increase the risk of predation.

INDIRECT IMPACTS TO NESTING AND MIGRATORY BIRDS

Indirect impacts to nesting birds could include the loss of habitat due to the colonization of invasive plants and a disruption of breeding or foraging activity due to facility maintenance. Weed abatement, mirror washing (which occurs at night), and maintenance activities would likely limit the use of some areas as foraging or nesting habitat. Indirect impacts to nesting birds may also occur from the drawdown of surface and subsurface water in adjacent lands such as the mesquite thickets and Stump Spring ACEC.

Another indirect risk to birds during project construction is entrapment. Birds may become entrapped within vertical pipes used to support the heliostats. It appears that birds may descend into pipes either in search of nest cavities or food and become trapped within the pipes. Once inside the cavity, the birds cannot climb the slick interior or spread their wings to fly (Brean 2011). Animals that become entrapped in these pipes die from starvation and dehydration (American Bird Conservancy 2011). Vertical pipes have been found to be a significant threat to bird mortality in Nevada, where the wide-spread use of vertical PVC pipes for mining claims markers has led to the widespread mortality of thousands of birds that had become entrapped in them (American Bird Conservancy 2011). Some of the cavity-nesting birds protected under the Migratory Bird Treaty Act (MBTA) and California Fish and Game Code Sections 3503 and 3513 that have been found dead in these pipes include Say's Phoebes, owls, woodpeckers, kestrels, and ash-throated flycatchers (Brean 2011). To date, the Nevada Department of Wildlife (NDOW) has found over 3,000 fatalities in 10,000 removed pipes (Brean 2011). California Audubon also indicated that open pipes kill birds indiscriminately and that both common birds and protected species have been found among the layers of dead birds in open pipes (http://ca.audubon.org/workinglands-pipes.php). A single pipe on a preserve in Kern County contained the remains of numerous birds (http://kern.audubon.org/Audubon_Kern_River_Preserve_death_pipes.pdf).

Habitat Loss for Nesting and Migratory Birds

Implementation of the proposed project would result in the direct loss of approximately 3,277 acres of habitat that supports foraging for a variety of resident and migratory birds. Because of the large size of the project, direct effects would include the loss of foraging habitat. Construction of the project facility would require large scale land disturbance within the project site. Although the applicant has proposed to mow vegetation and allow some vegetation to persist within the heliostat field, the habitat remaining would be degraded and have the potential to type convert to more disturbance tolerant species. In addition, construction of the power towers, power plant, roadway, and various facilities would result in the removal of potential nesting habitat for most species of birds. The loss of habitat from the proposed project would be significant absent mitigation. Conditions of certification required to reduce impacts to sensitive birds are described below.

Conclusions and Discussion of Mitigation for Nesting and Migratory Birds

The Point Reyes Bird Observatory (PRBO) has prepared a landscape analysis within the Desert Renewable Energy Conservation Plan (DRECP) planning area. This analysis identifies areas of high and low value to nearly 70 species. This review included common and special-status species that collectively utilize a range of habitat features. The PRBO ranked the Calvada Springs area of the Pahrump Valley near the project site in the lowest priority group. The study concluded that these low priority areas should be considered first for siting solar and other renewable energy installations to minimize impacts on breeding birds (Howell and Veloz 2011). However, at the project level, the existing mosaic of scrub communities, small washes, and adjacent mesquite habitat and mesquite dune scrubs are utilized by a wide range of species.

There is a growing body of evidence suggesting that populations of desert birds are at risk from invasive plants, wildfires, growing populations, and development. The Partners in Flight (PIF) North American Land Bird Conservation Plan characterizes species of the Southwestern Avifaunal Biome to have generally low population sizes, narrow distributions, high threats, and, when trend data exist, generally declining populations (Rich et al. 2004). Due to remoteness and difficult research conditions, bird populations found in Mojave and Colorado Desert habitats have poor or no trend data (Rich et al. 2004). Yet two of the top three fastest-growing metropolitan areas in the United States from 1990- 2000 (Las Vegas, NV and Yuma, AZ) are found within the area covered by this plan. In the western Mojave Desert, the population has tripled in the last twenty years (CalPIF, 2009). These pressures have been found to negatively impact desert bird populations (Latta et al. 1999). Bird species of the southwestern United States tend to have smaller populations and smaller breeding ranges, rendering these species more vulnerable to ecological stresses (Rich et al. 2004). Black-tailed gnatcatchers and black-throated sparrows have been found to be particularly sensitive to urbanization and the replacement of native desert scrub with exotic vegetation (Germaine et al. 1998 and Emlen 1974).

With the exception of a few non-native birds such as European starling, the loss of active bird nests or young is regulated by the federal Migratory Bird Treaty Act (MBTA) and Fish and Game Code Section 3503, though most native birds have no other special conservation status. The project's impacts to special-status birds are discussed under Special-Status Wildlife, below.

Implementation of the proposed project would result in direct, indirect and operational effects to nesting birds. During construction it is expected that most birds would disperse to adjacent habitat during the initial vegetation clearance for the proposed project. However, if site grading, brush removal, or construction were to occur during the nesting season, then it likely would destroy bird nests, including eggs or nestling birds.

Noise during construction may be loud enough to adversely affect bird nesting success. For most common species, staff concludes that this impact would be less than significant, but staff believes that it could significantly affect breeding habitat suitability for native birds, including special-status species. Construction activities would primarily occur between 7:00 AM and 6:00 PM and would result in a short-term, temporary increase in the ambient noise level. Construction noises are anticipated to range from 43 decibels to 74 decibels at 1500 feet from the noise source (piece of construction equipment) (HHSG 2011a, Table 5-7-7).

Open pipes left over the weekend or for extended periods of time pose a documented mortality risk to birds and possibly some species of bats. It appears that construction of the heliostat field requires the placement of many cylindrical pipes to support the solar reflectors.

To reduce the potential for direct impacts to nesting birds the applicant has proposed mitigation measures to avoid and minimize project related effects. This includes conducting pre-construction nesting surveys, and the establishment of limited disturbance buffers, ranging from 250 to 500 feet around active nests depending upon the species. The approach proposed by the applicant is valid, but may be difficult to achieve due to the extended (i.e., 29 month) construction schedule, scale of the project (i.e., 3,277 acres), and the numerous common birds expected to nest within the area prior to and during construction. Staff considers it highly unlikely that nesting birds could be completely avoided if clearing and grubbing occur during the nesting season.

As described above, the construction and maintenance activities associated with the project are expected to exclude some species of birds that are less tolerant of anthropogenic disturbance. However, some species of birds will likely nest in the project area both during construction and operation of the facility. These include common ravens, horned larks, various raptors, and other birds. Depending on the species, birds may actively nest on the ground close to equipment, within the open metal framework of the heliostats, or on idle construction equipment. For example, staff has observed recent nesting activity at several solar and transmission line developments in the Mojave and Colorado Desert and within the Carrizo Plain. In these locations birds nested on the ground near solar panels, vehicles, foundations, construction trailers, and other equipment left overnight or during a long weekend. In areas where construction was phased (i.e., footings, or tower structures) birds quickly utilized these features as nest sites. Low-nesting species are susceptible to population suppressants such as alteration of predation pressures and increased anthropogenic disturbance/traffic (Emlen 1974). Ground-nesting gambel's quail, greater roadrunners, and black-throated sparrows, all species detected on the site, have been found to be especially sensitive to these urban predation and disturbance threats (Emlen 1974).

While many of the birds consisted of common ravens, house finches, and doves, these species are protected by the MBTA and relevant Fish and Game codes. The likelihood of encountering nesting birds either within the 250-500-foot disturbance buffer proposed by the applicant or on vehicles and equipment is considered high.

Birds have demonstrated a varying degree of tolerance to human disturbance. Where some species such as house finches display a tolerance for human activities and have been documented nesting on a variety of manmade structures (Hill 1993); other birds including some raptors are often displaced by construction and may have reduced nesting success. Emlen (1974) identified two factors key to the decline of native desert avifauna in urban habitats: changes in the nature and quality of vital resources, and changes in the nature and magnitude of population suppressants. A study of bird buffers in the United Kingdom indicated that animals commonly move away from an approaching human or encroaching human activities such as recreation and this response can have adverse influences on, for instance, their feeding success (Burger & Gochfeld 1998, Fernández-Juricic & Tellería 2000), range use (Andersen et al. 1997), reproduction (Giese 1996, Miller et al. 1998), survival (Wauters et al. 1997, West et al. 2002) and abundance (Miller et al. 1998, Fernández-Juricic 2000, 2002). Studies near Tucson have shown that black-throated sparrows and black-tailed gnatcatchers in particular require undisturbed, native vegetation (Germaine et al. 1998). Post development, undisturbed native habitat is not expected to remain; however remnant strips of native vegetation may persist.

Urbanization also results in the alteration of vegetation structure important to desert avifauna (Germaine et al. 1998, Emlen 1974). Urbanization results in the rapid increase of foraging and watering opportunities, but these opportunities are generally skewed toward ground-foraging, seed-eating guilds (Beissinger and Osborne 1982, Emlen 1974). While this study focuses on more urban development such as residential housing; mowing, weed abatement, and human disturbance are expected to result in shifts in vegetation at the project site. This is, coupled with the expected level of disturbance at the site is expected to result in a transition to more disturbance tolerant species.

Project impacts to native birds can be reduced or offset through implementation of Conditions of Certification **BIO-1** through **BIO-8** (see Common Wildlife, above). These measures would require biological monitoring during construction activities, worker environmental awareness training, minimization of impact areas, and protection measures to prevent wildlife entrapment in trenches, pipes, or other facilities or supplies. In addition, some birds are capable of successfully nesting in close proximity to some forms of localized disturbance. Therefore staff has incorporated the applicant proposed measures into the recommended Conditions of Certification **BIO-15** (Avian Bat & Golden Eagle Protection Plan) and **BIO-16** (Pre-construction Nesting Bird Surveys), see discussion of impacts to sensitive birds. Condition of Certification **BIO-16** includes conducting pre-construction nesting surveys, and the establishment of limited disturbance buffers. The condition would require the applicant to survey the project area for nesting birds prior to construction, and to prepare and implement a nest management plan to ensure the protection of native birds and their nests. The Nest Management Plan would specify buffer areas for impact avoidance to nesting birds, dependent on the bird species or family, conservation status, and nature of disturbance. The Plan also would specify procedures for situations where it may be necessary to reduce buffer areas for certain low intensity construction activities.

Implementation of these conditions of certification would avoid direct impacts to nests, eggs, or young of migratory birds and would reduce the impacts of construction disturbance to nesting birds to less than significant levels under CEQA.

Species that utilize the project site for foraging but not nesting, such as coopers hawks or red-tailed hawks and wintering birds such as merlins, sharp-shinned hawks, and ferruginous hawks would not be directly affected; however, the loss of foraging habitat would be considered significant absent mitigation. Loss of nesting and foraging habitat for these special-status bird species would adversely affect populations of these species within the Pahrump Valley. As discussed in the cumulative impact subsection, the project would be a contributor to the cumulative loss of biological resources, including these special-status bird species. Implementation of Condition of Certification **BIO-12** (Desert Tortoise Compensatory Mitigation) would reduce this habitat loss by the preservation of similar foraging areas. Implementation of this condition of certification would reduce impacts from the loss of habitat to less than significant levels under CEQA.

Indirect impacts to habitat from the drawdown of surface and subsurface water in adjacent lands such as the mesquite thickets and Stump Spring ACEC would be reduced to less than significant levels with the implementation of conditions of certification, **BIO-23** (Groundwater-dependent Vegetation Monitoring Plan) and **WATER SUPPLY-4** (groundwater monitoring.

Project Operation Impacts and Mitigation

The operation of the HHSEGS project would result in long term persistent impacts to biological resources both within the existing perimeter fence and in adjacent habitats. Operational impacts include both direct and indirect impacts to biological resources that occur during the life of project operation, including maintenance activities. Because many maintenance activities occur at night (i.e., heliostat washing) human activities may disrupt native species in adjacent habitat. These impacts would remain an ongoing source of disturbance for many wildlife species that occur within the fenced facility perimeter and in adjacent habitat.

Operational impacts to biological resources include disturbance to common and sensitive wildlife (discussed below) from vehicle traffic; maintenance and washing (i.e., each heliostat would be washed with a pressure washing unit approximately every 14 days [ca. 6,071 heliostats washed every night based on 85,000 heliostats/14 days]); mowing and herbicide application; night time lighting and maintenance activities (i.e., washing and maintenance); noise; collisions with structures; and exposure to solar flux. These impacts are discussed further below.

Roads

The proposed project would require construction of ring roads in the heliostat field and access by facility staff and maintenance personnel would increase existing traffic levels along Tecopa Road. Increased traffic and use of these roads during operation of the facility will result in the ongoing loss of common and sensitive wildlife.

The ecological effects of roads have been widely studied (Hoff and Marlow 2002; Trombulak & Frissell 2000; Findlay & Bourdages 2000; Jones et al. 2000; Parendes & Jones 2000; Haskell 2000; Vistnes & Nellemann 2001). These studies have identified seven general effects from roads that include: mortality from road construction and vehicle collisions; modification of animal behavior; changes to the physical and chemical environment; the spread of invasive species, and increased human access and use (Trombulak & Frissell 2000). The large size of the project (i.e., approximately 3,277 acres) coupled with the activities required to support the operation of the facility such as mowing, bi-weekly washing, and routine maintenance, would result in ongoing disturbance and mortality to wildlife that remain within the project perimeter. Given the multi-year phased implementation of the project there would also be substantial use of access roads outside of the fenced project site. Staff considers impacts from operational traffic to be a significant impact to wildlife.

To minimize the risks of increased traffic fatality and other hazards associated with roads at the project site, the applicant has proposed a variety of general minimization measures which staff has incorporated into Condition of Certification **BIO-8**. These measures include confining vehicular traffic to and from the project site to existing routes of travel, prohibiting cross-country vehicle and equipment use outside designated work areas, and imposing a speed limit of 25 miles per hour within the project area, on maintenance roads for linear facilities, and on dirt access roads to the project site.

Noise

Operational noise from the HHSEGS is predicted to range from 90 dBA near certain equipment to roughly 65 dBA in areas more distant from any major noise source and would not exceed 54 dBA at the closest residence or 52 dBA at the St. Therese Mission (HHSG 2011a). Based on this data staff assumes both the facility site and surrounding area will be subject to ongoing noise greater than 65 dBA. No significant ground or air vibrations are expected to occur, nor are tonal noises, such as noise from motors and fans (*ibid.*). Noise from operation of the facility could discourage wildlife from foraging and nesting adjacent to the proposed project.

Noise may affect birds in several ways, including annoyance which causes birds to abandon nests that are otherwise suitable; raise the level of stress hormones, interfering with sleep and other activities; cause permanent injury to the auditory system; and interfere with acoustic communication by masking important sounds or sound components (Dooling 2006). Many bird species rely on vocalizations during the breeding season to attract a mate within their territory, and noise from construction could disturb nesting birds and other wildlife and adversely affect nesting and other activities. Reijnen et al. (1995) demonstrated that for two species of European warbler (*Phylloscopus* spp.), sound levels between 26 dB(A) and 40 dB(A) reduced breeding density by up to 60 percent compared to areas without disturbance. Studies have also shown that noise levels over 60 A-weighted decibels (dBA) can result in nest abandonment and intense, long-lasting noise can mask bird calls which can reduce reproductive success (Dooling and Popper 2007; Hunsaker 2001). In addition, 60 dBA has been used by the wildlife agencies and the Energy Commission as a reference point for evaluating noise impacts on wildlife. Staff considers noise impacts to most nesting birds above 60 dBA to be a significant impact.

Noise from daytime operation and nighttime washing and maintenance activities could affect wildlife in adjacent habitats by interfering with breeding or foraging activities and movement patterns, causing animals to avoid areas adjacent to the project. This could disrupt foraging, breeding, sheltering, and other activities. Nocturnal (i.e., active at night) wildlife would be affected less because the maintenance activates would occur in different locations each night. However, lighting and noise from the pressure washers would disrupt nocturnal animals in adjacent habitat and those that remain within the project fence line. Staff considers noise effects to be of a concern for wildlife located in and adjacent to the project site. Noise may result in significant impacts to wildlife or nesting birds along the perimeter of the project primarily along sensitive wash and mesquite habitat (located in Nevada).

Lighting

Bright lighting at night could disturb the nesting, foraging, or mating activities of wildlife and make wildlife more visible to predators. Night lighting could be especially disruptive to nocturnal animals, including desert kit fox and owls, which were observed onsite. Lighting may also increase the risk of predation of wildlife because they may be more detectable to nocturnal predators (USACE and CDFG 2009). Many insects are drawn to lights, and bats or other insectivores may be attracted to lighted construction areas which would increase the potential for disturbance and mortality. However, many small species, such as rodents, rabbits, snakes, and bats, are less active in bright lighting (Longcore and Rich 2004), which may be a biological adaptation to avoid predation during bright moonlight.

Night lighting could be disorienting to migratory birds and, if placed on tall structures, may increase the likelihood of collision, as discussed in the "Avian Collision and Electrocution" subsection of this section. Switched lighting would be provided for areas where continuous lighting is not required for normal operation, safety, or security; this would allow these areas to remain un-illuminated (dark) most of the time, thereby minimizing the amount of lighting potentially visible off site. These measures are described in Condition of Certification **VIS-2** (see the **Visual Resources** section). With implementation of this measure lighting impacts to wildlife would be minimized. Although facility lighting would be shielded it is expected that the project would be operated seven days per week. Maintenance activities would also occur seven days a week, including nighttime hours when mirror washing would be conducted. Light from these activities is expected to result in ongoing disturbance to wildlife both within the perimeter fencing and in adjacent habitat.

Impacts to Wildlife from Weed Management Activities

The applicant proposed weed management as an ongoing activity on the project site. This may consist of both mechanical weed removal and the application of herbicides. The use of herbicides to control weeds can be effective; however herbicides that are indiscriminately applied or that have residual toxicity could adversely impact native plants and wildlife, or negatively affect water quality. Some herbicides, such as pre-emergent herbicides designed to deter germination, have a residual toxicity that may be harmful to wildlife.

Wildlife could be exposed to herbicides in several ways, including direct spray; indirect contact through grooming or contact with affected vegetation; and ingestion of contaminated vegetation, prey species, and water. Small animals will generally receive a higher dose, in terms of body weight, than large animals for a given type of exposure (Durkin 2007). **Biological Resources Table 9** identifies the general effects of herbicides on wildlife.

Biological Resources Table 9
General effects of herbicides on wildlife

Herbicide	Effects on Vegetation	Effects on Wildlife
Chlorsulfuron	Rate and extent of uptake following foliar application varies by species Inhibits an enzyme that is essential for plant growth	Causes weight loss and decreased body weight gain in experimental mammals Appears to have low toxicity in mammals, birds, fish, and invertebrates
Clopyralid	Highly selective toxicity to terrestrial plants (primarily broadleaf species) Relatively non-toxic to aquatic plants and grasses Regulates plant growth by acting as a synthetic auxin, thus altering plant's metabolism and growth characteristics	Appears to be relatively non-toxic to terrestrial or aquatic wildlife May adversely affect liver and kidney weights and gastric epithelial tissue Appears to show no effect on viability of bird eggs and chick immune systems
*Dicamba**	Mimics plant hormone indole 3 acetic acid Mechanism appears to involve a stimulation of ethylene production leading to accumulation of abscisic acid and/or cyanide resulting in abnormal growth	Displays an apparent pattern of interspecies scaling, with smaller animals being less sensitive than larger animals Relatively non-toxic to mammals, fish, and amphibians Acute toxicity to birds appears to be generally low May reduce growth and stunt eye development in pre- and post-hatch birds
Glyphosate	Inhibits shikimic acid pathway, effectively blocking synthesis of certain phenolic compounds and aromatic amino acids Inhibits photosynthesis, respiration, and nucleic acid synthesis	May reduce food conversion efficiency leading to loss of body weight in mammals and birds Certain surfactants used with glyphosate are much more toxic to fish that others May cause histological changes in gills, kidneys, and liver of some fish
Imazapyr	Inhibits an enzyme that is essential for plant growth Practically non-toxic to conifers	Appears to be relatively non-toxic to terrestrial and aquatic animals
Picloram	More toxic to broadleaf plants than grasses Mimics naturally occurring auxins leading to uncontrollable and abnormal growth	Appears relatively non-toxic to terrestrial animals Moderately toxic to aquatic animals, particularly some fish May affect fry survival and growth in some fish
Triclopyr	Mimics indole auxin plant growth hormones causing uncontrollable growth At sufficiently high levels of exposure, abnormal growth is so severe that vital functions cannot be maintained and plants die	May cause developmental effects at levels that cause maternal toxicity in mammals May have adverse effect on mammalian kidney functions Higher concentrations may cause mortality or immobility in frog tadpoles

Herbicide	Effects on Vegetation	Effects on Wildlife
		Larger doses may cause a decrease in body length and smaller doses may lead to lethargic behavior in some fish Relatively non-toxic to birds

The functional value of the entire 3,277-acre project site would be lost for most species of wildlife. However, some disturbance-tolerant species, and the many small species trapped within the perimeter, including birds, small mammals, and reptiles, may be harmed by ongoing weed management activities, including the use of herbicides. Plants and wildlife that occur in close proximity to the project, or downstream of the project could also be directly or indirectly affected by herbicide use, including desert tortoise and other special-status species protected under a variety of LORS.

The known toxic effects of some herbicides on wildlife are summarized in **Biological Resources Table 9**. Staff considers potential impacts to wildlife from herbicide use to be significant, absent mitigation. To avoid potentially significant impacts, Condition of Certification **BIO-18** (Weed Management Plan)would require the project follow guidelines for protecting native species from herbicides recommended by The Nature Conservancy. These may include restricting herbicide use on windy days, controlling drift, prohibiting the use of pre-emergents and other herbicides with residual soil toxicity, prohibiting spraying or mechanical weed management near special-status species, and limiting weed management around the perimeter to isolated occurrences of highly invasive species. The use of herbicides in the project area would also be required to comply with regulations set forth by the U.S. Environmental Protection Agency (EPA) and California Department of Pesticide Regulation (CDPR).

Retention Area

Operation of the project would require the development of a 125-acre storm water retention area to manage stormwater runoff and protect downstream private lands from erosion and sedimentation. The retention area will occur on the western side of the project (CH2 2012ii) and would control peak flows that would occur from elevating the western perimeter roadway above the existing grade. The accumulated water would drain through an 18-inch culvert or infiltrate into the soil. Information in the AFC indicates that a 5 year storm could result in standing water over one foot deep, and water almost four feet deep could result from a 100-year storm. The applicant indicates that the retention area would drain completely within 24 hours with the installation of three 18-inch drain pipes (CH2 2012ii).

Water impounded in the retention area will adversely affect both native vegetation and wildlife. Small fossorial (i.e., burrowing animals), or species with limited dispersal abilities that remain within this area will be periodically lost during large storm events. This may include ground nesting birds. In addition, given the scarcity of water in the desert, many species of wildlife can be attracted to areas supporting large areas of standing water. Retention basins that hold water for extended periods of time would provide a potential water source in an otherwise arid region and could act as a subsidy to ravens. Since the retention area coincides with placement of heliostats, the location will be fenced from routine animal use; however, the retention basin may still attract predators and other species, including waterfowl. In addition, small mammals, waterfowl, shorebirds, and other resident or migratory birds may attempt to access areas supporting ponded water despite the perimeter fencing. The project site is located in an area where ephemeral drainages from the surrounding mountains terminate, and localized flooding would be expected, and has been previously documented at the site (KCET 2012).

Successful eviction of kit fox, burrowing owl, and badger has been a continuing concern on large solar projects. At the Ivanpah Electric Generating System project, kit fox have been observed climbing eight foot chain link fence (Douglas Davis pers. comm. 2012). Burrowing owls have also entered pens where tortoises are held onsite, and where human presence is a daily factor. On the Genesis Solar Electric Generating Project (GSEP), the use of electrified fencing added to project perimeter fencing has also failed to deter kit fox from entering and exiting the site on a daily basis (GSEP Monthly Compliance Report 2012). While it is uncertain if the desert kit foxes are trying to return to previous occupied territories or seeking ponded water these areas remain an ongoing concern for staff. Another concern is the location of the retention pond along the western border of the project site where attraction to the ponds by birds would increase the possibility of collision with facility structures. Staff considers large areas of standing water, even for relatively short durations of time, to pose a potential risk to desert tortoise and other wildlife because of the potential subsidy these pools provide to ravens.

Implementation of **BIO-8** (Impact Avoidance and Minimization Measures) would minimize the potential for the project to provide further subsidies to ravens and other predators. This condition includes the requirement that standing water does not persist on the project site for more than 24 hours after a precipitation event. With implementation of this condition, impacts to wildlife from the retention basin would be considered less than significant.

Avian and Bat Issues

The project would introduce several factors which could cause injuries or even mortality to birds. Potential operational impacts include collision with the power tower or heliostats, risk of burns to birds that fly into the reflected sunlight between the heliostats and the power towers, electrocution, and disturbance from lighting. These are discussed further below.

Collisions, Lighting, and Glare

The project would include two power towers, heliostat fields, and ancillary equipment including boilers and control facilities. Onsite facilities range from a height of 750 feet (power towers), to 120 feet for boilers and the air-cooled condenser unit. Each of the heliostats is approximately 12 feet high. The remaining facilities are generally less than 80 feet in height (HHSG 2011a). All of these features would pose a potential collision risk for birds. Birds are known to collide with communications towers, transmission lines, and other elevated structures including buildings. Estimates of the number of bird fatalities specifically attributable to interactions with utility structures vary considerably. Nationwide, it is estimated that hundreds of thousands to as many as 175 million birds are lost annually to fatal collisions with transmission and distribution lines (Erickson et al., 2001). Numerous studies have also documented extensive avian collision mortality associated with buildings and similar structures such as smokestacks or monuments (*ibid*). In California, even general estimates are unavailable, although it is plausible that such collisions result in the deaths of hundreds of thousands of birds each year (Hunting, 2002).

Collisions typically result when the structures are invisible (e.g., bare power lines or guy wires at night), deceptive (e.g., glazing and reflective glare), or confusing (e.g., light refraction or reflection from mist) (Jaroslow 1979). Collision rates generally increase in low light conditions, during strong winds, and during panic flushes when birds are startled by a disturbance or are fleeing from danger. The Avian Power Line Interaction Committee (APLIC) has determined that collisions are more probable near wetlands, within valleys that are bisected by power lines, and within narrow passes where power lines run perpendicular to flight paths (APLIC 1996). Collisions are more probable near wetlands, valleys that are bisected by power lines, and within narrow passes where power lines run perpendicular to flight paths. Passerines (e.g., songbirds) and waterfowl (e.g., ducks) are known to collide with wires (APLIC 2006), particularly during nocturnal migrations or poor weather conditions (Avery et al. 1978).

Diurnal birds, or those active during daylight hours, could also collide with tall structures. Staff has concluded that the risk of such impacts is low. Most diurnal bird collisions with tall structures are associated with guyed towers in poor visibility conditions such as fog or inclement weather (Manville 2001). The HHSEGS project does not include guyed structures. While the project would not have evaporation ponds that could attract birds to the site, it would contain a 155 acre stormwater retention basin that would hold water for up to 24 hours after seasonal rainfall. In addition, dust storms and or windy days may increase particles in the air, which in turn reflect the solar energy and could increase the collision risk for birds.

To date little is known regarding the avian response to glare from solar technology. However, it is likely that glare will affect birds to some degree. In the same way that large mirrored buildings may be confused by birds as open sky; the mirrors will reflect light and take on the color of the image being reflected. This may result in birds confusing the heliostats as either open sky or water and increase the collision risk. Bird response to glare is not well understood. Staff has reviewed research by McCrary et al. (1986) which quantified bird mortality, including collisions, at a 10 MW pilot SRSG pilot facility (Solar One) near Daggett, California. The Solar One facility consisted of a 79-acre heliostat field and 282-foot solar receiver tower. Staff is not aware of any other scientific study of bird mortality at any other comparable generator.

McCrary et al. documented 70 bird fatalities during the course of a 40-week study, and estimated that approximately 10 to 30 percent of bird carcasses went undocumented because animal scavengers removed the carcasses before they were detected by the researchers. Adjusting for the estimated number of undocumented birds, the total average mortality rate was 1.9 to 2.3 birds per week. The bulk of bird mortality (more than 80 percent) resulted from collisions. The average weekly mortality rate for collisions was 1.5 to 1.8 birds. Most of these mortalities were from collisions with the heliostat mirrors, and one known mortality resulted from collision with the solar receiver tower. The authors partially attributed these collisions to high numbers of birds attracted to the adjacent evaporation ponds and agricultural fields. The applicant has undertaken monitoring bird mortalities due to solar flux exposure at its six MW SEDC project in Israel (BS 2012x, BS 2012v, BS 2012w), a site that is significantly smaller than the proposed HHSEGS site. To date, no mortalities due to collision or lethal exposure to concentrated solar flux have been reported (Ibid.); however, staff concluded survey methodology was inadequate to detect carcasses presence. The proposed project would be substantially larger than both Solar One, SEDC, or GEMASolar (BrightSource Energy, Inc 2012x). **Biological Resources Table 10** compares physical characteristics of Solar One, GEMASolar, and SEDC to the proposed project**.**

Biological Resources Table 10
Avian Mortality Hazard: Comparison of SRSG Projects

Project Component	Solar One (San Bernardino Co., CA)	SEDC (Israel)	GEMASolar (Andalusia, Spain)	Hidden Hills SEGS (Inyo Co., CA)
Acreage / MW	79 acres / 10 MW	80 / 6 MW	457 acre/19.9 MW	3,277 acres / 500 MW
Mirrors	1,818 heliostats, each one 430 ft^2); Total = 781,740 ft^2	1,610 heliostats, 75-150 ft^2 each. Total = 120,000 – 240,000 ft^2	2,650 heliostats = to 1,075 ft^2	2 generators x 85,000 heliostats each (170,000 total); 2 mirrors per heliostat; each mirror 8.5 x 12 ft (102 ft^2 each, 205 ft^2 per heliostat); Total = 34.8 million ft^2
Tower(s)	One; 282 ft. tall	One; 256 ft tall	One; 420 ft tall	Two; each one 750 ft tall
Adjacent land use/ habitat	Desert shrubland; adjacent agriculture & evaporation ponds	No agriculture or wetlands; adjacent evaporation ponds; within major migratory flyway	Unknown	Adjacent to desert shrubland, near mesquite thickets in Nevada, and Important Bird Areas
Bird Mortality	70 mortalities documented during 40 weeks of surveys 19 were waterfowl & shorebirds; 51 (incl. all burns) were other species	Applicant commenced bird monitoring at this location in spring 2012. No mortality or injuries reported	No mortality or injuries noted after two days of carcass searches.	

Source: URS 2012a.

McCrary et al. (1986) also inventoried bird carcasses on the Solar One project site and estimated the number of birds in the surrounding approximately 370-acre area, including the solar facility, evaporation ponds, and adjacent agricultural fields. They estimated total bird mortality as 1.9 to 2.2 birds per week (including collisions and “burns”, from exposure to concentrated solar flux); and that collisions account for 1.5 to 1.8 of the weekly mortalities). Based on the total number of birds observed in the area, weekly, mortalities (collisions and burns) accounted for a 0.6 to 0.7 percent weekly mortality rate in the survey area. Much of the bird mortality consisted predominantly of collisions with mirrors, according to McCrary. These collisions were partially attributed to an increased numbers of birds attracted to the adjacent evaporation ponds and agricultural fields (McCrary 1986). However, it is important to note that the Solar 1 facility was completely graded, with heavy industry development adjacent to the facility. The proposed project enlists use of a low impact design, with the majority of habitat remaining intact onsite, albeit mowed.

The applicant has indicated that heliostat mirrors at the proposed project would be shorter than those at the Solar One site, and that this design difference would reduce collision hazard for birds. However staff has been unable to find documentation of relative collision hazards of taller or shorter mirrors. Staff believes that collision hazard is more likely to be a function of the total area of mirror surface than the height of the individual mirrors, and how birds appear to interact with reflective surfaces. The HHSEGS project would have 37 times more surface area of mirrors. Based on those factors, the Solar One collision mortality rates extrapolate linearly as 56 to 67 (rounded) bird mortalities per week at the larger HHSEGGS project site. The low value (56 birds per week) is based on the estimate for Solar One collision mortalities (1.5 birds per week) multiplied by 37 (mirror surface ratio). The higher value (67 birds per week) is based on the higher estimate for Solar One collision mortalities (1.8 per week) multiplied by 37(the mirror surface ratio). Annually, this results in a range of mortalities from 2,912 to 3,484 birds. These estimates do not account for morbidity that occurs as a result of collision and exposure to concentrated solar flux.

These extrapolations are intended as projections of the anticipated scale of bird collision mortality, using the best data available. Staff cautions, however, that this is not an estimated or predicted mortality rate. McCrary et al. (1986) noted that “The greater magnitude of these [larger commercial-scale] facilities may produce non-linear increases in the rate of avian mortality when compared to Solar One and extrapolations from this study should be made with caution.” Due to the many factors contributing to bird collision risk and bird behavior in a concentrated solar flux zone, staff cannot quantify expected bird mortalities from the project facilities. Nevertheless, staff believes that the risk is significant. See **Appendix BIO1** for a discussion of the nonlinear scaling of effects from concentrating solar power projects.

Lighting also plays a substantial role in collision risk because lights can attract nocturnal migrant songbirds, and major bird kill events have been reported at lighted communications towers (Manville 2001), with most kills from towers higher than 300 to 500 feet (Kerlinger 2004). Radar data from the Mojave Desert indicate that less than 15 percent of birds that migrate at night fly below 984 feet (Felix et al. 2008), therefore more migratory flight is likely to occur over the 750-foot power tower. Disruption of birds’ migratory path, such as happens during storm events can cause birds to fly at lower heights, and be at risk of collision with the tower or other project facilities. Many of the avian fatalities at communications towers and other tall structures have been associated with steady-burning, red incandescent L-810 lights, which seem to attract birds (Gehring et al. 2009). Longcore et al. (2008) concluded that use of strobe or flashing lights on towers resulted in less bird aggregation, and, by extension, lower bird mortality, than use of steady burning lights. Bright night lighting close to the ground at the project site could also attract bats and disturb wildlife that occurs adjacent to the project site (e.g., nesting birds, foraging mammals, and flying insects).

The project's transmission lines are not expected to pose a collision risk to bats. Although many studies have quantified bird strikes with transmission lines, analogous information on bats is very limited (Manville 2001). Collisions with distribution, collector or feeder lines will likely occur to some degree however collision risk is not thought to pose a significant risk to bats in the project area. The most likely collision risk for bats is associated with vehicle or equipment as bats forage near roads or work areas.

Given that most bat species can use echolocation to discriminate objects as small as 0.4 to 0.004 inches in size (Vaughan and Vaughan 1986), and the size of transmission lines are typically equal to or greater than 0.5 inches in diameter, the frequency of strikes with facility structures is expected to be extremely low.

Installation of heliostats could also cause an increase in Polarized Light Pollution (PLP) which occurs from light reflecting off of dark colored anthropogenic structures, and been demonstrated to be generated from even low-reflectance photovoltaic panels (Horvath et al. 2009). According to Horvath et al., PLP caused by anthropogenic structures can alter the ability of wildlife to seek out suitable habitat and elude or detect the presence of predators (Horvath et al. 2010). It has also been documented that for a variety of birds and other species PLP can affect their ability to detect natural polarized light patterns in the sky which can negatively affect navigation ability and ultimately affect dispersal and reproduction (Horvath et al. 2009). Although the proposed heliostats are not expected to result in PLP the effects of large reflective surfaces are poorly understood. Polarizing surfaces are also known to disrupt insect behavior, causing some insects to react as though the surface is water, and depositing eggs on polarizing surfaces ((Horvath et al. 2009)., Horvath et al (2009) determined that minimization of polarizing effects was possible by adding white grids onto solar panels, or otherwise minimizing the solar active area. The extent to which heliostats could serve as an attractant is not known.

There is uncertainty regarding how many birds may be killed by collisions with project features, but bird mortality is predictable. The significance of such mortality, in a CEQA context, is also uncertain, and would vary depending on the species involved, and the number of birds involved.

To minimize this risk of collision and disturbance to wildlife from lights, Condition of Certification **BIO-8** specifies that the lighting atop the towers be flashing strobe lights rather than steady burning lights, and that lighting be shielded, directed downward, and turned off when not needed. The project owner has proposed use of FAA lighting systems on the HHSEGS project, using only red lights at night with the longest permissible interval between flashes and the shortest flash duration permissible, which would further reduce the potential for nocturnal strikes. Staff has incorporated these measures into proposed Condition of Certification **VIS-3**, which directs the use, placement, and minimization of all lighting. Condition of Certification **BIO-15**, which requires development of an Avian, Bat, and Golden Eagle Protection Plan, would require the project owner to monitor, record, and report dead or injured birds found within the project footprint. The plan would also require the implementation of remedial actions including the placement of aerial markers, ribbons, or other devices to reduce bird mortality. Monitoring of operational impacts for seasonal factors, and species of birds affected, and types of injuries or mortalities has also been requested by the USFWS, is considered crucial in understanding operational impacts, bird behavior and responses to stresses, and identifying and implementing measures to avoid, minimize, or mitigate impacts. However, staff believes residual impacts to avian species will exist after implementation of the conditions of certification.

Staff also recommends Condition of Certification **BIO-15** (Avian, Bat, and Golden Eagle Protection Plan) to monitor bird mortality due to glare. Staff concludes that the Avian and Bat Protection Plan and mortality monitoring as recommended in Condition of Certification **BIO-15** would effectively determine rates of bird and bat mortality from collisions with structures. It may not be feasible to accurately determine the rate of latent mortality, when mortality occurs at a time and place removed from the project site. There is no feasible means of minimizing or avoiding this impact.

Solar Energy Flux

Implementation of the proposed project would have the potential to expose birds to potentially dangerous levels of solar energy. Solar energy from the field will strike the bird as it is reflected from the heliostat field to the solar receiver. Solar energy would be expected to strike the bird in the heliostat field, and the intensity of the exposure will vary, based on a number of factors including the angle of the bird (see **Appendix BIO1 and Appendix BIO2, Figures 1 -7**).

Thresholds for solar flux exposure have been established for humans, and range from 1.42kW/m^2 (24CFR, Section 51.204 Appendix II) to 5kW/m^2 (49CFR Part 193). No published threshold for avian exposure has previously been identified. Exposure to solar flux has the potential to result in direct and indirect effects to birds by damaging their eyes, including the loss of sight; burning or singeing feathers; compromising the molecular structure of feathers (i.e., non-visible damage); and secondary, non-visible physiological changes including elevated body temperatures or thermal stress. In some circumstances exposure to solar energy flux will result in the death of the bird either immediately or within a short period of time following exposure. The potential for injury depends on a variety of factors including the size and type of bird; length of exposure; and the level of solar energy flux (see **Appendix BIO1**). **Biological Resources Table 11** provides an example of the effects of solar energy flux on various organic materials including applicant's preliminary, unpublished anecdotal information on bird carcasses.

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Biological Resources Table 11
Effects of Thermal Radiation*

Radiant Heat Flux (kW/m^2)	Observed Effect
0.67	Summer sunshine in UK [a]
1	Maximum for indefinite skin exposure
6.4	Pain after 8 second skin exposure[b]
10.4	Pain after 3 second exposure[a]

12.5	Volatiles from wood may be ignited by pilot after prolonged exposure
16	Blistering of skin after 5 seconds[b]
29	Wood ignites spontaneously after prolonged exposure[a]
50	Singed or burned feathers; tissue discoloration and drying of a bird carcass after 20-30 seconds (BS 2012v)
52	Fibreboard ignites spontaneously in 5 seconds[a]

[a]D. I. Lawson (1954) [b]S.H. Tan (1967)
The data quoted for human exposure are essentially in agreement with information given by Purser (1995) and Mudan and Croce (1995)
Table source: Drysdale 1998, An Introduction to Fire Dynamics, 2nd Ed., by Dougal Drysdale, Publ: John Wiley and Sons, 1998, Table 2.8, P. 61

McCrary et al. (1986) found that 13 of the bird carcasses (19 percent) at the Solar One facility had been burned, reporting that the "heavily singed flight and contour feathers indicated that the birds burned to death," see Appendix BIO2, Figure 7. The authors interpreted these mortalities as the result of birds flying through that facility's standby points, though they did not observe the incidents, and the mortalities also may have been caused by flying within elevated flux levels surrounding the SRSG during normal operation. Risk of burning was evidently higher for aerial foragers (swifts and swallows) because of their feeding behavior. The McCrary study was based on systematic searches of the 32 hectare (79 acre) Solar One site but not beyond the site boundaries. Thus, if any birds were injured but were able to fly beyond the site's boundaries (about 1,200 ft from the receiver tower), they would not have been found by the field biologists and could have been scavenged before being observed. For this reason, staff believes that actual mortality from burning may have been higher than reported. It is also possible that birds considered collision victims had suffered damage to flight feathers such that birds were unable to fly, or had experienced damage to the eyes and became disoriented, resulting in collision with the heliostats. However, the authors did not perform microscopic examination of feather structure or eyes that would make this determination possible.

The HHSEGS's reflective surface area would be 37 times greater than Solar One's. Mortality ascribed to solar flux exposure at the Solar One site ranged from 0.3 to 0.4 birds per week. Based on those factors, the Solar One radiant energy flux mortality rate extrapolates linearly as 11 to 15 bird mortalities per week at the larger HHSEGS project site, or 572 to 780 bird mortalities per year. This extrapolation is intended as a rough projection of the anticipated scale of radiant energy flux mortality, but that it may be inaccurate for a variety of reasons. Even with site mortality monitoring it will be very difficult to discern the full impact of solar flux on birds. A detailed discussion of non-linear scaling effects has been included in **Appendix BIO1**. Due to the many factors contributing to bird collision risk, staff cannot quantify expected bird mortalities from radiant energy flux. Nevertheless, staff believes that the risk is significant. Interestingly, the authors concluded that power tower projects should be located away from water sources and rare, threatened, or endangered species (Ibid).

Elevated levels of solar flux would occur within some airspace over the solar field. This field would expose a variety of birds, bats, and insects to potentially damaging levels of solar energy. The applicant has stated that the HHSEGS would begin to operate at the moment the sun appears over the horizon; there is limited potential for bats to be active at that time. Birds that fly at lower elevations over the heliostat field may, intentionally or unintentionally, fly below zones of concentrated solar flux, and therefore not suffer damage from exposure to high levels of solar energy (see **Appendix BIO1**).

There is no information available to staff on the safe levels of solar energy flux that bats or insects may tolerate; however, because of body size and the absence of feathers, these species would be subject to adverse effects from lower intensities of solar energy flux than most birds. The risk to bats from the exposure of concentrated levels of solar energy is likely to be low. Bats are crepuscular, that is, primarily active during dawn and dusk, and at night when the facility would not be fully operational. Therefore this risk is not expected to be significant.

Staff has evaluated the formulation of a risk assessment model for the HHSEGS project, and the possibility of adapting existing risk models commonly used for the wind industry to power tower technology. Staff and the resource agencies have agreed that there is insufficient background data on expected bird use at the site to perform a risk assessment, and that a "retooled" wind project model is likewise not yet available to create a risk assessment model for this technology. Therefore, further quantification of mortalities is not currently possible. **Appendix BIO1** provides a "Characterization of Risk" and "Analysis of Uncertainty for the HHSEGS project and provides describes staffs best estimates for evaluating risks associated with this technology.

As described above staff believes that exposures to elevated levels of solar energy would be likely to kill living birds. In addition, staff believes that shorter exposures would be likely to cause other tissue or feather damage that could impair flight or vision or cause physiological effects and ultimately cause or contribute to mortality from other causes (e.g., reduce ability to forage, escape from predators, or thermoregulate). Staff also believes that longer exposures to lower energy flux levels are likely to cause feather damage or physiological effects. The following discussion is intended to illustrate the role of feathers to birds, and the types of behavioral or physiological functions that may be impaired or destroyed following exposure to concentrated solar flux in excess of safe thresholds, estimated to be no more than one minute's exposure at 4kW/m^2.

Damage to Plumage and Flight Feathers

A birds' plumage is well adapted to its environment, and serves a variety of roles, such as: flight, thermoregulation, protection from impact, defense, incubating eggs and young, tactile hunting, seasonal displays such as breeding plumage in male birds, and camouflage from predators (Raptor Research Foundation, 2012). When exposed to elevated levels of solar radiation; it is the plumage that is expected to show the first signs of damage. Eye exposure is also expected be a sensitive endpoint, and is discussed further below in the section entitled Irradiance.

Surface feathers, or contour feathers, cover and streamline the remainder of the body and also contribute to aerodynamics. Insulating feathers are found beneath the contour feathers. Damage to insulating feathers may affect the bird's thermoregulation (body temperature control). A bird's plumage is critical to insulating the bird from the environment, and is influenced by color and structure of the plumage (Wolf and Walsberg 2000).

Bird feathers grow from lines, or tracts, pterylae (Raptor Research Foundation 2012) with bare patches of skin in between, called apteria (Ibid.) There are several types of feathers, including fluffy down insulating feathers (which are used in the manufacture of pillows); semi-plumes, which shape and insulate the bird, bristles, usually around the face and used in feeding; filoplumes, used to feel and sense vibrations, and contour feathers, which add shape to a bird. A diagram of a feather is depicted in Appendix BIO2, Figure 6. Feathers are comprised of a central shaft, or rachis, and barbs come off the rachis at an approximately 45 degree angle (45°). Between barbs are two sets of barbules, microscopic filaments that connect each barb (Doctors Foster and Smith 2012, Muller and Patone 1998). Barbules have even smaller microstructures, called barbicels, which hooks the barbules together. These barbules act like a zipper, connecting the barbs and making them airtight and able to withstand air resistance during flight (Ibid., see also Muller and Patone 1998). This microstructure of a feather, consisting of barbules and barbicels, comprises the majority of the feather, and is not visible to the naked eye. These components, so critical to flight, are used in establishing a safe avian exposure criteria (see **Appendix BIO1**)

Flight feathers may be one of the most important feathers at risk from exposure to high levels of solar energy. The long relatively rigid feathers of the wings and tail (flight feathers) are the bird's aerodynamic flight surfaces. These feathers provide lift and are adapted to the body style of the bird, that is, raptors have long wings and long pointed flight feathers that allow for catching air current and generating great speed, while other birds have wing lengths and flight feather construction that allow for various flight patterns and behaviors. The feathers used for flight include primary, secondary, and tertiary feathers which are located along the arm of the bird, while the large tail feathers are called retrices. Feathers are "instrumental in flying [and] they play a critical role in temperature regulation" (Sibley 2002), and are considered the most valuable asset a bird has (Raptor Research Foundation 2012).

Feathers damaged by concentrated solar flux would only be replaced during a molt. Birds have no physiological means to replace damaged feathers other than seasonal molting. Molting generally occurs during or after the breeding season (Raptor Research Foundation 2012), and birds are known to time molting to optimize fitness such as after migration, or in concert with breeding. During a molt, the bird replaces all of the feathers over a period of four to 16 weeks. Typically the molt is staggered to allow the bird to fly and maintain thermal protection. Depending on the stage of molt, the existing plumage would provide varying degrees of protection from solar energy. A bird in the middle of molt, that may have areas of exposed skin, would be expected to have an increased risk from exposure to elevated levels of solar energy flux and may experience immediate tissue damage to tissue; having no thermal protection from plumage.

Birds replace lost feathers slowly and even minimal damage to flight feathers can significantly affect flight performance. Large birds, such as eagles and vultures may take up to two years to molt (Raptor Research Foundation 2012); although a few species will molt all flight feathers at once (Ibid.). When a feather is actively growing, blood is supplied to the shaft of the feather. When fully grown and formed the vessels that supply blood to the feather constrict and the feather is considered dead tissue, without feeling, similar to human hair. A feather broken while in the blood feather stage remains damaged until molt (Chubb 2003). Birds exposed to elevated levels of solar energy flux while in the blood feather stage may be subject to increased risk of feather damage. Additionally, it is unknown if a feather heated by flux could conduct heat through the feather shaft and into the follicle or skin of a bird.

Molting requires additional energy to create the feather components and synthesize them (Murphy 1999). A bird that has experienced damage from elevated levels of solar energy flux may have diminished abilities to meet existing energy requirements. Damaged plumage may require the use of additional energy to fly, forage, and perform normal behaviors lowering the survivability of the bird. Hawks and eagles have been demonstrated to manage the nutritional cost of molting by shedding just two feathers on each wing at a time, and typically having around 24 flight feathers total to be molted (Chubb 2003). Feathers produced during periods of poor nutrition can be faulty, showing ridges and other abnormalities (German Assn. for the Prot. Of Common Swifts 2012), therefore, one or more molts may be necessary to repair the damage, and a bird would be energetically challenged to do so if damaged feathers reduced the birds success at foraging.

Exposure to elevated levels of solar flux would be expected to damage feathers such that insulating and flight capacities are lost, impaired or even destroyed. Birds exposed to damaging levels of solar energy flux either during or after a recent molt may also have an increased the risk of mortality or decreased fitness. In a desert environment, staff expects that a bird exposed to high temperatures and with limited access to water would have low survivability, either succumbing to heat, or extreme cold during cold desert nights, or from being more susceptible to predation. Birds with exposed skin are considered “greatly disadvantaged” (Chubb 2003). As with most species, older and younger individuals would be considered more susceptible to injury or mortality from elevated levels of solar flux. For example, juvenile birds have feathers that are much softer, and are not as adept at maintaining feathers as adults (The Modern Apprentice 2012); and may be more susceptible to injury or mortality than older birds.

Flight Performance

Fight performance is critical to foraging, evading predators, conducting seasonal migration and breeding displays, and performing other life history characteristics. In pet birds, incorrect feeding or caging can cause damage and weakness in feathers such that swifts cannot thermoregulate or fly (German Assn. for the Prot. of Common Swifts 2012). Seemingly minor damage to flight feathers may affect a bird’s flight speed or its ability to maneuver; more significant damage to flight feathers would prevent flight altogether. Length of flight feathers, and asymmetry in flight feathers were noted to reduce take-off speed in birds, when impaired by damage, or during molt (Swaddle et al 1996). In rehabilitating wild birds, the condition of plumage is critical to determining if the bird can be released. If plumage conditions allow the bird to fly, thermoregulate, and waterproof themselves, the survival rate is much greater (Wildlife Rehabber 2012). Additionally, damage to flight feathers may impact a birds’ capability to migrate. Passerines with impaired flight feathers have been demonstrated to avoid long-distance flights (Hedenstrom 2003). Birds prevented from seasonal migrations due to the inability to effectively fly may experience mortality from the lack of food or exposure. Birds damaged by exposure to elevated solar energy flux would likely have limited abilities to complete these actives, and may suffer mortality at a later time or after leaving the site (i.e. off the project site). See **Appendix BIO1** for further discussion of flight mechanics.

Flight performance is also important in raising young. Adult birds make numerous trips back and forth from foraging grounds to the nest, carrying food items to young. A bird attempting to feed young with damaged flight feathers would have impaired flight capabilities that reduce the bird's ability to forage or hunt. Raptors in particular carry large prey to young, and have feathers adapted to these heavy loads. Bald eagles are capable of carrying up to half of their weight (Nye 2005), and damaged flight feathers would be detrimental to successful fledging of chicks.

Flight speeds and patterns will affect the length of time a bird is exposed to solar flux while moving across the project site. Flight speeds are reported to be typically within 10 20 to 50 miles per hour (mph) (USGS 1998), and vary dramatically on the upper end of the range. Appendix BIO1 provides estimates of the time required to traverse the solar field at various flight speeds, and also provides data for select flight paths and concentrated solar flux dose at the Solar 1 site. For reference purposes, horned larks and ravens are known to occur on the project site, and fly from 22 to 28 miles per hour, (mph) (USGS 2006), whereas mourning doves, which could also occur onsite, are faster flying, around 35 mph. Even faster are the swifts, whose speeds may possibly exceed 180 mph (Cooke 1933). It is unclear how flight speed may affect the likelihood of exposure to elevated levels of solar flux. Flight patterns would also affect the dose of solar flux a bird receives. Depending on species and behavior, birds exhibit various flight patterns such as continuous flapping, as well as non-continuous flapping such as soaring or gliding, flap-bounding and flap-gliding. Furthermore, flap speed varies depending upon energetics, weather conditions and speed needed, with swallows having a very low flap speed for birds of comparable size (Park et al 2001).

While it is unknown what the behavioral response of a bird will be from exposure to elevated levels of solar energy flux, passage through an area of high energy intensity could result in injury to the birds. Bird behavior will likely act in conjunction with flight speed to influence the probability of the exposure risk. Birds that fly at low elevations below elevated levels of solar energy flux are not expected to experience an exposure risk. However, aerial foraging birds, such as swifts and swallows, have been documented to be more likely to experience exposure to this risk (McCrary 1986).

The type and color of the plumage will also influence the potential risk to the bird. Plumage will absorb various amounts of solar radiation, depending on many factors. Plumage color, position of bird, density and structure of feathers, and flight speed, will all affect a birds' tolerance to this heat (Walshburg 1992). Other factors such as behavioral response to elevated flux levels, age of the bird, ambient temperature and humidity level will also affect how exposure to elevated solar energy levels will impact a bird. Birds will not be able to see the solar energy flux over the heliostat field, and therefore would not be expected to avoid the airspace where solar energy is concentrated. Birds may also become confused or disoriented and depending on behavioral response, such as flying lower, higher, or making evasive maneuvers will affect duration of exposure.

It is unknown what protection plumage will afford the different species of birds that may move into solar fields and experience elevated levels of solar energy flux. At low levels and short durations the birds may suffer little permanent damage and be able to survive post exposure. However, at exposure to high levels of solar energy flux even short durations may be lethal even if the bird is able to fly out of the flux field. For a large powerful bird, such as golden eagle, lethal damage to plumage, skin, or eyes from exposure to high levels of solar energy flux may occur, yet the bird may be able to fly away from the site. Documenting incidences of latent mortality that occur off the project site is likely not feasible nor is it possible to accurately predict what percentage of birds would be subject to this effect.

Irradiance

When the project is operating, the heliostats will reflect the sun's rays onto the SRSG, which occupy the top 130 feet of each solar power tower. During these times, the boilers absorb approximately 95 percent of the light that reaches them. Light that is not absorbed will be visible reflecting off of the surfaces of the solar boilers.

The perceived brightness of objects is measured in terms of retinal irradiance, which is a measure of the intensity of the light reaching the retina. Retinal irradiance also has the potential to cause adverse impacts. The avian eye is comparatively larger than the human eye (Brooke et al 1999), and raptors have even larger size eyes than non-predatory birds of the same weight (*Ibid*). Birds eyes are typically fixed in the socket and unable to turn (Project Beak 2012), although some species such as raptors have limited ability to turn their eyes (White et al 2007) (O'Rourke et al 2007), and have very wide fields of view (O'Rourke et al 2007). Some birds may be unable to look away or avoid exposure, given their physiological attributes (Dr. Gregg Irvin, personal communication). This lack of response would be considered similar to a "deer in the headlights". In humans, the sensation of pain is not linked to retinal damage, nor does it seem to be linked in animal species (*Ibid*).

It has been suggested that the presence of specially-adapted oils in the cones of avian eyes may provide some protection against solar irradiance (Vorobyev 2003). Staff has no data on how much, if any, protection is gained by the presence of these oils. However, it is assumed that wildlife have evolved and adapted protective physiological traits specific to their environment, and would not have innate protections against irradiance of the magnitude created by the project.

Staff has no further data regarding the impacts of irradiance exposure on wildlife. It should be noted that the possibility exists for wildlife to experience damage, yet still be able to fly off the site. For the purposes of evaluating significance thresholds, staff believes irradiance has the potential to cause injury or lethality to avian species that fly within an un-quantified area of the solar field. Estimates of species most susceptible, or numbers of individuals exposed to damage from irradiance is not currently available. Injury or death from exposure to irradiance would be in conflict with LORS. It should be noted that the monitoring and mitigation protocol outlined in Condition of Certification

BIO-15 would not detect eye damage, as necropsy of a live or freshly killed specimen would be needed to quantify damages. Staff has accounted for the lack of data by incorporating a safety margin (see Appendix BIO1) for flux exposure on feathers, and therefore will rely on damage to keratin (feathers) as the lowest endpoint of toxicity.

Applicant's Data

Staff has reviewed all information provided by the applicant with respect to solar flux. The applicant initiated a pilot study commissioned by the applicant at the SEDC site in Israel in April, 2012 (CH2 2012pp). The SEDC site uses similar technology, albeit is a much smaller project, with a 75-meter power tower. After 41 days of monitoring, only 3 bird carcasses were found at the SEDC site, with no signs of singeing or effects of collisions noted on the carcass. However, it is possible that flight capability was impaired by flux exposure, but not detected during examination of the carcasses.

Further information regarding the study was provided on November 1, 2012 (CH2 2012pp) and during a workshop held December 5, 2012, including information regarding study design at the site, and presenting the results of spring 2012 survey data. The study includes carcass searches within the heliostat field, as well as observation of bird behavior in the airspace over the project site. During 41 days of surveys a total of 62 species have been observed at the project site, with the majority of the birds flying above 100m. Fall surveys of the SEDC site will be performed from August 15 to October 15, 2012 (CH2 2012pp); no results were available to staff at time of publication of this analysis.
The applicant also provided results of the preliminary investigation on the effects of concentrated solar energy on bird carcasses to staff during a workshop on August 28, 2012, and December 5, 2012 (BS 2012uBS 2012v, BS 2012w, BW2012x). Carcasses of three species (chickens, doves, and quail) were exposed to various energy flux level for periods of 10 to 30 seconds. Burned or singed feathers and discolored or dried muscle tissue were observed in the carcasses exposed for 20 to 30 seconds to flux levels above 50 kW/m^2. These effects were not observed in carcasses exposed to lower flux levels for the same intervals. No data on longer exposures were available.

The levels of feather and tissue damage reported for these exposures at 50 kW/m^2 or above would be likely to kill living birds. In addition, shorter exposures at these energy flux levels would be likely to cause other tissue or feather damage that could impair flight or vision or cause physiological effects and ultimately cause or contribute to mortality from other causes (e.g., reduce ability to forage, escape from predators, or thermoregulate). Longer exposures to solar flux levels below 50 kW/m^2 are likely to cause feather damage or physiological effects. Staff has reviewed these studies, disagrees with conclusions presented, and notes that applicant's results are in stark contrast with other published literature. For example, a whole house is known to ignite after 15 to 20 minute exposure to flux density of 31.53 kW/m^2 (24CFR, Section 51.204, Appendix II); it seems unreasonable to believe that a bird might withstand even higher flux densities for any amount of time.

Conclusions and Discussion of Mitigation

Based on staff's understanding of solar energy flux intensity and exposure times, staff believes that birds flying for through energy flux in excess of safe thresholds will likely suffer significant damage to flight feathers, eyes, or skin so that they will be unable to survive longer than a few days. In some cases, where they fly through higher flux levels, these birds will fall to the ground with evidence of severe burning as reported by McCreary et al. (1986). Staff believes that many birds may continue flying for a few seconds or minutes, perhaps long enough to escape the hazard, but will be unable to fly effectively, find food, or escape predators and will die a short time after the exposure.

Staff also believes that birds exposed to concentrated solar flux will be at risk of suffering (1) feather damage and consequent flight impediment, or (2) hyperthermia, hypothermia, or other damaging physiological or anatomical effects. These effects of exposure are influenced by both the dose level and exposure time. These effects are considered significant and immitigable.

The project applicant has offered no mitigation for impacts stemming from exposure to solar flux, and has stated that the size and configuration of the project itself serves to minimize effects. Staff disagrees with this position; yet no feasible onsite mitigation and minimization measures to avoid the impact have been identified. Implementation of Condition of Certification **BIO-15 (**Avian, Bat, and Golden Eagle Protection Plan) will be required to monitor and potentially reduce the onsite loss of some birds and golden eagles. Opportunities for offsite mitigation may also be possible by enhancing, creating, or restoring offsite habitat demonstrated to be of value to the avian species occurring on the HHSEGS site. Other offsite mitigation may be available through a partnership between the project owner and the USFWS JointVenture Program (discussed further below). However, just as it is difficult to discern the full actual impact of the project on avian species, it is also difficult to identify feasible mitigation that is matched proportionally to such an impact.

In developing Condition of Certification **BIO-15** with respect to golden eagles, staff has considered the USFWS Draft Environmental Assessment for the West Butte Wind Project golden eagle take permit (2011c). The USFWS concludes (in its Draft) that the applicant's conservation measures would meet USFWS's purpose and need. The relevant conservation measure is 11 power pole upgrades for each eagle mortality. However the take of golden eagle is not permitable under state law, and such take cannot be "fully mitigated" under state law. Thus, even with mitigation for potential golden eagle take, the impact to golden eagles would be viewed as significant.

Staff has also considered the USFWS's recommended survey protocol for bird mortality at the Rice Solar Energy project (Rice project). The Rice project is a 150 MW concentrating solar power project, similar to the HHSEGS project in creating a concentrated solar flux field over the heliostats. The Rice Project (09-AFC-10) was certified by the Energy Commission in 2010, and pursuant to conditions of certification, a monitoring plan was developed for the Rice Project (Nicolai et al 2010).

Implementation of **BIO-15** (Avian, Bat, and Golden Eagle Protection Plan) would require the project owner to monitor, record, and report bird deaths and injuries from project construction and operation. Monitoring the project's operational impacts for seasonal factors, the species of birds affected, and the types of injuries or mortalities that occur have also been requested by the USFWS. This type of monitoring is considered crucial in documenting bird behavior, noting responses to stress, quantifying impacts, and subsequently identifying and implementing any available measures to avoid, minimize, or mitigate these impacts. If take occurs, it will be reported to the US Fish and Wildlife Service (USFWS) for further action. Additionally, Condition of Certification **BIO-15** has been developed to meet USFWS requirements for addressing the ESA, MBTA, and BGEPA. Feasible mitigation to reduce impacts below the level of significance are not currently known.

Condition **BIO-15** requires development of Avian, Bat, and Golden Eagle Protection Plans. These plans require development of project monitoring methodology and implementation of compensatory mitigation, should monitoring reveal significant impacts to avian species. This mitigation shall be implemented as needed based on levels of take revealed by monitoring, and would detail all appropriate minimization and compensatory actions, as determined in consultation with USFWS, CDFG, and the Energy Commission. These actions would vary from restoration of avian habitat that supports the species impacted by the project, power line retrofits or other means of minimizing take and enhancing habitat, and will allow for flexibility in measures imposed, based on effectiveness monitoring. These avian protection plans will also incorporate a means of accounting for individuals that may suffer damage from irradiance exposure, yet still be capable of flying off the site. These animals would not be detected during onsite carcass searches, yet would be adversely impacted by the project.

While data collection is important, and could potentially inform new mitigation or adaptive management strategies, feasible mitigation to reduce impacts to avian species from exposure to elevated levels of solar energy flux or irradiance to below the level of significance does not exist. This is because mitigation cannot avoid bird mortality, nor can it adequately replace birds in the local population that are killed by solar flux exposure. Further, if golden eagles are adversely affected, impacts to this species would be considered unmitigable because golden eagle is a fully protected state species. While habitat restoration actions may benefit by some measure the species impacted by improving survivability and reproduction of the species, staff is unaware of any means of directly correlating such restoration measures to the impact of solar flux on various bird, bat, and insect species. Staff concludes significant residual effects could exist after implementation of **BIO-15**.

Conservation Opportunities

Condition of Certification **BIO-15** would, among other things, require the development and implementation of conservation opportunities. Staff has accordingly conferred with various agencies to determine where these conservation opportunities may exist. While the final determination of specific conservation actions would be made during development of the Avian, Bat, and Golden Eagle Protection Plans, and are not limited to those opportunities presented here, the following are viable examples of conservation actions that may be taken by the project owner.

The USFWS Joint Venture is a collaborative, regional partnership of government agencies, non-profit organizations, corporations, tribes, and individuals that conserves habitat for priority bird species, other wildlife, and people. Joint Ventures bring these diverse partners together under the guidance of national and international bird conservation plans to design and implement landscape-scale conservation efforts. Joint Ventures have been widely accepted as the model for collaborative conservation in the 21st century. They use state of the art science to ensure that a diversity of habitats is available to sustain migratory bird populations for the benefit of those species, other wildlife, and the public. JointVenture actions include: biological planning, conservation design, and prioritization; project development and implementation; monitoring, evaluation, and research; communications, education, and outreach; and funding support for projects and activities.

Within California, several JointVentures exist: the Central Valley, Intermountain, and Sonoran. Based on personal conversations with USFWS and the Sonoran JointVenture Coordinator, means of compensation benefitting desert avian species are in place (Robert Mesta, personal communication), and further, the Sonoran JointVenture program also has the capability of designing conservation plans responsive to certain bird species or specific geographic locales. It is possible that conservation measures, as determined in the Avian, Bat, and Golden Eagle Protection Plans may entail cooperative effort with a JointVenture Program.

Staff has also conferred with the BLM (Chris Otahal, personal communication) regarding conservation opportunities at the Amargosa River Natural Area, which is comprised of three ACECs: the Upper Amargosa Mesquite Bosque Unit, Central Amargosa Unit, which includes the previous Amargosa Canyon and Grimshaw Lake Natural Areas plus additional lands in China Ranch Wash and the Tecopa area, and the Lower Carson Slough Unit. Within these ACECs restoration and enhancement of the Amargosa River and adjacent environs are ongoing, including tasks such as tamarisk removal and control of brown-headed cowbirds (*Molothrus ater*), a bird known to parasitize the nests of songbirds. The BLM has indicated that if conservation actions are deemed necessary through project operations monitoring, the possibility exists for the project owner to participate in these conservation opportunities through various means such as funding or supply of personnel.

Electrocution

Egrets, herons, raptors, and other large aerial perching birds, including those accorded state and/or federal protection, are susceptible to transmission line electrocution if they simultaneously contact two energized phase conductors or an energized conductor and grounded hardware. The design characteristics of transmission towers/poles are a major factor in raptor electrocutions. Electrocution occurs when a perching bird simultaneously contacts two energized phase conductors or an energized conductor and grounded hardware. This happens most frequently when a bird attempts to perch on a transmission tower/pole with insufficient clearance between these elements. Electrocution can occur when horizontal separation is less than the wrist-to-wrist (flesh-to-flesh) distance of a bird’s wingspan or where vertical separation is less than a bird’s length from head-to-foot. Electrocution can also occur when birds perched side-by-side span the distance between these elements (APLIC 2006).

The majority of bird electrocutions are caused by lines that are energized at voltage levels between 1-kV and 60-kV, and “the likelihood of electrocutions occurring at voltages greater than 60-kV is low” because phase-to-phase and phase-to-ground clearances for lines greater than 60-kV are typically sufficient to prevent bird electrocution (APLIC 2006). The proposed transmission lines on the project site are currently under review and the applicant has proposed burying transmissions lines on the project site. Therefore, the project will not afford new perching opportunities from these facilities; however, substation structures do provide perching opportunities for birds. To reduce potential effects of the project the applicant has indicated that construction and operations crews will use BMPs, and that transmission facilities will be designed to be raptor-safe in accordance with the Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006 (APLIC 2006). This includes placing perch deterrents on small structures to reduce the potential for birds to perch on the poles. Condition of Certification **BIO-8** requires above-ground transmission lines and all electrical components to be designed, installed, and maintained in accordance with APLIC guidelines to reduce the likelihood of large bird electrocutions and collisions. With the Implementation of proposed Condition of Certification **BIO-8**, the project transmission lines would not pose a significant electrocution threat to birds.

Impacts to Special-Status Wildlife

Habitat in the project area has the potential to support a variety of special-status wildlife. Some of the sensitive species observed in the project area include desert tortoise, burrowing owl, Le Conte's thrasher, golden eagle, American badger, and Nelson's bighorn sheep. **Biological Resource Table 4** lists the special-status wildlife species that have the potential to occur in the project area. Impacts to special-status or listed species would occur in the same way as described for common wildlife and could be caused by a variety of direct and indirect factors. Impacts to special-status species are described below.

Special-Status Reptiles

Desert Tortoise

The desert tortoise is listed as threatened under CESA, and the Mojave population (i.e., all animals located west of the Colorado River) is listed as threatened under the federal ESA. The proposed project would be required to obtain both state (Incidental Take Permit via Section 2081 of Fish and Game Code) and federal permits (USFWS Biological Opinion via Section 7 of the ESA). As part of its authority granted by the Warren-Alquist Act, the Energy Commission has in-lieu permitting authority for local and state agencies; therefore the state Incidental Take Permit (2081) for desert tortoise would subsumed in the Commission Final Decision.

Protocol-level surveys were conducted between March 13, 2011, and May 18, 2011 (HHSEGS 2011a). Desert tortoise and their sign were detected on the project site and in adjacent habitat to the east and south. Two live desert tortoises, the remains of a skeleton and shell, 58 burrows, 12 desert tortoise scats, and six sets of desert tortoise tracks were detected on the project site (See Figure 5.2 -7 Desert Tortoise and Sign in the AFC). Six live desert tortoise, 15 burrows, one desert tortoise scat, and three sets of tracks were detected within 150 meters of the project site. Surveys within the broader "zone of influence" (ZOI), which extends 1,600 meters from the project boundary, detected seven live tortoise, 21 burrows, and 5 desert tortoise scats. **Biological Resources Table 12** provides a summary of the applicant's data representing desert tortoise observations, burrows, and their sign within the project area, the 150 meter buffer, and the ZOI transects (HHSEGS 2011a). **Biological Resources Figure 5** identifies burrows detected by the applicant and staff during surveys of the project site conducted in August 2012.

Biological Resources Table 12
2011 Desert Tortoise Survey Results

Location	Tortoise	Carcass	Burrows	Scat	Tracks
Project Site	2	1	58	12	5
150 M Buffer*	6	0	15	1	4
Zone of Influence**	7	0	21	5	0
Total Sign	**15**	**1**	**94**	**18**	**9**

**Denotes sign identified within 150 meters of the project boundary*
*** Zone of Influence surveys were conducted in suitable tortoise habitat along all sides of the main project site at 200 meters, 400 meters, 600 meters, 1200 meters, and 1600 meters from the survey area perimeter. No ZOI transects were conducted south of the site due to the presence of private residences.*

Although only a small number of desert tortoises were detected on the project site it is likely that the project area supports a larger number of tortoises than were observed by the surveyors. Desert tortoises are frequently unavailable to be sampled by field crews because they make extensive use of underground shelters (Nussear 2004). Similarly, desert tortoises spend much of the year in burrows even during the active season (Woodbury and Hardy 1948; Marlow 1979; Nagy and Medica 1986; Bulova 1994), and only the proportion of the tortoise population that is above ground is usually sampled (Nussear 2004). Even when desert tortoise are active and above ground during the surveys only a subset of these animals are usually detected. This can lead to a violation of a critical assumption of the line distance sampling technique, namely, that all animals on the line are found (Anderson et al. 2001; Buckland et al. 2001).

In order to account for observer bias, weather conditions, and desert tortoise behavior the USFWS developed a predictive model (USFWS 2010) for estimating the expected range of desert tortoise that may present based on the limited ability to detect animals during the surveys. The USFWS 2010 survey protocol takes into account the probability that tortoises would be present above ground based on the previous winter's rainfall and the fact that not all tortoises within the survey area are seen by surveyors. The model then provides a mathematical formula that is used to estimate the number of adult and subadult tortoises that are actually present. Statistical techniques can provide further estimates of minimum and maximum numbers of tortoises expected, within a 95 percent confidence interval. In addition, most juvenile tortoises and tortoise eggs are not detected during field surveys.

The applicant has indicated that although most tortoises were found off the proposed project site, the abundance of burrows, recent scat, and tracks on site, and the close proximity (within 150 meters) of desert tortoise and their sign indicate an active population is using the site (HHSEGS 2011a, Appendix 5.2F). Based on the USFWS predictive formulas completed by the applicant between 6 and 33 adult and subadult desert tortoises are expected to occur on the project site (USFWS 2010a). In addition to adult and subadult desert tortoises, the proposed project site is expected to support a population of juvenile tortoises that are not considered in the USFWS formula.

Juvenile tortoises are extremely difficult to detect because of their small size and their cryptic nature. In many instances these species are overlooked during surveys. However, estimates of juvenile tortoise populations can be extrapolated using information based on a four-year study of tortoise population ecology conducted by Turner et al. (1987). This study determined that juveniles accounted for approximately 31.1 to 51.1 percent of the overall tortoise population. Using this range and the estimate of between six and 33 adult and subadult desert tortoises (i.e., lower and upper 95 percent confidence value), the project site may support between three to 34 juvenile tortoises (i.e., a total population range between nine and 67 adults, subadults, and juveniles).

The project site may also support areas containing the eggs of desert tortoise. The number of tortoise eggs that could be present on the project site was estimated based on the assumption of a 1:1 sex ratio and that all females present would lay eggs (clutch) in a given year. Applying the 1:1 sex ratio to the lower and upper 95 percent confidence values (i.e., five out of the nine adult desert tortoises and 17 out of the 33 adult desert tortoises) the project site could theoretically support between five and 17 reproductive females. Using the average clutches per reproductive female in a given year (i.e., 1.6, see Turner et al. 1984), multiplied by the average number of eggs found in a clutch (i.e., 5.8; see USFWS 1994b); approximately 46 to 158 eggs would be expected on the site in a given year. However, fewer eggs are likely to be onsite at any given time because it is likely that not all females are of reproductive age or elected to produce eggs during any given year. The estimated number of desert tortoise, their range class, and the number of eggs that have the potential to occur on the project site are presented in **Biological Resources Table 13.**

Biological Resources Table 13
Estimated Number of Desert Tortoise on the Project Site and Within the 150 meter Buffer (95 percent confidence values)

Adult and Sub-adults*		Juvenile Estimates**		Eggs***	Total Adult/Sub-adult and Juvenile	
Lower	Upper	Lower	Upper	(Min-Max)	Lower	Upper
6	33	3	34	46-158	**9**	**67**

*Value based on formula recommended by the USFWS. Numbers reflect the 95 percent confidence interval.
** Values based on the equations of Turner et al 1987. Equation assumes that juveniles account for approximately 31.1 to 51.1 percent of the overall tortoise population. If P = Percentage of juveniles in population, A = Number of adults, and J = Number of juveniles then P = J / (J + A). Therefore J = PA/ (1 – P).
*** Assumes a 1:1 sex ratio and that all females present would clutch in a given year. Assumes average clutches per reproductive female in a given year (i.e., 1.6, see Turner et al. 1984), multiplied by the average number of eggs found in a clutch (i.e., 5.8; see Service 1994).

Impacts to Desert Tortoise

Construction of the proposed project would result in direct, indirect, and operational effects to desert tortoise and their habitat. These effects are similar to those described for common wildlife and would occur during the initial stages of mobilization, construction, and from operation and maintenance of the proposed facility. In addition, the implementation of the proposed project would require the translocation of all desert tortoises that occur in the development footprint prior to construction. The translocation of desert tortoise from the project site has the potential to adversely affect desert tortoises that may occur on the project site and at designated recipient areas (See translocation effects below).

Direct Impacts to Desert Tortoise

During construction of the proposed project desert tortoises could be harmed during clearing, grading, and trenching activities or may become entrapped within open trenches and pipes. Construction activities could also result in direct mortality, injury, or harassment of individuals and eggs from encounters with vehicles or heavy equipment. Desert tortoises are known to shelter under parked vehicles and be killed, injured, or harassed when the vehicle is moved. Other direct effects could include individual tortoises or eggs being entombed in their burrows, collection or vandalism, disruption of tortoise behavior during construction and disturbance due to noise or vibrations from heavy equipment. Human disturbance, lighting and noise may disrupt desert tortoise in adjacent lands. Desert tortoise may also be injured or suffer mortality from encounters with workers' or visitors' pets. Windblown dust can also adversely affect desert tortoise by degrading habitat and decreasing the value of available forage. Desert tortoises may also be attracted to the construction area by the application of water to control dust, placing them at higher risk of injury or mortality by vehicle traffic.

Construction of the proposed project would occur over a period of 29 months and access the site through Tecopa Road. Section 5.12.4.2 (Summary of Construction Phase Impacts) of the AFC indicate that during the peak construction month, the project is projected to add 2,744 daily trips, with 907 trips occurring during the morning peak hour and 907 trips occurring during the afternoon peak hour. Use of paved roads and the small dirt access roads could result in mortality of desert tortoises by vehicle strikes. The potential for increased traffic-related tortoise mortality is greatest along paved roads where vehicle frequency and speed is greatest. Desert tortoises on dirt roads may also be affected depending on vehicle frequency and speed. Data indicate that desert tortoise numbers decline as vehicle use increases (Bury et al. 1977) and that tortoise sign increases with increased distance from roads (Nicholson 1978; Karl 1989; von Seckendorf & Marlow 1997, 2002).

Construction activities that result in fires can also directly affect desert tortoise and their habitat. Because of the abundance of annual grasses and weeds in the region wildfires that result from welding, vehicles carelessly parked on vegetation, smoking, or other ignition sources pose a potential direct impact to desert tortoise and can quickly spread to off-site areas. Direct effects of fire on desert tortoise include mortality by incineration, elevating body temperature, poisoning by smoke, and asphyxiation (Whelan 1995). Small individuals such as hatchlings are more at risk from lethal heating than large ones because they have a higher surface to volume ratio that allows heat to penetrate their vital organs relatively quickly (Brooks and Esque 2002).

Indirect Impacts to Desert Tortoise

Indirect effects to desert tortoises could include soil compaction, fugitive dust, the introduction of non-native and invasive plant species, and increased human presence along access roads. Indirect effects may also include habitat fragmentation, the disruption of existing home ranges, and barriers to dispersal. Increased human presence from new access roads or interest in the facility could lead to increased road kill, illegal collecting and the spread of disease due to abandonment of captive tortoises infected with upper respiratory tract disease.

Indirect effects to desert tortoise may also occur from wildfires. Desert tortoises that escape direct mortality from wildfires may still be affected by fire-induced habitat alteration. Alterations to habitat can result in mortality, decreased fecundity, increased predation, starvation, and dehydration; all resulting in reduced viability of this species (USFWS 2011a). Reduction in plant cover also reduces available shelter as perennial plants, especially woody shrubs, provide protection for desert tortoises from mortality due to predators and overheating from the sun (Woodbury and Hardy 1948; Burge 1978; Mushinsky and Gibson 1991). Although single fires may not produce long-term reduction in the cover of perennial plants or biomass of native annual plants (O'Leary and Minnich 1981), recurrent fire can convert native desert scrub to alien annual grasslands (Brown and Minnich 1986; Duck et al. 1997; Esque et al 2003). Indirect effects can also increase the risk of predation by predators attracted to the area by increased human activity, water or food subsidies. Clearing and grading activities would result in the exposure of large numbers of fossorial species such as small rodents and reptiles. Many of these species are killed or injured during these activities and attract ravens and other opportunistic predators.

Operational Impacts to Desert Tortoise

Operational impacts to desert tortoise include both direct and indirect effects including those described above. Typically, these effects are similar in type but smaller in magnitude when compared to construction related effects. These effects may include the risk of mortality from vehicle traffic, crushing of burrows by routine maintenance activities on access roads or if any desert tortoises remain in the facility area post construction, vegetation management activities, and washing of the heliostats. Other operational effects include fires, habitat degradation, and the spread of invasive plant species. Increased road traffic on Tecopa Road either from facility staff or sightseers increases the risk of road kill to both tortoises and common wildlife. This not only results in the loss of desert tortoise but increases the risk for subsidized predators such as ravens and coyotes.

Construction and operation of the project has the potential to increase raven and coyote presence in the project area. Ravens depend on human encroachment to expand into areas where they were previously absent or in low abundance. Ravens habituate to human activities and are subsidized by the food and water, as well as roosting and nesting resources that are introduced or augmented by human encroachment. Ravens were observed by the applicant and staff on the project site and are likely to increase during construction of the project.

The proximity to the community of Charleston View may provide subsidies to known predators of desert tortoise. For example, common raven populations in some areas of the Mojave Desert increased 1,500 percent from 1968 to 1988 in response to expanding human use of the desert (Boarman 2002). Since ravens were scarce in this area prior to 1940, the current level of raven predation on juvenile desert tortoises is considered to be an unnatural occurrence (BLM 1990; USFWS 2008a). In addition to ravens, feral dogs have emerged as major predators of the tortoise. Dogs may range several miles into the desert and have been found digging up and killing desert tortoises (USFWS 2011; Evans 2001).

Ravens may also use the perimeter fence as potential perch sites and new transmission line structures as nest and perch sites increasing the potential for loss of tortoises from raven predation. Several raven subsidies occur in the region including the city of Pahrump, Nevada, a trash dumpster placed along the road in Charleston View, and a small pond that occurs at a local firearms training institute located north east of the project. Small mammal, fox, coyote, rabbit, lizard, snake, and tortoise road kill along Tecopa Springs Road also provides an additional attractant and subsidy for opportunistic predators/scavengers such as ravens. In addition, bird collisions with facility structures or transmission lines may also attract ravens. As the project area is already subject to elevated raven predation pressure and any loss of juvenile tortoise due to the further addition of raven subsidies could have a long-term effect on the tortoise population by reducing the recruitment of juvenile tortoises into the adult life stages (Boarman 2003). The effects of reduced recruitment may not be apparent for years because tortoises do not typically reach sexual maturity until approximately 15 to 20 years of age, and are therefore considered indirect impacts of project operation.

Conclusions and Discussion of Mitigation for Direct, Indirect and Operational Impacts to Desert Tortoise

Implementation of the proposed project would result in significant direct, indirect, and operational impacts to desert tortoise. Section 5.2.9.2.1 (Mitigation Measure 2 – Desert Tortoise) of the AFC identified a series of actions that would be employed during construction to minimize project effects to this species. These actions include but are not limited to worker training; the installation of exclusion fencing to prevent desert tortoises from entering construction areas; conducting pre-construction clearance sweeps; translocating desert tortoises; construction monitoring; trash collection; and providing compensatory mitigation for lost habitat. The applicant has also proposed to implement dust control measures; inspect beneath vehicles; restrict construction traffic to designated routes; and require reduced vehicle speed limits to minimize the risk of collision with vehicles or equipment. These actions were reviewed and incorporated into staffs recommended Conditions of Certification **BIO-1** through **BIO-13**, which apply to the protection of desert tortoise and other biological resources.

The most effective mechanism for reducing impacts to desert tortoise is to avoid or minimize on-site disturbance. However, because of the distribution of this species on the project site it will not be possible to avoid all occupied habitat. Desert tortoise are cryptic species that are often overlooked during surveys, and can be difficult detect unless weather conditions are favorable. The primary strategy to reducing direct impacts from construction related effects is educating workers as to the natural history of desert tortoise through Condition of Certification **BIO-6** (Worker Environmental Awareness Program); **BIO-7 (**Biological Resources Mitigation and Monitoring Plan) identifying sensitive species locations and permit requirements; **BIO-8** (Impact Avoidance and Minimization Measures); conducting pre-construction surveys and relocating desert tortoise to pre-selected off-site locations required by **BIO-9** (Desert Tortoise Clearance Surveys and Exclusion Fencing and **BIO-10** (Desert Tortoise Translocation Plan). **BIO-10** would require that the applicant prepare and implement a desert tortoise translocation plan to move the tortoises from the project site prior to ground disturbance. Direct impacts would also be reduced through Condition of Certification **BIO-12** (Desert Tortoise Compensatory Mitigation), which requires the acquisition of compensatory mitigation lands to off-set habitat loss (Impacts to Desert Tortoise Habitat are discussed further below).

Even with the implementation of the Desert Tortoise Translocation Plan it is likely that some juvenile tortoises and eggs would be overlooked and subject to mortality from project activities within the enclosed fence line both during construction and operation of the facility. Likewise, the ongoing translocation experience associated with the Ivanpah Solar Energy Project has illuminated the need to revise the translocation strategy to increase the number of clearance surveys in order to detect tortoises. While impacts to desert tortoise would be minimized through the implementation of proposed Conditions of Certification **BIO-8** (Impact Avoidance and Minimization Measures)**, BIO-9** (Desert Tortoise Clearance Surveys and Exclusion Fencing), and **BIO-10** (Desert Tortoise Translocation Plan) some onsite mortality would likely occur because of the cryptic nature of juvenile tortoises and from recent hatchlings not detected during the pre-construction clearance surveys. It is also likely that desert tortoise will continue to be found within the project fence line during the multi-year development of the project. Similarly, maintaining the integrity of the tortoise fence after storms and in locations where burrowing mammals such as coyote, badger and kit fox have breached the fence line will be an ongoing challenge. In addition, conditions of certification **BIO-9** (Desert Tortoise Clearance Surveys and Exclusion Fencing) and **BIO-10** (Desert Tortoise Translocation Plan) have inherent risks and could themselves result in direct and indirect effects to tortoises on the proposed project, translocation, and control sites. These could include direct effects such as mortality, injury, or harassment of desert tortoises due to equipment operation, fence installation activities, removal of tortoise burrows, and tortoise translocation. Indirect effects could include but are not limited to intraspecific competition for burrows or forage, increased stress, and the spread of disease. These impacts are described in more detail below.

Indirect effects to desert tortoise would also be reduced through the implementation of the conditions identified for direct effects. Implementation of the worker environmental awareness training (Condition of Certification **BIO-6**) would reduce the potential for wildfires to occur. Condition of Certification **BIO-8** would minimize the risks of increased traffic fatalities. These measures include confining vehicular traffic to the project site and existing routes of travel, prohibiting cross country vehicle and equipment use outside designated work areas, and imposing reduced speed limits on the dirt access roads. Condition of Certification **BIO-8** will also prohibit the use of the existing desert trail network to access the site and require vehicles to access the project via Tecopa Road and Highway 160. Potential impacts from the spread of invasive plant species would be reduced to less than significant levels through the implementation of conditions of certification **BIO-18** (Weed Management Plan). Condition of Certification **BIO-23** (Ground Water-Dependent Vegetation Monitoring Plan) would prevent significant adverse impacts to the mesquite dune scrub and Stump Spring ACEC, which are also used by desert tortoise (Poff pers. comm. 2012, HHSEGS 2011a). Implementation of these measures would reduce impacts of the proposed project to less-than-significant levels under CEQA.

The AFC did not identify specific mitigation to reduce the impacts of increased raven presence at the project site. However, measures proposed by the applicant including the removal of trash, management of standing water, and the removal of road kill would reduce raven subsidies. However, because of the responsibility to fully mitigate impacts to desert tortoise staff has proposed Conditions of Certification **BIO-8** (Impact Avoidance and Minimization Measures) and **BIO-13** (Raven Management Control Plan and Fee). These conditions would minimize the project's potential to cause increased predation on desert tortoise by ravens and other species in the project area by requiring a variety of impact avoidance and minimization measures to collect road kill; control trash and minimize other human activities that tend to increase raven activity; and implement on-site raven management and control. The project owner would also be required to provide a one-time per-acre contribution to support the USFWS Regional Raven Management Program.

Regional Approach to Raven Control

The USFWS, in cooperation with CDFG and BLM, has developed a comprehensive regional raven management and monitoring program in the California Desert Conservation Area to address the regional, significant cumulative threat that increased numbers of common ravens pose to desert tortoise recovery efforts (USFWS 2010b). The Regional Raven Management Program will implement recommendations in the USFWS E*nvironmental Assessment to Implement a Desert Tortoise Recovery Plan Task: Reduce Common Raven Predation on the Desert Tortoise* (USFWS 2008). To mitigate the projects contribution to cumulative and indirect impacts on desert tortoise from raven predation, staff proposes that the applicant contribute toward implementation of the Regional Raven Management Program (USFWS 2010b), as described in Condition of Certification **BIO-13**. To mitigate for the regional effects of ravens on desert tortoise, the applicant shall provide a onetime fee in the amount of $105.00 per acre and a two percent fund management fee to the REAT Account held by NFWF for 3,197 acres of desert tortoise habitat disturbed by the project. This payment of $342,399 would support the regional raven management plan activities focused within the Mojave Desert Recovery. The fees contributed by the applicant would fund staff to implement raven removal actions, provide education and outreach efforts, and survey and monitor the activities identified in the federal Environmental Assessment (USFWS 2008b).

Staff has concluded that that implementation of these actions would be an effective means of reducing the project's cumulative contributions to desert tortoise predation from increased raven numbers. Implementation of these conditions would reduce direct, indirect and operational impacts to desert tortoise to less-than-significant levels under CEQA and would also satisfy the CESA requirements to fully mitigate impacts to desert tortoise under Fish and Game Code Section 2081.

Translocation

As discussed above, desert tortoises are a listed species under both the State and federal ESA. Projects like HHSEGS that result in "take" of desert tortoise require a authorization from the USFWS. This authorization may be provided in the form of an "incidental take statement" in compliance with Section 7 of the ESA. For many large scale projects the USFWS requires that all living desert tortoises are removed from the development site and placed in areas where the tortoise have a possibility to survive.

This relocation is called “translocation” when desert tortoises are move more than a certain distance from their current habitat (i.e., typically greater than 500 meters/1642 feet). For the HHSEGS project it is likely that translocation will be required and the USFWS will require a “translocation plan” as part of the Biological Opinion that accompanies its permit for incidental take.

Large scale land acquisition to support military training, residential and commercial development, and the construction of industrial level solar infrastructure projects has necessitated the use of translocation as a tool to minimize direct losses to desert tortoise and other sensitive wildlife. Construction of the proposed project would require the translocation or removal of all desert tortoises, including adults, subadults, and any juveniles that are found on the site during clearance surveys. An important consideration in assessing potential impacts from the translocation effort is establishing the proposed translocation sites. Translocation and control sites should occur on lands that can be managed for the protection of this species. The translocation of animals to privately held lands is not recommended by USFWS and CDFG, given the threat of future development and other inherent risks to desert tortoise associated with private land.

Most of the desert tortoise sign that occurs on the HHSEGS project is located near the eastern border of the project site; however, desert tortoise sign was observed in scattered locations across large portions of the site. Animals that are identified in the eastern area will likely be translocated to lands located immediately east of the proposed project site. These lands consist of suitable habitat that may include portions of the animals existing home range. The lands in this area are managed by the BLM and primarily occur within the State of Nevada. In order to comply with CDFG legal requirements all desert tortoises translocated to this area will be placed on lands located adjacent to the project that occur in California. Although the land in California is limited to a narrow strip of habitat; the land is contiguous with suitable habitat that occurs in Nevada. Animals found near the western border of the project site or in areas greater than 500 meters from a proposed translocation site will be held and tested prior to release in conformance with the proposed Translocation Plan.

The distance of the translocation site from the project site also affects the methods used during the implementation of the plan. Current USFWS standards require disease testing and quarantine for any tortoise translocated more than 500 meters (1642 feet). This requirement is intended to limit the potential exposure risk to healthy tortoises adjacent the project site. However, for each desert tortoises translocated to a long distance sites, two other tortoises must be handled, disease tested, and radio tagged. Therefore, a total of three tortoises are handled for each translocation event. Desert tortoises at the recipient site and control site are diseased tested and radio tagged in order to ensure that healthy animals are not being introduced into a diseased population and to track the animals post-release. In addition disease testing and radio tagging allows the agencies to track the mortality of translocated versus host or control populations; provides long term monitoring of the populations; and provides a mechanism for evaluating whether mortality occurs uniformly across the three groups. These requirements may not be enacted in the event that only short distance translocation occurs and if the number of desert tortoises is determined to be low (i.e., usually less than five animals).

For some areas the USFWS will limit the maximum number of desert tortoises that may be relocated to a particular area to minimize potential effects to the host population from resource competition. In order to assess this impact, additional information is required of the applicant, specifically the density of desert tortoises inhabiting proposed translocation sites.

Translocation activities require the implementation of a series of actions. Some of the proposed activities include but are not limited to:

- The identification of the proposed translocation and control sites;
- The evaluation of the habitat quality on the translocation and control sites;
- A determination of existing tortoise density and an assessment of the sites ability to accommodate additional tortoises above baseline conditions;
- Pre-construction fencing and clearance surveys of the project site;
- The construction of holding pens for quarantined translocated tortoises prior to their release into host populations;
- Pre-construction surveys of the proposed translocation sites;
- The placement of tracking units (GPS) on tortoises from the project site, translocation site, and control site;
- Disease testing for long distance translocated tortoises, host, and control sites;
- Long term monitoring and reporting of control and translocated and host populations; and
- The implementation of remedial actions should excessive predation or mortality be observed.

Translocation of desert tortoise has inherent risks that must be considered when implementing this activity. Capturing, handling, and relocating desert tortoises could result in harassment, injury, or mortality of desert tortoises. Impacts of translocation may include elevated stress hormone levels, changes in behavior and social structure dynamics, genetic mixing, increased movement (caused by antagonistic behavior with other tortoises, avoidance of predators or anthropogenic influence, homing, or seeking out of preferred habitat), spread of disease, and increased predation. Handling, holding, and transport protocols may also compound with abiotic factors to affect the outcome for translocated individuals (Bertolero et al. 2007; Field et al. 2007; Rittenhouse et al. 2007; Teixeira et al. 2007), particularly during extreme temperatures, or if they void their bladders. Averill-Murray (2001) determined that tortoises that voided their bladders during handling had significantly lower overall survival rates (0.81-0.88) than those that did not void (0.96). Desert tortoises that are improperly handled by biologists without the use of appropriate protective measures may be exposed to pathogens that spread among tortoises in both resident and translocated animals. The introduction of diseased tortoises to a recipient site or holding pen may also result in the spread of upper respiratory tract disease (URTD). The USFWS consider URTD to be one of the most serious infectious disease affecting desert tortoises.

Translocation may be a useful tool in the conservation of some species, yet well designed studies are necessary to properly evaluate its efficacy (Field et al 2007). As of 2012 there are a number of ongoing translocation actions that are currently underway. Most of these translocation events are related to military land expansion and solar energy development. Definitions of success are variable and determining ultimate success can require lengthy studies (Fischer and Lindenmayer 2000, Seigel and Dodd 2002). For the HHSEGS project translocation should be considered a mechanism to salvage existing animals and place them in an area where they have the potential to survive post construction.

Success rates of herpetofauna translocations range from 14 percent to 42 percent, suggesting that improved efforts are essential for the future recovery of many reptiles and amphibians (Dodd and Seigel 1991; Germano and Bishop 2009). Existing studies also suggest that animals move away from the translocation site and move through the landscape at a higher rate than control animals (Sullivan et al. 2004; Bertolero et al. 2007; Field et al. 2007). More specifically, a review of 91 herpetofauna translocation projects reported the primary causes of translocation failure were homing response by translocated individuals and poor habitat in translocated areas, followed by human collection, predation, food and nutrient limitation, and disease (Germano and Bishop 2009). The risks and uncertainties of translocation to desert tortoises are well recognized in the desert tortoise scientific community. The Desert Tortoise Recovery Office (DTRO) Science Advisory Committee (SAC) has made the following observation regarding desert tortoise translocations (DTRO 2009, p. 2):

> *As such, consensus (if not unanimity) exists among the SAC and other meeting participants that translocation is fraught with long-term uncertainties, notwithstanding recent research showing short-term successes, and should not be considered lightly as a management option. When considered, translocation should be part of a strategic population augmentation program, targeted toward depleted Populations in areas containing "good" habitat. The SAC recognizes that quantitative measures of habitat quality relative to desert tortoise demographics or population status currently do not exist, and a specific measure of "depleted" (e.g., ratio of dead to live tortoises in surveys of the potential translocation area) was not identified. Augmentations may also be useful to increase less depleted populations if the goal is to obtain a better demographic structure for long-term population persistence. Therefore, any translocations should be accompanied by specific monitoring or research to study the effectiveness or success of the translocation relative to changes in land use, management, or environmental condition.*

However, many translocations of desert tortoises have been limited in scope and applicability; shortcomings have included small sample size, loss of tortoises by death, poaching, transmitter failure, limited sampling period, inadequate information on resident tortoises; variation in release techniques or timing of releases, and use of captive or penned tortoises (Walde et al. 2011). In a study conducted over that last four years at Fort Irwin the USGS observed highly variable mortality rates ranging from 34 percent in 2009 to 1.5 percent in 2011(Drake et al. 2011). Tortoise mortality rate for 2011 continued to decrease from previous years despite an increase in the number of tortoises being monitored (*ibid.*). **Biological Resource 14** provides a summary of the data as taken from 2011 USGS study at Fort Irwin California.

Biological Resource Table 14
Desert tortoise mortality from 2008-2011 at the Ft. Irwin Study Site.*

Study Year	Number Dead	Number Monitored	Percent Mortality
2008	39	121	32.2
2009	31	90	34.4
2010	11	82	13.4
2011	8	525	1.5

*Drake et al 2011.

This study also suggested that the majority of desert tortoise mortality could be attributed indirectly to predation. In times of drought when predators (e.g. coyotes, kit foxes, and bobcats) have fewer mammalian prey items available, they will increase take of less preferred prey including desert tortoises (Woodbury and Hardy 1948, Berry 1974). During droughts, coyotes apparently killed most of the tortoises in one study at the Desert Tortoise Natural Area (Peterson 1994) and 21 to 28 percent of the marked wild population in a study near Ridgecrest, California were killed by canids. Longshore et al. (2003) found that periods of drought may directly influence tortoise survivorship leading to regional population declines. Turner et al. (1984) also reported unpublished materials from K.H. Berry indicating that a site in the west Mojave had less than five percent mortality during five previous years (estimated from carcass remains), followed by a year when she observed 27 percent mortality among 48 marked tortoises over 12.5 km^2. Esque et al. (2010) found mortality rates at sites spanning the Mojave Desert ranged from zero to 43.5 percent, where two of the sites had no mortality observed and seven sites had some mortality in at least one of three years reported here.

Recent mortality data compiled from the ISEGS Monthly Compliance Report - July 2012 identified that of approximately 504 animals tracked (i.e., hatchlings, resident, control, and translocated animals) 32 were deceased and 21 have been identified as missing. The breakdown of mortalities included four hatchlings (born within the holding pens), six control animals, six resident animals, eight animals identified for translocation but held in pens, and seven animals that were subject to short distance translocation efforts. Excluding hatchlings and missing animals' mortality rates (i.e., 28/ 447 animals) for all desert tortoise including resident, control, and translocatee's is approximately six percent at this time. However, this is preliminary data and the long term effects of translocation for this population are not yet known.

While recent data suggests that translocation may be an effective tool for minimizing impacts to desert tortoise in some instances; the implementation of any translocation activity must be completed in a thorough and well-coordinated manner. To provide guidance for these actions the USFWS prepared specific draft guidelines for clearance and translocation of desert tortoises from the project sites. This included the *Translocation of Desert Tortoises (Mojave Population) From Project Sites: Plan Development Guidance* (USFWS 2010b). This document provides guidance including the timing of relocation/translocation, disease testing requirements, and other actions intended to minimize impacts to desert tortoise.

The applicant provided a Preliminary Draft Desert Tortoise Translocation Plan in Data Response, Set 1B in December 2011. The plan provides a general outline only and the applicant has indicated a revised plan is forthcoming. However, the complete plan will be required by the USFWS, CDFG, and Energy Commission prior to implementing any tortoise clearance activities. The plan will be required to identify the proposed translocation and control areas, identify the number of tortoises that can be translocated into these areas, and provide a detailed methodology to describe the proposed translocation procedures, disease testing, and long term monitoring.

Biological Resources Table 15 (Desert Tortoise Density Estimates and Impact Summary) estimates of the numbers of tortoises that could be translocated from the project site; numbers of tortoises that would be handled at the translocation and control sites; and numbers of undetected juveniles and eggs that may occur at the project site. These estimates were derived through surveys and mathematical formulations. The number of desert tortoises that may actually occur on the project site is expected to fall somewhere between the upper and lower statistical 95 percent confidence level identified in the USFWS formula. Nonetheless, for the purposes of this analysis, the FSA presents the largest probability estimates of desert tortoise that has the potential to occur on the project site.

Biological Resources Table 15
Desert Tortoise Density Estimates and Impact Summary

	Estimated Number of Tortoises Subject to Direct Project Effects						
Project Feature	**Adult and Sub-adults***		**Juvenile Estimates****		**Eggs*****	**Total Adult/Sub-adult and Juvenile********	
	Lower	Upper	Lower	Upper	(Min-Max)	Lower	Upper
Project Site	6	33	3	34	46-158	9	67
Translocation Area²	6	33	3	34	N/A	9	67
Control Area³	6	33	3	34	N/A	9	67
Subtotal	18	99	9	102	N/A	27	201

*Value based on formula recommended by the USFWS. Table assumes all tortoise are detected and translocated.
** Values based on the equations of Turner et al 1987. Equation assumes that juveniles account for approximately 31.1 to 51.1 percent of the overall tortoise population. If P = Percentage of juveniles in population, A = Number of adults, and J = Number of juveniles then $P = J / (J + A)$. Therefore $J = PA/ (1 – P)$. For translocation purposes it is highly likely that most of the juvenile tortoise will not be detected during the clearance surveys. However they are included here for documentation purposes.
*** Assumes a 1:1 sex ratio and that all females present would clutch in a given year. Assumes average clutches per reproductive female in a given year (i.e., 1.6, see Turner et al. 1984), multiplied by the average number of eggs found in a clutch (i.e., 5.8; see Service 1994).
****Table assumes all tortoises are detected and translocated. The actual number of tortoises that may be subject to translocation is expected to be a subset of this value based on the assumption that only 15 percent of juvenile desert tortoise are likely to be detected.

Comments on the PSA provided by the applicant suggested the number of desert tortoises estimated in the PSA is too high, and recommended a reduced estimate. This information was reviewed and considered by staff. However, the PSA estimates are derived from the applicant's AFC (Appendix 5.2 F, Desert Tortoise Survey Report). The derived numbers are based on the USFWS predictive model and include desert tortoises that were found within 150 meters of the proposed project site. Staff utilized these numbers as a basis for extrapolating the expected levels of adult, sub-adult, and juvenile desert tortoises and their eggs based on the calculations of Turner et al (1985). The PSA used applicant data that between six and 33 adult and subadult desert tortoises may occur on the project site and within a 150 meter buffer. The AFC assessment correctly suggested that desert tortoise found within 150 meters of the project boundary may include portions of the project site as part of their home range. Staff has used these assumptions and the USFWS model to calculate the number of desert tortoise affected by the project. Applicant in its comments proposes to exclude from the estimate animals immediately adjacent to the site. Staff and CDFG believe that this approach would severely underestimate project impacts, as the project is removing part of the home range of these desert tortoises, and the level of disturbance from construction may force temporary abandonment of the remaining portion.

As described in **Biological Resources Table 15** (Desert Tortoise Density Estimates and Impact Summary) approximately six to 33 adult tortoises (lower and upper USFWS 95 percent confidence level), three to 34 juvenile tortoises (based on 31.1 to 51.1 percent of the total population identified by Turner), and 46 and 158 eggs are expected to occur on the proposed project site. The actual number of animals that may be subject to translocation is expected to be a subset of this value. It is estimated that only 15 percent of juvenile tortoises (0.15 multiplied by the number of juveniles) on the site would be located during clearance surveys.

As described above, there are inherent risks to any action that requires the handling, disease testing, and translocation of desert tortoise. For the proposed project these risks could occur in the translocated, host, and the control population. Although desert tortoises will not be translocated into the control population some mortality may occur from handling or from the placement of GPS tracking devices. For example, mortality at control populations is expected to be approximately five percent based on a review of scientific studies of tortoise mortalities associated with routine handling (Moore pers. comm. 2010).

For this project translocation mortality rates are assumed to range up to 45 percent. This value represents the high end of documented translocation mortality for desert tortoise at this time. Using the five percent mortality rate for the control population (adult and juvenile tortoises multiplied by 0.05) and the 45 percent mortality rate for the translocated and host populations (adults and juveniles multiplied by 0.45) this would result in the potential loss of between eight and 36 tortoises from translocation mortality. In addition, given the likelihood that all of the eggs will be lost and assuming approximately 85 percent of the juveniles will be overlooked, it is reasonable to estimate that between three and 29 juvenile desert tortoises (i.e., 85 percent of 3-34), and all of the 46 to 158 eggs would be lost.

In total, translocation could result in the estimated loss of between 46 to 158 eggs and between 11 and 65 desert tortoise if mortality rates are 45 percent for the translocated animals. If mortality rates are lower there would be a corresponding reduction in desert tortoise deaths from translocation activities.

Condition of Certification **BIO-10** requires development of a Desert Tortoise Translocation Plan in consultation with CDFG and USFWS. The Desert Tortoise Translocation Plan will include the identification and prioritization of potentially suitable locations for translocation; desert tortoise handling and transport considerations (including temperature); animal health considerations; a description of translocation scheduling, site preparation, and management; and specification of monitoring and reporting activities for evaluating success of translocation. With implementation of proposed Condition of Certification **BIO-10**, adverse impacts associated with desert tortoise translocation would be minimized.

Direct Impacts to Desert Tortoise Habitat

The project would result in “take” of desert tortoise as that term is defined under both State and federal law. Under the CESA, impacts for take of listed species must be “fully mitigated,” such that the project does not result in the net loss of the species. CDFG, were it issuing the take permit, would require “compensatory mitigation” to meet the requirement that the project be “fully mitigated.” Since the Energy Commission is issuing a permit that subsumes the CDFG “take” permit, staff has consulted with CDFG to determine the compensatory mitigation appropriate for the project.

Implementation of the proposed project would result in the direct loss of approximately 3,197 acres of occupied desert tortoise habitat. These impacts are significant and require compensatory mitigation. This includes approximately 1,580.5 acres of Mojave Desert scrub and 1,616.5 acres of shadscale scrub. The project area also includes 77 acres of disturbed lands including a fallow orchard (HHSEGS 2011a, Figure 5.2-3). In addition, the site includes a grid of unpaved roads; disturbed ruderal habitat, and a large bermed area primarily devoid of native vegetation. The loss of this habitat would reduce access to foraging, denning, and dispersal areas. Compensatory mitigation is not requested for the 77 acres of disturbed habitat on the project site.

The U.S. Geological Surveys (USGS) has developed a model which appraises the habitat value of various regions inhabited by the desert tortoise. The Desert Tortoise Habitat Model (Nussear et al. 2009) ranks tortoise habitat based on sixteen environmental data layers including soils, landscape, climate, and biotic factors that were merged with desert tortoise presence data region wide. This model provides an output of the statistical probability of habitat potential that can be used to map potential areas of desert tortoise habitat (*ibid.*). The habitat quality is given a numeric value ranging from zero to one. Areas within the designated mapping unit of one square kilometer given a rank of zero are not considered suitable habitat for desert tortoise; areas given the value of 1.0 represent high quality habitat for this species. Model values for the proposed project site range from of a high of 1.0 in the southeastern tip of the project site to 0.7; with the majority of the site ranked as 0.8 or 0.9. In other words, the model suggests that the majority of the project site either is, or potentially could be, excellent tortoise habitat.

Desert tortoise and their sign are concentrated within the northeastern third of the project site. This location abuts the California Nevada State line and is contiguous with open desert. Desert tortoise sign also occurs to a limited degree on most of the project; this included several burrows and a single scat. Desert tortoise or their sign were not detected on the southwestern corner of the site which consists of an approximately 640-acre parcel. Habitat on the project site consists of three primary vegetation community types. This includes Mojave Desert scrub, shadscale scrub, and disturbed communities that consist of disturbed areas and a fallow orchard. In addition, a network of unpaved roads excavated for a proposed residential subdivision, particularly in the western two-thirds of the site.

The highest concentration of desert tortoise or their sign was associated with the creosote bush scrub communities that dominate the eastern portion of the site. Creosote bush scrub in this area is largely unaffected and is considered to be of moderate-to-high quality (in terms of structure and species diversity). In addition, a total of 11 special-status plant species were documented in the eastern portion of the project site (HHSEGS 2011a) which suggests the site retains native habitat functions. **Biological Resources Figure 4** provides photos of representative habitat in the project area. The presence of tortoise in this area may be associated with a variety of factors including the more intact creosote bush scrub communities that occur in this area, soil composition, increased grass and herb layers, and proximity to adjacent natural lands supporting similar vegetation types. Although burrow density and sign was concentrated in this area; burrows were present to some degree in most of the project area. Although portions of the site have been degraded by roads, the majority of habitat is largely undisturbed in the eastern portion of the project site. Similarly, while noxious weeds and other invasive non-native plants were mapped across the entire project site (as were special-status plants); the eastern portion of the site is much less affected by non-native species.

Desert tortoise sign was also detected in vegetation supporting shadscale scrub. Shadscale or saltbush scrub dominates the western half of the project which is common on the finer textured and more saline or alkaline soils that occur between playas and the gravelly alluvial fans. Although desert tortoise are found in shadscale communities across their range desert tortoise density and sign was lower in areas dominated by this community. Habitat quality in the western portion is highly variable, ranging from densely weedy, highly degraded habitat of low native diversity to areas dominated by shadscale scrubs of moderate-to-high native species diversity. Some areas appear to have an agricultural history and most of this community type supports a moderate-to-high component of non-native annual weeds. However, although portions of this community type have been degraded two special-status plant species, Pahrump Valley buckwheat and Goodding's phacelia, were documented in scattered locations in the western and eastern portions of the project site.

Many invasive non-native species are adapted to and promoted by soil disturbance (Lathrop & Archibald 1980). Once introduced, they can out-compete native species because of minimal water requirements, high germination potential and high seed production (Beatley 1996). Weeds can outcompete native annuals where nitrogen deposition (near highways such as Tecopa Road) and precipitation rates are higher, leading to higher risk of wildfire (Allen et al. 2010), and can become locally dominant, representing a serious threat to native desert ecosystems (Abella et al. 2008). Lower desert tortoise densities on the southern and western portion of the project site may also be associated with the proximity to Tecopa Road and the residential communities that occur in this area. Dogs may range several miles into the desert and have been found digging up and killing desert tortoises (USFWS 2011, Evans 2001).

Although the USGS tortoise map identifies most of the project area as high quality desert tortoise habitat, portions of the project site are degraded and likely provide a reduced forage base for desert tortoise. As with any model of this nature, the regional scores reflect a hypothesized habitat potential given the range of environmental conditions where tortoise occurrence was documented (Nussear et al. 2009). As such, the model may underrate some areas and overrate others compared to their actual habitat potential (*Ibid.*)

Nussear et al. (2009) also states that the map of desert tortoise potential habitat does not account either for anthropogenic effects, such as urban development, habitat destruction, or fragmentation, or for natural disturbances, such as fire, which might have compromised habitat potential. While portions of the site are mapped as good quality habitat some of these areas do not appear to routinely support desert tortoise or their sign. In addition, only limited desert tortoise or their sign was detected within most of the vegetation characterized as shadscale scrub. While the presence of desert tortoise is not strictly limited to vegetative structure alone, the degraded habitat, presence of weeds and proximity to residential properties likely limits the use of this area by this species.

Impacts to Critical Habitat

There is no federally designated critical habitat for desert tortoise within the proposed development footprint and no direct or indirect impacts to critical habitat are expected to occur from the project. The nearest designated critical habitat for this species is located approximately 20 miles south of the project site within the Shadow Valley Unit (USFWS 2011a). Until the proposed translocation areas have been provided by the applicant it is unknown whether any critical habitat units would be subject to effects from translocation activities.

Habitat Loss and Compensatory Mitigation

Compensatory mitigation for desert tortoise typically involves balancing the acreage of habitat loss with acquisition of lands that would be permanently protected and enhanced to support healthy populations of desert tortoise. The compensation comes about by removing threats to desert tortoise and by improving the carrying capacity of the acquired property so that more desert tortoises will survive and reproduce on these lands.

For the acquisition of mitigation lands to truly compensate for the habitat loss and to make up for the numbers of desert tortoise that would otherwise have been supported by that habitat, the acquisition must be accompanied by: (1) permanent protection and management of the lands for desert tortoise, and (2) enhancement actions. The permanent protection is essential because it would allow the lands to be managed in a way that excludes multiple threats and incompatible uses (grazing, off-highway vehicle use, roads and trails, utility corridors, military operations, construction, mining, grazing by livestock and burros, invasive species, fire, and environmental contaminants). Without this protection and management the desert tortoise populations on the acquired lands would be subject to the same threats that led to its population declines and threatened status. This level of protection would be necessary to meet the mitigation requirements for loss of desert tortoise habitat under CEQA and CESA. An equally important component of mitigation is the implementation of enhancement actions to improve desert tortoise survival and reproduction. These actions might include habitat restoration, invasive plant control, road closures or road fencing, reducing livestock and burro grazing, reduce the risk of wildfires, and by controlling ravens and other predators. Without permanent protection and enhancement actions on lands acquired for mitigation, the project's impacts would result in a net loss of desert tortoises and their habitat.

To fully mitigate the loss of desert tortoise habitat under CESA, the CDFG usually requires a mitigation ratio greater than 1:1 for compensation lands (i.e., acquisition of more than one acre of compensation lands for every acre lost), and typically uses a 3:1 ratio or higher for good quality habitat such as that found in portions (i.e., northeastern portions) of the project site. The higher ratio reflects value of the existing habitat and the limits to increases in carrying capacity that can be achieved on the acquired lands, even with implementation of all possible protection and enhancement measures. Depending on the quality of habitat that is lost and the habitat conditions of the land that is acquired, it is difficult to sufficiently increase the carrying capacity of the acquisition lands to completely offset habitat loss without relying on additional acreage to increase the numbers of desert tortoise that can be supported on the mitigation lands.

The applicant proposed a 1:1 ratio to mitigate permanent impacts to desert tortoise habitat in the AFC. The PSA recommended adopting the applicant's proposed 1:1 ratio for (1,616.5 acres) of the project site that supports shadscale scrub communities because some of these areas were more disturbed, are proximal to other disturbed areas, and have less evidence of use by desert tortoise. However, based on an analysis of site conditions and the expected use of the site by desert tortoise the PSA suggested that for areas supporting creosote bush scrub (1,580.5 acres) a 3:1 ratio was appropriate. The highest desert tortoise densities and most suitable habitat were observed in the north and eastern portions of the project site; in areas primarily supporting creosote bush scrub. These areas support relatively intact vegetation and provide more complex topography and soil development.

Applicant comments on the PSA state that the habitat quality on the site is relatively low value compared to many areas of the desert and that the PSA mitigation was excessive and not warranted for this site. The applicant identified a number of factors that reduce the habitat value at the site, including but not limited to the presence of silty soil types, the surficial geology, the relatively flat topography, existing vegetation patterns, and the presence of weeds. In addition, the applicant stated that the number of desert tortoises estimated by staff in the PSA is too high and provided an alternative estimate. In summary, the applicant suggests that the site has a low value to desert tortoise and recommends that mitigation ratios should range from between 0.5:1 to 1.5:1 for the proposed project site.

In response to applicant's comments, staff conducted supplemental field investigations to further evaluate the site. These investigations were conducted by a wildlife biologist and botanist and included two biologists from the CDFG. The site visit confirmed staff's (and CDFG's) earlier estimate of habitat value, an appraisal consistent with other factors previously considered. Despite the presence of weeds which are acknowledged as locally abundant in some areas, most of the lands present on the project site are relatively intact and are characterized by areas supporting biotic soil crusts, native shrub cover, and a diverse assemblage of annual plant life. Most of the heavily disturbed areas are located along the roads that form a grid pattern across much of the site; however, lands within the existing road system continue to support large areas of native vegetation. For example, Section 5.2.6.3.1 of the AFC indicates that for creosote bush scrub communities "the understory consists of a large variety of mainly annual forbs, a few species of native grasses, and a few species of non-native grasses". Staff confirmed this during biological surveys of the project site and a review of the annual plant species detected during botanical surveys conducted by the applicant. In addition, based on a review of information provided in the AFC approximately 131 native annuals and shrubs occur on the project site. This includes approximately ten plants considered rare by the California Department of Fish and Game and California Native Plant Society. Similarly, approximately 63 species of birds, 18 reptiles, and nine mammals were detected or expected to occur on the project site. Notwithstanding the presence of invasive weeds, and some heavily disturbed areas the presence and distribution of native plants and animals indicates the site supports a fairly diverse assemblage of wildlife which are not associated with more heavily disturbed areas.

Staff's conclusion regarding appropriate mitigation ratios are based on a wide range of biotic and abiotic factors. These included but were not limited to the existing vegetation communities; annual plant composition; percentage and distribution of weeds; presence of soil crusts; level of site disturbance; soil composition; proximity to adjacent lands supporting desert tortoise populations; and proximity to developed lands. Staff also took into consideration the number and distribution of desert tortoise on the project site; the landscape level scale of the project; the projects location; the sites' importance for connectivity and regional movement and gene flow; and the cumulative effects of other projects. The mixed compensation ratio reflects the variability of site habitat quality.

Desert Tortoise Mitigation Requirements

To satisfy CDFG's full mitigation standard the proposed mitigation must meet criteria described in Title 14 CCR, Sections 783.4(a) and (b). These criteria include requirements that the proposed mitigation would be capable of successful implementation, and that adequate funding is provided to implement the required mitigation measures and to monitor compliance effectiveness of the measures. As described above, the CDFG has recommended the following mitigation strategies that fulfill the state's full mitigation standard for desert tortoise. CDFG would require a 3:1 ratio (1,616.5 acres) for areas supporting creosote bush scrub and a 1:1 (1,580.5 acres) ratio for areas of the project site that supports shadscale scrub communities. In total this would require the acquisition of 6,358 acres of compensatory mitigation for desert tortoise. This results in several conditions of certification: **BIO-12** (Desert Tortoise Compensatory Mitigation) requires acquisition, protection and enhancement of desert tortoise habitat, in combination with the requirements for a Designated Biologist and Designated Monitor (**BIO-1** through **BIO-5**), worker training (**BIO-6**), mitigation monitoring (**BIO-7**), general avoidance and minimization measures (**BIO-8**), clearance surveys and fencing (**BIO-9**), relocation/translocation plan (**BIO-10**), and **BIO-13** (Raven Management). These conditions of certification, if adopted by the Commission, would fully mitigate project impacts to desert tortoise. Acquisition of appropriate mitigation lands as described in **BIO-12** would secure lands that would promote protection of high quality desert tortoise habitat and facilitate biological connectivity in the region.

Potential indirect impacts to desert tortoise habitat from the spread of invasive plant species would be reduced to less than significant levels through the implementation of Conditions of Certification **BIO-18** (Weed Management Plan), and **-**(Ground Water-Dependent Vegetation Monitoring Plan would minimize and potentially avoid impacts to locally important groundwater-dependent vegetation used by desert tortoise. Implementation of these measures would reduce these indirect impacts of the proposed project to less-than-significant levels under CEQA.

Calculation of Financial Security for Desert Tortoise Compensatory Mitigation

CDFG, were it the permitting agency, would require the applicant to provide financial assurances to guarantee that an adequate level of funding is available to implement all impact avoidance, minimization, and compensation measures described in the desert tortoise conditions of certification that are not carried out before project impacts occur. CDFG's approach has been adopted by the Commission in previous siting cases. The required financial assurances are generally provided in the form of an irrevocable letter of credit, an escrow account, a pledged savings account, or another form of financial security prior to initiating ground-disturbing project activities. The proposed conditions of certification typically specify the dollar amount of the security, and include a provision for adjusting that financial security amount when parcel-specific information is available. This financial security amount is calculated by multiplying the acreage of the impact area by the total per-acre costs, a figure which represents the sum of the costs required for: (1) land acquisition, (2) initial habitat improvements, and (3) a fund to support long-term management of the acquired lands. The latter cost for the long-term management fund is typically the largest component of the mitigation fee. Interest from the fund provides enough income to cover annual stewardship costs on the acquired lands and includes a buffer to offset inflation.

The amount for the fund is established by a Property Analysis Record (PAR), a computerized database methodology developed by the Center for Natural Lands Management (<www.cnlm.org/cms>) which calculates the costs of land management activities for a particular parcel. These activities include preparation of a desert tortoise management plan tailored for each parcel of mitigation land to assess habitat status, identify desired conditions, and develop plans to achieve conditions that would best support desert tortoise. Once the management plan is prepared and approved by the appropriate resource agencies, implementation of enhancement actions such as fencing, road closure, invasive plant control, habitat restoration, and monitoring can begin. The goal of these activities is to increase the carrying capacity of the acquired lands for desert tortoise and increase their population numbers by enhancing survivorship and reproduction.

Funding for the initial habitat improvements supports those actions needed immediately upon acquisition of the property to secure it and remove hazards. These activities might include fencing or debris clean-up, or other urgent remedial action identified prior to acquisition. When the management plan is completed for the acquired parcel, activities such as these are thereafter funded from the interest produced by the long-term management fund described above.

Condition of Certification **BIO-12**, Desert Tortoise Compensatory Mitigation, specifies financial security for acquisition of 6,358 acres and provides an estimate of associated costs. These costs include an acquisition fee of $1,000 per acre, initial habitat improvement costs at $250 per acre, long-term management fund is estimated at $1,450 per acre, and other administrative and acquisition costs (see **Biological**

Resources Table 16). The estimated composite mitigation cost for establishing the financial security would be $3,506 per acre. This security amount may change with updated appraisals and when a Property Analysis Record is prepared for the parcels selected for acquisition. It is important to note that these are estimates based on current costs; the requirement is defined in terms of acres, not dollars per acre, and actual costs may vary.

The applicant may elect to purchase and permanently protect compensation lands itself; to fund the acquisition and initial improvement of compensation lands through National Fish and Wildlife Foundation (NFWF) by depositing funds for that purpose into NFWF's Renewable Energy Action Team (REAT) Account; or to fund the acquisition of compensation lands through a third party other than NFWF, as outlined in **BIO-12**. REAT options are described below. Further, **BIO-12** would require that the project owner provide financial assurances to guarantee an adequate level of funding to implement the compensation measures described above. Because there are several suitable options available to the applicant to satisfy the compensation requirement, and because mitigation requirements must satisfy the requirements of both state and federal Endangered Species acts, the calculation of the security amount includes estimates of all transaction and management fees described above. These calculations are presented in **Biological Resources Table 16**.

Biological Resources Table 16
Desert Tortoise Compensation Cost Estimate[1]

	Task	Cost
1.	Land Acquisition	$1000 per acre[2]
2.	Level 1 Environmental Site Assessment	$3000 per parcel[4]
3.	Appraisal	$5000 per parcel[4]
4.	Initial site work - clean-up, enhancement , restoration	$250 per acre[4]
5.	Closing and Escrow Costs – 1 transaction includes landowner to 3rd party and 3rd party to agency	$5000 per transaction
6.	Biological survey for determining mitigation value of land (habitat based with species specific augmentation)	$5000 per parcel
7.	3rd party administrative costs - includes staff time to work with agencies and landowners; develop management plan; oversee land transaction; organizational reporting and due diligence; review of acquisition documents; assembling acres to acquire….	10% of land acquisition cost (#1)
8.	Agency costs to review and determine accepting land donation - includes 2 physical inspections ; review and approval of the Level 1 ESA assessment; review of all title documents; drafting deed and deed restrictions; issue escrow instructions; mapping the parcels….	15% of land acquisition costs (#1) × 1.17 (17% of the 15% for overhead)
	SUBTOTAL - Acquisition & Initial Site Work	**$12,560,229.00**

9.	Long-term Management and Maintenance (LTMM) Fund - includes land management; enforcement and defense of easement or title [short and long term]; monitoring….	$1450 per acre[5]
	SUBTOTAL - Acquisition, Initial Site Work, & LTMM	**$9,219,100.00**
	SECURITY SUBTOTAL -	**$21,779,329.00**
	NFWF Fees	
10.	Establish the project specific account	$12,000.00
11.	Pre-proposal Modified RFP or RFP processing[9]	$30,000
12.	NFWF management fee for acquisition & initial site work	3% of SUBTOTAL
13.	NFWF Management fee for LTMM Fund	1% of LTMM Fund
	TOTAL for deposit in REAT-NFWF Project Specific Account	**$22,290,326.87**

1. All costs are best estimates as of summer 2010. Actual costs will be determined at the time of the transactions and may change the funding needed to implement the required mitigation obligation. Note: regardless of the estimates, the developer is responsible for providing adequate funding to implement the required mitigation.
2. For the purposes of determining costs, a parcel is defined at 40 acres, recognizing that some will be larger and some will be smaller, but that 40 acres provides a good estimate for the number of transactions anticipated (based on input from CDD).
3. Generalized estimate taking into consideration a likely jump in land costs due to demand, and an 18-24 month window to acquire the land after agency decisions are made. If the agencies, developer, or 3rd party has better information on land costs in the specific area where project-specific mitigation lands are likely to be purchased, that data overrides this general estimate. Note: regardless of the estimates, the developer is responsible for providing adequate funding to implement the required mitigation.
4. Based on information from CDFG.
5. Two transactions at $2500 each: landowner to 3rd party; 3rd party to agency. The transactions will likely be separated in time.
6. Includes staff time to work with agencies and landowners; develop management plan; oversee land transaction; organizational reporting and due diligence; review of acquisition documents; assembling acres to acquire.
7. Includes agency costs to accept the land into the public management system and costs associated with tracking/managing the costs associated with the donation acceptance, including 2 physical inspections; review and approval of the Level 1 ESA assessment; review of all title documents; drafting deed and deed restrictions; issue escrow instructions; and parcel mapping .
8. Estimate for purposes of calculating general costs. The actual long term management costs will be determined using a Property Assessment Report (PAR) tailored to the specific acquisition. Includes land management; enforcement and defense of easement or title [short and long term]; monitoring.
9. Each renewable energy project will be a separate sub-account within the REAT-NFWF account, regardless of the number of required mitigation actions per project.
10. If determined necessary by the REAT agencies if multiple 3rd parties have expressed interest; for transparency and objective selection of 3rd party to carryout acquisition.

The compensatory mitigation described in Condition of Certification **BIO-12**, in addition to other conditions of certification that reduce impacts to desert tortoise, would meet CESA's full mitigation standard and would mitigate CEQA impacts to desert tortoise to less-than-significant levels. CDFG is currently reviewing this calculation of financial security costs (acquisition costs, initial habitat improvement, and long-term management endowment). However, the calculations for security are consistent with past CDFG guidance on Energy Commission projects that included an Incidental Take Permit, and staff believes believe that CDFG would find this approach acceptable.

"In Perpetuity" Protection for Acquired Mitigation Lands

The Energy Commission and CDFG do not accept land acquisition as adequate mitigation for impacts to endangered species unless the lands can be maintained and protected in perpetuity for the benefit of those species. CDFG or an appropriate land conservation organization would be required to own, protect, and manage the mitigation lands to ensure permanent protection.

Location of Acquired Mitigation Lands

Coordination with CDFG is ongoing in conjunction with Nevada BLM and the USFWS to define an appropriate geographic boundary for compensatory acquisitions. Consideration has been given to the preferences of the County of Inyo, which has expressed concerns regarding the siting of mitigation lands. With less than three percent of the county in private holdings, the county requests that private lands not be used for mitigation purposes. While biological factors suggest that the proposed mitigation land should be as close to the project site as possible, ideally in the Pahrump Valley, a broader region, such as the NEMO planning area, or eastern Mojave Recovery Unit could also be beneficial to the species. The State Lands Commission is another entity with substantial land available for sale and use as compensatory mitigation. Revenue from the sale of "school lands" held across California is intended to benefit the State Teachers' retirement fund (Barker, 2011).Together the Departments of General Services, Corrections and Rehabilitation, Transportation (Caltrans), Water Resources, Fish and Game, the University of California, and the State Lands Commission adopted a memorandum of understanding between the Energy Commission to facilitate the development of renewable energy projects on state buildings, properties, and rights-of-way.

Summary – Impacts and Mitigation for Desert Tortoise

The impact analysis and translocation requirements for desert tortoise have been based on the applicant's survey data, USFWS probability calculations for determining desert tortoise number on a project site, and available published literature. Based on this data the project site supports approximately six to 33 adult tortoises, three to 34 juvenile tortoises, and 46 to 158 eggs.

Based on the existing data the applicant will be required to translocate between an estimated low of six desert tortoises (six adults and subadults, and no juveniles) to an estimated high of 38 desert tortoises (33 adults and subadults, and five juveniles). If all of these tortoise are translocated to areas greater than 500 meters from the project site, an estimated 18 (six adults + no juveniles multiplied by three) to 114 tortoises (33 adults + five juveniles multiplied by three) would require handling, radio tagging, and long term monitoring.

Total mortality estimates for the proposed project range from a low of eight desert tortoises and approximately 46 eggs to a high or 65 desert tortoise and approximately 158 eggs. These figures represent estimates only and reflect a conservative approach to quantifying project impacts to desert tortoise. Should lower numbers of desert tortoise be detected on the project site the associated impacts to this species would be correspondingly lower as well. However, should the number of tortoises detected on the project site during the translocation events exceed the 38 identified for translocation, the applicant would be required to cease the translocation efforts and coordinate with the CPM, USFWS, and CDFG to determine if translocation efforts should be stopped to consider if new mitigation measures or translocation sites are needed.

Conditions of Certification **BIO-1** through **BIO-9** describe measures that would avoid and minimize direct impacts to sensitive biological resources, including desert tortoise. Conditions of Certification **BIO-10** and **BIO-12** would require additional measures specific to desert tortoise, including installation of tortoise exclusion fencing; pre-construction clearance surveys; monitoring; verification that all desert tortoise impact avoidance, minimization, and compensation measures to replace lost habitat are implemented; translocation of tortoises from the project area; and acquisition of compensation lands. Condition of Certification **BIO-13** would require the preparation and implementation of a Raven Monitoring, Management, and Control Plan which would minimize impacts to desert tortoise resulting from increases in raven populations.

Staff concludes that implementation of these conditions would reduce impacts to desert tortoise to less-than-significant levels under CEQA and would also satisfy the CESA requirements to fully mitigate impacts to desert tortoise under Fish and Game Code Section 2081.

Mojave Fringe-Toed Lizard and Gila Monster

Mojave fringe-toes lizard habitat has been mapped along portions of the California Nevada border (DRECP 2011). However, this species has not been detected on the project site during multiple surveys and the preferred habitat for this species (i.e., sand ramps, partially stabilized dunes, and sand fields) is not present on or adjacent to the project site. While it is likely that populations of this species exist in the region they are likely restricted to locations in and near areas supporting large areas of friable sands. Direct and indirect impacts to this species are not expected to occur.

Gila monsters were not observed during biological surveys conducted by the applicant. This species is often associated with rocky outcrops, sandy soils and desert riparian areas which are largely absent from the project site. Based on the current distribution of this species and preferred habitat associations impacts to Gila monster are not expected to occur.

Impacts – Special-Status Mammals

American Badger and Desert Kit Fox

American badger burrows and desert kit fox complexes were found on the project site. In addition, the project site supports suitable foraging and denning habitat for these species. The desert kit fox is designated as a furbearer and, under Title 14 Section 460 of the California Code of Regulations, “may not be taken at any time.” The California Fish and Game Code defines “take” as to “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill” (§ 1-89.1). The CDFG does not issue Incidental Take Permits or Memoranda of Understanding to permit the capture or handling of desert kit fox. American badger is considered a species of special concern, which affords this species special consideration and protection under CEQA.

Direct Impacts to American Badger and Desert Kit Fox

Direct impacts to American badger and desert kit fox include mechanical crushing of individuals or burrows by vehicles and construction equipment, noise, dust, and loss of habitat. Construction activities could also result in the disturbance of badger maternity dens during the pup-rearing season (15 February to 1 July). Because of the large size of the project, numerous badgers or kit foxes may be affected. For example, depending on prey densities, home ranges of badgers can vary from 338 to 1,549 acres (Zeiner et al. 1990). Their distribution in a landscape coincides with the availability of prey, burrowing sites, and mates, with males ranging wider than females during the breeding and summer months (Minta 1983). While home ranges are expected to be larger and badger densities lower in more arid regions, construction of the project could result in the loss of as many as nine home ranges if home ranges are small (3,277 acres divided by a 338-acre home range) to as few as two home ranges if home ranges are large (3,277 acres divided by a 1,549-acre home range). Based on the number of pocket gopher burrows and small rodent burrows observed by staff, prey densities appear high on the project site, primarily along disturbed access roads. While badgers near the perimeter of the project may be able to effectively disperse to other areas, the placement of the tortoise exclusion fence is expected to trap badgers in the project footprint.

Estimates of kit fox home range size vary widely, and population densities fluctuate drastically depending on the availability of food, predation pressures, and rainfall (Zoellick and Smith 1992; White and Garrott 1999; Arjo et al. 2003). In addition, many kit fox home ranges overlap considerably, often by 20 percent or more (Zoellick and Smith 1992). Therefore, it is difficult to estimate the actual number of desert kit fox that currently occupy the project site. However, the applicant identified numerous active kit fox complexes on the project site during surveys conducted in 2011. Desert kit fox could be trapped within the site by the exclusion fence, as described above for badgers. Construction activities could also result in disturbance or harassment to these species on lands adjacent to the proposed project.

Indirect Impacts to American Badger and Desert Kit Fox

Indirect impacts to badgers and kit foxes include alteration of soils, such as compaction that could preclude burrowing, alteration in prey base, and the spread of invasive plants. Forcing kit foxes into adjacent habitat may also increase the risk and spread of diseases. Operational impacts include risk of mortality by vehicle strikes on access roads by maintenance personnel, the spread of invasive plants, and disturbance due to increased human presence.

Forcing animals out of active territories can result in increased stress which can lead to disease and possibly death. Forcing diseased animals to adjacent territories can threaten the local populations. Several of the recent kit fox deaths (preliminary estimates of eight deaths) have been caused by canine distemper, a disease that had not been documented in desert kit fox until construction of the Genesis project.

Habitat Loss for American Badger and Desert Kit Fox

Implementation of the proposed project would result in the direct loss of approximately 3,277 acres of habitat for American badger and desert kit fox. Staff considers these impacts to be significant and require compensatory mitigation. The loss of this habitat would reduce access to foraging, denning, and dispersal areas.

Conclusions and Discussion of Mitigation for American Badger and Desert Kit Fox

Prior to construction of the project the applicant would be required to evict all American badger and kit fox from the project site. This is often accomplished through passive mechanisms, designed to discourage animals from remaining onsite. During this "passive relocation," or hazing, dens of these species are typically blocked, and fitted with one-way doors. Once the animals have abandoned the burrow the den is excavated to ensure no animals remain then collapsed to prevent re-occupation of the den. Displaced animals are then forced to disperse to adjacent habitat. On the project site, construction of the project would occur in phases. Depending on the fencing plan animals would be required to disperse up to a mile in any given direction to find habitat outside the fenced area. Displaced animals would attempt to locate suitable new burrows in territory not already occupied by residents of the species. Passive relocation on a large site has proven problematic and may lead to increased predation risk, overcrowding of remaining suitable habitat, competition for food, mates, and territory in adjacent lands. Currently private lands surround the project to the south and west which extends at least 1,600 meters beyond the boundaries of the project site. Publically-held land is located east of the project.

Staff considers eviction of resident kit fox or badgers into adjacent private lands unsuitable for kit fox and badgers, as the land cannot be managed for the benefit of the species. For kit fox, access to safe burrows reduces predation by eagles and coyotes and provides thermal refugia. Staff is concerned that unless supplemental burrows can be provided on adjacent lands, forcing kit fox from the project area will likely result in mortality. To minimize this risk staff recommends that the applicant attempt to evict animals onto adjacent public lands that are afforded some protection by the BLM.

Staff is also concerned regarding the viability of displacing the animals. Typically, procedures used to evict kit fox from the site include passive hazing or grading the site such that safe, vegetated "escape corridors" to undisturbed land are maintained. While effective to a degree on smaller sites, the use of the method on large solar sites has proven challenging. Additional scrutiny of kit fox impacts has resulted from the deaths of kit fox on or adjacent to the Genesis Solar Energy Project. Staff is aware of difficulties in fully evicting kit fox from active solar projects where construction is underway. Rather than establish new permanent offsite territories, some kit fox attempt to remain onsite, digging new burrows overnight, or possibly moving briefly offsite, only to return to the following day. This results in increased stress to kit fox, as the animals are forced to repeatedly search out and/or create new dens, avoid humans and equipment, and find prey. Successful eviction is also important because kit fox may not be disturbed during the pupping season (February 15 through May 31), and must be protected with construction buffers during this time.

Potential direct and indirect impacts to American badgers and desert kit fox are significant, and considering the landscape level scale of the project, some level of mortality is expected even with staff's proposed conditions of certification. The implementation of Condition of Certification **BIO-8** (Impact Avoidance and Minimization

Measures) and Condition of Certification **BIO-14** (American Badger and Kit Fox Management Plan) would reduce impacts to American badgers and desert kit fox. These conditions require the project owner to perform preconstruction surveys for badger and kit fox dens in the project area, including areas within 250 feet of all project facilities, utility corridors, and access roads prior to ground disturbance. If these species are present, the applicant will flag and avoid occupied badger and kit fox dens during ground-disturbing activities and establish a buffer to avoid loss of natal dens. The applicant would also be required to map all kit fox dens and badger dens and document the type of the burrow/den (i.e., natal, single den, complex). Condition of Certification **BIO-14** would also require the applicant, in consultation with CDFG, to prepare a management plan for kit fox and American badger. Staff expects implementation of an adaptive management approach emphasizing flexibility in passive relocation methods, ground-disturbance schedule, placement of escape dens on facility property, and treatment of possible disease outbreak.

Condition of Certification **BIO-12** (Desert Tortoise Compensatory Mitigation) would mitigate habitat loss for these species. **BIO-22** (Compensatory Mitigation for State Waters), **BIO-18** (Weed Management Plan), and **BIO-23** (Groundwater-dependent Vegetation Monitoring Plan), would further reduce direct and indirect impacts of the project to less than significant levels under CEQA.

Nelson’s Bighorn Sheep

The Nelson’s bighorn sheep is a BLM sensitive species and is classified as fully protected by the State of California. Nelson’s Bighorn sheep are known from the local mountain ranges and the applicant detected the horn of a bighorn sheep on the project site. At a staff workshop conducted in Bishop, California, residents from the Charleston View and other local communities stated that a herd of sheep had been sighted on the project site in May of 2012. The CDFG confirmed that herds of this species are present in the Nopah Range to the west, the Kingston Range to the south (CNDDB 2012), and that they occupy, or have occupied in the past, the north portions of the Nopah Range.

Direct Impacts to Nelsons Bighorn Sheep

Direct effects to bighorn sheep could include disturbance from construction activities, noise, and lighting. Construction of the facility may also pose a partial barrier to movement for this species.

Indirect Impacts to Nelsons Bighorn Sheep

Indirect impacts include the degradation of habitat in the region from invasive weeds, human disturbance, and lighting. Additional indirect effects include avoidance of areas near manmade structures, increased traffic on desert roads by the public, and risk of wildfires. Degradation of seeps or springs from groundwater pumping may also occur. Loss of surface water sources within existing and historic bighorn sheep ranges may diminish the viability of existing populations or the potential for successful reintroduction or natural colonization where this species is absent. The influence to bighorn sheep from the loss of any particular water source will depend on the number of water sources available to bighorn sheep in the region (Wehausen 2005). Water sources can be lost to bighorn sheep due to various causes, including domestic and feral stock use, vandalism, or natural disasters.

Operational impacts include the degradation of habitat in adjacent areas due to increased human presence associated with use of new facility, noise, nighttime maintenance activities and mirror washing. Public interest in the new facility may also result in increased road traffic along roads in the region.

Habitat Loss for Nelsons Bighorn Sheep

Implementation of the proposed project would result in the direct loss of approximately 3,277 acres of habitat that likely supports only periodic use for foraging and movement. Staff considers the loss of habitat from the proposed project to be adverse but less than significant.

Conclusions and Discussion of Mitigation for Nelsons Bighorn Sheep

The Society for Conservation of Bighorn Sheep has recommended a minimum buffer of one mile from the upper edge of any solar development to the base of rugged terrain to protect spring foraging habitat. The proposed project is located several miles from the base of either the Nopah or Spring mountains. However, in years of high rainfall, animals may move further out from rugged terrain to take advantage of available forage resources and, thereby, temporarily occupy new habitat that has the potential to facilitate gene flow, and enhance reproductive success (Bleich pers comm. 2012).

While sheep will range far from mountainous areas, especially during intermountain movement, the implementation of the proposed project is not expected to result in the loss of annual spring forage for this species or act as a barrier to movement. Because of the distance to known herds the project is also not expected to result in direct impacts from noise, dust, or human activity unless sheep are undergoing seasonal movement at the time of construction. The most likely risk to bighorn sheep would be increased road traffic during spring lambing or during periods of intermountain movement. Sheep have been known to acclimate to human habitual noise and human presence to a certain degree, whereas being exposed to sudden noises or human presence elicited a stronger startle response (Papouchis et al 2001).

Ensuring availability of intermountain areas used for movement by bighorn sheep is fundamental to colonization of vacant habitat and to metapopulation processes, in general. Colonization allows the species to maintain adequate metapopulations to thrive. Colonization by ewes is the slow link in this process, but has recently been documented in several Mojave Desert ranges in California (Bleich et al. 1996; Torres et al. 1996). Consequently, intermountain areas of the desert floor that bighorn traverse between mountain ranges are as important to the long term viability of populations as are the mountain ranges themselves (Schwartz et al. 1986; Bleich et al. 1990b, 1996). CDFG has informed staff that the project site likely has some import in facilitating movement by bighorn sheep between the Nopah Range and other, nearby, mountain ranges.

Several intervenors and members of the public have commented that the site is or may be more frequently used by bighorn sheep. However, staff notes that significant portions of Pahrump Valley remain undeveloped and the project would not preclude intermountain movement. Although intermountain movement may periodically occur consultations with experts in bighorn sheep ecology (Dr. Wehausen, personal communication) have stated that the Pahrump Valley may be too wide for bighorn sheep to cross and the movement of bighorn sheep between mountain ranges does not depend upon inter-valley movements in this area. Rather, these movements are expected to occur across rugged mountain habitat. In addition, the project site does not provide the rugged terrain more suitable for bighorn sheep, and is located over three miles from the preferred escape habitat for this species (i.e., slopes greater than 15 percent, see **Biological Resource Figure 7, Bighorn Sheep Habitat**). Because sheep are only expected to visit the site infrequently and the project will not preclude movement significant impacts to foraging habitat or movement corridors are not expected to result from implementation of the proposed project.

Implementation of the following conditions would minimize potential impacts, if any, to this species. These include Conditions of Certification **BIO-5** (Designated Biologist and Biological Monitor Authority) in which the Designated Biologist and Biological Monitor can halt any activities that would be an adverse impact to biological resources including bighorn sheep; **BIO-6** (Worker Environmental Awareness Program); **BIO-7** (Biological Resources Mitigation Implementation and Monitoring Plan); and **BIO-8** (Impact Avoidance and Minimization Measures). Implementation of these measures would reduce impacts on bighorn sheep to less-than-significant levels under CEQA.

Compensatory mitigation for the loss of land associated with the project is being provided for both desert washes and to reduce impacts to desert tortoise. While not required to reduce potential impacts to bighorn sheep, Condition of Certification **BIO-12** (Desert Tortoise Compensatory Mitigation), **BIO-22** (Compensatory Mitigation for State Waters), and **BIO-18** (Weed Management Plan) may benefit bighorn sheep should these lands occur in areas used by the species either as spring forage or for intermountain movement.

Direct and indirect impacts from groundwater pumping are not expected to occur on water sources located within mountain ranges utilized on a permanent basis by Nelson's bighorn sheep; see the **Soils** section of this FSA for staff's analysis of impacts to groundwater resources. However, project groundwater pumping could potentially impact the seasonal spring pools at Stump Spring ACEC, which provides water from December to July, by lowering the water table in the vicinity of the springs. Cumulative and incremental impacts to mountain block streams in the Clark Mountains have also been identified, including at Manse Springs to the north of the project site. The connection of mountain block streams to the groundwater supply is not known for this region. However, without mitigation, these impacts to water sources could be significant. Condition of Certification **WATER SUPPLY-4** (groundwater monitoring) would require the applicant to stop pumping groundwater if declines in groundwater levels reach the project boundary. **WATER SUPPLY-2** would offset the project's contribution to the Pahrump Valley groundwater basin overdraft.

Potential indirect impacts associated with the degradation of habitat in adjacent lands or by reducing access to surface water at Stump Spring would be reduced to less than significant levels with the implementation of conditions of certification **BIO-23** (Groundwater-dependent Vegetation Monitoring Plan) and **WATER SUPPLY-4** (Groundwater Monitoring).

Special-status Bats

The AFC indicated that there was a low to moderate potential for sensitive bat species to occur in the project area. However, due to proximity of the project site to suitable habitat for foraging and roosting (e.g. Stump Spring ACEC, scattered mesquite thickets along the Stateline, etc.), staff requested that the applicant install an Anabat station. Three special-status bats have been detected onsite, the pallid bat, Yuma myotis, and the Western small-footed myotis. These species have the potential to forage within the project site and adjacent areas and some bat species utilize large areas for foraging. For example, the pallid bat is capable of flying more than 18 miles, although most foraging occurs within about two miles of the diurnal roost (Hermanson and O'Shea 1983). Western mastiff bats have been heard in open desert, at least 15 miles from the nearest possible roosting site (Vaughan1959).

Direct Impacts to Special-status Bats

Direct impacts to bats could include mortality of individuals during construction activities should bats elect to day or night roost in equipment or the power towers. The placement of large open structures may be an attractant to bats which are known to periodically day roost on open structures such as the eves of buildings. Bats could also be directly impacted by the loss of foraging habitat due to construction of permanent structures or other construction activities, and temporary disturbance during construction (noise, air turbulence, dust, and ground vibrations from construction equipment). Bats that forage near the ground, such as the pallid bat, would also be subject to crushing or disturbance by vehicles driving at dusk, dawn, or during the night.

In general, bats are highly mobile and it is unlikely that construction activities would result in mortality of bats in the project area. Although bats forage periodically in the project area, most activities will occur during daylight hours when the potential for bat interactions is limited. The applicant has not proposed specific avoidance measures for bats and staff considers the likelihood of roosting bats to be low. However, because potential roost sites may be constructed on the project area (i.e., power towers, stacks of pallets or constriction materials) and sensitive bats are known to occur at the site, staff considers potential impacts to these species significant absent mitigation. In order to reduce these impacts staff has developed pre-construction monitoring and impact avoidance measures for bats to reduce impacts to potential day roosts. Conditions of certification required to reduce impacts to sensitive bats are described below.

Indirect Impacts to Special-status Bats

Indirect effects include the loss of foraging habitat due to type conversion, night time lighting that exposes bats to predation, and alteration in prey bases. Because crews will work at night to wash mirrors it is likely that bats will be attracted to the night lighting associated with the project area. Bats may also be attracted to project features such as night lighting, mirror washing, and the retention basin (when filled), as these features may attract prey items such as insects. Indirect impacts to the Stump Spring ACEC and associated mesquite thickets in Nevada, as well as to the Amargosa River in California, may also occur (see also the **Water Supply** section for more information).

Habitat Loss for Special-status Bats

Implementation of the proposed project would result in the direct loss of approximately 3,277 acres of habitat for several species of bats. The most likely bat to forage on the ground would be the pallid bat. Other bats may periodically forage over the project site post development or be attracted to night lighting. Staff considers the loss of habitat from the proposed project to be significant absent mitigation. Conditions of certification required to reduce impacts to sensitive bats are described below.

Conclusions and Discussion of Mitigation for Special-status Bats

Implementation of the proposed project has the potential to result in the direct loss of special status bats. The project is not expected to result in the loss of maternity roosts, day roosts, or hibernacula for sensitive bats. These features are not known to occur on the project site, and while bats will utilize large trees for day roosts, the habitat on the project site (primarily Mojave Desert scrub and windrows of dead Arizona cypress trees surrounding the abandoned orchard) is generally exposed and may not be well suited for this behavior. Roosting opportunities for bats are available in habitats offsite, such as the Nopah and Kingston ranges, potentially within buildings in Pahrump Valley, and other habitat that provides rock outcrops, tree hollows, and such sheltered roosts. Bats may also be associated with the large trees that occur immediately south of the site in the community of Charleston View or in the many stored trailers and vehicles that occurs on private lands east of the project site. It is possible that bats may roost within some of the dense mesquite that occurs near the California/Arizona Stateline. Staff recommends the implementation of Condition of Certification **BIO-8.** This condition includes specific language regarding the avoidance of roosting bats or maternity colonies should they occur. Implementation of this condition would reduce project impacts to a level that is less-than-significant.

Potential indirect impacts associated with the degradation of habitat in adjacent lands or by drawdown of the spring-fed surface water at Stump Spring, other smaller seasonal springs, and other areas known to support a variety of foraging bats, would be reduced to less than significant levels with the implementation of Condition of Certification **BIO-23** (Groundwater-dependent Vegetation Monitoring Plan). With the implementation of these conditions of certification, impacts from the project to special-status bats would be considered less-than-significant under CEQA.

Operation of the project may also have the potential to alter the abundance of insect prey for both bats and birds. The presence of insect prey on the project site, and the hazard to bats from collision with and thermal exposure is also poorly understood. Presumably, bats will be able to avoid striking the heliostats and support facility through the use of echolocation. Similarly, while bats are active at dawn and dusk, when the facility is just commencing or ending daily operation, it is likely the solar flux levels will be at sub- lethal levels. Studies by Horvath et al. (2010) have suggested that some solar panels could cause an increase in Polarized Light Pollution (PLP) which occurs from light reflecting off of dark colored anthropogenic structures; the authors also demonstrated that some insects are attracted to photovoltaic solar panels and mistake these structures for the surface of water, depositing eggs on the solar panels. According to Horvath et al. (2009), PLP caused by anthropogenic structures can alter the ability of wildlife to seek out suitable habitat and elude or detect the presence of predators.

Because the heliostats onsite would also be expected to polarize light, they may also serve as an attractant. In general, many species of insects are attracted to light or heat.

Staff recommends the implementation of **BIO-15** (Avian, Bat, and Golden Eagle Protection Plans), to assist with monitoring operational impacts and formulate adaptive management strategies if significant project effects upon bats are demonstrated through project operations monitoring.

Impacts - Special-Status Bird Species

Special-Status Bird Species

The desert scrub communities present on the project site support a broad range of food items for resident and wintering birds, including seeds from annual grasses and forbs, various insects, small mammals, and a variety of small resident birds. Species expected to use the site include golden eagle, burrowing owl, loggerhead shrike, Leconte's thrasher, northern harrier, and prairie falcon. **Biological Resources Table 4** identifies the special-status birds either observed during surveys conducted by the applicant or species that have the potential to occur on or near the project site.

Direct Impacts to Special-status Birds

Direct impacts to special-status nesting birds or raptors would be similar to impacts described above (see subsections entitled Overview of Impacts to Wildlife, and Nesting Birds). This includes the impacts of mortality from solar flux, collision with power tower, heliostats, or other project features, removal or disturbance of vegetation that supports nesting birds, increased noise levels from heavy equipment, increased human presence, and exposure to fugitive dust.

Indirect Impacts to Special-status Birds

Indirect impacts to special-status nesting birds or raptors would be similar to impacts described above (see subsections entitled Overview of Impacts to Wildlife, and Nesting Birds). This includes the loss of habitat due to the colonization of invasive plants and a disruption of breeding or foraging activity due to facility maintenance. The drawdown of surface and subsurface water in adjacent lands such as the mesquite thickets and Stump Spring ACEC could result in significant impacts to bird habitat.

Birds may also become trapped within vertical pipes used to support the heliostats. In addition, noise and lighting effects have been demonstrated to adversely affect behavior, reproduction, and increase the risk of predation. The project's collision hazards and concentrated solar energy hazards have the potential to result in the loss of special-status bird species, and staff concludes that these hazards present a significant and unavoidable impact (see Operational Impacts, above).

Habitat Loss for Special-status Birds

Implementation of the proposed project would result in the direct loss of approximately 3,277 acres of habitat that supports foraging for a variety of resident and migratory birds. As with most common bird's, species that rely on the site for year round cover, foraging and nesting would be subject to more intense effects of the proposed project when compared to species that utilize the project site for foraging alone. Other special-status species may use the site during winter or migration season, but would not nest on the site. The effects of foraging, migration stopover, and wintering habitat loss for these species would be comparable to other habitat loss effects (see Overview of Wildlife Habitat Impacts, above). All native birds, including special-status species, are protected under the federal Migratory Bird Treaty Act (MBTA) and California Fish and Game Code. The loss of habitat from the proposed project would be significant absent mitigation. Conditions of certification required to reduce impacts to sensitive birds are described below.

Conclusions and Discussion of Mitigation for Special-status Birds

Implementation of the proposed project would result in the direct loss of habitat supporting special-status birds. Declines in verdin, pyrrhuloxia (*Cardinalis sinuatus*), northern flicker, cactus wren, Leconte's thrasher, crissal thrasher, Bendire's thrasher, loggerhead shrike, and greater roadrunner populations have all been correlated to urbanization, though verdin and cactus wrens have also been found to be unaffected by urban development if nest-site alternatives are present in the urban matrix (Corman and Wise-Gervais 2005, Germaine et al. 1998, Emlen 1974). It is expected that construction of the HHSEGS facility will result in the displacement of these and other sensitive birds. Staff considers these effects to be significant absent mitigation.

Direct impacts to sensitive birds can be reduced or offset through implementation of staff's recommended Conditions of Certification **BIO-1** through **BIO-8** (see Common Wildlife, above). Staff also recommends Conditions of Certification **BIO-15** (Avian Bat & Golden Eagle Protection Plan) and **BIO-16** (Pre-construction Nesting Bird Surveys), see discussion of impacts to common birds. Condition of Certification **BIO-16** includes conducting pre-construction nesting surveys, and the establishment of limited disturbance buffers. The condition would require the applicant to implement a nest management plan to ensure the protection of sensitive birds or their nests. Implementation of these conditions of certification would avoid direct impacts to nests, eggs, or young of migratory birds and would reduce the impacts of construction disturbance to nesting birds to less than significant levels under CEQA.

The loss of foraging habitat would be considered significant absent mitigation. Loss of nesting and foraging habitat for these special-status bird species would adversely affect populations of these species within the Pahrump Valley. As discussed in the cumulative impact subsection, the project would be a contributor to the cumulative loss of biological resources, including these special-status bird species. Implementation of Condition of Certification **BIO-12** (Desert Tortoise Compensatory Mitigation) would reduce this habitat loss by the preservation of similar foraging areas. Implementation of this condition of certification would reduce impacts from the loss of habitat to less than significant levels under CEQA.

Indirect impacts to habitat from the drawdown of surface and subsurface water in adjacent lands such as the mesquite thickets and Stump Spring ACEC would be avoided or reduced to less than significant levels with the implementation of conditions of certification, **BIO-23** (Groundwater-dependent Vegetation Monitoring Plan) and **WATER SUPPLY-4** (groundwater monitoring). With the implementation of these conditions impacts to sensitive birds from the proposed project would be considered less-than-significant under CEQA.

Golden Eagle

Golden eagles are known to occur in the region and have been observed foraging over and/or near the project site during bird surveys by staff and the applicant. Surveys conducted by the applicant identified 19 nests in the region, and this species has been observed in proximity to Charleston View. Golden eagles can have extremely large home ranges and would be expected to prey on many of the species that occur on the project site.

Direct Impacts to Golden Eagles

Direct impacts to golden eagles include the loss of foraging habitat and disturbance from construction activities such as clearing and grading. Increased human presence and vehicle traffic could also adversely affect golden eagles. Noise from these activities will likely exclude or greatly reduce foraging in and adjacent to the Proposed Project. Construction noises are anticipated to range from 43 decibels to 74 decibels at 1500 feet from the noise source (piece of construction equipment) (HHSG 2011a, Table 5-7-7). During project operation, direct impacts could occur from exposure to concentrated solar flux.

Indirect Impacts to Golden Eagles

Indirect impacts could include the loss of habitat due to the colonization of invasive plants and a disruption of breeding or foraging activity due to facility maintenance. Weed abatement, mirror washing (which occurs at night), and maintenance activities would likely limit the use of some areas as foraging or nesting habitat. Glare or heat associated with the heliostats may also adversely affect the use of the site by this species. In addition, noise and lighting effects have been demonstrated to adversely affect behavior, reproduction, and increase the risk of predation. Post development, golden eagles could collide with facility structures or be subject to mortality from exposure to solar energy flux (see Operational Impacts, above).

Habitat Loss for Golden Eagles

Golden eagle, are known to forage within the proposed project site. While golden eagles do not nest onsite, the site provides important foraging habitat. Project construction would result in the loss of 3,277 acres of suitable foraging habitat for these species. Staff considers this loss of foraging habitat a significant impact. Conditions of certification required to reduce impacts to sensitive birds is described below.

State and Federal Guidelines Protecting Golden Eagles

The Bald and Golden Eagle Protection Act (BGEPA) prohibits the take of bald and golden eagles without a permit. A federal permit is required for take. Under state law, golden eagles are fully protected and no take is allowed for this species, in contrast with federal law.

On November 10, 2009, the USFWS introduced new rules (74 FR 46835) requiring a permit for all activities that might result in take of golden or bald eagles, including activities that might cause decreased productivity or nest abandonment. This was supported through the preparation of an Environmental Assessment (EA) and Implementation Guidance for take permits were issued under the Bald Eagle and

Golden Eagle Protection Act (USFWS 2010d). The USFWS concluded that all activities that may disturb or incidentally take an eagle or its nest as a result of an otherwise legal activity must be permitted by the USFWS under this act. Under (72 FR 31132) the USFWS defines disturb as any activity interfering with normal breeding, feeding, or sheltering behavior to the degree that it causes or is likely to cause decreased productivity or nest abandonment. Because large-scale solar projects would result in the loss of large amounts of golden eagle foraging habitat, there are concerns regarding the cumulative impacts to golden eagles from the loss of foraging habitat.

Given the nature of the potential impacts and loss of foraging habitat, coupled with potential injury or mortality from concentrated solar flux (see Operational Impacts, above), the USFWS has recommended that the project applicant apply for a federal Eagle Act Permit, and has also indicated that two-to three years of eagle survey data are necessary to apply for the permit. The project owner is not required to apply for a permit, and an Eagle Act Permit is not being considered as part of this analysis.

Conclusions and Discussion of Mitigation for Golden Eagles

The proposed project site does not provide nesting habitat for golden eagles; however, scrub communities present on the project site provide suitable foraging habitat for this species. Golden eagles are extremely susceptible to disturbance during the breeding season and have been documented to abandon nests when disturbed. However, the nearest nest is located over four miles to the west of the project site, Figure 8, Golden Eagles at Hidden Hills Project Site. Similarly, all of the 19 nests located within 10 miles of the project site were unoccupied in 2011. While it is possible that these nests may become occupied at any time the distance from the project site greatly reduces the potential of the proposed project to result in direct effects to golden eagles or their nests from construction or operation activities.

Golden eagles are expected to actively forage on and near the proposed project site. This includes year round residents and seasonal migrants. The development of the 3,277-acre project site would result in substantial loss of foraging habitat for this species. Accelerated commercial and urban development was attributed to golden eagle nesting declines along the Colorado Front Range (Boeker 1974). Post development, staff considers it likely that golden eagles will be effectively excluded from foraging on the project site. While it is possible that this species may forage near the border of the site; the large numbers of structures within the heliostat field, coupled with glare would likely preclude foraging within the solar field. If foraging did occur within the heliostat field, it could lead to collision, electrocution, or lethal exposure to solar flux (see Operational Impacts, above).

The USFWS considers that foraging habitat loss may be interpreted as take under the BGEPA if it causes territory abandonment or reduced productivity. Staff believes that these effects, would be difficult at best to attribute to any given land use. However, staff concludes that the loss of foraging habitat would be significant under CEQA and require compensatory mitigation. Staff does not consider the habitat loss to constitute take under state or federal LORS.

The USFWS has also raised concerns regarding potential collision threats associated with solar and renewable technologies. To address potential collision concerns (see

Operational Impacts, above) staff has proposed Condition of Certification **BIO-15** (Avian, Bat, and Golden Eagle Protection Plan). This requires a monitoring and reporting program that would document and report potential collision mortality from the proposed solar fields. The plan would specify the project owner's anticipated take of golden eagles and provide specific measures proposed to compensate for that take (e.g., retrofitting of existing off-site electrical distribution lines to reduce electrocution risk, or removal of existing disturbance in nesting habitat, or the control of ravens). The Plan would also specify the project owner's proposed measures to remediate any further take of eagles that may exceed the estimated.

Staff concludes that even with the implementation of the proposed Conditions of Certification it is possible that golden eagles will be subject to mortality. Staff considers these impacts to be significant and unavoidable. Staff notes that any take of bald or golden eagles even if mitigated as required under CEQA, would violate the state Fish and Game Code due to the species' status a fully protected species. Staff believes that if golden eagle became a covered species under the Desert Renewable Energy Habitat Conservation Plan (in preparation) or another plan meeting state requirements as a Natural Community Conservation Plan, such take could be authorized under state law.

To offset other project related effects and the loss of foraging habitat staff recommends the implementation of conditions of certification **BIO-1** through **BIO-9**, **BIO-15**, and **BIO-12**, which include worker training, implementation of Best Management Practices, pre-construction surveys, biological monitoring, the avian protection plan, and acquisition and preservation of compensatory mitigation lands. Conditions of Certification **BIO-22** (Compensatory Mitigation for State Waters), **BIO-18** (Weed Management Plan), **BIO-23** (Groundwater-dependent Vegetation Monitoring Plan), and **WATER SUPPLY-4** would reduce direct loss of golden eagle habitat.

Burrowing Owl

The burrowing owl is a CDFG Species of Special Concern. Construction and operation of the project would result in impacts to burrowing owls and their habitat. Burrowing owl sign (feathers, whitewash, and/or pellets) was detected at on the project site during protocol surveys for desert tortoise conducted from March 13, 2011 to May 18, 2011 (HHSEGS 2011a). The AFC (HHSEGS 2011a, Table 5.2-7) notes that incidental sightings of burrowing owls were observed in 2010 and the spring of 2011. Supplemental information provided by the applicant including a Draft Burrowing Owl Mitigation and Monitoring Plan, suggests that there is no conclusive evidence that burrowing owl nesting occurred on the site during 2011 and that burrowing owls likely use the project site, but burrows on the western portion of the project site are temporary and short-term due to the fine silt and clay soils and impacts that rain events have on it (CH2 2012y). Further the applicant contends that winter surveys, conducted by the applicant January 30, 2012 and February 2, 2012 to a previously reported burrow, was found to be collapsed and no burrowing owl sign was observed at the burrow. No burrowing owls or fresh sign was found at any of the nine previously identified burrowing owl burrows within the project site or the 150 meter buffer. Furthermore, visual surveys of the project area and buffer, conducted by the applicant, did not detect any burrowing owl sign.

The applicant may be correct in concluding that use of the site by burrowing owl is limited; however there is no reliable data to draw this conclusion. A review of Table 2 (Sensitive Species and Sign Locations) of Appendix 5.2 F(Desert Tortoise Survey Report) indicate that of the eight potential burrowing owl burrows detected, two contained pellets, white wash and feathers. However, there is no indication that focused burrow surveys consistent with burrowing owl monitoring guidelines were implemented. These surveys, which consist of repeated burrow surveys, are required to assess if owls are physically present and breeding at a given location. A single breeding season survey alone is not effective to determine if burrowing owls are breeding at a location. However, staff recognizes that the applicant did not conduct these surveys based on direction from the CDFG once burrowing owls were detected.

Direct Impacts to Burrowing Owls

Direct impacts to burrowing owls would be similar to those described for nesting birds. This includes the crushing of burrows, removal or disturbance of vegetation, increased noise levels from heavy equipment and the, increased human presence, and exposure to fugitive dust. Because burrowing owls are cavity dwellers that are primarily active during crepuscular periods (i.e., dawn and dusk) or at night, birds flushed from burrows during the day are exposed to elevated predation risk from various raptors. Burrowing owls also exhibit site fidelity and owls displaced during construction or from passive relocation activities increase the risk of mortality for this species if they lack access to adequate burrows.

Indirect Impacts to Burrowing Owls

Indirect impacts would be similar to those described for nesting birds and could include the loss of habitat due to the colonization of noxious weeds, plant community shifts associated with the maintenance, long term human presence associated with the 29 month construction schedule, mowing of existing vegetation and the degradation of foraging habitat. Operational impacts include increased human presence from maintenance personnel that would flush or otherwise disturb burrowing owls, invasive plant control activities, weeding, and vehicular use of access roads. Burrowing owls may also be at risk from collision or electrocution with facility structures and exposure to solar flux (see Operational Impacts, above).

Habitat Loss for Burrowing Owls

Project construction would result in the loss of 3,277 acres of suitable foraging habitat for burrowing owls. Staff considers this loss of foraging habitat a significant impact. Conditions of certification required to reduce impacts to burrowing owls are described below.

Conclusions and Discussion of Mitigation for Burrowing Owls

Burrowing owls are rare in the undisturbed desert areas of the eastern and southeastern portion of California (Small 1994). By the 1940s', burrowing owls had become scarce in many portions of the desert southwest as a result of shooting and elimination of ground squirrel burrows (Grinnell and Miller 1944). Limited data suggest that they are decreasing in some areas, but may be stable or increasing in others (Klute et al. 2003). Surveys in California in 1986-91 found population decreases of 23-52% in the number of breeding groups and 12-27% in the number of breeding pairs of owls (DeSante et al. 1997). In addition, in a 2003 report by the U.S. Fish and Wildlife Service, breeding burrowing owls were thought to be largely extirpated during the last 10-15 years from multiple areas in California, including Napa, Marin, San Francisco, Santa Cruz, and Ventura counties, coastal San Luis Obispo county and the Coachella Valley (http://burrowingowlconservation.org/PR12-09-2010.html).

Notwithstanding the current conservation designation assigned to this species by the CDFG and BLM habitat for burrowing owls continues to be lost through development. A ranking of the most important threats to the species included loss of habitat, reduced burrow availability due to rodent control, and pesticides (James and Espie 1997).

If burrowing owls are present within or adjacent to a construction zone, disturbance could destroy occupied burrows or cause the owls to abandon burrows. Construction during the breeding season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. The loss of occupied burrowing owl habitat (habitat known to have been occupied by owls during the nesting season within the past three years) or reductions in the number of this rare species, either directly or indirectly through nest abandonment or reproductive suppression, would constitute a significant impact absent mitigation. Furthermore, burrowing owls and their nests are protected under both federal and State laws and regulations, including the Migratory Bird Treaty Act and California Fish and Game Code Section 3503.5.

The applicant has proposed mitigation based on the current guidelines recommended by the CDFG Staff Report on Burrowing Owl Mitigation (CDFG, 1995) and the revised 2012 CDFG Staff Report on Burrowing Owl Mitigation (CDFG 2012). Staff has included these recommendations into proposed Condition of Certification **BIO-17** (Burrowing Owl Impact Avoidance and Minimization Measures). Staff is considering the recently published 2012 revision to those guidelines (CDFG 2012) to provide the most relevant guidance addressing impacts and mitigation development to this species.

To avoid potential impacts to burrowing owls that might be nesting or residing within burrows in the project impact area, the proposed conditions of certification include the completion of pre-construction surveys of the site using established protocols. If present, the applicant would establish a buffer and avoid active nests during the breeding season. If owls are detected using a burrow outside the breeding season the owls may be passively displaced pending the establishment of artificial burrows and the acquisition of adequate mitigation lands. As described above the strategy for displacing owls depends greatly on how burrowing owls use the site, their number, and the timing of construction activities. Because project construction would occur for up to 29 months and result in the land use conversion of approximately 3,277 acres of habitat; passive relocation may result in the repeated harassment of resident owls should they try to re-establish territories within the projects footprint. While construction of replacement burrows in off-site areas and the acquisition of mitigation lands would reduce impacts to the species, it is likely that owls would attempt to occupy areas close to known territories. This could require multiple passive relocation events for the same owls. Each of these events stresses the bird and exposes the owls to predation, lost breeding opportunities, thermal stress, and potential territorial disputes.

There is much debate among state, federal, local, and private entities over the most practicable and successful relocation/translocation methods for burrowing owl. When only passive relocation is used as an impact avoidance measure, it is generally only effective when burrowing owl nesting territories are directly adjacent to permanently protected lands (i.e., military reservation, airport, wildlife reserve, agricultural reserve with appropriate crop type such as alfalfa). Conversely active translocation of owls involves trapping owls, temporarily holding them in enclosures with supplemental feeding, and releasing at a suitable off-site location with existing or artificial burrows prior to breeding.

While active translocation might be a better solution than passive relocation for evicting owls from a large project site, California Fish and Game Code 3503.3 prohibits the active relocation of burrowing owls. Therefore, staff is can only recommend the implementation of passive relocation techniques. Although passive relocation would be conducted to avoid direct mortality of owls within the proposed project area, previously occupied burrow(s) would be destroyed and foraging habitat would be degraded. Due to the loss of habitat compensatory mitigation is required to reduce these impacts to less than significant levels. The location and amount of compensatory habitat required to mitigate impacts to burrowing owl is often based on the number of impacted owls and assumes that currently occupied habitat will be replaced with nearby occupied habitat.

The applicant has indicated that no more than five owl territories occur on the project site (CH2 2012y). Territories are typically defined as an area used by a species for foraging and reproduction. In addition, at least eight burrows with sign have been discovered onsite. However, given the occasional migratory nature of burrowing owl, staff cannot predict how many burrowing owls or physical burrows might be detected onsite during pre-project surveys. In some circumstances burrows that occur adjacent to project activities are blocked to minimize conflicts with breeding birds. Staff would consider the closure of burrows in adjacent lands to constitute a significant impact that requires compensatory mitigation.

In order to reduce impacts to burrowing owls from the loss of burrows and foraging habitat the acquisition of off-site habitat for burrowing owl should take into consideration the foraging distance and average home range of breeding and non-breeding owls. Diurnal home range for owls can be 150 feet on both sides of burrow. Nocturnal home range is much larger, one square mile per owl pair, and several owls can overlap in that one square mile. The mean home range for 11 male burrowing owls in 1998 and 22 males in 1999 was 177 hectares (437 acres) and 189 hectares (467 acres), respectively, at Naval Air Station in Lemoore, California which is located south of Fresno (*ibid.*). Male burrowing owls often move greater than 1,000 meters when foraging in the breeding season and home ranges often overlap (*ibid.*). Due to the wide variation of home range size used by burrowing owls and lack of known occurrences of burrowing owls surrounding the project site, staff believes that owls identified during surveys would be impacted by project development. Suitable, off-site (preferably occupied) burrowing owl habitat would need to be acquired to offset the loss of these habitat resources on the project site. Acknowledging that owl territories can overlap staff is considering the site to support between two to four burrowing owls and at least two territories.

For the purposes of establishing compensatory mitigation requirements staff is assuming that each territory encompasses approximately 300 acres. The use of the 300 acre territory size takes into consideration the wide variation of territory size and that some territories likely overlap. Provided that adequate conditions exist on the proposed desert tortoise mitigation lands staff believes the mitigation lands for burrowing owls may be nested within the lands acquired for desert tortoise.

Implementation of Conditions of Certification **BIO-1** through **BIO-8, BIO-12** (Desert Tortoise Compensatory Mitigation), and **BIO-17,** which outlines survey requirements, eviction guidelines, and compensatory requirements; the project's impacts to burrowing owls would be mitigated to less-than-significant under CEQA.

Impacts to Wildlife Movement Corridors

Recent studies indicate that habitat fragmentation and isolation of natural areas ultimately results in the loss of native species within those communities (Soulé et al. 1988). Populations of animals that are isolated from other populations are higher risk of extirpation both from sources such as drought, disease, or wildlife. In the Mojave Desert large areas have been subject to habitat fragmentation from residential development, agricultural practices, military land uses (including Fort Irwin, Marine Corps Logistic Base Yermo, and Twentynine Palms); and off highway vehicle use. On a local scale, the city of Pahrump is one of the fastest growing cities in Nevada. The amount and distribution of suitable habitat is an essential element to consider for the management of wildlife. For example, some species require, and are often limited to, unique vegetation or terrain features for breeding or foraging such as bighorn sheep and desert tortoise.

Direct impacts of the project include the placement of physical structures such as the solar arrays, buildings, or other facilities that block or impede wildlife movement. Ground-disturbing activity, including heliostat and power tower installation and construction, grading of new access roads, and use or improvement of existing access roads would also be expected to interfere with terrestrial wildlife movement during construction. Construction could also affect wildlife in adjacent habitats by interfering with movement patterns or causing animals to temporarily avoid areas adjacent to the construction zone. More mobile species such as birds and larger mammals would be evicted from the project site and prevented access by perimeter fencing. Because construction would occur for up to 29 months it is likely that wildlife use of the area would be adversely affected.

Indirect impacts include human disturbance, shade, altered vertical structure (i.e., heliostat arrays) that reduce the sites' openness (a key element associated with use of an area by some species), the proliferation and spread of invasive weeds, and potential for increased predation risk from the addition of perch sites.

Operational impacts include night time lighting that increases predation risk, and collisions with vehicles (see Operational Impacts, above).

Wildlife corridors provide a variety of functions and can include habitat linkages between natural areas; provide greenbelts and refuge systems; and divert wildlife across permanent physical barriers to dispersal such as highways and dams by roadway underpasses and ramps (Haas 2000, Simberloff et al. 1992). Generally, the accepted definition describes a wildlife corridor as a linear habitat, embedded in a dissimilar matrix that connects two or more larger blocks of habitat (Beier and Noss 1998). Noss (1987) also suggests several potential advantages to corridors, including increased species richness and diversity, decreased probability of extinction, maintenance of genetic variation, a greater mix of habitat and successional stages, and alternative refugia from large disturbances.

Even within relatively open expanses of the Mojave Desert many species move through the landscape utilizing various physical and biotic features. Some species including Nelson's bighorn are strongly associated with steep mountainous regions and tend to move between these features quickly often utilizing local water sources where available. Likewise, many birds and some mammals seasonally utilize patches of microphyll woodlands, mesquite thickets, and riparian areas during summer and winter migratory passages. An important consideration of any wildlife corridor analysis is evaluating what target species occur in the project area and determining how these species use and move through the landscape affected by the proposed project. For example, desert tortoise while capable of long distance dispersal, are essentially corridor dwellers that complete their entire life history cycle within a relatively small area. In many instances home ranges for desert tortoise may run between 200 and 640 acres. Nelson's bighorn sheep are wide ranging species that may use portions of the project site only for episodic foraging and during periods of intermountain movement. Species may also use an area as true movement or dispersal corridor, on a seasonal basis, where the time spent within a given block of land is limited.

The HHSEGS project would be located in the Pahrump Valley, a broad alluvial plain, located between the Nopah Range, Kingston Range, and the Clark Mountains. Although this area remains largely undeveloped the valley is confined by the steep mountain ranges which affect the dispersal and distribution of some species in the region. Ongoing development in the region including the city of Pahrump, local airfields, and rural residents has led to various forms of habitat fragmentation in the region. Although the project is adjacent to Tecopa Road and bordered by rural residences to the south, the entire project site to provide habitat used by resident and dispersing animals. Habitat suitability and permeability (i.e., ease of movement for the species in the defined habitat) on the project site appears to be high for east-west movement with no existing barriers to dispersal or movement. North-south movement on the project site is hindered by both Tecopa Road and the community of Charleston View.

Construction of the proposed HHSEGS facility would result in the land use conversion of approximately 3,197 acres of natural lands. This would likely disrupt movement on a local scale and would fragment existing home ranges for many small species including desert tortoise, kit fox, and badger. Based on the vegetation, topography and connectivity to other open areas, these impacts are locally significant but the project would not be expected to result in the genetic isolation of the species in the project area.

The project would also have the potential to restrict some areas used by big horn sheep. Bighorn sheep are known from the region and likely use the project site for periodic intermountain movement. Bighorn sheep are known to move between the Nopah Range, the Spring Mountain Range, and the Kingston and Clark ranges. This species is known to forage in the bajadas near the foothills of the mountains and may move across the flatlands associated with the project. While not located in a designated wildlife corridor for this species the project area and adjacent desert flatlands would be expected to support this species. Wehausen (2005) and others (Schwartz et al. 1986; Bleich et al. 1990, 1996) consider intermountain areas of the desert floor that bighorn traverse between mountain ranges as important to the long term viability of populations as the mountain ranges themselves. Construction of the project may obstruct or hinder some of this movement. For other wide ranging mammals including coyotes, badgers, bighorn sheep, and desert kit fox the project will also pose an obstacle but will not completely prevent movement.

For other less motile species such as desert tortoise, construction of the project will hinder north-south and east-west movement. To reduce potential operational effects to desert tortoise the project will be constructed with fencing that prohibits tortoises and other non-avian wildlife from entering the site. This fencing will result in permanent barriers to east-west and north-south movement for the entire 3,277 acre site. East-west movement will remain available along the northern boundary of the project. Movement along the southern border of the project may occur however this small area would abut Tecopa Road.

Impacts to wildlife movement from the construction and operation of the project power plant site and transmission line in California would be adverse but not significant. The presence of adjacent large areas of open habitat and adjacent natural lands will not preclude movement in the area, rather, movement would be expected to reroute around the project site. The proposed project's construction impacts to wildlife movement would be less than significant.

Impacts to Special-status Plants

Summary of Impacts to Special-status Plants

Construction and operation of the project would directly and indirectly impact 28 occurrences of 11 special-status plant species located within the project boundary. None of the affected species are state or federally listed Threatened, Endangered, Rare, or Candidate species but nine of the 11 species have a highly restricted range in California. This is depicted in **Biological Resources Figure 9**.

All 11 species have a California Rare Plant Rank (CRPR) of 1B or 2, meaning they are "rare, threatened, or endangered in California". All 11 species have distribution outside California (a CRPR 2 rank) but 2 species are also rare outside California (CRPR 1B). The CRPR rank is assigned by the Rare Plant Status Review groups, representing over 300 botanical experts, and jointly managed by the California Department of Fish and Game (CDFG) and the California Native Plant Society (CNPS).

The difference between a CRPR Rank 1B and 2 is not reflection of the degree of rarity within California, or the risk of extinction within California; it simply distinguishes plants that are rare in California and elsewhere from plants that are rare or endangered in California but more common outside the state.

CDFGs Natural Diversity Database (CNDDB) Element Rank is, however, an *index of extinction risk* within California*.* Consequently, staff utilizes both measures in its analyses of special-status plant impacts. The CNDDB Element Rank, formerly known as the NatureServe rank, is based on a methodology (Master et al. 2009) used by natural heritage programs and conservation data centers throughout North America, and has been used by CNDDB since the mid-1980s. Species' conservation status is summarized as a series of ranks from "critically imperiled" to "secure and widespread" that are assessed at the state level, and at a global level. All but two of the 11 special-status plant species in the project area have a state extinction index, or "state rank" of "S1" or "S2":

> **S1 = "Critically imperiled** because of extreme rarity (often 6 or fewer occurrences statewide) or because of some factor(s) making it especially vulnerable to extinction from the state/province."
>
> **S2 = "Imperiled** in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state/province."

Two of the 11 species (Pahrump Valley buckwheat and pink-flowered androstephium) have a CNDDB Element Rank of S3:

> **S3 = "Vulnerable** in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation."

The following is a list of the special-status plant species that occur within the project footprint and would be directly affected by the project. Their CRPR Rank and CNDDB Element rank is also provided:

- **desert wing-fruit** (*Acleisanthes nevadadensis*) (syn=*Selinocarpus nevadensis)*) – CRPR 2; CNDDB S1
- **pink-flowered androstephium** (*Androstephium breviflorum*) – CRPR 2; CNDDB S3
- **Nye milk-vetch** (*Astragalus nyensis*) – CRPR 1B; CNDDB S1
- **Preuss' milk-vetch** (*Astragalus preussii* var*. preusii*) – CRPR 2; CNDDB S1
- **gravel milk-vetch** (*Astragalus sabulonum*) – CRPR 2; CNDDB S2
- **Tidestrom's milk-vetch** (*Astragalus tidestromii*) – CRPR 2; CNDDB S2
- **Wheeler's skeletonweed** (*Chaetadelpha wheeleri*) – CRPR 2; CNDDB S1/S2
- **purple-nerve spring parsley** (*Cymopterus multinervatus*) – CRPR 2; CNDDB S2
- **Torrey's joint-fir** (*Ephedra torreyana*) – CRPR 2; CNDDB S1
- **Pahrump Valley buckwheat** (*Eriogonum bifurcatum*) – CRPR 1B; CNDDB S3
- **Goodding's phacelia** (*Phacelia pulchella* var*. gooddingii*) – CRPR 2; CNDDB S2

Construction and operation of the project would *eliminate a substantial portion* of the California range, or total documented occurrences in California, of four special-status plant species, thus increasing their risk of extinction in California. The proportion of the total documented occurrences, including occurrences found by the applicant over two years of offsite surveys, is shown in parenthesis:

- **gravel milk-vetch** (50% of total documented occurrences in state eliminated);
- **Wheeler's skeletonweed** (25%);
- **Torrey's joint-fir** (45%);
- **Preuss' milk-vetch** (18%).

Condition of Certification **BIO-20** (Special-status Plant Compensatory Mitigation) requires offsite mitigation, in the form of preservation. Three offsite occurrences shall be protected for every S1 ("critically imperiled") species affected and two offsite occurrences protected for every S2 ("imperiled") species affected. Range ranks (e.g., an S1S2 rank) shall defer to the more imperiled rank. Condition of Certification **BIO-20** includes the option of mitigating in the form of restoration of offsite populations in immediate threat or risk from off-road vehicles, noxious weeds, herbivores, or other factors. The project can elect to implement the restoration on private lands or fund a participating agency to conduct restoration of at-risk occurrences on public lands. Selection criteria for projects and performance standards are included in **BIO-20** and restoration proposals are subject to review and approval by the Compliance Manager and participating agency.

Avoidance and minimization measures (**BIO-19**) – standard Best Management Practices (BMPs) – are required for protecting the nine special-status plant occurrences located in close proximity to the project boundary from indirect effects during operation or accidental impacts during construction. Potential indirect impacts from the introduction and spread of invasive weeds, and from accidental herbicide drift, will be minimized through Condition of Certification **BIO-18** (Weed Management Plan). The risk of fire, and indirect impacts to plants resulting from fires, will be minimized through fire prevention measures contained in **BIO-8** (General Impact Avoidance & Minimization Measures).

The conservation status, range, local distribution, general and microhabitat preferences of the 11 affected species are discussed in the "Setting" subsection of this Biological Resources section, and in the applicant's botanical survey reports (HHSEGS 2011a, Appendix 5-2G; CH2 2011h; CH2 2012c; Hiss pers. comm.).

California Laws Protecting Native Plants

From the CDFG webpage *California Laws Protecting Native Plants: California Environmental Quality Act* (2012x):

> "CEQA provides protection not only for State-listed or Federally-listed species, but "also for any species that can be shown to meet the criteria for listing (CEQA Guidelines Section 15380)."

CEQA requires a “*mandatory finding of significance*” for special-status species that meet CEQA’s definition of “rare” or “endangered,” regardless of their formal listing status under the Native Plant Protection Act (NPPA), California Endangered Species Act (CESA) or any other law:

> “When any of the following conditions occur the lead agency shall find that a project may have a significant effect on the environment which will require a Mandatory Finding of Significance...When a project has the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, *reduce the number or restrict the range of an endangered, rare or threatened species*.” [emphasis added]

> “[CDFG] encourages public agencies to ensure that actions they approve do not significantly impact such species.” “As the trustee agency for the wildlife of California, which includes plants, ecological communities and the habitat upon which they depend, [CDFG] advises public agencies during the CEQA process to help ensure that the actions they approve do not significantly impact such resources.”

Special-status species defined in CDFGs *Special Plants List* (2012a) and *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (CDFG 2009), and monitored by CNDDB include:

> ““Taxa which meet the criteria for listing, even if not currently included on any list, as described in Section 15380 of the California Environmental Quality Act (CEQA) Guidelines; these taxa may indicate “None” under listing status, but note that *all CNPS 1 and 2* and some List 3 and 4 (now known as California Rare Plant Ranks 1A, 1B, 2, 3, and 4) plants may fall under Section 15380 of CEQA.” [emphasis added]

Spring 2012 Survey Results

This impact assessment includes an analysis of the results of offsite surveys conducted by the applicant in spring and summer of 2012 (CH2 2012oo). Because several of the special-status plant species affected by the project were only recently added to the CNDDB (2012a) and California Native Plant Society *Inventory or Rare and Endangered Plants of California* (CNPS 2012), and because the area is generally under-surveyed, the applicant elected to conduct extensive offsite surveys in Pahrump and surrounding valleys over a two-year period, to determine whether any of the affected species may be more common than previously understood. As expected, many new occurrences were found for a few species, and no new occurrences were detected for others.

Reconnaissance level offsite surveys were conducted in several locations during the spring of 2011 and 2012, with a focus on species most substantially affected by the project in terms of the number of total documented occurrences affected. Estimated population sizes are included (in parentheses) in the summary of new offsite occurrences detected during the 2012 surveys, below. Note that populations of most desert annuals (such as Pahrump Valley buckwheat) can fluctuate wildly in response to variable annual precipitation, and the timing of storms. In particularly dry years, even perennials can remain dormant and undetectable. New occurrences found in spring 2012 include:

- 2 occurrences of **Preuss' milk-vetch** (est. 20,000 plants)
- 8 occurrences of **Tidestrom's milk-vetch** (252 plants)
- 1 occurrence of **Wheeler's skeletonweed** (1 plant)
- 7 occurrences of **Torrey's joint-fir** (126 plants)
- 20 occurrences of **Pahrump Valley buckwheat** (est. 7.3 million plants)
- 5 occurrences of **desert wing fruit** (10 plants)

The offsite surveys conducted in spring 2011 (a normal rainfall year) yielded many new occurrences for some – but not all – of the affected species. New occurrences were found in Pahrump Valley, Stewart Valley, Chicago Valley, and California Valley. The applicant also documented some new occurrences east of the California-Nevada border that bisects Pahrump Valley, and in the Ash Meadows area of Nevada (the Nevada occurrences are not included in the CNDDB).

Staff requested CNDDB to update the Element Rank upon receipt of the applicant's 2012 survey data to ensure the ranks used in the analysis were current and reflect all new occurrences. Predictably, the Element Rank for Pahrump Valley buckwheat was downgraded to an S3 ("vulnerable" but not "imperiled"). Tidestrom's milk-vetch was also downgraded from an S1 to an S2, and Goodding's phacelia was downgraded from an S1 to an S2 as a result of new occurrences detected in 2011.

In May 2012, a focused survey for Torrey's joint-fir was conducted onsite and in a 250-foot buffer surrounding the project site. The applicant intends to continue surveying for Torrey's joint-fir offsite because it was not added to the CNDDB (2012) and CNPS *Inventory* (2012) until January 2012. Nor is it included in the old or new editions of the flora of California (Hickman 1993; Baldwin et al. 2012); in such a case it is reasonable to conclude that the species may be more common because it would have been overlooked, and not considered, during any rare plant surveys of the region.

Proportion of State Distribution Affected and Other Factors Considered

This assessment employed a combination of qualitative and simple quantitative analyses. Occurrence data from CNDDB and the various herbaria were compared spatially in GIS to prevent duplication and to view current and historical occurrences with landform datasets on aerials and topographic base maps to better understand: 1) species' threats and vulnerabilities relative to probable future development; 2) peripheral status; 3) potential for fragmentation and indirect effects from nearby development and other cumulative concerns, and 4) examination of the ownership of lands containing or adjacent to occurrences to assess potential for mitigation offsite through acquisition or restoration.

Information sources consulted to determine the total number of documented occurrences in California include:

- California Natural Diversity Database (CNDDB 2012)
- California Native Plant Society Online Inventory [v8] (CNPS 2012)
- Consortium of California Herbaria (CCH 2012)
- Calflora (Calflora 2012)
- University of California Riverside herbarium records (UNR 2012)

In all cases, occurrences or collections that were greater than 20 years old (referred to as “historical” occurrences in the CNPS Inventory) were not included in the analysis of total state distribution because the data is unreliable for a variety of reasons -- ambiguous location descriptions, occurrences subsequently eliminated by development or agriculture, etc.

All of the project survey data, to date, has been incorporated into the CNDDB, including the spring 2012 survey results. The number of occurrences described in this analysis and shown in the CNDDB reflects CNDDBs prompt processing of the applicant’s new GPS data in order to compare the applicant’s survey results to the CNDDB database occurrences by a common metric. An “occurrence” is defined by CNDDB as individuals of a particular species occurring within one-quarter mile of each other that are not separated by significant habitat discontinuities. Consequently, aggregations of rare plant locations depicted in the applicant’s special-status plant maps were lumped by CNDDB into a single occurrence if they fell within one-quarter mile of each other. In general, numbers of occurrences are used to evaluate rarity rather than population size because population size data is incomplete for most species, and the populations of desert annuals fluctuate wildly in response to a variable and unpredictable climate.

Staff’s analysis of the significance of impacts considered the following additional factors:

- Size and integrity of the local (Pahrump Valley) population;
- Proportion of the local population that would be affected;
- The peripheral status of the local population (whether isolated or in close proximity to other sub-populations);
- Species’ patterns of rarity and (where known) dispersal mechanisms;
- Site quality and vigor of the offsite occurrences;
- Consideration of whether the local populations have characteristics that would assign them local or regional significance;
- Potential indirect impacts such as introduction or spread of invasive plants, operation impacts (dust, chemical drift, fire risk, erosion and sedimentation), fragmentation of the local population; and downstream impacts to hydrologic and geomorphic processes that may be necessary to sustain the habitat;
- Integrity and quality of habitat and occurrences onsite;
- Potential cumulative threats to remaining occurrences, and
- Ownership and management threats and opportunities

Direct Impacts to Special-status Plants

Partial site grading and construction, trenching, road construction, vehicle and equipment traffic, and initial vegetation mowing and herbicide spraying are expected to eliminate many of the occurrences within the project footprint. The remainder are expected to be destroyed over time or significantly compromised through a variety of indirect effects, discussed later. Cumulative impacts are discussed in a separate chapter later in the Biological Resources section. Potential direct impacts to special-status plants on the proposed transmission line in Nevada (Hidden Hills Valley Electric Transmission Line (HHVETL) are not included in this analysis.

Construction of the project would eliminate a substantial portion of the total documented occurrences in California of four of the 11 special-status plant species: gravel milk-vetch; Wheeler's skeletonweed; Torrey's joint-fir, and Preuss' milk-vetch. **Biological Resources Table 17**, below, summarizes the direct impacts based on occurrence data that incorporates the results of the spring 2012 surveys and the most current CNDDB version (September 2012). The calculation of the proportion of total statewide occurrences affected by the project is made after subtracting the "historical" occurrences (shown in brackets) not observed in the past 20 years.

Biological Resources Table 17
Proportion of Special-status Plant Species Affected by Project

Common name (*Scientific name*)	**Status Codes[3] CNDDB Element Rank (Global/State)** **CRPR List**	**Total Documented Occurrences in California (including project onsite & offsite occurrences[1])** (historical >20 yrs not included)[2]	**Total Number of Occurrences on Project Site and Affected by the Project**	***Proportion of Total Statewide Distribution Affected by Project[4]***
desert wing fruit (*Acleisanthes nevadensis syn=Selinocarpus nevadensis*)	G5 / **S1** CRPR List 2.3	**13** <1>	**1**	**8%**
Goodding's phacelia (*Phacelia pulchella* var. *gooddingii*)	G4T2T3 /**S2** CRPR List 2.3	**19** <3>	**1**	**6%**
gravel milk-vetch (*Astragalus sabulonum*)	G5 /**S2** CRPR List 2.2	**19** <11>	**4**	**50.0%**
Nye milk-vetch (*Astragalus nyensis*)	G3 /**S1** CRPR List 1B.1	**19** <0>	**1**	**5%**
Pahrump Valley buckwheat (*Eriogoum bifurcatum*)	G2 / **S3** CRPR 1B.2 BLM Sensitive	**40** <1>	**3**	**8%**

Common name (*Scientific name*)	**Status Codes[3] CNDDB Element Rank (Global/State)** **CRPR List**	**Total Documented Occurrences in California (including project onsite & offsite occurrences[1])** (historical >20 yrs not included)[2]	**Total Number of Occurrences on Project Site and Affected by the Project**	***Proportion of Total Statewide Distribution Affected by Project[4]***
	CRPR List 1B.2			
pink-flowered androstephium (*Androstephium breviflorum*)	G5 /**S2S3** CRPR List 2.2	**93** <8>	**1**	**1%**
Preuss' milk-vetch (*Astragalus preussii* var. *preussii*)	G4T4 /**S1.2** CRPR List 2.3	**22** <0>	**4**	**18%**
purple-nerve spring parsley (*Cymopterus multinervatus*)	G5? /**S2** CRPR List 2.2	**31** <9>	**1**	**4.5%**
Tidestrom's milk-vetch (*Astragalus tidestromii*)	G4G5 /**S2** CRPR List 2.2	**59** <8>	**2**	**4%**
Torrey's Mormon-tea (*Ephedra torreyana*)	G5? / **S1** CRPR List 2.1	**11** <0>	**5**	**45%**
Wheeler's skeletonweed (*Chaetadelpha wheeleri*)	G4 /**S1S2** CRPR List 2.2	**25** <5>	**5**	**25%**

[1] The total number of occurrences includes spring 2012 data and September 2012 version of CNDDB. [2] Herbarium collections >20 ys old and CNDDB occurrences not seen >20 ys not included in this analysis because they are unreliable; location descriptions are often ambiguous, misidentified, or the site has been developed or converted.

[3] Status Codes

CNDDB Element Rank (NatureServe)

Global rank (G-rank) and **State rank (S-rank)** is a reflection of the overall condition of an element throughout its global (or **State)** range. Subspecies are denoted by a T-Rank; multiple rankings indicate a range of values. **State rank (S-rank)** is assigned much the same way as the global rank, except state ranks in California often also contain a threat designation attached to the S-rank. An H-rank indicates that all sites are historic.

G1 or S1 = Critically imperiled; Less than 6 viable element occurrences (EOs) OR less than 1,000 individuals
G2 or S2 = Imperiled; 6-20 EOs OR 1,000-3,000 individuals
G3 or S3 = Rare, uncommon or threatened, but not immediately imperiled; 21-100 EOs OR 3,000-10,000 individuals
G4 or S4 = Not rare and apparently secure, but with cause for long-term concern; this rank is clearly lower than G3 but factors exist to cause some concern; i.e., there is some threat, or somewhat narrow habitat.
G5 or S5 = Demonstrably widespread, abundant, and secure.

California Rare Plant Rank (former California Native Plant Society List)

List 1B = Rare, threatened, or endangered in California and elsewhere
List 2 = Rare, threatened, or endangered in California but more common elsewhere
List 3 = Plants which need more information
List 4 = Limited distribution – a watch list
0.1 = Seriously threatened in California (high degree/immediacy of threat)
0.2 = Fairly threatened in California (moderate degree/immediacy of threat)
0.3 = Not very threatened in California (low degree/immediacy of threats or no current threats known)

Bureau of Land Management

BLM Sensitive = Species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. BLM Sensitive species also include all Federal Candidate species and Federal Delisted

species which were so designated within the last 5 years and CNPS List 1B plant species that occur on BLM lands. http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/blm_manual.Par.43545.File.dat/6840.pdf.
[4] The percentage of the total statewide distribution affected is calculated *after* subtracting historical occurrences (occurrences that have not been observed in over 20 years; shown in brackets in column 3) from the number of total documented occurrences in California.

Indirect Impacts to Special-status Plants

Potential indirect impacts to special-status plants located on or adjacent to the project site include: introduction and spread of invasive plants; alteration of the surface hydrology or geomorphic processes that maintain habitat for rare plants; fragmentation of the local population; increased risk of fire; erosion and sedimentation of disturbed soils; disturbance of the structure and functioning of biological soil crusts; impacts of herbicide spraying and other chemical drift on plants and their pollinators; shading; potential disease from mist during mirror-washing; and fugitive dust during construction and operation, which disrupts photosynthesis and other metabolic processes. Plants and other sessile organisms are particularly vulnerable to the effects of habitat fragmentation. Small fragments of habitat can only support small populations and are more vulnerable to extinction.

Status as Peripheral Populations

California occupies an important biogeographic location and zone of ecological transition on the Pacific coast of North America, and so its floristic diversity includes many widespread taxa on the edge of their range. This includes many of the CRPR Rank 2 plants in the project area, which represent the western limit of those species' ranges—geographically marginal, peripheral populations on the frontiers of their ranges. Peripheral populations can be completely isolated from their core populations, or they can occur in closer proximity to other marginal populations.

Peripheral plant populations are at greater risk of extirpation because they occur on the edge of a species' range. Relative to core populations, peripheral populations tend to be smaller, more isolated, and more genetically and ecologically divergent than central populations, they have more variable densities, and are ecologically distinctive and/or occur in marginal habitats (Leppig & White 2006).

The biological and intrinsic values of these peripheral populations are well documented; maintenance of genetic variation contributes to long-term species survival and preservation of local genetic diversity (Channel and Lomolino 2000). Interestingly, when species undergo catastrophic range contractions, populations on the edge of the range have significantly greater survival than core populations (*Ibid.*). Thus, the maintenance of genetic variation in the form of small, isolated populations contributes to long-term species survival and preservation of local genetic diversity (Leppig & White 2006). The degree of spatial isolation and ecological distinctiveness are the best criteria for assessing a population's conservation significance, especially in the absence of population genetics data (*ibid.*).

CNDDB Element Rank (NatureServe Rank) – an Index of Extinction Risk in California

The case for rarity and extinction risk in California of the affected species is demonstrated, in part, through the California Natural Diversity Database (CNDDB) Element Rank. The rank evaluates several factors of rarity, threats, and population trend, which are scored and weighted, and include: range & extent; area of occupancy; population size; number of occurrences; number of occurrences or percent area with good viability/ecological integrity; environmental specificity; long- and short-term trend; threats (severity, scope, impact, and timing); intrinsic vulnerability, and other considerations (Master et al. 2009). The CNDDB Element Rank definitions are summarized in the introduction to this analysis, and on page iii-iv of the state's special-status plant list, published by the *California Department of Fish and Game Natural Diversity Database Special Vascular Plants, Bryophytes, and Lichens List* (CNDDB 2012b), also known as the "*Special Plants List*". The rarity of the affected species is demonstrated spatially in **Biological Resources Figure 9,** which also demonstrates the highly restricted range of many of the affected species in California.

CRPR Rank 1 and 2 Plants Widely Recognized as Rare and Endangered In California

CDFG recognizes the California Native Plant Society (CNPS) as an authority on rare, threatened, and endangered plants in California. CDFG works collaboratively with the nationally recognized organization in the management of the Rare Plant Status Review groups that assign the "CRPR rank" (formerly CNPS List). The Rare Plant Status Review groups represent over 300 botanical experts from government, academia, NGOs and the private sector. From CDFG *Special Plants List* (CNDDB 2012x)

> "In March 2010, DFG changed the name of "CNPS List" or "CNPS Ranks" to "California Rare Plant Rank" (or CRPR). This was done to reduce confusion over the fact that CNPS and DFG jointly manage the Rare Plant Status Review groups and that the rank assignments are the product of a collaborative effort and not solely a CNPS assignment. The old name gave the false impression that CNPS solely assigned the ranks and had excessive influence on the regulatory process."

The CNPS website <<http://www.cnps.org/cnps/rareplants/>, a site familiar to botanical consultants and accessible to the general public, provides over 18 pages of details on the Rare Plant Program and Rare Plant Status Review Groups, including: the rare plant status review process; the relationship between CNPS and CDFG in establishing the lists, or ranks; staff and leadership; the Rare Plant Program Committee; contact information; a flow chart of the process; instructions for recommending an addition, list change, deletion, or name change; a description of the regional plant status review groups; a description of the rare plant status review public forum; and sample forms for proposed additions and proposed status changes.

CRPR Rank 1B plants are California endemics, i.e., their entire global distribution is limited to California, or they are also rare outside California. The CRPR Rank 2 is defined in CDFGs *Special Plants List* (CNDDB 2012x):

> "CRPR Rank 2 = **Plants Rare, Threatened, or Endangered in California, but More Common Elsewhere**: Except for being common beyond the boundaries of California, plants with a California Rare Plant Rank of 2 would have been ranked 1B. From the federal perspective, plants common in other states or countries are not eligible for consideration under the provisions of the Endangered Species

> Act. Until 1979, a similar policy was followed in California. However, after the passage of the Native Plant Protection Act in 1979, *plants were considered for protection without regard to their distribution outside the state.*"[emphasis added]

Applicant, in its comments, questions CDFG's interpretation that "range" pertains to distribution within the state, and not outside of it. This interpretation of the significance of the California range of a species that also occurs outside California – more specifically the interpretation of the term "range" in "...all or a significant portion of its range...." was upheld in *California Forestry Association v. California Fish and Game Commission* [3], in which the court upheld a trial court's ruling that that the term "range" in the CESA[4] refers to a species' California range only, thereby entitling a species to protection if it is threatened with extinction throughout all, or a significant portion, of its California range (as opposed to its worldwide range).

Indeed, at least five CESA listed plant species are also CRPR Rank 2 species (species that have distribution outside California), and many more CESA-listed wildlife species also have distribution outside California

The language in question in that case, i.e., the term "range" in "...all or a significant portion of its range...." is the same language, verbatim, used in Section 15380 of CEQA to define species that are endangered, rare, or threatened. The California courts have concluded that CEQA and CESA are complimentary statutes whose provisions must be given concurrent effect where possible. For example, in *Mountain Lion Foundation v. Fish and Game Commission*, the California Supreme Court held that California's Courts "are obligated to harmonize the objectives common to both [CEQA and CESA] to the fullest extent the language of the statutes fairly permits."

In *California Forestry Association v. California Fish and Game Commission*[10] the court concludes by noting that species listed under CESA for which the same species are listed under the FESA are justified, because a listing regulation under the CESA ensures that a species remains protected in California if the same species is delisted under the FESA. Further, the decision considered a scenario in which a species is delisted under the FESA because it is flourishing in areas outside of California but is still declining in California. Already having in place a CESA listing of the same species would ensure continued protection of the species in California without having to endure the lengthy wait for a species to move from petition status to listing status[5]. If the species were not already listed under the CESA, it could suffer a dramatic decline in population during the time it takes for the Commission to amend the existing regulations to list the species, undermining the purpose of the CESA."

CDFG's interpretation of the law is thus consistent with the case law, and is reflected in the analysis in this document.

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[3] *California Forestry Association v. California Fish and Game Commission* (2007) 156 Cal.App4th 1535.

[4] *Mountain Lion Foundation v. Fish and Game Commission* (16 Cal.4th at p. 122)

[5] In that case, it took approximately four years for the two coho salmon units at issue to be listed as endangered and threatened under the CESA.

California Native Plant Society is a Recognized Authority

The applicant has questioned whether the CNPS rare plant “Lists” (now CRPR Rank), or the ranking process itself, provides sufficient evidence of the rarity of a species, and in this and other proceedings has questioned whether CNPS can be relied upon as an authority for assessing the rarity of plants in California.

Recognizing that formal listings under federal and state law only account for a fraction of California’s native plants that are, as a matter of empirical fact, threatened with extinction, CNPS began publishing an inventory of California’s rare and endangered plants, beginning 1974 (CNPS 2001; CNPS 2012). For over 30 years, the CNPS Inventory has served as a forum for regular review of the status of rare plants by a broad body of scientists and field botanists, and as a means of bringing that critical information to the attention of regulatory agencies and the concerned public.

Indeed, as illustrated by resource agencies’ recognition of the CNPS Inventory in agency guidelines for rare plant surveys and assessing impacts to rare plants (CDFG 2009; BLM 2009; CNDDB 2012; and others), and in the courts, the CNPS Inventory is considered by CDFG and other agencies as a primary source of information for determining whether non-listed plants meet CEQA’s independent definitions of “rare” and “endangered,” thus triggering a mandatory finding of significance, environmental review, and the implementation of all feasible mitigation measure to reduce or avoid impacts to such special-status, non-listed plants.

CRPR Rank 1 and 2 Plants Meet CEQA Definition of Rare and Endangered

Applicant in its comments questions whether the plants listed above should be considered rare or endangered. This is presumably because of the legal implications: CEQA Guidelines section 15065 lists certain project impacts that require *mandatory* findings of significance. One such condition is if the project has the potential to substantially degrade the quality of the environment, or *substantially reduce the number or restrict the range of an endangered, rare, or threatened species*. The special-status plant species that would be directly affected by the project are not listed under the California Endangered Species Act, but that does not diminish the significance of their loss. Indeed, there are many plant species without CESA listing whose entire statewide distribution is limited to a small number of occurrences, threatened by one or more factors, and thus their vulnerability to extinction in California is very high. The Commission has acknowledged the rare and endangered status of CRPR Rank 1 and 2 species (formerly termed “CNPS List 1" and "List 2") in its siting decisions, including the Ivanpah Solar Electric Generating System project, Palen Solar Power Project, Blythe Solar Power Project, and Genesis Solar Electric Project.

Plants not CESA-listed must nevertheless be considered “rare” or “endangered” where such plants meet the definitions of these terms in CEQA Guidelines section 15380. Section 15380 provides that a plant or animal species must be treated as “rare” even if not on one of the official lists if “A) although not presently threatened with extinction, the species is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens; or B) the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.” Plants on CNPS List 1A, 1B, and 2 meet these criteria, and are thus considered to be “rare” by CDFG.

Case for Rarity

“Rare” and “rarity” are generic, commonly used terms in the scientific literature used to describe scarcity, a statement about the geographic distribution and population sizes of a particular species. The terms “threatened” and “endangered” typically refer to human activities and other processes that are increasing a species’ vulnerability to extinction, and the degree of endangerment.

Rarity is based upon pattern of *distribution* and *abundance.* There are three basic kinds of rarity based on these two factors:

1) Restricted in distribution, but locally abundant (e.g., Pahrump Valley buckwheat);

2) More widespread, but never abundant; and

3) Localized and not abundant

The affected species’ rarity and endangerment is clearly demonstrated in **Biological Resources Table 17**, and in the spatial representation of these species’ highly restricted range in California (**Biological Resources Figure 9**). Combined with the species’ CNDDB Element Rank and additional factors considered in this analysis, it is clear that *the affected species exist in such small numbers in California that all or a significant portion of the species’ California distribution may become endangered.* **Biological Resources Table 17** underscores the degree of endangerment for four species, represented by the total documented occurrences in California, including the applicant’s two years of focused surveys, and in the proportion of those occurrences that would be eliminated by the project. Additional cumulative threats to remaining occurrences in California are discussed in the “Cumulative Impacts” subsection. The case for rarity and concern is also reflected in the CNDDB Element Rank, an index of extinction risk within the state.

Conclusions and Discussion of Special-status Plant Mitigation

As shown in **Biological Resources Table 17**, direct impacts to four of the 11 species are *significant because the project would eliminate a substantial portion of their range in California* and because the affected species *exist in such small numbers in California that all or a significant portion of the species’ California distribution may become endangered*:

- **gravel milk-vetch** – CNDDB S2 (50% of total documented occurrences in California eliminated);
- **Wheeler’s skeletonweed** – CNDDB S1S2 (25%);
- **Torrey’s joint-fir** – CNDDB S1 (45%), and
- **Preuss’ milk-vetch** – CNDDB S1 (18%).

For the remaining species, the population or range in California is larger and more stable, the proportion of the total statewide distribution and range affected by the project and/or extinction risk is substantially less, and/or the local population is robust.
Two years of offsite surveys were conducted to determine if these species were more common than previously understood, but the direct impacts still affect a substantial portion of their state distribution and thus increase their vulnerability to extinction within the state. This is aggravated by potential indirect threats and cumulative impacts from other past, present and foreseeable future actions within their already highly restricted range in California (see “Cumulative Impacts” subsection). For all four species, the total documented occurrences is less than 20, a threshold at which a species assigned extinction risk increases from “vulnerable” to “imperiled” under the methodology used by CNDDB and Natural Heritage programs around the world to establish extinction risk (Master et al. 2009), and “making it very vulnerable to extirpation from the state/province.” Combined with the threats from indirect and cumulative impacts, the extinction risk could increase to “critically imperiled” and “especially vulnerable to extinction in the state” as the total documented occurrences is reduced to approximately 6 viable occurrences or fewer, and/or those occurrences are threatened by one or more factors (Master et al. 2009).

Staff reviewed the ownership and management threats and opportunities for these species to determine if offsite mitigation was feasible. All four species have multiple occurrences on undeveloped private lands and/or occurrences threatened by invasive non-native plants, off-road vehicles, and other factors on private and public lands that could benefit from dedicated restoration efforts to reduce or eliminate the threats.

Avoidance along the eastern boundary could minimize the project’s direct impacts to special-status plants. However, staff considered the possibility that because of the position of the project on the California-Nevada border, the constraints to dispersal and limitations in connectivity due to the location of a different habitat type to the east (coppice dunes) and the obstructions of the project to the west, avoidance along a strip on the eastern side of the project (where most occurrences are located) may not be sustainable over the long term and thus may do little to protect the California range of the affected species. Because washes and wind are important seed dispersal pathways (O’Leary pers. comm.), disruption of the natural surface drainage patterns from east to west (into California) by the project, and because the direction of the prevailing winds is from California into Nevada (northwest to southeast), any avoided occurrences along the eastern edge may have limited connectivity, which affects their long-term sustainability or viability, and dispersal pathways into California may be affected over the long term. Staff concluded that mitigation that protects occurrences better situated in California is preferable to avoiding a strip along the eastern boundary with Nevada that may or may not be sustainable.

Condition of Certification **BIO-20** (Special-status Plant Compensatory Mitigation) provides guidelines and performance standards for offsite mitigation through acquisition, with an option for mitigation through restoration of at-risk occurrences. **BIO-20** would require the project owner to place a conservation easement on the mitigation site to ensure protection in perpetuity from future development, and provide stewardship fees necessary for basic protection (e.g., fencing and/or signage if needed). Three offsite occurrences shall be protected for every S1 (“critically imperiled”) species affected and two offsite occurrences protected for every S2 (“imperiled”) species affected. Range ranks (e.g., an S1S2 rank) shall defer to the more imperiled rank. Species that are currently assigned an S1 CNDDB Rank (“critically imperiled”) warrant a higher mitigation ratio in order to protect the species from immediate endangerment.

Under the terms of **BIO-20**, this can be accomplished through acquisition alone or a combination of acquisition and restoration if the restoration can be demonstrated to save an occurrence at moderate to high risk from threats. These may include threats from: noxious weeds or other invasive plants; unauthorized off-road vehicles; alteration of the drainage patterns and/or geomorphic processes essential to maintain the habitat, or herbivores. Because connectivity and maintenance of the ecological processes essential for maintaining the habitat are essential for the long-term sustainability of an occurrence, **BIO-20** requires the mitigation proposal to demonstrate that the acquired or restored occurrence can be protected from the edge effects of adjacent land uses.

The same mitigation strategy, mitigation ratios, and a similar condition of certification was adopted to minimize special-status plant impacts on at least three other Energy Commission-licensed projects (Blythe, Genesis, and Palen projects). As an example of mitigation ratios required by other agencies, in CDFG practice, compensatory mitigation for streams and riparian vegetation is typically mitigated at a minimum mitigation-to-effect ratio of 3:1 for permanent effects and 1:1 for temporary effects (Vyverberg pers. comm.).

There is also potential for impacts to special-status plant occurrences in close proximity to the project boundary during operation. These potential impacts include: the spread of weeds into currently uninfested areas; chemical drift from weed management and dust control; fugitive dust from grading, mowing and road maintenance; increased risk of wildfire from project operation and increased traffic on area roads; and sedimentation of washes offsite from erosion of channels onsite and upstream. Although these indirect project effects are individually minor, they are cumulatively considerable when considered in combination with past, present, and foreseeable future projects in the region (see “Cumulative Impacts” subsection).

Nine occurrences of eight rare species were mapped within a 250-foot buffer surrounding the project. In most cases, the occurrences extend to or near the project boundary. These include: Nye Valley milk-vetch (1 occurrence); Preuss’ milk-vetch (1); pink funnel lily (1); Tidestrom’s milk-vetch (1); Wheeler’s skeletonweed (1); Torrey’s joint-fir (1); Pahrump Valley buckwheat (1), and Goodding’s phacelia (1).

Condition of Certification **BIO-19** includes avoidance and minimization measures for protecting against accidental impacts during construction and indirect impacts following construction. The Best Management Practices (BMPs) described in **BIO-19** are standard BMPs employed on development projects for protecting adjacent oaks, streams, wetlands, etc., and are consistent with avoidance measures described in the Energy Commission’s BMP Manual (CEC 2010). **BIO-19** *does not require the project owner to implement BMPs offsite* avoidance and minimization measures are only required onsite, i.e., at or near the project boundary, to prevent impacts to adjacent sensitive resources. Examples of BMPs include silt-fencing, temporary construction fencing and signage, and guidelines for preventing or minimizing herbicide drift.

Condition of Certification, **BIO-21** (Qualified Botanist) would ensure that specific measures for protecting special-status plants are carried out by a qualified botanist or vegetation ecologist.

Measures for control of fugitive dust, herbicide and other chemical drift, and erosion control measures are incorporated into **BIO-8** (General Impact Avoidance and Minimization Measures). Because washes facilitate the dispersal of special-status plants as well as act as conduits for the spread of some invasive weeds, **BIO-22** (State Waters Compensatory Mitigation and Avoidance & Minimization Measures) and **SOIL-1** contain measures for preventing erosion and sedimentation of washes onsite and downstream. Measures for avoiding and minimizing indirect impacts to offsite occurrences from the spread of invasive weeds are contained in **BIO-18** (Weed Management Plan).

It is reasonable to conclude that one of the four significantly affected species – Torrey's joint-fir – could potentially be more common than currently understood because: 1) it was just added to the CNDDB and CNPS *Inventory* (CNPS 2012) in January 2012; and 2) the species was not known to occur in California before it was discovered on the project site, and it is not included in the state flora (Baldwin et al. 2011). This means, in this unique case, there is a high potential that it may have been overlooked by other surveyors, an opinion shared by at least one other recognized local expert (Silverman pers. comm.). Currently, only one round of surveys has been conducted to assess the size of the species' population in California. **BIO-20** includes a provision that if many new occurrences are found in fall 2012 or spring 2013 that results in a downgrading of the CNDDB Element Rank from an S1 to an S3 ("vulnerable but not under immediate threat of extinction"), and the proportion of the statewide distribution affected by the project is less than 10 percent, the mitigation requirement for that species would be dismissed.

Operation Impacts to Groundwater-Dependent Ecosystems

Local Groundwater-Dependent Ecosystems

Groundwater levels near the proposed project's water supply wells will decline during the project pumping (HHSEGS 2011a, Appendix 5.15D; **Water Supply Figures 19** and **20**). Groundwater pumping could have significant indirect and cumulative impacts to biological resources if it lowers the water table in areas where groundwater-dependent ecosystems occur. Approximately 4,000-acres of mesquite habitats occur within one-half mile and five miles of the project wells (**Biological Resources Figure 1 and 2**; CH2 2011g, Figure DR48-1).

WATER SUPPLY Figure 18 summarizes staff's estimate of the potential drawdown at the distance of the Stump Springs monitoring well and the latent effects on water levels after pumping ends. The range of drawdown estimated at the distance of the Stump Springs monitoring well ranges from no drawdown (based on minimum transmissivity and maximum storativity) to a 19-foot drawdown (minimum transmissivity and storativity); all other aquifer parameter combinations fall between these two limits. These results are considered maximum potential impacts because they ignore the potential (undemonstrated) buffering effects of the state line fault zone, which may – to some degree -- limit the hydraulic connection between project pumping and groundwater northeast of the fault zone associated with Stump Springs. More often, such faults provide a partial barrier to groundwater flow, but not a complete barrier (Belcher pers. comm.; Comartin 2010).

These estimates of drawdown do not include the cumulative effect of other foreseeable future projects in the vicinity, the most significant of which would come from the BrightSource Energy project ("Sandy Valley Project") located near the opposite side of Stump Spring ACEC that would pump 170 acre feet per year. **WATER SUPPLY Figure 22** also shows that the potential cumulative water level decline at both Stump Springs could be greater than 60 feet. Similarly, this estimate does not consider the potential buffering effects of the fault, i.e., the spread of drawdown from the project wells to Stump Springs could be limited on the northeast of the fault. Staff is concerned about the close proximity of the project wells to sensitive groundwater-dependent ecosystems, which are extensive and occur as close as 600 feet to the project boundary.

Many public and agency comments expressing similar concerns about the impacts of groundwater pumping on dependent habitats and wildlife of the project were received. These include comments from:

- BLM California State Director and Nevada State Director of BLM (BLM 2012a; BLM 2012b; CEC 2011v);
- Inyo County (INYO 2012a; INYO 2012b)
- Nevada Department of Wildlife (NDW 2011a)
- Amargosa Conservancy (ARM 2011a; ARM 2011b; Wright 2011a);
- The Nature Conservancy (TNC2012a);
- Center for Biological Diversity (CBD 2012b);
- Big Pine Paiute Tribe of Owens Valley (PINE 2012a);
- Pahrump Paiute Tribe (PAIU 2012a)

The comments from BLM (BLM 2012a; 2012b), Inyo County (INYO 2012a; 2012b), and The Nature Conservancy (TNC 2012x) contain specific and detailed recommendations for mitigation in the form of long-term monitoring and provisions to stop, reduce, or modify pumping if adverse impacts are detected.

The record of conversation with The Nature Conservancy (CEC 2012g) contains links to presentations made by the BLM California Desert District and USGS. These agencies expressed concern about the potential for cumulative impacts to the Amargosa Wild and Scenic River and other resources of the Lower Amargosa Valley.

There was considerable discussion about the proposed project and other energy projects in the region at the December 12-13, 2011 meeting on the Amargosa Basin, hosted by the Desert Manager's Group (CEC 2012g).

Differences between the applicant's and staff's assessments of this issue center on: 1) the ability of the groundwater-dependent ecosystems to withstand a sustained, project-related decline in the water table; 2) the reliability of limited area well data and the pre-project pump tests to accurately predict the lateral or vertical extent of the project's effects in a complex hydrogeologic setting; 3) the applicant's assertion that the fault zone represents a complete barrier to groundwater flow and buffer between the project and sensitive resources (rather than a partial barrier), or that its highly unlikely that project pumping would affect resources on the other side of the fault; and 4) the conservation values of the area mesquite washes and mesquite dunes. Many public and agency comments also expressed concern about whether information currently available is adequate to conclude there is no long-term cumulative risk to the Amargosa Wild and Scenic River and other regional groundwater-dependent resources. Some of these differences are addressed below, followed by staff's analysis of significance of potential impacts to groundwater-dependent biological resources. A detailed analysis of the applicant's groundwater assessment and **Water Resources** staff's independent analysis of the applicant's recent pump test data is contained in the **Water Supply** section of the FSA.

Historic Decline of Springs Due to Groundwater Pumping

Many local springs experienced precipitous water table declines and ultimately stopped flowing as a result of groundwater depletion in the middle of the last century (Harrill 1986; Malmberg 1967; Buqo 2004; Comartin 2010). Before extensive agricultural development, the Pahrump Valley playa area (northwest of the project) supported some phreatophytic vegetation, which is largely absent now. Groundwater pumping in the Pahrump Valley for agriculture (predominantly alfalfa and cotton) peaked in 1968 and there was a significant downward trend in static water levels between the years 1953 and 1996, based on an analysis of 651 wells within one mile of a mesquite woodland (Crampton et al. 2006). Groundwater withdrawals accompanying large-scale agricultural development caused some major springs in the area to stop flowing during this period of groundwater withdrawal. Some springs eventually recovered after some the pumping stopped (Moreo et al. 2003). Historically, Manse and Bennetts Springs discharged along the base of the broad alluvial fans at the foot of the Spring Mountains. Groundwater withdrawal in the valley caused these springs to cease flowing in the 1970s. In the late 1990s, after the heavy agricultural pumping stopped, Manse Spring began to flow again. Other springs have not recovered.

Pumping has declined since the heavy agricultural pumping of the last century but with the population expansion that followed, agricultural groundwater uses were replaced by domestic, and the basin is still considered in an overdraft condition (Comartin 2010).

Currently, groundwater at the Stump Spring monitoring well is 28 feet below ground surface (bgs); however, the well is not located at or close to the actively discharging spring, and may not reflect the hydrograph or groundwater levels at the spring. Stump Spring supports three seasonal pools that provide exceptionally valuable open water habitat over a period that extends from approximately December to July (Poff pers. comm. 2012). BLM recently discovered that three additional unnamed seeps within 5 miles of the project boundary have above-ground spring discharge (Poff 2012). Two of these support healthy wetland-riparian vegetation; the third spring appears to have at least minor intermittent flow that was significantly greater historically. The proximity of these water sources to the adjacent mesquite habitats and desert scrubs significantly increases the value of the habitat for many wildlife species, including some special-status species.

There is inadequate well data in the area to conclude the project will have no effect on the area seeps and springs. However, despite such uncertainty, the documented corresponding decline of the basin's springs during the last century's agricultural pumping is cause for concern.

Significance of the Resources At-risk

The mesquite woodlands and coppice dunes in the southern Nevada region have significant biological importance, providing habitat to many wildlife species in the region, including several species covered under the Clark County Multiple Species Habitat Conservation Plan (MSHCP). The extent and condition of these important resources, however, has been severely impacted by the diverse activities of a growing population (Crampton et al. 2006). In response, the development of a Mesquite-Acacia Conservation Management Strategy (CMS) was adopted in the MSCHP (*ibid.*).

Stump Spring, in addition to its status as an ACEC, is identified as a conservation management priority in the CMS and describes Stump Spring as having "significant wildlife values". Stump Spring also provides a critical seasonal water source in an otherwise extremely arid landscape.

The entire Pahrump Valley "metapatch" (a collection of smaller patches), including the groundwater-dependent mesquite habitats and seeps east of the project and north of the ACEC, is also an identified conservation priority in the CMS, which recommends "coordination with Nye County to protect the woodlands that occur in Nye County". Mesquite habitats were also a proposed conservation priority in the scoping for the Southern Nye County MSHCP (USFWS undated).

In a landscape dominated by desert scrub, the contrastingly dense cover and shade provided by the mesquite serve as important breeding, foraging, and resting places for many avian species (Crampton et al. 2006). They offer protection from weather and predators, and provide refuges where birds may experience more favorable energy budgets. Although mesquite comprise a small percentage of the total vegetation in the desert, they support disproportionately greater densities of birds than surrounding desert habitats. They add structural complexity to the landscape, providing nesting sites and food resources for breeding birds.

Many special-status wildlife species are dependent on or strongly associated with mesquite in the region. These are discussed in detail in the "Setting" subsection of this FSA, and summarized in **Biological Resources Table 5**; (Crampton et al. 2006; NDW 2011a). A decline in the habitat functions and value of the mesquite habitats from groundwater pumping could adversely affect special-status species, including Clark County MSHCP covered species.

The applicant has argued that there is no evidence of the habitat values of the mesquite habitats near the project. The importance of mesquite to wildlife is a matter of empirical fact, an exhaustive review of which is contained in BLMs Mesquite-Acacia Conservation Management Strategy (Crampton et al. 2006), and endorsed in comment letters from

BLM, the Nevada Department of Wildlife, The Nature Conservancy, Amargosa Conservancy, and in conversations with USFWS and CDFG. Staff and CDFG observations of wildlife use of mesquite habitats east of the project are consistent with the habitat values and wildlife associations described in literature. The applicant has provided no evidence for their implausible assertion that the extensive mesquite resources east of the project have no significant value to wildlife.

The applicant has taken issue with a reference to the mesquite as “woodlands” because of a concern that it implies the resources have the habitat values of a tree-dominant community. The Mesquite-Acacia Conservation Management Strategy (Crampton et al. 2006) and BLM use the terms “woodland”, “dune scrub” and “bosque” to describe the mesquite-dominant habitats in the project vicinity, which vary from shrubby forms to low trees up to 15 ft with trunks to eight inches diameter or larger. Whatever description is used, it does not diminish their value to wildlife in the Stump Spring area, which BLM describes as “significant”; an opinion reflected in the multi-agency recognition of the area mesquite as a conservation priority. Nevertheless, a detailed and academic discussion of the classification of mesquite, based on consultation with the CDFG Senior Vegetation Ecologist, is provided in the “Setting” section of this FSA to address the applicant’s comments.

Tolerance of Mesquite to Declining Groundwater Elevations

In Data Response Set 1A (CH2 2011g), the applicant states that “...mesquite, rooted in shallow groundwater as they are, must be adapted to appreciable inter-annual fluctuations in groundwater level. They would need to survive lowered groundwater conditions, potentially for years when there are a number of drought years in a row—not an infrequent occurrence in the desert. Observation suggests an inter-annual variability in groundwater depth of greater than 6 feet in the vicinity of Corn Creek Springs in the Upper Las Vegas Valley.” The applicant also noted that while some area wells declined as much as 40 feet during the second half of the last century, the mesquite persisted. Given this evidence, they speculate that “draw-downs of less than 10 feet must be within the tolerance of the groundwater-dependent vegetation that has survived to the current time.”

By contrast, applicant’s data response also states that “....while mesquite are adapted to some variability, including declines, in water table elevation, it also seems that historic die back of groundwater-dependent vegetation is likely due to long-term and persistent draw-down of the water table and decline of shallow groundwater influenced by artesian flow” (CH2 2011c). Staff concurs; the potential cumulative effect of the project pumping and other past, present, and future projects, including another BrightSource Energy project near Stump Spring is likely to be significant, particularly when combined with the effect of future droughts. This is particularly worrisome given the overdraft condition of the valley basin and adverse effects already apparent in the mesquite stands near the northern end of the project.

Figure DR49-2, from the same submittal (CH2 2011g), provides a photographic example of the die-back apparent on the stands closest to Pahrump. On the previous page the applicant states “No appreciable die-back of mesquite coppice vegetation was noted on the dunes southeast of the Tecopa Highway (CH2 2011g, Figure DR49-1).

Die-back of groundwater-dependent vegetation was found north and northwest of the Tecopa Highway, both on the dunes closer to the project area (*ibid*.) and in arroyos farther north and east...” Staff confirmed this in several site visits. The applicant argues this could be caused by mistletoe and not attributable to basin drawdown (cite comment letter).

On the subject of mesquite mistletoe competition with its host, the BLM-sponsored Mesquite-Acacia Conservation Management Strategy (CMS) (Crampton et al. 2006), states

> “Hemiparasites are seldom the primary cause of death to their hosts.... The most common damage is death of the branch distal to the infection (Boyce 1961), although this is less likely as distal branch size increases (Reid and Stafford Smith 2000).”

This is consistent with staff’s on-the-ground observations, and both staff and the CMS noted an overall low mistletoe infection rate. Regarding the primary cause of decline of mesquite (Crampton et al. 2006):

> “The primary natural factor influencing leguminous [mesquite] tree survival appears to be water supply...Honey mesquite mortality increases with increasing distance from the water table (Stromberg et al. 1992). Although mesquite roots have been excavated at depths as great as 60 meters (Phillips 1963), this is the exception rather than the rule. In general, it becomes increasingly difficult for mesquite to survive once the water table falls below 15 meters (Judd et al. 1971).”

Groundwater pumping and water level declines are documented to have caused the decline or death of mesquite in many areas of the southwest (Sawyer et al. 2009; Judd et al. 1971; Webb & Leake 2006; Stromberg pers. comm.; Keeler-Wolf pers. comm.). “Similar effects are seen throughout the species range in California and Nevada” (Keeler-Wolf pers. comm. 2010). Keeler-Wolf (*ibid.*) has “observed mesquite and the effects of water drawdown [and noted] observation of dead and dying mesquite in several places in California, Nevada, and elsewhere....up and down the Mojave River from Hinkley to Camp Cady to Cronese Lakes.” Groundwater pumping is a serious threat in many locations and has led to the decline of numerous stands (Sawyer et al. 2009).” Stromberg (pers. comm.), Arizona State University, described documented examples of mesquite that died as a result of groundwater-pumping on the Gila River and Santa Cruz River.

The applicant cites a case study from literature of a mesquite that rooted to a depth of 190 feet, and implied that, based on this single case, that the mesquite roots would chase the decline of the water. Staff consulted a researcher from Arizona State University, and recognized expert in the impacts of groundwater pumping on phreatophytes (Stromberg pers. comm.):

> “The ability of mesquite roots to ‘track’ a declining water table unfortunately is not well studied. As the water table declines, the plant will have to invest more energy into root production and root maintenance and it is likely that its

> aboveground biomass will decrease. In general, there is a relationship between root to shoot ratios and plant water stress. For mesquite, specifically, there is a documented relationship between the degree of water stress a mesquite tree experiences and its above ground biomass (see Martinez and Lopez-Portillo 2003). Also note that increased drought stress can decrease the ability of a mesquite tree to survive other ecological stressors, such as damage by herbivores (see Martinez et al. 2009)."

The County of Inyo Water Department (INYO 2012b) recommended staff establish a typical rooting depth for mesquite on which to base its analysis and mitigation recommendations. Staff conducted an exhaustive literature review of the subject prior to publication of the PSA, and consulted recognized experts (Stromberg pers. comm.; Keeler-Wolf pers. comm.). In fact, there is no way to establish a typical rooting depth for mesquite on which to base critical groundwater management decisions, as, for example, Inyo County has been able to establish for groundwater-dependent meadows in the Owens Valley area.

There are many environmental factors affecting rooting depths: soil porosity and texture, temperature, soil water and oxygen content, and soil chemistry. Soil salinity is also an important factor in these settings. Examples in literature of mesquite rooting to great depths are exceptions (Stromberg pers. comm.). Honey mesquite's taproot commonly reaches depths of 40 feet (12 m) when subsurface water is available (Fisher et al. 1973). The example of a mesquite rooting to over 50 meters (160 ft) was a case study in which the roots of a mesquite followed a mine shaft. In areas where the soil is shallow, or where a distinct calcium carbonate layer is present, the taproot seldom extends more than 3 to 6 feet (1-2 m) (Heitschmidt et al 1988; Ansley et al. 1989; Steinberg 2001). From Stromberg (pers. comm.):

> "There is the one documented case of mesquite (*Prosopis juliflora*) rooting to a depth of 53 meters depth; this appears to be an atypically deep value, and is for a plant in a Sonoran desert upland setting (Phillips, 1963). Roots of [mesquite] generally are strongly dimorphic, with shallow lateral roots near the surface and deep tap roots (Virginia et al., 1976; Bleby et al., 2010). Along incised rivers in southern Arizona and New Mexico, roots of [velvet mesquite] have been observed at cutbanks at depths of at least 8 meters (Cannon, 1911), 9 meters (Zimmerman, 1969), and 12 m (Havard, 1894). Maximum rooting depths for [honey mesquite] include 9 meters and 15 meters for plants growing along an arroyo and playa lake edge, respectively (Silva et al., 1989) and 20 meters in a karst landscape (Bleby et al., 2010)."

The maximum tolerable water table decline is difficult to predict and variable depending on many environmental factors; however, the warning signs of impending changes in ecosystem processes may already be present in the stands most affected by the basin overdraft (i.e., stands closest to Pahrump). As described above, die-off is already occurring in the northernmost mesquite stand and there is a well-documented decline in water tables throughout the valley that parallels the drying of springs. Given the strong above-ground evidence that groundwater levels in the area may have already declined to levels low enough to cause die-back, combined with a documented decline in groundwater levels, the stands near the northern end of the project may well be at or near the limits of their tolerance.

Staff agrees that mesquite can withstand inter-annual fluctuations in groundwater level. The question is whether the stands can take an additional and sustained lowering of the water table through all seasons (not just the dry season) that extends 30 years or more.

Fault Zones as Hydraulic Barriers

The applicant posits that the position of the project west of the fault zone, “combined with studies conducted by Buqo in 2006 indicate that the hydraulic gradient in the Pahrump Valley Fault Zone [state line fault zone] was found to be lower relative to the overall gradient of the valley. This indicates that the fault zone may act as a hydraulic flow barrier, which could isolate impacts to the greater Pahrump Valley aquifer from onsite pumping. If the groundwater basin in the project area is indeed disconnected from the larger basin, then impacts from site pumping may not extend out to areas of greater groundwater production to the north.” The applicant adds “Because the discontinuity cannot be demonstrated, however, this analysis assumes that local drawdown may have regional impacts.”

Staff concurs; faults have hydraulic properties that result in decreased cross-fault flow and enhanced flow parallel to the fault by juxtaposing geologic strata of contrasting permeability, resulting in an impediment to groundwater flow (Belcher pers. comm. 2012; Belcher & Sweetkind 2010). However, because this fault juxtaposes carbonate basement rock against carbonate rock, it may present only a partial barrier (*ibid.*). More importantly, no studies have been conducted to confirm the assertion that a barrier is present and protective. A synoptic set of monitoring wells on both sides of the fault would be required to assess the hydraulic connection across the fault (Comartin 2010; Belcher pers. comm.).

Ecological Consequences

When groundwater is maintained within the root zone, management decisions can be made that do not result in loss of cover or adverse impacts to dependent vegetation. However, lowering the local water table from groundwater pumping has been demonstrated to cause die-off and habitat conversions where pumping causes water levels to drop below the effective rooting depth (Manning 2006, 2007, 2009, and others). Stromberg (1996) noted that “groundwater declines equal to or less than one meter have resulted in loss of canopy vigor, declines in radial growth and shoot increment, and tree death” in cottonwood-willow forests. “Velvet mesquite, for example, is a deep-rooted species that grows over a wide range of groundwater depths, but that varies in height, foliage area, leaf size, and xylem [stem] water potential as groundwater declines.” Stromberg also describes documented examples of loss of biodiversity, increases in invasive weeds, decreases in cover, and other ecosystem impacts. Other organisms dependent on or associated with these groundwater-dependent plant species would also be affected. The complex below-ground systems of bacteria, algae, and fungi, which provide many valuable ecosystems services (e.g. breakdown of organic matter, nitrogen fixation, carbon storage, and recycling of nutrients are also destroyed or adversely affected when water tables are lowered (Kimsey pers. comm. 2012; Manning 2009).

Impacts to these important biological resources are potentially significant even if the mesquite habitats do not ultimately die as a result of the project. Ultimately, if pumping causes a sustained lowering of the water table below the effective rooting depth of the predominant species, it could set off a cascade of impacts to other shallower-rooted species, as well as dependent wildlife.

Impacts observed in the northernmost mesquite stands presumed (based on documented groundwater declines) to be declining as a result of groundwater drawdown, include a reduction in mesquite cover combined with an increase in cover by weedy annual grasses. As an example, in mesquite stands near an agricultural well in Chuckwalla Valley, staff observed a near complete die-off of the shallower-rooted facultative phreatophyte four-wing saltbush and an increase in cover of Russian thistle in stands, even where the deeper-rooted mesquite was not affected.

Loss of the mesquite associated with the coppice dunes could leave dunes vulnerable to deflation (USACE 2012; Brady pers. comm.) if the plants that anchor or stabilize the dunes die.

Animals, including mammals, reptiles, birds, and invertebrates that require certain plant species or a certain vegetation structure may no longer find suitable food, cover, or nesting habitat if the habitat structure of the mesquite habitats is affected or there are die-offs. For example, ladderback woodpeckers, Lucy's warblers and ash-throated flycatchers can only nest in tree trunks sufficiently large to hold nest cavities, (Crampton et al 2006); drought-induced stunting or loss of the taller mesquite along the washes east of the site and at springs would diminish or eliminate the value of the mesquite for some avian species. Decreases in fruit production can affect many common and special-status species. Local extirpations, if they occur, are compounded if the displaced animal or affected plant species is an important food source for another animal.

Cumulative Concerns

The total dependence of the community of Pahrump on the basin’s groundwater resources, and the potential for significant cumulative effects from another solar thermal project near Stump Spring (the BrightSource Energy Sandy Valley project), is another serious concern. A detailed analysis of the potential cumulative groundwater drawdown is provided in the “Water Supply” section of the FSA, and in the “Cumulative Impacts” subsection of this Biological Resources section.

Over 10,000 pumping wells are located in the basin. Groundwater pumping in this already significantly over-appropriated basin has placed these valuable habitats in direct competition for scarce water supplies. Compounding the effects of groundwater pumping, the indirect impacts of salt cedar invasion, fragmentation, and fire from urban and agricultural development have also taken their toll on the ecological health of the basin’s mesquite woodlands, mesquite dune scrubs, and area springs. Additional demands on groundwater resources from renewable energy projects and urban expansion may threaten the continued survival of mesquite in much of their range in southern Nevada (Crampton et al. 2006) and California (Sawyer et al. 2009). Water-stressed mesquite may also be a more common scenario under climate change, accentuated by the higher water demands of a growing population (Crampton et al. 2006).

Discussion of Impacts and Mitigation

Project-related groundwater pumping may impact sensitive and biologically significant groundwater-dependent ecosystems located within the cone of depression identified by staff in their analysis of recent pump test data (see **Water Supply Figures 19** and **20**), including mesquite habitats , seasonal seeps and springs, and an Area of Critical Environmental Concern (ACEC). If project-related groundwater pumping in the vicinity of the groundwater-dependent ecosystems described above causes the water table to decline below the level of effective rooting, the impacts would be significant, and could occur at an ecosystem scale. The potential ecosystem-scale consequences of these impacts are discussed above.

The applicant argues that the project will have no offsite groundwater drawdown, based on the results of its pump test. Water Resources staff has argued the applicant has misinterpreted the pump test results and presents a worst case scenario. Several parties, including BLM California, BLM Nevada, Inyo County Water Department, and The Nature Conservancy agree with staff's conclusion that the applicant has misinterpreted the pump test data. The Inyo County Water Department hydrologist commented on the inadequacy of the necessarily simple hydrologic analytical models used by the applicant and staff

> "...do not provide a single, uniquely correct interpretation of the aquifer system...." and "...extrapolating the results from a test that spanned a few days into an assessment of impacts over the life of the project is inherently uncertain." (INYO 2012b) "Additional testing for a week or month will not eliminate this uncertainty, so the CEC is faced with developing its final staff assessment based on inconclusive data. A high level of hydrogeologic uncertainty is not unique to this project; rather, it is typical when making hydrogeologic predictions...." (*ibid*.)

The Inyo County Water Department supports staff's argument that long-term monitoring and adaptive management are necessary and reasonable:

> "For HHSEGS, because the assessment of impacts is inconclusive, the most viable way for the project to proceed is to require monitoring that will allow tracking of impacts to the groundwater system before they develop during the life of the project, so that mitigation can be implemented if it becomes apparent that groundwater dependent resources will be impacted. This approach is reasonable and feasible for HHSEGS."

Inyo County Water Department proposes -- with consensus from all other interested parties -- that observations of water level change can be used to anticipate adverse impacts and manage pumping to avoid them, and supports staff's recommendation that if a conservative threshold is exceeded, that pumping cease until the project can demonstrate the drawdown is not the result of project-related pumping.
The exceptional ecological values of Stump Spring, and the habitat values of other nearby desert springs and mesquite habitats, are discussed under the Existing

Conditions subsection of this analysis. These resources have been identified as conservation priorities in the BLM document *Mesquite-Acacia Conservation Management Strategy*, and adopted by the Clark County Multiple Species Habitat Conservation Plan (BLM 2012a, Crampton et al. 2006).

Given the ecological significance of the resources at-risk, and evidence that some stands may already be at or near the limits of their tolerance, even seemingly minor drawdowns could have significant impacts. Even if stands persisted, their habitat function and value could be seriously affected. Their ability to support special-status species may be diminished, and in a worse-case scenario there could be local extirpations.

Although there is potential for the state line fault zone to buffer the effects of project pumping, the data is inconclusive, and cannot be demonstrated without hydraulic evidence obtained from wells placed on either side of the fault, and across the fault. Given the cumulative concerns described above, combined with the limited quantity and reliability of the data, and the ecological significance and sensitivity of the resources at risk, a greater factor of safety must be applied. Without the safety net of a long-term (30 year), well-designed and peer-reviewed monitoring plan, protection of the resources cannot be assured. Without monitoring, and a plan for remedial action to restore groundwater levels, the impacts would be significant and immitigable.

Unanimous Support for Long-term Monitoring and Adaptive Measures to Protect Groundwater-dependent Ecosystems

There was unanimous concern among the commenting resource agencies and land managers about the impacts of project-related groundwater pumping to these important resources, support for long-term groundwater monitoring, and for a provision to "stop, reduce, or modify" project pumping if monitoring detects a drawdown in the vicinity of the resources (BLM 2012a; BLM 2012b; INYO 2012a; INYO 2012b; TNC 2012a; ARM 2012b; Custis pers. comm.).

Staff consulted 16 agency hydrologists and biologists and recognized experts in the development of the groundwater-dependent vegetation monitoring conditions. Experts in vegetation ecology, environmental statistics and the development of long-term vegetation monitoring plans, impacts of groundwater pumping on dependent ecosystems were consulted, as well as staff's own hydrologists and geologists. A complete list is provided under "Personal Communications" following the list of references at the end of this FSA section. Similar conditions were adopted for another Energy Commission-licensed project (Palen Solar Power Project).

Patten, Rouse & Stromberg (2007) suggest that on-site monitoring is critical for detecting impacts, and long-term vegetation data are capable of providing early warning signs of impending changes in ecosystem processes (Patten et al. 2007). Combined with the data on groundwater and climate, sampling of plant communities can provide sensitive metrics for assessing ecological changes over time.

Condition of Certification **BIO-23** provides detailed specifications and performance standards for the development of a peer-reviewed vegetation monitoring plan. The vegetation monitoring plan would be used in conjunction with the groundwater monitoring plan proposed by **Water Resources** staff in **WATER SUPPLY-4.** To ensure that the selection of adaptive measures was not deferred until a later time, Condition of Certification **BIO-23** outlines the remedial action that would be taken once a project-related adverse effect is detected. If water levels in either of the Power Block 1 or Power Block 2 onsite monitoring wells identify a projected 0.5 foot or greater water level decline at the property boundary due to project pumping during construction or operation, the project owner is required to stop pumping until or unless the project owner can provide evidence that demonstrates, subject to review and approval by the Compliance Manager and interested agencies, that: 1) the pumping can be reduced or modified to maintain groundwater levels above the 0.5 ft. drawdown threshold at the project boundary; or 2) the drawdown trigger was exceeded due to factors other than the project pumping and the project did not contribute to the drawdown; or 3) through vegetation monitoring and soil coring described in **BIO-23** and predictive water level trend analysis **WATER SUPPLY-4**, that a greater groundwater drawdown will not result in significant adverse impacts to the groundwater-dependent vegetation.

Agency and Others' Concern about Sensitivity of Vegetation Triggers and Multi-Parameter Approach for Adaptive Action and Revisions to the Vegetation Monitoring Condition of Certification

BLM, Inyo County, The Nature Conservancy, and Amargosa Conservancy expressed concern in their PSA comments about the sensitivity of the "vegetation triggers" or field indicators prescribed in **BIO-23** to provide adequately early warning of impending ecosystem changes (BLM 2012b; INYO 2012b; TNC 2012a; ARM 2012b). Specifically, there were objections to the ambiguity and/or adequacy of the "20 percent decline in vigor" of the mesquite for triggering adaptive action.

Staff agrees it was not clear that the 20 percent threshold was a measure of individual plant vigor, rather than tree mortality. Characteristic measures of plant vigor, or response to drought stress, include decreases in biomass, crown density, and twig die-back. The 20 percent threshold was developed in consultation with vegetation monitoring specialist Willoughby (pers. comm.) as the "minimum detectable change" in crown density or biomass. Stromberg (pers. comm.) agreed that a 20 percent decline in biomass or crown density is a good threshold, and a decline in vigor from which the mesquite could easily recover, *assuming* immediate action was taken to halt pumping and restore the groundwater levels. It is possible or even likely that groundwater elevations would not recover immediately, and may take as long to recover as it did to drawdown to the threshold level, based on consultation with Water Resources staff, and other hydrogeologists (Custis pers. comm.; INYO 2012b). For this reason, and to address BLM and others concerns about the sensitivity of the trigger, staff conducted a literature review and consulted Stromberg (pers. comm.) and other vegetation ecologists with The Nature Conservancy (Parker pers. comm.) and BLM (Edwards pers. comm.) to determine if more sensitive measures were available that could provide accurate, reliable, and efficient field measures of mesquite drought stress. Regarding the earliest warning signs of drought stress in mesquite, Stromberg (pers. comm.) responded

> "There will be declines in stem water potential, transpiration rate, and amount of carbon fixed (via photosynthesis) in the early stages....Objective techniques for

measuring drought stress include measurements of 1) stem water potential (technically xylem water potential); 2) gas exchange rate; 3) transpiration rate."

Stromberg (pers. comm.) and Edwards (pers. comm.) agree that eco-physiological parameters could be developed for these measurements of drought stress that could be used to develop thresholds for adaptive action after baseline measurements were taken at the site to establish the seasonal variations, and variability between stands, or plots.

Condition of Certification **BIO-23** (Groundwater-dependent Vegetation Monitoring Plan) has been revised to base adaptive action on these more sensitive and earlier warning signs of stress. **BIO-23** requires the development of field-calibrated thresholds from baseline data to establish the range of seasonal and stand variability, and to factor the variability into the thresholds. Although the numeric thresholds are not specified at this time, **BIO-23** provides performance standards for the thresholds. It also provides detailed guidelines for the content of the monitoring plan, and requires approval of the plan by the Compliance Manager in consultation with the BLM Nevada and BLM California state leads for Soil, Water, Air and Riparian Programs, the BLM Southern Nevada District and BLM Barstow District hydrologists and botanists, and the Inyo County Water Department.

Hydrologists and vegetation ecologists representing BLM, The Nature Conservancy, Inyo County Water Department, and Amargosa Conservancy commented on Condition of Certification **BIO-24**, which was originally presented in the PSA, and has since been incorporated into **BIO-23** in this FSA. The above groups expressed concern that under the three-parameter threshold in **BIO-23** and **BIO-24** of the PSA (PSA pp. 4.2-235-242), adaptive action cannot be taken until all three parameters are met ("groundwater drawdown and vegetation decline that cannot be correlated solely to regional drought condition"). BLM and The Nature Conservancy commented that this places an unfairly high burden of proof on the resource that could "result in adverse and irreversible impacts to the vegetation" (BLM 2012b), and a "difficult test that, if it were required to invoked pumping limitations, protracted litigation would almost certainly ensue." (TNC 2012a). These entities recommended a more rigorous and protective threshold that requires pumping be curtailed or stopped if groundwater levels decline more than 0.5 feet at the project boundary. Pumping would not resume unless the project can demonstrate through vegetation monitoring data –based on the more sensitive and field-calibrated measures described above and/or soil coring to establish rooting depths—that the project pumping is not causing an adverse effect on the groundwater-dependent resources. Given that the specific numeric thresholds for the more sensitive (and reliable and objective) measurements of drought stress require field calibration from baseline data, staff agrees with this simpler, single-parameter approach to the threshold, and has revised **BIO-23** and **BIO-24** accordingly, blending the two conditions into one final condition, **BIO-23**. The field measurements of drought-stress would—in combination with corresponding drawdown – be used to establish whether or not pumping could resume, and at what level; however, the requirement to "stop, reduce, or modify pumping" would be triggered solely by the 0.5 foot drawdown at the project boundary.

The County of Inyo Water Department has a long history of requiring long-term groundwater monitoring for pumping project in Owens Valley, and considerable experience in the development of related groundwater monitoring plans and conditions of approval. Staff accepted many of the Inyo County Water Department's recommended changes to **BIO-23** and **BIO-24,** resulting in one condition, **BIO-23**.

The 0.5-foot Drawdown Trigger Can be Detected with a High Level of Confidence

The applicant has argued that the groundwater monitoring conditions require "...a precision that is not possible...in an area where the water table can vary by several feet annually due to normal variations in seasonal rainfall." Water Resources staff responded to the same comment at the June 14, 2012, public workshop, and in the Water Supply sections of the PSA and FSA. Water Resources staff noted that water levels on the project side of the state line fault are very stable, and concluded that because water levels on the project site are stable (unlike offsite wells in other parts of the basin), the 0.5 foot drawdown threshold can be detected with nearly 100 percent confidence.

Groundwater Monitoring is Not Unprecedented

Applicant's comments argue that groundwater monitoring of the kind proposed by staff (as well as many of the commenting agencies and entities) is unprecedented. But this is incorrect. In fact, a similar condition was imposed on another Energy Commission-licensed project (Palen Solar Power Project). Moreover, it is now common practice to require monitoring, management, and mitigation plans for groundwater impacts; so common that the term "3M plans" is used by practitioners (Harrington pers. comm.; Custis pers. comm.). As an example, the monitoring plan for the Coso Hay Ranch Water Extraction Project in Inyo County requires monthly monitoring at 10 well locations for the life of the 30-year project, identifies triggers at each well, some as low as 0.2 feet, and specifies that pumping must *stop, change, or reduce pumping*:

> "Requiring that observed drawdown values [at intervening monitoring wells],over time be kept below these defined trigger levels would provide an early warning system, allowing for the system operations to *change, to reduce or stop pumping* before maximum acceptable drawdown levels propagated down the valley to Little Lake [emphasis added]."

Inyo County's agreement with the Los Angeles Department of Water and Power has provisions for monitoring, management and control of pumping, mitigation of impacts from pumping for water management and export activities in Owens Valley (Harrington pers. comm.). The primary goals of the agreement are to avoid causing significant decreases in the live cover of groundwater-dependent vegetation, significant changes in vegetation type, groundwater mining and other significant adverse effects. Extensive monitoring began in 1983 to determine the relationship between groundwater pumping and its impact on native vegetation, including the responses of managing pumping to minimize impacts. In contrast, the monitoring for the HHSEGS project requires relatively simple vegetation monitoring that is required only twice annually, at an appropriately small number of plots, and can be conducted by the Designated Biologist (under the supervision or training of a qualified botanist).

The projects described above use considerably more water, but it is the project's *very close proximity* to sensitive and ecologically significant resources that are at the crux of staff's concern. The 1) close proximity (and thus potential for impacts), combined with: 2) significant cumulative concerns from the proposed Sandy Valley project; 3) limited quantity and reliability of the data; 4) hydrogeologic complexity of the area; and 5) the identification of these resources as conservation priorities justify staff's concern. A conservative approach must be applied that combines long-term groundwater elevation monitoring and monitoring the health of the mesquite, with triggers for adaptive action if impending impacts are detected. This approach has been generally supported by Inyo County (Inyo 2012b) and BLM Nevada and California (BLM 2012a; BLM 2012b), and finds support in many additional scoping comments and PSA comments.

The applicant has argued that the monitoring condition would make the project "un-financeable and un-buildable". However, an almost identical condition was imposed on another Energy Commission-licensed project (Palen Solar Power Project) – a project that was approved for purchase by BrightSource Energy, Inc., in June 2012 (BrightSource Energy, Inc 2012). Note that the remedial action described in **WATER SUPPLY-4** (Groundwater Monitoring) and **BIO-23** allows the project the option of *reducing* water consumption to sustainable levels, for example through water conservation measures. The conditions also provide the project with an option to *modify* pumping, for example, through the installation of new wells located farther from the sensitive resources, or through timing and rotation if monitoring shows that resources adjacent to one of the wells can sustain a greater drawdown than resources affected by the second or third pumping wells (Froend pers. comm.). Staff consulted researchers and manufacturers of waterless mirror-washing technologies, some of which are already available for photovoltaic projects and solar trough projects (Hofman, Baldini, Schik, Hemadrasa, and Mishra pers. comm.).

With the options described above, and examples of other projects requiring a similar conditions that were licensed and built, staff believes the adaptive action described in **WATER SUPPLY-4** and **BIO-23**) is *reasonable and feasible*, an opinion shared by hydrologists representing Inyo County, CDFG, and BLM.

Alternatives to Vegetation Monitoring

Staff considered eliminating the vegetation monitoring component (**BIO-23**) and basing the adaptive action solely on the 0.5 ft. groundwater drawdown threshold at the project boundary (**WATER SUPPLY-4**). Staff concluded that the vegetation monitoring was necessary to determine the drawdown level at which the mesquite begin to exhibit signs of drought stress, a level staff expects to vary from one area to the next due to geologic and hydrogeologic complexity of the area, and variations in the amount of background decline (present or historical groundwater drawdown). If the requirement to "stop, reduce, or modify pumping" is triggered by the 0.5 ft drawdown at the project boundary, the project could not resume pumping unless it can establish evidence of a sustainable level of pumping.

Condition of Certification **BIO-23** includes a provision for using soil coring to establish the maximum effective rooting depths of the groundwater-dependent plant species in the project vicinity (mesquite and four-wing saltbush). Stromberg (pers. comm.) agreed that a soil core would "provide valuable information on the distribution of the root system." The BLM Southern Nevada District hydrologist indicated that a proposal to collect soil cores on BLM land for establishing thresholds for protecting resources may qualify for a categorical exemption (Poff pers. comm.). The amount of drawdown, relative to the maximum rooting depth, that the plants can sustain before manifesting signs of stress is unknown, however, and would require corresponding measurements of drought stress to establish a safe drawdown threshold.

Mitigation Considered But Rejected

A full range of mitigation options was considered. Mitigation in the form of offsite plantings and transplantation was considered but rejected. This type of mitigation has a long, documented history of failure. A study by CDFG (Fiedler 1991) found that, even under optimum conditions, ex-situ mitigation plantings were not effective in 85 percent of cases studied. Recent studies are even more discouraging. Mitigation with a high potential for failure would not be further considered. Where the hydrology is intact, riparian and wetland plantings have a higher potential for success than upland habitats in an arid region; however, groundwater elevations are declining throughout this basin and plantings may not be self-sustaining over the long-term. Mitigation through offsite restoration is risky for many of the same reasons, and large-scale salt cedar removal projects come with their own set of biological impacts (Shafroth et al. 2010) that must be analyzed and are likely to be significant, largely due to potential impacts to special-status bird species and other nesting birds.

Nor does offsite mitigation replace the complexity of plants and animals, including special-status species that make up the mesquite dune or mesquite woodland ecosystem, or replace the ecological processes essential to maintain these complex systems.

Compensatory mitigation through acquisition and preservation of offsite mesquite habitats was considered but rejected for a number of reasons:

1. Mesquite habitats are rare natural communities (Sawyer et al. 2009; Crampton et al. 2006; NNHP 2010b), and may have additional significance if mesquite clones are of ancient origin; acquisition and preservation would still result in a significant net loss and a residual cumulative effect not alleviated by putting a conservation easement on another stand;

2. Desert springs may be one of the rarest and most endangered habitats. Many have already stopped flowing and those that remain may be threatened by the basin imbalance. Desert springs have exceptional significance and importance to wildlife; they are the only natural source of water for wildlife in the desert, they often support rare and endemic species, and they are disappearing region-wide at an alarming rate due to groundwater pumping;

3. Other mesquite habitats in the basin are also threatened or degraded, and may not be sustainable. Staff considered the value of placing easements on mesquite stands with a higher value (at least to avian species) such as Stewart valley; however, few other stands of high quality occur in the basin, and they are already affected or by past and present groundwater declines, firewood cutting, the edge effects of urbanization, and expected continuing groundwater declines in this over-appropriated basin; thus they may not be sustainable over the long-term;

4. Stump Spring and the habitat surrounding the ACEC offer exceptional habitat values due in part to the presence of seasonal open water habitat. The presence of other active seeps and springs east of the project (Poff 2012) significantly increases the value of the habitats outside the ACEC to wildlife;

5. BLM is currently designing a new Area of Critical Environmental Concern (ACEC) to protect the mesquite and other resources just east of the project boundary and north of the existing Stump Spring ACEC (Poff, pers. comm);

6. Placing an easement on another mesquite stand does not mitigate for impacts to special-status species likely to use Stump Spring and other seeps and springs in the area, such as special-status bats, migratory birds, and special-status birds;

7. Allowing a net loss of mesquite habitat is in conflict with the goals and objectives for mesquite in Clark County MSHCP Mesquite Conservation Management Strategy (CMS), particularly for identified high priority conservation sites, which include Stump Springs and the Pahrump Valley metapatch (Crampton et al. 2006). The management goals include "maintaining woodlands at their current extent and restoring and enhancing remaining stands at year 2000 and higher levels". The CMS objectives include "sustaining surface and groundwater levels at current or higher levels". The CMS concludes "either all woodlands existing in 2000, including those on private lands, must be protected and restored, or the area and/or quality of remaining woodlands must be enhanced to compensate for a loss of woodlands in a way that allows the same numbers of individual plants and animals to exist with the same probabilities of persistence [in fewer but enhanced woodlands]." The CMS adds "it is not clear whether the latter option [enhancement] is feasible. Thus, the CMS emphasizes preserving all current woodlands, including private ones."

Impacts to Regional Groundwater-Dependent Resources

BLM, The Nature Conservancy, Amargosa Conservancy, and others have expressed concern that pumping from the Pahrump Valley groundwater basin, combined with the cumulative effects of other past, present, and foreseeable future pumping, may cause impacts to the Amargosa Wild and Scenic River system, the Amargosa River ACEC, other mesquite woodlands in Pahrump Valley, Stump Springs ACEC, and other ecologically significant groundwater-dependent resources, including state and federal listed species. BLM and others have stressed the "outstanding remarkable values" of the federally-designated Amargosa Wild and Scenic River, which is wholly supported by groundwater in the form of seeps and springs. The project would pump from the Pahrump Valley basin-fill aquifer, which is included within and hydrologically connected to the Death Valley Regional Groundwater Flow System (DVRFS))Belcher & Sweetkind 2010).

Approximately 35 state and/or federal-listed species and other species exist in the Amargosa River and Ash Meadows regions that are found nowhere else globally. The Ash Meadows National Wildlife Refuge, one of several areas of exceptional biological importance also sustained by the regional groundwater basin, has the greatest concentration of rare and endemic species in the United States and the second greatest in all of North America (USFWS 2012)[6] including several endemic pupfish species. Deacon (2007) demonstrated that some pupfish species may be highly sensitive to even minor changes in the groundwater.

In addition to the 35 state or federal-listed species, 22 other special-status species are known to depend on the areas groundwater system through seeps and springs, spring pools, the Amargosa River and its tributaries, and areas of shallow groundwater. The list does not include the abundance of unique, rare and sensitive groundwater-dependent natural communities.

BLM and others have expressed concern that there is insufficient information on the complex hydrogeology of the basin for the applicant to conclude no indirect or cumulative effect to the Amargosa Wild and Scenic River and other groundwater-dependent resources from project pumping. The applicant proposes that the project pumping would not affect these resources indirectly or cumulatively because of evidence they believe demonstrates that there is no hydraulic communication between the shallow aquifer (from which they will pump 140 afy) and the deeper carbonate aquifer.

The Water Supply analysis concluded that given the lack of evidence for a hydraulic connection, the relatively large intervening distance (about 20 miles), and uncertainty in potential flow barriers and permeability contrasts within the subsurface it would be speculative to conclude that project, pumping would adversely affect the Amargosa River. In the analysis, staff states there is no available data that identifies groundwater flow paths or confirms a hydraulic connection between the local basin-fill aquifer (the Pahrump Valley Groundwater Basin) and the Amargosa River, so the water consumed by project pumping may or may not be a source of inflow to the Amargosa River. Although staff concludes that a significant impact due to project pumping is unlikely, **WATER SUPPLY-1**, which requires an offset of project water use in the local basin-fill aquifer, would ensure there is likely no net overall change in subsurface outflow from the local aquifer that might affect the Amargosa River (See the “Water Supply” analysis of this FSA).

Impacts to Mesquite Dunes

The potential for impacts to dunes downwind of the project from obstruction of the wind-sand transport corridor by the project was considered because prevailing winds are from the northwest, and mesquite dune scrubs occur east and southeast of the project. Staff consulted two independent geologists with local expertise during a recent site visit (Brady & Vyverberg pers. comm. 2012). Their informal opinion (no report was prepared) is that the dunes developed along the Stateline Fault Zone as the Pleistocene lake retreated, and the exposed sands, or sands eroded from the sparsely vegetated hill slopes that developed under the new arid climate accumulated around mesquite associated with the fault-induced springs (Brady pers. comm. 2012). Indicators that the dunes are no longer active (accreting) include: 1) there is no apparent source area (dunes or other sand source) upwind of the dunes; 2) the leeward sides of the dunes are completely stabilized; 3) there is no loose sand in the stream channels around the

[6] USFWS. 2012. *Ash Meadows National Wildlife Refuge*. U.S. Fish and Wildlife Service.

dunes, and 4) the windward side is wind scoured and not accreting. The lee sides are also eroded but well-vegetated, and there is no sand there which, in an active system, would supply the next dune down wind. The conclusion was that the dunes would not occur where they are under the present climate; there is no source for the sand and no transport corridor to supply sand to the dunes. For these reasons, the mesquite dune scrub downwind of the project would not be affected by any obstructions upwind. Impacts to the dunes could occur if project-related groundwater pumping caused groundwater levels to drop below the level of effective rooting and the mesquite died, leaving dunes vulnerable to deflation (USACE 2012a; Brady pers. comm.); impacts to the coppice dunes and other groundwater-dependent ecosystems are described in the previous subsection of this FSA section.

Construction Impacts to Desert Washes

Jurisdictional Waters of the State and Waters of the U.S.

A total of 23.82 acres of jurisdictional Waters of the State, including single-thread channel and braided ephemeral streams, were delineated by the applicant on the proposed project site (URS 2012b). Of these 23.21 acres, 0.42 acres are also Waters of the United States. Six of the features are also depicted as blue line features on the U.S. Geological Survey (USGS) topographic maps. During an August 2012 field verification of the applicant's state waters delineation (URS 2012b), an additional nine ephemeral streams were identified within the project boundary. Features mapped as "nonjurisdictional waters" in the preliminary State waters delineation report (i.e., pooling areas, moist pooling areas, alkaline soils areas, sheet flow areas) were confirmed by the Energy Commission and CDFG as not constituting waters of the State. The CEC and CDFG conducted a site visit to verify the state waters delineation in August 2012. The CEC provided the applicant with data representing 9 additional drainages, adding an additional 3.13 acres of jurisdictional waters of the state within the project boundary. With the addition of the 3.13 acres by the CEC, the areal extent of State jurisdictional waters within the HHSEGS project boundary totals 23.21 acres (CH2 2012mm).

Impacts to Ephemeral Streams

The applicant proposes to minimize impacts to desert washes by allowing them to pass through the site, rather than diverting them around the site in artificially constructed channels. This analysis recognizes that at least a portion of the hydrologic and geomorphic functions would be maintained, and mitigation ratios were reduced accordingly. However, staff and the CDFG maintain that the wildlife habitat functions and values of the streams would be eliminated or significantly diminished by a combination of partial site grading, road construction and maintenance, perimeter exclusion fencing, dust and weed control, vegetation mowing, mirror-washing, glare and lighting, human disturbance, and potential erosion and sedimentation of streams during storm events as the storm flows navigate around the mirror pylons and other obstructions. The functions and values of the 0.4 acres of streams delineated just upstream of the project's eastern boundary, within California, could be indirectly impacted from construction of the underground and overhead transmission line. Indirect effects to the upstream portion of the state waters include: human disturbance, glare, lighting, road maintenance, and potential headcutting (erosion) from trenching through the washes.

Importance of Ephemeral Desert Washes to Wildlife

The importance of ephemeral streams to wildlife in the desert is undisputed; it is well-documented in the literature, the sum of which represents decades of observations and surveys (Levick et al. 2008; Baxter 1988; Kirkpatrick et al. 2007; Kubick & Remsen 1977; Tomoff 1977; Daniels & Boyd 1979, and others). Loss of the habitat function and values of all or a significant portion of all streams across a 3,277-acre site is a substantial adverse effect on state jurisdictional waters. It conflicts with state LORS, and it is a significant impact.

Ephemeral and intermittent streams in the arid west provide important habitat for wildlife and are responsible for much of the biotic diversity (Levick et al. 2008). They have higher moisture content, and the topographic relief provides shade and cooler temperatures within the channel. In cases where the habitat is distinct in species composition, structure, or density, wash communities provide habitat values not available in the adjacent uplands. They provide movement corridors and seasonal access to water or moisture. Baxter (1988) noted that washes, because of their higher diversity plant communities, are probably important foraging locations for desert tortoise; in smaller washes, there is greater cover and diversity of spring annuals, providing important food sources. Researchers have noted the high diversity of herpetofauna in desert washes and many snakes and lizards preferentially use xeroriparian habitat because of its denser cover (*ibid.*). Kirkpatrick et al. (2007) noted that even dry, ephemeral washes have greater avian abundance and species richness than adjacent uplands. In a study of 66 plots on BLM lands in California, dry washes support 1.5 times more breeding species and twice as many wintering species as the more common desert scrub (Kubick & Remsen 1977; Tomoff 1977; Daniels & Boyd 1979, and others).

Staff's observations of the habitat functions and values provided by the washes on the project site, and observations of wildlife use of the features are consistent with the literature. During the state waters delineation field verification and other site visits, biologists from CDFG and staff noted the washes offer habitat functions and values distinct from the surrounding upland. For example, anywhere there are concentrations of water, the vegetation is denser and more robust, which in turn provides more shade, escape cover, more seed and other food sources, including more insects, which would in turn support more reptiles, etc. The washes also have greater plant species diversity; for example, germination of rattlesnake weed (*Chamaesyce albomarginata*), a preferred desert tortoise food, was abundant in the lower reaches of many channels, particularly at the terminus of the streams where soils remain saturated longer. Bunchgrasses (*Sporobolus airoides, Pleuraphis rigida*) are more abundant on some features. The terminus of these streams held water longer and thus provided sources of temporary pooling. Staff noted higher mammal density on the streams and their active floodplains, evidenced by greater bioturbation and more abundant coyote scat.

The applicant argues that CDFG's interpretation of Fish and Game Code (PSA pp. 4.2-44-45) is not consistent with the California Code of Regulations definition of "stream." The definition of a stream in Title 14, Section 1.72 of the California Code of Regulations (CCR) is not the definition used by Fish and Game Code (Section 1600 *et seq.*). The Section 1.72 definition was developed to address a specific sports fish issue that came before the Fish & Game Commission; while the definition does speak to periodic and intermittent flow, Section 1.72 is limited to fish-bearing or aquatic life-bearing streams (Vyverberg pers. comm.).

Fish and Game Code Chapter 6, Fish and Wildlife Protection and Conservation, Section 1600 *et seq.* was enacted to provide for the conservation of fish *and* wildlife resources associated with stream ecosystems. The Fish and Game Code further defines fish and wildlife to include: "...*all wild animals, birds, plants, fish, amphibians, invertebrates, reptiles, and related ecological communities, including the habitat upon which they depend for continued viability."* (FGC Division 5, Chapter 1, section 45, and Division 2, Chapter 1, section 711.2(a), respectively)

Ephemeral Streams Not Excluded Under Fish and Game Code

The applicant's PSA comments assert that the washes on the project site have no value to wildlife because they are *narrow* or *ephemeral*. This assertion is not supported by the relevant literature. Moreover, it finds no support in law or the policies and practice of CDFG. For the purposes of implementing sections 1601 and 1603 of the Fish and Game Code, California Code of Regulations Title 14, section 720, requires submission to CDFG of general plans sufficient to indicate the nature of a project for construction by or on behalf of any person, governmental agency, state or local, and any public utility, of any project which will divert, obstruct or change the natural flow or bed of *any* river, stream or lake designated by the department, or will use material from the streambeds designated by the department, all rivers, streams, lakes, and streambeds in the State of California, including *all rivers, streams and streambeds which may have intermittent flows of water*, are hereby designated for such purpose. The term "*...intermittent flows...*" has long been interpreted by the courts and the Attorney General's office to include ephemeral flow (Vyverberg pers. comm.).

While Fish and Game Code sections 1600 *et seq.* do not include a definition for "stream", it has been the practice of the Lake and Streambed Alteration Program (LSA) to define a stream as: A body of water that flows perennially, intermittently, or ephemerally. Streams include a channel, banks, bed, and floodplains where present.

During the field verification of state waters, conducted after a 0.20-inch storm event, the smaller washes onsite contained water and/or evidence of recent inundation, and were expressed by a number of fresh fluvial indicators reflective of stream processes. Characteristic hydrology indicators, fluvial indicators and other geomorphic features used in staff's identification of state waters include: channel morphology; inundation or saturation; fresh deposition; ripples; changes in vegetation species composition, structure or density (relative to the adjacent creosote uplands); wrack; mud drapes; changes in sediment texture; sediment sorting; scour or shelving; and gravel ramps. The use of these indicators to delineate desert streams is well-documented in literature and agency guidance (USACE 2005; Lichvar & McColley 2008; Lichvar & Wakely 2004). Photos of a sampling of the stream features and indicators are provided in **Biological Resources Figure 3**.

All Desert Wash Vegetation Protected Under Fish and Game Code

Fish and wildlife resources are held in trust for the people of the State by and through the California Department of Fish and Game (FGC § 711.7). CDFG is responsible for conserving, protecting, and managing fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of these species (Fish and Game Code Section 1802).

The importance of vegetation along streams to the function and values of the stream habitat is a matter of undisputed fact, supported by the body of scientific literature, and presumed by CDFG (Vyverberg pers. comm.). The applicant's argument that the vegetation is not linked to ecosystem function and the vegetation along the washes is not an integral part of the stream system is erroneous. Fish and Game Code links stream protection with the presence of fish, wildlife, *and their habitat.* Fish and Game Code Chapter 6, Fish and Wildlife Protection and Conservation, Section 1600 *et seq.* was enacted to provide for the conservation of fish *and* wildlife resources associated with stream ecosystems. The Fish and Game Code further defines fish and wildlife to include: "...*all wild animals, birds, plants, fish, amphibians, invertebrates, reptiles, and related ecological communities, including the habitat upon which they depend for continued viability."* (FGC Division 5, Chapter 1, section 45, and Division 2, Chapter 1, section 711.2(a), respectively).

The applicant also argues that the washes are "devoid of any plant life"; a statement with no basis in fact. The applicant's own delineation report discusses the vegetation along the washes and notes the distinctions in the species composition of the wash vegetation (URS 2012b). This is consistent with staff and CDFG's observations of the washes during numerous site visits, including the verification of the applicant's delineation of state waters, conducted approximately 7-10 days following a large storm event, and one day following a smaller (0.2 inch) storm event. As described above, staff found an abundance of germination of native annuals in the lower reaches of many washes, including the smallest washes; germination that was not apparent in the adjacent uplands. There were differences in the species composition of the wash vegetation on some (not all) washes; however, the vegetation is typically larger, more robust, and denser along the washes than in the adjacent uplands.

The regulations do not limit CDFG's protection or conservation authority to one specific type of vegetation community (e.g., woody riparian vegetation but not other wash communities). It has been the practice of the LSA Program to define "riparian" to mean: *areas adjacent to perennial, intermittent, and ephemeral streams, lakes, and estuarine-marine shorelines that are transitional between terrestrial and aquatic ecosystems and that are distinguished by gradients in biophysical conditions, ecological processes, and biota, areas through which surface and subsurface hydrology connect waterbodies with their adjacent uplands. Riparian areas include those portions of terrestrial ecosystems that significantly influence exchanges of energy and matter with aquatic ecosystems (i.e., a zone of influence)* (Vyverberg pers. comm.).

Conclusions and Discussion of Mitigation Regarding State Waters

It has been CDFG policy and practice to collect notification fees for Section 1600 *et seq.* jurisdictional "projects" in conjunction with Energy Commission (CEQA) projects (Condon pers. comm.). Applicants provide information regarding planned stream encroachments, water diversions (activities subject to Section 1600 *et seq.*) in a completed 1600 notification form, including fees, which facilitates the Energy Commission's and CDFG's review of the information. CDFG consults with the Energy

Commission with recommendations for minimization and mitigation measures. The Energy Commission includes those measures under the conditions of certification.

On October 10, 2012, the applicant submitted a
Notification of Lake or Streambed Alteration form and required fees, based on the revised delineation of state waters (CH2 2012mm). Fish and Game Code Section 1605 assumes implicitly that some form of mitigation will likely be part of any Lake and Streambed Alteration Agreement issued for a project. CDFGs no net loss policy for riparian/riverine habitat means that if a project results in a loss of one acre of stream then a minimum of two acres of compensatory stream mitigation are required to satisfy the no net loss goal (Vyverberg pers. comm.). In practice, compensatory mitigation is typically mitigated at a minimum mitigation-to-effect ratio of 3:1 for permanent effects and 1:1 for temporary effects.

The 2:1 mitigation ratio for impacts to desert washes proposed in Condition of Certification **BIO-22** (State Waters Compensatory Mitigation) is supported by CDFG (Branston pers. comm.). Although CDFG has received mitigation at a 3:1 ratio for impacts to desert washes, the regional office has agreed to a 2:1 ratio in recognition that at least some portion of the hydrologic and geomorphic function would be maintained (*Ibid.*). Staff and CDFG are united in their assessment that the impacts to habitat functions and values from perimeter exclusion fencing, partial site grading, road construction and maintenance, vegetation maintenance, spraying, noise, glare, and human disturbance are significant.

No compensatory mitigation is required for indirect impacts to streams in Nevada; however, there is a small (0.4 ac.) portion of the washes just east of the project that are located in California. The match of pre-and post-project flows will protect the soil and water resources downstream of the project but will not protect the upstream portion of the streams immediately adjacent to the project at the east boundary. Unless the trench fill and surface is fundamentally transparent to the stream, sediment can be expected to be removed preferentially from the trench area. Once a pipeline is exposed, the erosion will first be greatest on the downstream edge, eventually undermining the pipe, at which point headcutting is commonly initiated (Vyverberg pers. comm.). Headcutting and other erosion can be avoided or minimized through recommended erosion control measures.

With implementation of **BIO-22,** which includes the compensatory mitigation discussed above, impacts to state waters would be reduced to less-than-significant levels.

<u>Introduction and Spread of Noxious Weeds and Other Invasive Plants</u>

Noxious Weeds and Other Invasive Plants in the Project Area

Thirteen species of invasive weeds were documented in the project area, including two California Department of Food and Agriculture A-rated pests (Russian knapweed and halogeton). Project-related construction activities, vehicle and equipment use during operation and closure, mirror-washing, and sedimentation of streams from adjacent weedy areas are all expected to increase the spread of weeds into adjacent public and private lands from contaminated vehicle and equipment tires and undercarriages. Naturally disturbed habitats such as dunes and washes are particularly vulnerable to colonization by weeds. Many invasive non-native species are adapted to and promoted by soil disturbance, and seeds are commonly transported on vehicles and by wind and water.

Vegetation management on the project site is expected to promote the proliferation of invasives, particularly cheat grass and red brome. Suppressing the surrounding taller native vegetation by mowing can give lower-growing weeds a competitive edge. The native perennial shrubs would be weakened and diminished in size, utilizing less moisture and nutrients, and increasing sunlight available to the weeds between shrubs. These in turn could spread into adjacent lands by contamination of vehicles and equipment, and along washes that pass through the site and drain into lower-lying areas. They can be spread along area roads and transmission corridors, which are common vectors for the spread of weeds.

New species not currently found in the project vicinity can be inadvertently introduced on the tires and undercarriages of workers vehicles commuting from southern Nevada (Inyo County 2012b).

County agricultural commissioners and have expressed concern about the spread of weeds, particularly the introduction of highly invasive species common in southern Nevada from which employees and contractors are likely to commute (Inyo County 2012b).

Ecological Consequences

About 42 percent of federally threatened or endangered species are listed because, among other factors, threats from invasive species (Brooks & Pyke 2002). They can directly affect wildlife and sensitive plants, or indirectly affect them by causing destructive changes in ecosystem processes. Accordingly, the management of invasive plants is now a top priority for land managers.

Invasive species out-compete native species for moisture and nutrients because of minimal water requirements, high germination potential and high seed production (Beatley 1966) and can become locally dominant, representing a serious threat to native desert ecosystems (Abella et al. 2008). In some areas of the western Mojave Desert, weeds now comprise 50 to 97 percent of the herbaceous plant material produced each spring. Showy wildflowers and special-status plants are swamped by monocultures of red brome and other annual weeds that contribute little or nothing to the food web (Pavlik 2008). Invasives have decreased the quality and quantity of plant foods available to desert tortoises and other herbivores and thereby affected their nutritional intake (Hazard et al. 2002; Nagy et al.1998).

Without consumption by wildlife, the dead material from the previous year accumulates to form a continuous, flammable canopy over thousands of acres in areas where fire was once infrequent for lack of fuel; areas that now burn frequently and with catastrophic consequences. Burned creosote and other native shrubs are typically replaced by short-lived perennials and non-native grasses (Brown & Minnich 1986), resulting in large-scale habitat conversions.

Weeds and the Increased Risk of Fire

Fire in desert ecosystems is well documented to cause catastrophic, landscape-scale ecosystem changes and impacts to the local species (Allen et al. 2011; Abella 2009; Belnap et al. 2005; Brooks & Esque 2002; Brooks et al. 2004; Brooks & Matchett 2006; Pavlik 2008; and others). The proliferation of non-native annual grasses and other weeds has dramatically increased the fuel load and frequency of fire in many desert ecosystems (Lovich & Bainbridge 1999). Unlike other ecosystems in California, fire was not an important part of the Mojave Desert ecosystems and most perennials are poorly adapted to even low-intensity fires; the animals that coevolved are not likely to respond favorably to fire either. Instead of occurring every 30 to 100 years as fires did historically in the region, wildfires are now recorded about every five years (*Ibid.*). Between 1980 and 1990 and average of 38 square miles was burned every year in the Mojave Desert. Because of the proliferation of annual grasses and other weeds, the fires sweep across the desert scrubs, incinerating the native species with no tolerance for the new form of disturbance. High temperatures also sterilize the soil of its beneficial fungi and kill desert tortoise and other wildlife. The effect is then magnified by the opportunistic colonization of newly burned areas by non-native annual grasses that in turn significantly delays or inhibits natural regeneration. This in turn results in permanent habitat conversations from diverse desert scrubs to weedy, flammable grasslands, or weed-infested scrubs that choke out special-status plants, offer little habitat value for wildlife and increase their risk of mortality under a new regime of frequent, catastrophic fires. Thus a relatively few invasive, productive, and unchecked non-native plants from other arid regions can create a cascade of habitat degradation (*ibid.*).

Wildfires are rare in the desert but the sharp increase in daily vehicle use would correspondingly increase the risk of ignition, particularly at pullouts and on partially vegetated unpaved roads where the exhaust system comes into contact with dry grass or other vegetation. Sparks generated by mowers, welders, grinders, and other equipment are also common ignition sources; fires caused by converter equipped vehicles can occur instantaneously once the vehicle has come to a stop on dry grass. The weeds that typically recolonize disturbed soils along roads and transmission corridors tend to increase the flammability of the roadside vegetation. The impacts to these poor-adapted desert communities and special-status wildlife, including desert tortoise, would be severe.

Conclusions and Discussion of Mitigation

Indirect effects from the introduction and spread of invasive weeds, and the concomitant increase in vegetation flammability and disruption of ecosystem processes are The applicant conducted thorough weed surveys and mapping as part of the pre-application studies. The applicant acknowledges the potential of the project to introduce and spread invasive weeds, and proposes to prepare a weed management plan (HHSEGS 2011a). Condition of Certification **BIO-18** provides guidelines and performance standards for the development of a weed plan. **BIO-18** requires the project owner to manage or contain weeds onsite for the life of the project to prevent their spread into adjacent offsite habitat, or to nearby communities via employees and contractors contaminated vehicles and equipment. **BIO-18** also includes measures for minimizing the accidental introduction or spread of weeds from contaminated vehicles and equipment entering the site during construction, operation, and closure. **BIO-18** requires the establishment of a washing station where construction vehicles and equipment would be inspected and washed within an approved area or commercial facility prior to entry or exit to prevent the introduction and spread of invasive weeds.

Herbicides can help protect native vegetation from invasive weeds, but they can also have detrimental environmental impacts (CNPS 2008). Wildlife within and adjacent to the project can be directly or indirectly harmed by herbicide drift from sprayers, or residual soil toxicity from the use of some pre-emergent herbicides. Because of this, it is best to select a contact herbicide that has low toxicity and no residual toxicity (as many pre-emergent herbicides and soil fumigants have. The application method should be designed to minimize drift in or near sensitive species or native habitat offsite. Not all herbicides or application methods are equally appropriate, effective, or safe, given different site conditions and weed species. To avoid accidental harm to biological resources from weed management activities, **BIO-18** includes specifications for environmentally safe weed management, including: employing only manual methods of weed management within 100 feet of offsite biological resources; spraying only on windless days; using sprayer adapters that confine the width of the spray pattern and eliminate drift; and using rollers or brushes to apply herbicides rather than sprayers, and prohibiting the use of herbicides with residual soil toxicity.

BIO-8 and **BIO-18** contain additional measures for fire prevention to address the concomitant increased risk of fire from an increase in abundance and distribution of weeds, especially annual grasses such as red brome, cheat grass, and Mediterranean grass and potential ignition from mowing, welding, grinding, and increased vehicle

CUMULATIVE IMPACTS

"Cumulative" impacts refer to a proposed project's incremental effect viewed over time together with other closely related past and present projects and projects in the reasonably foreseeable future whose impacts may compound or increase the incremental effect of the proposed project (Public Resources Code Section 21083; California Code of Regulations, Title 14, Sections 15064[h], 15065[c], 15130, and 15355). The following sections present a definition of the geographic extent within which cumulative impacts are analyzed and an analysis of the project's potential incremental effects when combined with other past, present, and future projects.

The standard for a cumulative impacts analysis is defined by the use of the term "collectively significant" in the CEQA Guidelines section 15355; the analysis must assess the collective or combined effect of development. Cumulative impact assessments cannot conclude that contributions to cumulative impacts are not significant because the contributions represent a small percentage of the overall problem. Doing so could improperly omit facts relevant to an analysis of the collective effect that the project and other related projects would have upon biological resources. The result could be approval of projects based on an analysis that avoided evaluating the severity of impacts which, when taken in isolation appear insignificant, but when viewed together appear significant.

GEOGRAPHIC EXTENT

The geographic scope of staff's preliminary analysis of cumulative effects to special-status wildlife encompasses Pahrump Valley and makes a broad, regional evaluation of the impacts of reasonably foreseeable future projects that threaten special-status wildlife in the southern Amargosa Desert region, from the Las Vegas environs to Pahrump and Ash Meadows, and south to Sandy Valley. For some biological resources, a different geographic scope was warranted, such as the use of watershed boundaries to analyze cumulative effects to desert washes. The analysis of impacts from the inadvertent introduction and spread of invasive weeds considered species known to infest the communities from which most equipment and employee vehicle traffic will originate in southern Nevada. The analysis of the project's cumulative impacts to groundwater-dependent ecosystems makes a broader, regional evaluation of biological resources within the context or geographic scope of the Death Valley Regional Groundwater Flow System (DVRFS), which includes Pahrump Valley.

Because many species found in Pahrump Valley also extends into the state of Nevada, staff considered the potential for cumulative impacts from the Nevada side of the valley, or further, depending on the habitat needs and movement capability of each species, and the scope of the hydrological and vegetative cumulative impacts. Impacts to the Nevada portion of local population could indirectly affect the viability of the species' range in California; fragmentation of formerly large contiguous populations into smaller, isolated occurrences is generally believed to increase extinction risk, and reproduction needs depends on proximity to neighboring metapopulations. Ensuring connectivity between patches of suitable habitat and metapopulations helps to ensure species vigor and persistence.

EXISTING CUMULATIVE CONDITIONS

Over the past two hundred years, California's southern deserts have been subject to major human-induced changes that have threatened native plant and animal communities by habitat loss, fragmentation, and degradation. Some of the most conspicuous threats are those activities that have resulted in large scale habitat loss due to urbanization, agricultural uses, landfills, military operations, mining activities, as well as activities that fragment and degrade habitats such as roads, off-highway vehicle activity, recreational use, and grazing (Berry et al. 1996; Boarman and Sazaki 2006; Avery 1997; Jennings 1997). In addition, these development pressures facilitated the introduction of non-native plant species and increases in predators such as ravens, which contribute to population declines and range contractions for many special-status plant and animal species (Boarman 2002).

PROJECTS CONTRIBUTING TO CUMULATIVE EFFECTS TO BIOLOGICAL RESOURCES

Past and present projects in Pahrump Valley and adjacent areas in the northeastern Mojave Desert that have contributed to cumulative impacts to special-status species found in the project study area include:

- Conversion of natural communities for agriculture and groundwater pumping for irrigated agriculture (mostly cotton and alfalfa) during the last century, fragmenting and isolating populations; altering surface drainage patterns (dispersal pathways), surface and groundwater hydrology, introducing agricultural weeds into the local ecosystem;

- Development of military reservations and military training activities;
- Past and present residential, commercial, and industrial development in the Pahrump environs, fragmenting populations, increasing the risk of fire, off road vehicles, and the spread of invasive plants;
- Construction of highways and other roads, modifying surface runoff patterns and acting as vectors for the spread of invasive plants;
- Transmission corridors, another common vector for weed spread; and
- BLM grazing allotments (sheep and cattle grazing), which also contributed to the spread of invasive weeds, particularly red brome and cheat grass.

Reasonably foreseeable future actions that are expected to contribute to cumulative impacts include:

- Pahrump Valley General Aviation Airport (650 acres on BLM lands);
- Element Power Solar project (2,560 acres on BLM lands);
- PSI Amargosa (Pacific Solar) (PV project on 1,700 acres of BLM lands);
- Amargosa Farm (4,350 acres of BLM lands);
- Silver State Solar Project (600 acres on BLM lands);
- Sandy Valley Solar Project (a 15,190-acre BrightSource Energy project on BLM lands);
- Table Mountain (8,549 acres on BLM lands);
- South Solar Ridge (8,549 acres on BLM lands);
- Southern Owens Valley Solar Ranch (3,100 acres on private lands);
- Lathrop Wells Solar (5,336 acres on BLM lands);
- Solar Express Transmission (122 miles on undetermined right of ways);
- St. Therese Mission (17.5 acres on private lands);
- Urban expansion in the Pahrump Valley and Sandy Valley areas;
- HHSEGS Hidden Hills Valley Electric Transmission Project (10 acres on BLM lands);
- Searchlight Wind Energy (18,949 acres on BLM and public lands);
- Stateline Solar Farm (2,114 acres on BLM lands in San Bernardino County); and
- Infrastructure development associated with urban expansion and renewable energy development

Approximately two percent of Inyo County is in private ownership. Large tracts of land are in public trust, held by the BLM. The BLM manages land for multiple uses. While maintenance of habitat features and functions is a priority, the BLM must allow uses that stand in direct conflict with many conservation goals. Mining claims, grazing leases, renewable energy and other project development, and recreational uses may all be permittable under certain circumstances.

ANALYSIS OF CUMULATIVE EFFECTS TO BIOLOGICAL RESOURCES

This qualitative assessment of cumulative effects was based on a review of the project's onsite and offsite survey data, databases, literature, and consultation with regional experts. In addition to the combined effects of habitat loss and direct mortality, staff identified a range of indirect effects that combine with similar effects from other past, present, and foreseeable future project that must be factored into the cumulative analysis. This suite of indirect impacts to which the project would contribute includes: increase in ravens, coyotes, and other predators; introduction and spread of invasive weeds; the effects of groundwater pumping on springs and other dependent ecosystems; altered surface drainage patterns; fragmentation; increased risk of fire; erosion and sedimentation of streams; potential for the introduction and or spread of wildlife diseases; diminished habitat values from increased noise and lighting; exotic wildlife invasions; dust and air pollution; road kills; human disturbance; and other factors contributing to a significant cumulative effect.

Cumulative Impacts – Special-status Wildlife

Desert Tortoise

The geographic extent of the analysis of cumulative impacts to desert tortoise is the range of the Mojave Desert portion of the population with special emphasis on the Eastern Mojave Recovery Unit, as recognized by the USFWS (USFWS 2011a). The Mojave population's range encompasses the area north and west of the Colorado River in the Mojave and Sonoran/Colorado deserts in California, southern Nevada, southwestern Utah, and extreme northwestern Arizona (USFWS 2011a).

The proposed project is located in the Pahrump Valley which occurs in the south-central portion of the Eastern Recovery Unit. The Pahrump Valley has direct connectivity to adjacent valleys within the Amargosa Desert region in California and Nevada. However, the USFWS 2011 Recovery Plan noted that genetic differentiation occurred for desert tortoises at the Amargosa Desert and Pahrump Valley sites. This area is more confined than other units and movement has been more confined by the adjacent mountains and Death Valley. For this region a lack of desert tortoise habitat dedicated to conservation to the west of the Spring Mountains and in Las Vegas Valley highlights the need for careful management in these areas to maintain connectivity among populations and the genetic variation within this recovery unit (USGS 2011). Corridors north and south of the Spring Mountains warrant particular management attention to prevent genetic isolation of populations on either side of this mountain range. Ongoing development in these areas, including in and near Pahrump Valley contributes to the decline in habitat and may further isolate populations of desert tortoise.

To promote substantial populations for desert tortoise recovery in the Mojave population's range, the 1994 Recovery Plan (USFWS) designated six Recovery Units traversing all four abovementioned states. In 2011 the Recovery Units were revised to better reflect genetic and geographic boundaries and were reduced to five units. The establishment of the Recovery Units is intended to protect the species and its habitat requirements so that desert tortoises can maintain self-sustaining within each recovery unit into the future. However, desert tortoises are slow-growing animals that do not reach sexual maturity until age 15 to 20 years and have a low reproductive rate over a long period of reproductive potential; these life history characteristics hinder recovery since tortoises experience high mortality rates prior to reaching sexual maturity (USFWS 2011a).

Urbanization/loss of habitat, deteriorating habitat quality from off-highway vehicles, invasion of non-native grasses and weeds, predation by ravens, collection, livestock grazing, and spread of an upper respiratory tract disease have all contributed to the decline of desert tortoise populations. In response to this decline, large expanses of desert tortoise critical habitat and numerous ACEC/DWMA areas have been identified or established within the NEMO southern recovery unit planning area. Cumulatively, the impacts of these projects to desert tortoises in the Mojave population would be significant.

The proposed project's incremental contribution to cumulative impacts to desert tortoise would be similar to the impacts of other solar developments in the range of the Mojave population, and would include loss of habitat, interference with regional movement, stress and potentially illness or mortality from translocation, and indirect impacts from an increase in predators such as the common raven. The current USGS Desert Tortoise Habitat Model (Nussear et al. 2009) maps the project area and portions of the Pahrump Valley as "Medium Quality" desert tortoise habitat, with scores of 0.7 to 0.9 on a scale of 0 to 1.0 (0 being the lowest quality and 1.0 being the highest quality). The model is a predictive model for mapping the potential distribution of desert tortoise habitat and is useful tool for evaluating different land-use issues that tortoises face at a landscape scale. It is not intended to be used, or viewed, as a substitute for ground-based and site-specific field surveys. Model scores reflect a hypothesized habitat potential given the range of environmental conditions where tortoise occurrence was documented. The report (Nussear et al. 2009) specifically states:

> "*. . . there are likely areas of potential habitat for which habitat potential was not predicted to be high, and likewise, areas of low potential for which the model predicted higher potential. Finally, the map of desert tortoise potential habitat that we present does not account either for anthropogenic effects, such as urban development, habitat destruction, or fragmentation, or for natural disturbances, such as fire, which might have rendered potential habitat into habitat with much lower potential in recent years*".

Based on staff's field observations, surveys conducted by the applicant, and historic land uses in portions of the project site, desert tortoise habitat quality on the project site ranges from good to somewhat degraded. Even so, the site is occupied habitat and the observations of desert tortoises of different age class, numerous burrows, and their sign suggest the site remains actively populated. Construction of the proposed project would have permanent and long-term impacts to approximately 3,258 acres of habitat at the solar field site. The project would also disturb habitat in occupied habitat in Nevada to support linear facilities including a natural gas pipeline and transmission line. The NEMO indicates there are approximately 172,000 acres of Class III desert tortoise in the Pahrump Valley. This area is defined by the NEMO as "the Pahrump Valley is bounded by the Nopah Range on the west and northwest, the Nevada State line on the east, the town of Pahrump on the northeast, and the Inyo/San Bernardino county line on the south”. Construction of the proposed project would result in a 0.02 percent loss of this existing habitat solely within the Pahrump Valley. Region wide the loss of habitat would be extremely low.

Mitigation measures to reduce project-level impacts to desert tortoise include: construction minimization measures (**BIO-8**); clearance surveys and exclusion fencing (**BIO-9**); preparation and implementation of a translocation plan (**BIO-10**); acquisition and conservation of compensation lands (**BIO-12**); and preparation and implementation of a plan to control ravens (**BIO-13**). Together these measures would reduce project-level impacts of the solar generator, generator tie-line, and interconnector substation to less than significant under CEQA and would fully mitigate those impacts under CESA. After implementation of these measures, the project's contribution to significant cumulative effects to desert tortoises would not be cumulatively considerable.

Nelson’s Bighorn Sheep

The proposed project would not impact any identified connectivity corridors as identified by CDFG, or wildlife habitat management areas (WHMA) designated by BLM as protective of bighorn sheep habitat. Large-scale renewable energy development could significantly impact gene flow between sheep populations through significant cumulative impacts to connectivity corridors, potentially decreasing the viability of the metapopulation of bighorn sheep. The project itself, however, would have no direct contribution to the loss of habitat within the identified connectivity corridors or the WHMAs.

Proposed future projects could also cumulatively and significantly affect bighorn sheep through the loss of spring foraging habitat on the upper bajadas adjacent to occupied range. The impact of development within a 1-mile buffer from the base of occupied ranges (or potentially restored populations in unoccupied ranges) was assessed for potential impacts to bighorn sheep foraging habitat. No significant direct impacts to bighorn sheep WHMAs, connectivity corridors, or spring foraging habitat would result from the proposed project; therefore, no mitigation measures relating to bighorn sheep are proposed by staff.

The project’s contribution to the loss of habitat, increased noise and lighting, road kills, fragmentation, and the spread of invasive pest plants is cumulatively considerable. However, the project’s contribution to these effects would be reduced to a level less than cumulatively considerable through implementation of several conditions of certification designed to address indirect effects as well as habitat loss. These include completion of badger and kit fox specific pre-construction surveys, as well as impact avoidance and minimization measures in **BIO-14**; **BIO-8** (General Impact Avoidance and Minimization Measures) contains specific measures to minimize noise and lighting impacts; **BIO-18** (Weed Management Plan); **BIO-12** to acquire 6,358 acres of desert tortoise habitat, which is expected to contain suitable habitat for badger and kit fox; and **BIO-22**, which requires acquisition and protection of desert washes and adjacent habitat within the local watersheds, which will minimize future fragmentation in the vicinity of the project area by protecting lands from future development.

Although the project would be expected to affect wildlife movement and connectivity across the Pahrump Valley, the project is not expected to significantly affect—directly, indirectly, or cumulatively—bighorn sheep movement.

American Badger and Desert Kit Fox

Reasonably anticipated cumulative effects considered by staff in a qualitative manner include habitat fragmentation and the diminished habitat values of remaining habitat from increased noise, lighting, exotic plant invasions including their ability to fuel wildfires and alter fire regimes, exotic wildlife invasions, dust and air pollution, increase in predators, agriculture, urban development and the consequences of human intrusion into previously undisturbed habitats: hunting, use of rodenticides and other poisons, road kills, trapping, and human disturbance.

Approximately 63,000 acres of habitat, of which a large portion may be suitable for American badger and desert kit fox foraging or denning habitat, would be displaced by proposed future projects within the greater region of the project. This cumulative effect, when combined with the anticipated indirect effects to remaining habitat and populations described above, is cumulatively considerable. The project's contribution to the loss of habitat, increased noise and lighting, road kills, fragmentation, and the spread of invasive pest plants is cumulatively considerable. However, the project's contribution to these effects would be reduced to a level less than cumulatively considerable through implementation of several conditions of certification designed to address indirect effects as well as habitat loss. These include completion of badger and kit fox specific pre-construction surveys, as well as impact avoidance and minimization measures in **BIO-14**; **BIO-8** (General Impact Avoidance and Minimization Measures) contains specific measures to minimize noise and lighting impacts; **BIO-18** (Weed Management Plan); **BIO-12** to acquire 6,358 acres of desert tortoise habitat, which is expected to contain suitable habitat for badger and kit fox; and **BIO-22**, which requires acquisition and protection of desert washes and adjacent habitat within the local watersheds, which will minimize future fragmentation in the vicinity of the project area by protecting lands from future development.

Eagles and Passerine Birds

An estimated 63,000 acres of habitat for terrestrial and avian species will be lost if the projects listed for the cumulative analysis are constructed. This effect, when combined with the anticipated indirect effects to remaining habitat and populations described above, is cumulatively considerable. The project's contribution to the loss of habitat, increased noise and lighting, road kills, habitat fragmentation, potential to spread of invasive species, and hydrological impacts would be cumulatively considerable. At this time, staff is unable to make determinations of cumulative effects stemming from loss of golden eagle and migratory birds due to operation of the project. Project operation could result in injury or mortality (take) of golden eagle due to exposure to solar flux and or irradiance, and injury or mortality to migratory birds. Staff is expecting further data from the applicant regarding project impacts and feasible mitigation.

The project's contribution to these effects would be reduced through implementation of several conditions of certification designed to address direct and indirect effects as well as habitat loss; however staff observes that residual impacts of project operation are still expected. These conditions of certification include **BIO-1** through **BIO-8** which requires avoidance and minimization measures during the life of the project, construction monitoring, worker training, fugitive dust control, fire prevention, weed management, and the presence of the designated biologist and/or biological monitors on the project site at all times during ground disturbance or any other construction activity. **BIO-8** also requires transmission lines and all electrical components to be designed, installed, and maintained in accordance with the Avian Power Line Interaction Committee guidelines. **BIO-15** the development of an avian and bat plan. **BIO-16** requires pre-construction monitoring and avoidance for nesting birds. **BIO-23** requires monitoring of ground water to ensure impacts to groundwater-dependent vegetation does not result in habitat degradation for these species. **BIO-23** also requires remedial action if monitoring detects impending ecosystem changes. **BIO-12** directs the acquisition of 6,358 acres of desert tortoise habitat, which is expected to contain suitable habitat for eagles and passerines; and **BIO-22**, which requires acquisition and protection of desert washes and adjacent habitat within the local watersheds, which will minimize future fragmentation in the vicinity of the project area by protecting lands from future development, and also provide high quality habitat for eagles and passerines.

Western Burrowing Owl

The project's contribution to the cumulative loss of burrowing owl habitat is comparable to the cumulative loss of badger and kit fox habitat, described above. The potential loss of habitat from all proposed future projects is significant, and the project's contribution to that effect is cumulatively considerable. The project will also contribute to a cumulatively considerable impact from habitat fragmentation, degradation of groundwater-dependent vegetation, edge effects, noise and lighting, increased road kills, increased risk of fire from weed invasion and increased ignition sources (vehicles), and an increase in avian predators, all of which ultimately degrade the function and values of the remaining habitat. The project's contribution to these indirect effects and loss of habitat would be mitigated to a level less than cumulatively considerable through implementation of **BIO-17** preconstruction surveys, avoidance and minimization measures, and compensatory mitigation; measures for addressing impacts from noise, lighting, and traffic (road kills) through a variety of measures in **BIO-8**; **BIO-18** (Weed Management Plan) to address the project's contribution to the spread of invasive weeds; **BIO-12** for acquisition of 6,358 acres of desert tortoise habitat, which is likely to contain suitable habitat burrowing owls; and **BIO-22** which requires acquisition and protection of desert washes and adjacent habitat within the local watersheds, which will minimize future fragmentation in the greater vicinity of the project by protecting the acquired desert wash habitat from future development.

Special-Status Bats

Approximately 63,000 acres of habitat could be lost to future development, of which portions may be suitable for bat roosting or foraging habitat. The project would not impact any bat roosts, so the project's contribution to the cumulative loss of special-status bat roosting habitat is not considered an issue. However, staff considers the loss of foraging habitat to be cumulatively significant. The project could contribute to a cumulatively considerable impact within the aquifer system underlying the Pahrump Valley. This effect is cumulatively considerable when combined with the anticipated indirect effects to remaining foraging habitat and bat populations. These indirect effects include fragment habitat, degrade groundwater-dependent vegetation, increase competition for remaining food and roost sources, promote weeds and habitat degradation, and change in insect abundance. Operational impacts of the proposed project may also be cumulatively significant when considered with solar and wind development.

The project's contribution to these impacts and loss of habitat would be mitigated to a level less than cumulatively considerable through **WATER SUPPLY-4** (Groundwater Elevation Monitoring) and **BIO-23** (Groundwater-dependent Vegetation Monitoring Plan), which ensure groundwater pumping would minimize potential impacts to groundwater-dependent ecosystems, including springs; **BIO-18** (Weed Management Plan) which will address the project's contribution to the spread of invasive weeds; and **BIO-22** which requires acquisition and protection of desert washes and adjacent habitat within the local watersheds, which could preserve important foraging and roosting habitat.

Cumulative Impacts – Special-status Plants

The geographic scope of the analysis of cumulative effects to special-status plants encompasses the range of the affected species in California, and portions of the local population that extend into Nevada. The qualitative assessment was based on a review of the project's offsite survey data, databases, literature, and consultation with regional experts.

In addition to the project's contribution to the reduction and fragmentation of local populations from construction, the project also contributes to the cumulative, interactive, and synergistic impacts of multiple indirect threats from a variety of sources, including past, present, and future urban development, agriculture (crop lands), grazing, roads and other infrastructure development.

Past and present projects in Pahrump Valley and adjacent valleys that may have contributed to cumulative impacts to special-status plants found in the project study area include:

- Conversion of natural communities for agriculture and groundwater pumping for irrigated agriculture (mostly cotton and alfalfa) during the last century, fragmenting and isolating populations; altering surface drainage patterns (dispersal pathways), surface and groundwater hydrology, introducing agricultural weeds into the local ecosystem;
- Past and present residential, commercial, and industrial development in the Pahrump environs, including the Charleston View subdivision, fragmenting populations, increasing the risk of fire, ORV, and the spread of invasive plants;
- Construction of highways and other roads, modifying surface runoff patterns and acting as vectors for the spread of invasive plants;
- Transmission corridors, another common vector for weed spread; and
- BLM grazing allotments (sheep and cattle grazing), which also contributed to the spread of invasive weeds, particularly red brome and cheat grass.

Reasonably foreseeable future actions that are expected to contribute to cumulative impacts to special-status plants:

- Pahrump Valley General Aviation Airport
- Element Power Solar project
- PSI Amargosa (Pacific Solar) PV project
- Sandy Valley Solar project (a BrightSource Energy project)
- St. Therese Mission (a commercial facility)
- Urban expansion in the Pahrump Valley and Sandy Valley areas;
- HHSEGS Hidden Hills Valley Electric Transmission Project;
- Infrastructure development associated with urban expansion and renewable energy development

These future projects are expected to combine with the project's effects of fragmentation and isolation of populations, introduction and spread of invasive weeds, increased risk of fire, altered surface drainage patterns, and the interruption of dispersal pathways. The BLM Nevada botanist confirmed the projects listed above would have a cumulatively significant impact of the Nevada rare species Pahrump Valley buckwheat and Nye milk-vetch (Edwards pers. comm. 2012).

Large reserves of BLM or National Park Service wilderness lands in the project vicinity are not expected to contain occurrences of the special-status plants found in the project area, or to buffer or minimize cumulative effects. The wilderness areas are drawn around local mountain ranges and do not include the basin habitats known to support these species.

Where BLM lands in Pahrump and adjacent valleys do contain suitable habitat for the affected species, the lands outside ACECs have a multiple use management designation that limits the ability of the agency to protect the occurrences, in perpetuity, from renewable energy development or other authorized mixed uses.

Any quantitative analyses of the extent of a species known macro-habitat should not be misconstrued to conclude that the habitat is potentially occupied by special-status; plants are sessile organisms with very specific microhabitat requirements that are not well understood. The failure to find many new occurrences of most of the affected species after two years of focused offsite surveys is a testament to their rarity. The actual distribution of rare plants within their general habitat preferences is typically confined to small, scattered and infrequent occurrences within an already restricted range. Alternately, rare plants can also sometimes be locally abundant, but highly restricted in their range, such as Pahrump Valley buckwheat.

The most significant of cumulative effects to special-status plants in the region include: fragmentation and isolation of populations; introduction and spread of weeds; increased risk of fire; and fires of greater intensity and ecological damage from the increase and spread of annual grasses.

Staff considered the mitigated effect of the project after implementation of conditions of certification **BIO-19** (Special-status Plant Avoidance & Minimization Measures) and **BIO-20** (Special-status Plant Compensatory Mitigation). No monitoring or management of adjacent offsite special-status plant occurrences is proposed because adjacent lands are not owned or accessible to the project. Nor can the project manage any weeds that may have spread to offsite occurrences or been introduced into the vicinity on the contaminated vehicles and equipment of employees and contractors. Avoidance and minimization measures included in **BIO-19** will minimize the project's impacts to occurrences immediately adjacent to the project boundary. However, without monitoring and adaptive management of project-related weed occurrences offsite, fire prevention measures, and compensatory mitigation at ratios adequate to address the net loss of occurrences the project effects – although individually minor – are cumulatively considerable, when viewed in connection with the similar effects of past, present, and foreseeable future projects in the Pahrump Valley environs. These residual effects would be addressed with the addition of the following fire prevention measures:

- **BIO-20** (Special-status Plant Compensatory Mitigation) - requires mitigation at ratios greater than 1:1 to address the net loss of occurrences and the project's contribution to fragmentation of affected species;

- **BIO-6** (Worker Environmental Awareness Program) – measures added to ensure worker awareness of special-status plants, weeds, and fire;

- **BIO-18** (Weed Management Plan) – fire prevention measures added, including prohibiting the use of mowers and other mechanical methods of weed control during periods of high fire risk, requiring mowing be conducted during the early morning (low risk) hours, prohibiting disking (which increases weeds and thus the flammability of vegetation), and requiring basic fire prevention measures during mowing (contact information for fire personnel, a live water supply, shovels and extinguishers);

- **BIO-8** (Avoidance and Minimization Measures) – measures added for minimizing weed vectors and fire ignition sources.

  - Because washes are important dispersal pathways for rare plants, additional measures were added to **BIO-22** (State Waters Compensatory Mitigation and Avoidance & Minimization Measures) for minimizing the effects of erosion and sedimentation downstream or offsite and minimizing alteration of geomorphic and hydrologic functions downstream.

  - Conditions of certification **BIO-7** (BRMIMP) and a new condition, **BIO-21** (Qualified Botanist) will ensure the full and timely implementation of the measures described above under the supervision of a qualified botanist or vegetation ecologist.

Cumulative Impacts – Introduction and Spread of Invasive weeds

Nearly all of the past and present urban and agricultural development has occurred in northern Pahrump Valley; however, past grazing and other smaller residential and agricultural operations have impacted the southern Pahrump Valley. Transmission corridors, railroads, paved and unpaved roads, and off-road vehicle routes are particularly effective as conduits for the spread of weeds, and these features have in the past and continue to spread weeds throughout the region.

Past and present projects or actions in the area between Pahrump Valley, Las Vegas, the project site, and Death Valley National Park that have contributed to the cumulative spread of invasive weeds include:

- Livestock grazing in Pahrump and adjacent valleys during the last and prior centuries, which introduced weeds on contaminated feed and animals, and established by overgrazing and poorly timed grazing, which favors weeds over native species;
- Construction and operation of highways 160, 178, 127, and 190 and associated local and interstate travel between Death Valley National Park, Pahrump, and Las Vegas; transportation routes are major vectors for long-distance dispersal of invasive plants;
- Tecopa Railroad and other area railroads from the late 19^{th} and early 20^{th} century fostered invasions for many weedy species, such as cheat grass and Russian thistle (Brooks & Pyke 2002);
- Residential development in Pahrump and Charleston View has caused a general increase in vehicle traffic, which facilitates the spread of weeds. Area residential development also promotes increased off-road vehicle use, which in turn introduces weeds into previously uninfested areas. The increase in weeds, particularly annual grasses, increases the frequency of fire, which in turn promotes further habitat conversions to weed-dominated habitats;
- Construction and maintenance of gas and electric transmission corridors are major vectors for the past, present and continued spread of invasive plants;
- Excessive groundwater pumping in Pahrump Valley for irrigated agriculture (mostly cotton and alfalfa) during the last century significantly lowered the basin groundwater table, and lowering groundwater favors the establishment of salt cedar over native mesquite in riparian areas.

Reasonably foreseeable future actions that are expected to contribute to cumulative spread of invasive weeds:

- Pahrump Valley General Aviation Airport, and the associated soil disturbance and increase in vehicle traffic;
- Element Power Solar project and its concomitant construction-related soil disturbance, particularly along linears, and increase in vehicle traffic;
- Pacific Solar project, construction-related soil disturbance, construction and maintenance of linears, and increase in vehicle traffic;
- Sandy Valley Solar project, construction-related soil disturbance, construction and maintenance of linears, and a corresponding increase in vehicle traffic;
- St. Therese Mission (a commercial facility), associated soil disturbance and increase in vehicle traffic;

- Urban expansion in the Pahrump Valley and Sandy Valley areas, associated soil disturbance, ORV, increased risk of fire and construction-related soil disturbance, and significant increase in vehicle traffic, which facilitates the spread of weeds on infected tires and undercarriage;
- Hidden Hills Valley Electric Transmission Project; and
- Infrastructure development and improvements associated with urban expansion and other renewable energy development; transmission and other corridors are major vectors.

The past, present, and foreseeable future projects listed above combine with the project's contribution to the spread of weeds and contribute to a cumulatively considerable effect. The effects of weeds are insidious and synergistic, and affect not only biological resources but also recreational and agricultural resources, and public safety. Invasive species rank second only to habitat destruction in causing species endangerment across the United States (Brooks & Pyke 2002).

Staff considered the mitigated effect of the project after implementation of **BIO-18** (Weed Management Plan). The Inyo-Mono County Agricultural Commissioner expressed particular concern – in comment letters and public workshops -- about the high potential for the employee commuter traffic and contractors to introduce new and virulent weed species into the area from the communities of Pahrump and Las Vegas. Because the project cannot monitor project-related increases in weeds along roads off the project site**, BIO-18** includes a requirement to pay a fee, as requested by Agricultural Commissioner, for increased monitoring and abatement costs.

Under Section 5421 of the California Food and Agriculture Code, the State, through its agricultural commissioner's, has the authority to require eradication or control. Under Section 5430 "…the amount which is incurred or expended by the county in the abatement is a lien on the land against which the expense is chargeable."

Other indirect effects that are individually minor but cumulatively considerable include an increased risk of fire from the proliferation of weeds onsite and along area roads from the increased traffic and increase in ignition sources. These effects would be addressed with the addition of fire prevention measures in **BIO-8** (General Avoidance and Minimization Measures), **BIO-6** (Worker Environmental Awareness Program), and **BIO-18. BIO-21** (Qualified Botanist) requires the weed plan be prepared by a qualified botanist or vegetation ecologist. With implementation of these additional measures, the project's contribution to these cumulative effects would be less than cumulatively considerable.

Cumulative Impacts – Groundwater-dependent Ecosystems

Prior to agricultural and urban development in southern Nevada, the distribution of mesquite and acacia woodlands was much greater; the Las Vegas Valley was a 3 mile by 12 mile expanse of mesquite and acacia woodlands when the first Europeans settled here (Paher 1971). The Virgin, Muddy, and Colorado rivers are also believed to have supported more extensive and denser stands of mesquite (Crampton et al. 2006).

The *Manual of California Vegetation* (Sawyer et al. 2009) reports that groundwater pumping in California is "a serious threat in many locations and has led to the decline of numerous stands." Sawyer et al. (2009) also report that the invasive salt cedar has invaded stands along much of the Colorado River, and other rivers and desert wetlands in California; salt cedar invasion is a common sight along hydrologically altered streams.

Firewood cutting has decimated many stands of mesquite in its range in California and Nevada (Sawyer et al. 2009; Crampton et al. 2006). Most firewood cutting has occurred near urban areas. In the California Mojave Desert region, the most extensive stands of mesquite remaining today are reported at Tecopa (Sawyer et al. 2006), approximately 20 miles west of the Nopah Range.

The most severe future threats to mesquite habitats are urbanization and water development/management, and, to a lesser degree, exotic plants, fire, and conversion to agriculture (Crampton et al. 2006).

As Nevada's most heavily allocated groundwater basin, Pahrump Valley has seen its population increase exponentially over the past 30 years. Data obtained from the Nevada Division of Water Resources (NVDWR) by Comartin (2010) demonstrate that annual pumping has continuously exceeded this sustainable basin yield estimate for over 50 years resulting in considerable water level declines.

The vast majority of the population growth has been in the Nye County, Nevada portion of the valley; the California portion remains sparsely populated. Until recently, there has been relatively little pumping in the southern portion of the valley near Stump Spring, but the recent push for renewable energy development has placed these important resources at risk. Declining groundwater elevations today are seen as far south as Stump Spring; however, the decline is greatest in the northern part of the valley. Mesquite stands closest to Pahrump are in obvious decline from lowering water tables but the well at Stump Spring has shown a steady background decline of approximately 0.3 feet per year.

Pahrump Valley currently has the highest density of domestic wells (approximately 11,000) in Nevada, and consequently is the most over-allocated groundwater basin in the state. The majority of domestic wells are drilled at an interval between 140 and 160 feet below land surface (Buqo 2006) and are vulnerable to substantial water table declines (Comartin 2010). Although extraction rates have steadily decreased since the late 1960s, current pumping rates of approximately 24,000 ac-ft/yr still significantly exceed the sustainable basin yield estimate of 19,000 ac-ft/yr estimated by Harrill (1986). If the population increases to the projected 50,000 residents by 2050 (Buqo 2006), the depletion of Pahrump Valley groundwater resources will continue.

The cumulative effect of urban growth in Pahrump, Nevada, where water rights are dangerously over-appropriated, and in California, where they are essentially unregulated; appropriated rights in Pahrump are 5 times greater than the basins' perennial groundwater yield. Compounding the impacts of over-appropriation, there is no single, coordinated groundwater management entity to ensure that future development on both sides of the bi-state basin will be sensitive to the groundwater needs of the mesquite habitats and other groundwater-dependent plant and wildlife resources.

The strain placed on the Pahrump Valley groundwater system through unsustainable extraction rates throughout the valley threatens the future viability of the entire Pahrump Valley Metapatch of mesquite woodlands and coppice dunes.

Past and present impacts in Pahrump Valley groundwater basin that have already contributed to water table declines and impacts to area springs and mesquite habitats include:

- Groundwater pumping for irrigated agricultural operations during the last century (mostly cotton and alfalfa);
- Past and present groundwater pumping for residential, commercial, and industrial development in the Pahrump environs; and
- Construction of highways and other roads that modify the hydrologic balance of an area through increases in impermeable surfaces and modifications of surface runoff patterns.

The southern portion of the basin, where the project is located, has experienced very little of the past and present groundwater pumping for agricultural and urban uses. Declines in the northern portion of the basin are significantly greater than declines experienced in the southern portion, to date. Nevertheless, declines in water levels at the springs east of the project parallel the declines throughout the northern portion of the basin.

Reasonably foreseeable future actions in the southern portion of the Pahrump groundwater basin that were are expected to combine with the project's effects on area springs and mesquite habitats, or considered in the analysis, include:

- Pahrump Valley General Aviation Airport – acre feet/year (afy) groundwater use unknown
- PSI Amargosa PV Project – 0 afy
- Sandy Valley (BrightSource Energy Solar Partners) – 170 afy
- Element Power PV Solar Project – 5-7 afy
- St. Therese Mission (a commercial facility)– afy groundwater use unknown
- Climate change is expected to exacerbate already declining water levels and increase the demand for groundwater in the local basin.

The past, present, and foreseeable future projects listed above would combine with the project's contribution to the loss or degradation of remaining mesquite woodland ecosystems and their dependent common and special-status species – and contribute to a significant cumulative effect.

Although there is potential that the impact at Stump Spring ACEC could be individually minor, even seemingly minor impacts can be cumulatively considerable if they affect an extremely rare or ecologically significant resource.

WATER SUPPLY Figure 22 shows that the potential cumulative water level decline at Stump Springs could be greater than 60 feet. Although the sandy valley project is the primary contributor, the project nevertheless contributes to a cumulatively significant impact. The potential for the fault zone to buffer the project impacts to Stump Springs is speculative; monitoring wells across the fault zone would be required to assess the project's contribution to this effect. Fault zones more typically provide a partial – not complete – barrier to groundwater flow (Belcher pers. comm.; Comartin 2010).

Regarding a drawdown impact from cumulative pumping on the Amargosa River, the Water Supply analysis concluded there is inadequate information available to quantify the hydraulic connection between the basin and river. Given the lack of evidence for a hydraulic connection, the relatively large intervening distance (about 20 miles), uncertainty in potential flow barriers, permeability contrasts within the subsurface, and the presence of the fault zone which would isolate pumping effects from the Sandy Valley site, staff concluded that a significant cumulative impact at the Amargosa River due to project pumping is unlikely. However, **WATER SUPPLY-1** which requires an offset of project water use in the local groundwater basin would ensure there is likely no net cumulative overall change in subsurface outflow from the PVGB that might affect the Amargosa River.

Although there is potential that the impact at Stump Spring ACEC could be individually minor, even seemingly minor impacts can be cumulatively considerable if they affect an extremely rare or ecologically significant resource.

Given the cumulative concerns described above, combined with the limited quantity and reliability of the data, and the ecological significance and sensitivity of the resources at risk, a conservative approach must be applied that combines long-term groundwater elevation monitoring and monitoring the health of the mesquite, with clear and detailed triggers for adaptive action if impending impacts are detected.

Long-term vegetation monitoring data are capable of providing early warning signs of impending changes in ecosystem processes (Patten et al. 2007). Combined with the data on groundwater and climate, sampling of vegetation responses can provide sensitive metrics for assessing ecological changes over time. However, to ensure that the information is appropriate for management, it is important that monitoring and analysis be designed to test for magnitudes of changes rather than just existence of change, a phenomenon that can occur under disturbance or non-disturbance conditions.

Staff consulted local and regional experts in groundwater hydrology, the impacts of groundwater pumping on dependent resources, and sampling and monitoring plant populations and prepared a peer-reviewed condition of certification (**BIO-23**) that would ensure the project's effects are rendered less than cumulatively considerable.

Conditions of certification **BIO-23** (Groundwater-dependent Vegetation Monitoring) and **WATER SUPPLY-4** (Groundwater Level Monitoring) would minimize the project's contribution to cumulative impacts to Stump Springs and other groundwater-dependent resources in the local basin.

Under **BIO-23**, if water level monitoring, as described in WATER SUPPLY-4, identifies a 0.5 foot or greater water level decline at the property boundary due to project pumping, the project owner shall cease pumping. Pumping cannot resume unless the project provides evidence, subject to review and approval by the CPM and interested agencies, that either: 1) the pumping can be reduced or modified to maintain groundwater levels above the 0.5 ft. drawdown threshold at the project boundary; 2) the drawdown trigger was exceeded due to factors other than the project pumping and the project did not contribute to the drawdown; or 3) through vegetation monitoring and soil coring described in the condition, and predictive hydrologic trend analysis described in **WATER SUPPLY-4**, a greater groundwater drawdown will not result in adverse impacts to the groundwater-dependent vegetation from which it cannot recover fully in one season.

A full range of mitigation options was considered; these are discussed in detail under "Impacts to Groundwater-dependent Ecosystems" subsection of this FSA section, including the rationale for the proposed and the rejected mitigation options.

Cumulative Impacts – Desert Washes

The geographic scope for the analysis of cumulative impacts to desert washes encompassed the Pahrump Valley watershed. Pahrump Valley Playa, located 3 miles northwest of the project, is the receiving basin for the desert washes that drain the watershed. The desert washes that cross the project site are alluvial fan distributary channels that drain the western flank of the Spring Mountains in Nevada.

Although the project would attempt to maintain existing surface drainage, rather than divert the runoff around the project perimeter, staff considers the perimeter exclusion fencing, and regular vegetation mowing and spraying and road construction and maintenance, and human activity to be a significant impact to the habitat functions and value of the streams.

Past and present projects in Pahrump Valley and adjacent valleys that have contributed to cumulative impacts to desert washes include:

- Conversion of basin and alluvial fan habitats for agriculture during the last century, which lowered groundwater tables and dried springs and spring channels and affected the base flows of spring-fed streams, and spread the highly invasive salt cedar into riparian areas and degraded habitat quality;
- Past and present residential, commercial, and industrial development in the Pahrump Valley watershed, which fragmented stream habitat, diverted flows and altered surface and groundwater hydrology, increased the risk of fire in riparian areas, increased ORV and the spread of invasive plants along washes, and increased erosion and sedimentation; and

- Construction of highways and other roads, modifying surface runoff patterns and acting as vectors for the spread of invasive plants;

Reasonably foreseeable future actions that are expected to contribute to cumulative impacts to desert washes:

- Pahrump Valley General Aviation Airport
- Element Power Solar project
- Pacific Solar project
- Sandy Valley Solar project
- St. Therese Mission (a commercial facility)
- Urban expansion in the Pahrump Valley and Sandy Valley areas
- Infrastructure development associated with urban expansion and renewable energy development (paved and unpaved maintenance roads, transmission lines (gas and electric, underground and overhead)

The effects of these past, present, and foreseeable future projects combine with the project's effects and contribute to a significant cumulative effect on desert washes in the local watershed, particularly on the habitat functions and value of the washes. Desert washes are also important dispersal pathways for the seed of common and special-status plants, and where the habitat is distinct from the adjacent uplands in composition, density, or structure, they may provide important habitat values that are not present in the adjacent uplands.

Staff considered the mitigated effect of the project after implementation of **BIO-22** (compensatory mitigation for state waters) and added additional avoidance and minimization measures for protecting adjacent offsite washes near construction, and design guidelines for road crossings and discharge points to minimize erosion and sedimentation, and included measures in **BIO-18** (Weed Management Plan) to prohibit the use of herbicides that could be harmful to wildlife using adjacent washes. Further loss and/or fragmentation of remaining washes in the basin would be minimized through acquisition and preservation of washes within the local watershed and at a ratio of 2:1, and restoration of degraded washes as described in **BIO-22** (compensatory mitigation and avoidance and minimization measures for state waters), **BIO-7** (monitoring and reporting requirements), **BIO-8** (Impact Avoidance and Minimization Measures), **BIO-21** (Designated Botanist), **BIO-2** (Designated Biologist), and **BIO-4** (Designated Biological Monitor) will ensure that these mitigation measures are fully implemented.

CUMULATIVE IMPACTS - SUMMARY OF CONCLUSIONS

Construction and operation of the proposed project will have effects on a number of biological resources that are individually limited but cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects. However, cumulative impact assessments cannot conclude that contributions to cumulative impacts are not significant merely because the contributions represent a small percentage of the overall problem.

The project's contribution to significant cumulative effects to listed species and sensitive wildlife such as the desert tortoise are not cumulatively considerable after the implementation of conditions of certification intended to minimize or fully mitigate those impacts. For desert tortoise these include construction and minimization measures (**BIO-8**), clearance surveys and exclusion fencing (**BIO-9**), preparation and implementation of a translocation plan (**BIO-10**), acquisition and conservation of compensation lands (**BIO-12**), and preparation and implementation of a plan to control ravens (**BIO-13**).

The project's contribution to desert kit fox, American badger, bats, and Nelsons bighorn sheep are cumulatively considerable but mitigated by the implementation of conditions of certification **BIO-8** (General Impact Avoidance and Minimization Measures), **BIO-14** which requires the development of a management plan for kit fox and American badger, **BIO-18** (Weed Management Plan); **BIO-12** for acquisition of 6,358 acres of desert tortoise habitat, which is expected to contain suitable habitat for badger and kit fox and dispersal habitat for bighorn sheep; and **BIO-22**, which requires acquisition and protection of desert washes and adjacent habitat within the local watersheds.

The HHSEGS project's contribution to significant cumulative effects to migratory birds and golden eagles is cumulatively considerable when combined with the anticipated indirect effects to remaining habitat and populations. The project's contribution to the loss of habitat, increased noise and lighting, road kills, habitat fragmentation, potential to spread of invasive species, and hydrological impacts is cumulatively considerable. Staff considers the cumulative effects stemming from the loss of golden eagle and migratory birds that may occur due to operation of the project to be cumulatively considerable even with the implementation of proposed Conditions of Certification. The following impact avoidance, minimization, and mitigation Conditions would address the project's contribution to many of the significant cumulative impacts described above: **BIO-16**, a nesting bird management plan, **BIO-8** (Impact Avoidance and Best Management Practices), and **BIO-16** (Pre-construction Nest Surveys).

The project's incremental contribution to cumulatively significant impacts to other wildlife, desert washes, and groundwater-dependent ecosystems is cumulatively considerable. Conditions of certification **BIO-1** through **BIO-26** contain measures for avoiding, minimizing, and compensating for direct and indirect impacts. Funding mechanisms, worker environmental compliance training, mitigation monitoring and reporting, and requirements for designated biologists, monitors, and a designated botanist will ensure accountability and full implementation of conditions. Staff assessed the mitigated effect and considered whether new mitigation measures were needed to address any residual effects. New conditions of certification were added, and other conditions strengthened to ensure that the project's contributions to these significant cumulative impacts are less than cumulatively considerable.

COMPLIANCE WITH LORS

The proposed project must comply with state and federal LORS that address state and federally listed species, as well as other sensitive species and their habitats. Applicable LORS are presented in **BIOLOGICAL RESOURCES Table 1**.

STATE LORS

Under the Warren-Alquist Act (Pub. Resources Code § 25500) the Energy Commission's certificate for thermal power plants 50 MW and more is "in lieu of" other state, local, and regional permits (*ibid*.). All required terms and conditions that might otherwise be included in state permits are incorporated into the Energy Commission's certificate or license. When conditions of certification are finalized in the FSA, staff expects the proposed mitigation measures would satisfy the following state LORS and take the place of terms and conditions that, but for the Commission's exclusive authority, would be addressed for the following LORS and state permits:

Incidental Take Permit: California Endangered Species Act (Fish and Game Code §§ 2050 et seq.). The California Endangered Species Act (CESA) prohibits the "take" (defined as "to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill"") of state-listed species except as otherwise provided in state law. Construction and operation of the proposed project would result in the take of desert tortoise, listed as threatened under CESA. No other state-listed species would be affected by the project. Condition of Certification **BIO-12** specifies compensatory mitigation for desert tortoise habitat loss. Ratios proposed by staff include 1:1 for areas dominated by shadscale scrub and 3:1 for areas dominated by Mojave Desert scrub. In total compensatory mitigation would require the acquisition and preservation of approximately 6,358 acres of desert tortoise habitat. Avoidance and minimization measures described in conditions of certification **BIO-6** through **BIO-10**, **BIO-12**, and **BIO-13 (**Raven Management Plan) would also mitigate for potential impacts to desert tortoise. **BIO-9** and **BIO-10** require the applicant to fence the project site and translocate tortoise from the project site prior to construction. Conditions of certification **BIO-1** through **BIO-5** for a Designated Biologist and Biological Monitor, **BIO-6** (Worker Environmental Awareness Program) and **BIO-7** (Biological Resources Mitigation Implementation and Monitoring Plan) would ensure timely and thorough compliance under the supervision of qualified biologists. Implementation of these conditions of certification would ensure compliance with CESA.

Streambed Alteration Agreement: California Fish and Game Code §§ 1600-1607. Pursuant to these sections, CDFG typically regulates all changes to the natural flow, bed, or bank, of any river, stream, or lake that supports fish or wildlife resources. Construction and operation of the project would result in direct impacts to approximately 23.21 acres of jurisdictional state waters, and indirect impacts to 4.51 acres, according to the applicant's delineation. Condition of Certification **BIO-22** specifies compensatory mitigation for the loss of state waters at a ratio of 2:1. The compensatory mitigation requirements and avoidance and minimization measures in **BIO-22** would minimize and offset direct and indirect impacts to state waters, and would assure compliance with California Fish and Game Code that provides protection to these waters and their associated riparian vegetation.

Protected furbearing mammals (California Code of Regulations, Title 14, Section 460). This regulation specifies that fisher, marten, river otter, desert kit fox and red fox may not be taken at any time. Condition of Certification **BIO-14** (American Badger and Kit Fox Management Plan) requires the development of a management plan to safely exclude animals from the project site and ensure compliance with the California Fish and Game Code that provides protection to these species. The California Department of Fish and Game (CDFG) does not issue Incidental Take Permits or Memoranda of Understanding to permit the capture or handling of desert kit fox.

Fully Protected Species (Fish and Game Code, sections 3511, 4700, 5050, and 5515). Designates certain species as fully protected and prohibits the take of such species or their habitat unless for scientific purposes (see also California Code of Regulations Title 14, section 670.7). Golden eagle and bighorn sheep are fully protected species that occur in the project area. Condition of Certification **BIO-15** requires the completion of Avian, Bat, and Golden Eagle Protection Plans, and **BIO-16** (Pre-construction Nesting Bird Surveys) will avoid direct take of golden eagles during construction. Staff notes that these conditions will not ensure full protection of golden eagles during project operations. Condition **BIO-15** requires mitigation should a golden eagle be taken by the project, however, any take of golden eagles even if mitigated as required under CEQA, could violate the state Fish and Game Code due to the both species' status as migratory birds and fully protected species. To mitigate for lost habitat, **BIO-12** (Desert Tortoise Compensatory Mitigation) will ensure the preservation and management of large areas of natural lands. Bighorn sheep are not expected to be taken during project construction and impacts to this species would be mitigated through the implementation of avoidance and minimization measures identified in conditions of certification **BIO-1** through **BIO-8**.

Nelson's bighorn sheep (Fish and Game Code section 4902). Regulates adoption of sound biological management practices, included sport hunting, of the Nelson's bighorn sheep. Bighorn sheep are not expected to be taken during project construction and impacts to this species would be mitigated and compliance achieved through the implementation of avoidance and minimization measures identified in conditions of certification **BIO-1** through **BIO-8**.

Nest or Eggs (Fish and Game Code section 3503). This regulation protects California's birds by making it unlawful to take, possess, or needlessly destroy the nest or eggs of any bird. Implementation of conditions of certification **BIO-8** (Impact Avoidance and Best Management Practices) and **BIO-16** (Pre-construction Nest Surveys) would ensure the project complies with regulations that protect nesting birds and their nests.

Birds of Prey (Fish and Game Code section 3503.5.) This regulation identifies that it is unlawful to take, possess, or destroy any birds in the orders Falconiformes and Strigiformes or to take, possess, or destroy the nest or eggs of any such bird. Implementation of conditions of certification **BIO-8** (Impact Avoidance and Best Management Practices) and **BIO-16** (Pre-construction Nest Surveys) would ensure the project complies with regulations that protect nesting birds and their nests.

Migratory Birds (Fish and Game Code section 3513). This regulation protects California's migratory birds by making it unlawful to take or possess any migratory nongame bird as designated in the Migratory Bird Treaty Act or any part of such migratory nongame birds. Implementation of conditions of certification **BIO-8** (Impact Avoidance and Best Management Practices) and **BIO-16** (Pre-construction Nest Surveys) would ensure the project complies with regulations that protect nesting birds and their nests. Condition of Certification **BIO-15** requires development of Avian, Bat, and Golden Eagle Protection Plans, however, no feasible mitigation to avoid operational impacts of the project is available. **Nongame mammals (Fish and Game Code section 4150).** This regulation makes it unlawful to take or possess any non-game mammal or parts thereof except as provided in the Fish and Game Code or in accordance with regulations adopted by the California Fish and Game Commission. Implementation of conditions of certification **BIO-8** (Impact Avoidance and Best Management Practices) would ensure the project complies with regulations that protect nongame animals.

Migratory Birds (Fish and Game Code section 355-357). The Fish and Game Commission may, annually, adopt regulations pertaining to migratory birds to conform with or to further restrict the rules and regulations prescribed pursuant to the Migratory Bird Treaty Act. Implementation of conditions of certification **BIO-8** (Impact Avoidance and Best Management Practices) and **BIO-16** (Pre-construction Nest Surveys) would ensure the project complies with regulations that protect migratory birds.

California Native Plant Protection Act of 1977 (Fish and Game Code section 1900 and following) designates state rare, threatened, and endangered plants. No state listed Rare, Threatened, or Endangered plant species occur on the project site or would be indirectly affected by the project construction or operation. Implementation of conditions of certification **BIO-8** (Impact Avoidance and Best Management Practices), **BIO-18** (Weed management Plan), **BIO-19** (Special-Status Plant Impact Avoidance and Minimization), and **BIO-20** (Special-Status Plant Compensatory Mitigation) would ensure the project complies with regulations that protect native plants.

California Desert Native Plants Act of 1981 (Food and Agricultural Code section 80001 and following and California Fish and Game Code sections 1925-1926) protects non-listed California desert native plants from unlawful harvesting on both public and private lands in Imperial, Inyo, Kern, Los Angeles, Mono, Riverside, San Bernardino, and San Diego counties. Unless issued a valid permit, wood receipt, tag, and seal by the commissioner or sheriff, harvesting, transporting, selling, or possessing specific desert plants is prohibited. The Inyo-Mono Counties Agricultural Commissioner would issue a permit to the project owner for the removal of three common cactus species that occur within the project boundaries. Condition of Certification **BIO-7** (Biological Resources Mitigation Implementation & Monitoring Plan) requires the applicant provide a copy of all state and federal permits.

Porter-Cologne Water Quality Control Act. This act is administered by the state regional water quality control boards (RWQCB), which regulates discharges of waste and fill material to waters of the State, including "isolated" waters and wetlands. For projects under the jurisdiction of the Energy Commission, applicants file a waste discharge report to the RWQCB, who then issues waste discharge requirements (WDRs) for inclusion in the Energy Commission's license. For HHSEGS, the Lahontan RWQCB will issue the WDRs, which will be incorporated into the Condition of Certification **BIO-7** (Biological Resources Mitigation Implementation & Monitoring Plan), which requires the project owner provide a copy of all state and federal permits and implement all provisions of those permits ensure compliance with the Porter-Cologne Water Quality Control Act. These WDRs have yet to be issued. The Lahontan RWQCB will separately issue a Clean Water Act Section 401 Water Quality certification for the project.

FEDERAL LORS

The project is located on private lands and is therefore not subject to the provisions of BLM's California Desert Conservation Area (CDCA) Plan or the Northern and Eastern Mojave Desert Management Plan (NEMO). Staff considered the following federal LORS and the management direction of the designations described below:

Areas of Critical Environmental Concern (ACEC) are specific, legally defined, BLM designations where special management is needed to protect and prevent irreparable damage to important historical, cultural, scenic values, fish and wildlife, and natural resources or to protect life and safety from natural hazards. The project is not included within any designated ACEC; the potential for indirect impacts to biological resources and groundwater resources of the Stump Spring ACEC from project groundwater pumping were assessed.

To avoid adverse impacts to the ACEC, conditions of certification **WATER SUPPLY-4** and **BIO-23** require monitoring of the response of groundwater and dependent vegetation to project pumping for the life of the project. If water level monitoring, as described in **WATER SUPPLY-4**, identifies a 0.5 foot or greater water level decline at the property boundary due to project pumping, the project owner shall cease pumping. Pumping cannot resume unless the project provides evidence, subject to review and approval by the CPM, in consultation with BLM and Inyo County water Department, that either: 1) the pumping can be reduced or modified to maintain groundwater levels above the 0.5 ft. drawdown threshold at the project boundary; 2) the drawdown trigger was exceeded due to factors other than the project pumping and the project did not contribute to the drawdown; or 3) through vegetation monitoring and soil coring described in this condition, and predictive hydrologic trend analysis described in **WATER SUPPLY-4**, a greater groundwater drawdown will not result in impacts to the mesquite.

Critical Habitat consists of specific areas defined by the USFWS as areas essential for the conservation of the listed species, which support physical and biological features essential for survival and that may require special management considerations or protection. The project would not result in direct or indirect impacts to critical habitat for any federal listed species.

Endangered Species Act (ESA; 16 USC Section 1531 et seq.). Potential take of the desert tortoise or its habitat, listed as threatened by the USFWS, requires compliance with the federal Endangered Species Act (ESA) (16 USC §§ 1531 et seq.). No other federal-listed species would be affected by the project. “Take” of a federally listed species is prohibited without an Incidental Take Permit, which would be obtained through a Section 7 consultation between BLM and the USFWS. The applicant will submit a Draft Biological Assessment (BA) for the project to BLM, and when BLM has reviewed and made appropriate revisions to the draft BA it will be submitted to the USFWS so that the formal Section 7 consultation process can be initiated. A draft BA is not yet available for review. Implementation of the conditions of certification **BIO-1** through **BIO-10**, **BIO-12**, and **BIO-13**, summarized above, would ensure compliance with the federal ESA. When available, a copy of the BO would be required (**BIO-7**).

Bald and Golden Eagle Protection Act (Title 16, United States Code, Sections 668-668c) A recently issued Final Rule (September 2009) provides for a regulatory mechanism under the Bald and Golden Eagle Protection Act (Eagle Act) to permit take of bald or golden eagles comparable to incidental take permits under the ESA. This rule adds a new section at 50 CFR 22.26 to authorize the issuance of permits to take bald eagles and golden eagles on a limited basis. The proposed project could potentially result in “take” of the golden eagle from the loss of foraging habitat or collision with facility structures. Proposed conditions of certification **BIO-15**, which requires the completion of Avian, Bat, and Golden Eagle Protection Plans and **BIO-16** (Pre-construction Nesting Bird Surveys) will avoid direct take of this species during construction. To mitigate for lost habitat **BIO-12** (Desert Tortoise Compensatory Mitigation) will ensure the preservation and management of large areas of natural lands that would also provide suitable eagle foraging habitat. While acquisition does not address the net loss of foraging habitat in the immediate future, it would reduce future losses of habitat by placing a permanent conservation easement and deed restrictions on private lands. Condition of Certification **BIO-15** will facilitate data collection and advance understanding of project impacts, and requires mitigation for take of golden eagle. The USFWS has encouraged the project owner to apply for an Eagle Conservation Permit, which would permit take of golden eagle.

Migratory Bird Treaty Act (16 U.S.C. §§ 703 et seq.) This law makes it illegal to “pursue, hunt, take capture, or kill” any migratory bird or nest or egg of such bird, except as allowed by permit or regulations. While the project would kill birds, such kill is incidental to a legal commercial activity, and would not likely be considered a violation of the Act if unintentional and consistent with all agency mitigation requirements and recommendations.

Clean Water Act (Title 33, United States Code, sections 1251 through 1376, and Code of Federal Regulations, part 30, section 330.5(a)(26)) Section 404 of the federal Clean Water Act (CWA) requires permitting and monitoring of all discharges to surface water bodies. On March 19, 2012, a new Nationwide Permit (NWP 51) was issued for "Land-Based Renewable Energy Generation Facilities" affecting 1/2 acre or less of non-tidal Waters of the U.S., or 300 linear feet of streambed. In a December 14, 2011 correspondence to the applicant, the Corps verified the applicant’s delineation of Waters of the U.S and determined that only two streams, totaling 0.42 acre, were subject to USACE jurisdiction. Condition of Certification **BIO-22** requires 2:1 compensatory mitigation for the loss of 23.21acres of state waters, which includes compensation for impacts to 0.42 acres of federal jurisdictional waters. **BIO-22** and issuance of a permit by the Corps will ensure compliance with these provisions of the Clean Water Act. Condition of Certification **BIO-7** (Biological Resources Mitigation Implementation & Monitoring Plan) requires the project owner provide a copy of all state and federal permits and implement all provisions of those permits. In addition, the preservation of lands to mitigate desert tortoise as required by **BIO-12** (Desert Tortoise Compensatory Mitigation) will also preserve desert habitat that may potentially have Waters of the U.S. or influence Waters of the U.S.

LOCAL LORS

Inyo County Renewable Energy Ordinance (Title 21). Title 21 is intended to support, encourage and regulate the development of the County's solar and wind resources while protecting the health, safety and welfare of its citizens and its environment. Specific to biology, Title 21 requires restoration and revegetation of a renewable energy project site once the facility is decommissioned or otherwise ceases to be operational. To ensure the project complies with this local ordinance, staff has recommended **BIO-26** (Facility Closure, Revegetation, and Reclamation Plan).

NOTEWORTHY PUBLIC BENEFITS

The HHSEGS project would result in significant impacts to sensitive biological resources, and would permanently diminish the extent and habitat value of native plant and animal communities in the region. Staff has therefore concluded that the HHSEGS project would not provide any noteworthy public benefits related to biological resources.

FACILITY CLOSURE

When facility closure occurs, whether planned or unexpected, it must be done in such a way as to protect the environment and public health and safety. Inyo County requires that applicants for renewable energy projects prepare a plan for closure, reclamation and revegetation of the site in the event the facility is decommissioned, or ceases to be operational (County Ordinance 1158 § 3, 2010.). Reclamation plans must be site-specific, based upon the character of the surrounding area, characteristics of the property as type of native vegetation, soil type, habitat, climate, water resources, and the existence of public trust resources.

Based on applicant's data response Set 2E (CH2 2012y), applicant acknowledges this local ordinance and confirms its intent to comply with these regulations. Condition of Certification **BIO-26** (Closure, Revegetation, and Reclamation Plan) would ensure the project complies with Inyo County's Title 21. This plan will present the goals and objectives of reclamation of the site, methods of revegetation, success criteria and monitoring to insure all standards are met, and other activities, project owner responsibilities, or and closure requirements of Inyo County Title 21. The **Land Use** section presents further information, including description of funding sufficient for these activities, as required by **LAND-2**. Facility closure mitigation measures would also be included in the BRMIMP prepared by the project owner as required in Condition of Certification **BIO-7.** Staff also notes that per Title 21 (Section 21.20.030), a draft reclamation plan is required at the time an applicant applies for a renewable energy permit from the County.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff received comments on the Biological Resources section of the Preliminary Staff Assessment (**PSA**) from the following parties.

- Inyo County (INYO 2012j)
- Bureau of Land Management (BLM 2012b)
- National Park Service (NPS 2012a)
- The Nature Conservancy (TNC 2012a)
- Amargosa Conservancy (ARM 2012a)
- Basin and Range Watch (BRW 2012b)
- Pahrump Paiute Tribe (PAIU 2012a)
- Richard Arnold, Pahrump Paiute Tribe (PAIU 2012b)
- Big Pine Tribe of Owens Valley (PINE 2012a)
- Intervenor Cindy MacDonald (MAC 2012b)
- Intervenor Center for Biological Diversity (CBD 2012b)
- Intervenor, Old Spanish Trail Association (OSTA 2012c)
- Applicant, BrightSource Energy, Inc. (CH2 2012ee)

Energy Commission staff has summarized these comments and provided responses in **Appendix 1** -- PSA Response to Comments, Biology.

CONCLUSIONS REGARDING LORS COMPLIANCE

With implementation of proposed conditions of certification, the project may comply with most laws, ordinances, regulations, and standards (LORS), and most direct, indirect, and cumulative impacts would be avoided, minimized, or mitigated to less than significant levels. However, even with the implementation of the proposed conditions of certification the project would kill or injure a large number of birds from either collisions with structures (including mirrors) or from solar flux damage. Birds at risk include golden eagles, a species often seen at the site. Should take of golden eagle occur, a federal permit for such would be required pursuant to federal law. Since state law does not allow take of golden eagle, such take could not be in compliance with state law.

STAFF'S PROPOSED FINDINGS OF FACT

1. Construction and operation of HHSEGS will disturb approximately 3,277 acres of desert habitat, of which approximately 77 acres has previously been developed or significantly disturbed.

2. Invasive non-native weeds occur across much of the eastern two-thirds of the project site but the density and ecological threat or impact varies from low to high.

3. The plant communities and landscape features in and around the HHSEGS site provide suitable foraging breeding for a variety of wildlife including nesting birds, and/or facilitate wildlife movement throughout the greater region.

4. A total of 23.21 acres of jurisdictional Waters of the State, a CDFG-designated sensitive habitat, occur on the project site. A total of 0.42 acres are also Waters of the United States, and six of the washes are also depicted as blue line features on the U.S. Geological Survey (USGS) topographic maps.

5. The project would maintain a portion of the hydrologic and geomorphic processes of many of the affected washes by allowing them to pass through the site, rather than diverting them around the site in artificially constructed channels; however these processes would be altered by the berm constructed across the downstream boundary of the project to control stormwater, partial site grading, and the obstruction of flow paths by mirror pylons and roads.

6. The perimeter exclusion fencing, required to exclude desert tortoise, in conjunction with ongoing operational activities would eliminate the habitat function and values for most wildlife. These activities include: regular human disturbance, lighting and glare, noise, regular vegetation mowing, mirror washing, dust and weed control, and other operational activities.

7. Ephemeral desert washes comprise the majority of streams in the desert and CDFG recognizes the habitat function and values to wildlife provided by ephemeral desert, including: seasonal or temporary sources of water higher biotic diversity; higher moisture content, topographic and habitat complexity; denser and more robust vegetation; shade and cooler temperatures; greater food sources; greater abundance of native annuals.

8. Wildlife habitat functions and values were observed and documented by Energy Commission and CDFG staff during multiple site visits, and habitat along most washes was observed to be distinct from the adjacent uplands.

9. Condition of Certification **BIO-22** (State Waters Compensatory Mitigation) would offset impacts to state waters through acquisition and preservation of comparable habitat offsite. To address a no net loss policy for riparian and riverine (stream) habitat, **BIO-22** would require compensation at a ratio of 2:1, or two acres of washes protected for every acre affected, and would fully mitigate loss of state waters.

10. Condition of Certification **BIO-8** requires that a copy of the Army Corps of Engineers permit or official communication confirming no permit is necessary be provided to the Energy Commission, and all requirements implemented on the project site, to mitigate for waters of the U.S.

11. One state and federally listed threatened species, the desert tortoise, occurs on the HHSEGS site.

12. Portions of the project site support relatively intact habitat for desert tortoise, but the habitat value is not uniform.

13. Desert tortoise sign (i.e., live animals, tracks, burrows, or scat) is present across most of the site but is concentrated near the eastern border of the project.

14. Tortoise present near the boundary of the project site will be affected by the project, and should be considered for determining project impacts and mitigation.

15. Impacts to desert tortoise can be fully mitigated by requiring compensatory mitigation at a 3:1 ratio for creosote bush scrub habitat and a 1:1 ratio for shadscale habitat.

16. One state fully protected species, the golden eagle, forages on the HHSEGS site, and nests within ten miles of HHSEGS project site.

17. Structures that are part of the HHSEGS project, including the heliostats, ancillary facilities, and the power tower, could cause bird deaths from collisions. The actual frequency of collisions is unknown, and collisions may be secondary to flux exposure.

18. The impact of avian collisions with project features generally is significant, and is significant, although adaptive measures may reduce the number of such collisions

19. Operation of the HHSEGS project will concentrate solar flux. This is expected to result in bird injury and death from exposure in excess of avian tolerance. Birds may also die from exposure to repeated low levels doses of solar flux, or die from exposure after leaving the project site.

20. The impact of solar flux on bird species is potentially significant inasmuch as morbidity and mortality is likely for golden eagle and migratory birds, for which no incidental take is permitted under state law.

21. The project site supports a variety of common and special status wildlife including the American Badger and burrowing owl; species considered by the California Department of Fish and Game as species of special concern. The site also supports desert kit fox. The desert kit fox is designated as a protected furbearer, which may not be trapped or taken.

22. American badger, kit fox, and burrowing owl would be displaced by HHSEGS project construction.

23. Impacts to American badger, kit fox, and burrowing owl are adverse but are less than significant with the adoption of feasible mitigation measures required by the Commission.

24. The HHSEGS site provides occasional forage and dispersal pathways for the fully protected Nelson's bighorn sheep. This species would still be able to complete intermountain travel.

25. Implementation of conditions of certification **BIO-9**, **BIO-12**, **BIO-18** through **BIO-20**, and **BIO-1** through **BIO-22** would reduce impacts to Nelson's bighorn sheep and their habitat. The project is not expected to pose significant impacts to movement for this species.

26. The project impacts to Nelson's bighorn sheep are adverse but less than significant with the adoption of feasible mitigation measures required by the Commission.

27. Implementation of conditions of certification **BIO-1** through **BIO-10**, **BIO-12**, and **BIO-13** will reduce significant impacts to the desert tortoise, considered "take" under CESA.

28. Implementation of conditions of certification **BIO-14**, **BIO-1** through **BIO-9**, **BIO-14**, and **BIO-18** through **BIO-23** will reduce impacts to American badger and kit fox to a level that is less than significant.

29. Implementation of conditions of certification **BIO-1** though **BIO-8**, **BIO-12, BIO-17** will reduce impacts to burrowing owl to a level that is less than significant.

30. Construction noise is not expected to have a substantial impact on nearby wildlife with the implementation of Conditions **NOISE-1** through **NOISE-7, BIO-15, and BIO-16**.Implementation of Conditions of certification **BIO-1** through **BIO-8**, **BIO-14, BIO-18 and BIO-12, BIO-15, BIO-16, and BIO-25 will re**duce impa**cts to nesting birds and sp**ecial-status bat species to less than significa**nt.**

31. Construction and operation of the project would directly and indirectly impact 28 occurrences of 11 special-status plant species located within the project boundary.

32. None of the affected species are state or federally listed Threatened, Endangered, Rare, or Candidate species but nine of the 11 species have a highly restricted range in California.

33. All 11 species onsite have distribution outside California but are rare in California (CRPR Rank 2; formerly CNPS List 2), and meet the criteria in Section 15380 of the CEQA Guidelines for designation as "rare".

34. Nine additional occurrences of eight special-status (CRPR rank 1B and 2) species were documented offsite in very close proximity to the project boundary, and thus in close proximity to construction and operation.

35. Conditions of certification **BIO-19, BIO-18**, and **BIO-8** specify Best Management Practices and other measures for avoiding and minimizing indirect impacts to these occurrences in close proximity from fugitive dust, herbicide and other chemical drift, the introduction and spread of weeds, and increased risk of fire.

36. Condition of Certification **BIO-20** (Special-status Plant Compensatory Mitigation) offers two options for offsite mitigation to offset impacts to occurrences onsite: 1) preservation, and 2) restoration of at-risk occurrences, and includes performance standards for each option. Mitigation ratios for preservation are based on the degree of rarity and extinction risk.

37. The HHSEGS project will lower groundwater levels within an area proximate to the site's pumps, as well as in the water basin generally.

38. How far and fast project pumping cone of depression will propagate cannot be determined with certainty given certain geological complexities in the area.

39. Large concentrations of groundwater-dependent mesquite habitats occur in close proximity to the project in Nevada, some within a half-mile or less of the project.

40. The mesquite habitats located near the project include the Stump Springs Area of Critical Environmental Concern (ACEC), an area designated for protection of its biological and cultural resources by the Bureau of Land Management. Stump Springs ACEC also contains an active seasonal spring.

41. The applicant mapped 4,040 acres of groundwater-dependent habitats within an approximate 5 to 6-mile radius of the project; most of these occur on lands administered by the Nevada Bureau of Land Management.

42. One of the largest concentrations of mesquite patches in southern Nevada occurs in Pahrump Valley; the 9,047-acre Pahrump Valley metapatch; no mesquite or other groundwater-dependent communities occur within the project boundary.

43. At least three active seasonal seeps and springs occur within a 5-mile radius of the project, and several additional inactive springs that stopped flowing during the period of heavy agricultural pumping in the last century.

44. The Nevada Bureau of Land Management Mesquite-Acacia Conservation Management Strategy states mesquite have significant biological and cultural importance in southern Nevada, and identified the mesquite habitats in Pahrump Valley and Stump Springs areas as conservation priorities.

45. The Conservation Management Strategy states that the Stump Springs area has significant wildlife habitat values, and that in a landscape dominated by desert scrub, mesquite patches serve as important breeding and foraging areas for wildlife, including many special-status species.

46. The Bureau of Land Management Southern Nevada District is currently considering establishing a new ACEC to protect the mesquite and other resources north of Stump Springs and east of the project boundary.

47. Project groundwater pumping could have significant direct and cumulative impacts on the mesquite habitats east of the project and the Stump Springs ACEC if project pumping should result in water levels being lowered below the effective rooting depth of the mesquite and other groundwater-dependent species.

48. If mesquite habitats are adversely affected, dependent wildlife would also be affected, including some special-status species.

49. Mesquite rooting depths are highly variable and the ability of mesquite to track a declining water table is not well documented.

50. Groundwater levels across the entire Pahrump Valley have already declined as a result of basin groundwater pumping, particularly in the northern valley or areas closest to Pahrump.

51. There has been a severe over-allocation of water rights in the Pahrump Valley groundwater basin.

52. There is a fault zone between the project site and Stump Springs ACEC and other mesquite habitats that may buffer the effects of project pumping but the protective properties of this fault zone are not presently known or established.

53. The hydrogeology of this portion of the Death Valley Regional Flow System is complex and not well understood.

54. Groundwater monitoring is necessary to determine whether there will be drawdown that will negatively affect Stump Springs ACEC and other mesquite habitats and area seeps and springs.

55. Vegetation monitoring and/or soil cores to examine rooting depths are necessary to determine the tolerance of mesquite to declining water tables and to determine whether project water use is negatively affecting Stump Springs ACEC and the area mesquite habitats.

56. There is significant public interest on the groundwater issues of the project, and the potential for project pumping to negatively impact area mesquite habitats, dependent wildlife, and springs.

57. Several local, state, and federal agencies submitted scoping comments and/or PSA comments expressing concern about groundwater pumping impacts to biological (and cultural) resources.

58. The Bureau of Land Management submitted scoping comments and PSA comments urging the Energy Commission to adopt conditions of certification requiring groundwater monitoring and groundwater-dependent vegetation monitoring to protect these resources on adjacent BLM lands, and require the project stop, reduce or modify pumping if monitoring detects a groundwater drawdown beyond the project boundary.

59. Implementation of conditions of certification **BIO-23**, **WATER SUPPLY-2**, **and** WATER **SUPPLY-4** will avoid or minimize indirect impacts from project pumping to less than significant levels.

60. Thirteen species of invasive weeds were documented in the project area, including two California Department of Food and Agriculture (CDFA) A-rated pests (Russian knapweed and halogeton) subject to state-enforced actions including eradication.

61. Increased vehicle and equipment use during construction and operation could increase the spread of weeds into adjacent public and private lands from contaminated vehicle and equipment tires and undercarriages.

62. Mowing and mirror-washing and soil disturbance could also increase the spread of weeds by making the habitat more vulnerable to invasion by weeds.

63. The spread of invasive plants is a major threat to biological resources in the Mojave Desert, causing destructive changes in ecosystem processes and increasing the risk of catastrophic fire and fire frequency.

64. Condition of Certification **BIO-18** (Weed Management Plan) requires the project owner to manage or contain weeds onsite for the life of the project to prevent their spread into adjacent offsite habitat, or to nearby communities via employees and contractors contaminated vehicles and equipment.

65. **BIO-18** includes specifications for environmentally safe weed management to avoid accidental harm to biological resources from weed management activities.

66. Construction and operation of the project will have effects on a number of biological resources that are individually limited but cumulatively considerable when viewed in connection with the effects of past, current, and probable future projects.

67. The project's contribution to significant cumulative effects to desert tortoise are not cumulatively considerable after implementation of conditions of certification **BIO-8, BIO-9, BIO-10, BIO-12 and BIO-13** to minimize or fully mitigate those impacts.

68. The project's contribution to significant cumulative effects to desert kit fox, American badger, special-status bat species, and Nelson's bighorn sheep are not cumulatively considerable after implementation of Conditions of Certification **BIO-8, BIO-12, BIO-14, BIO-18, and BIO-22**.

69. The project's contribution to significant cumulative effects to migratory birds and golden eagles is cumulatively considerable when combined with the anticipated indirect effects to remaining habitat and populations.

70. The significant cumulative effect from the loss of migratory birds and golden eagles that may occur during project operation would be cumulatively considerable even with the implementation of conditions of certification **BIO-8**, **BIO-15**, and **BIO-16** which address impact avoidance and minimization measures would address the project's contribution to this significant cumulative impact.

71. The project's contribution to significant cumulative effects to other wildlife, desert washes, and groundwater-dependent communities are not cumulatively considerable after implementation of Conditions of Certification **BIO-1** through **BIO-26**.

PROPOSED CONDITIONS OF CERTIFICATION

Staff proposes the following conditions of certification:

DESIGNATED BIOLOGIST SELECTION AND QUALIFICATIONS[7]

BIO-1 The project owner shall submit the resume of the proposed Designated Biologist, with at least three references and contact information, to the Energy Commission Compliance Project Manager (CPM) for approval. The Designated Biologist must meet all qualifications as stated within the U.S. Fish and Wildlife Service's (USFWS's) Biological Opinion (BO) for the HHSEGS project. Those qualifications at a minimum shall include at least three references and contact information.

The Designated Biologist must meet the following minimum qualifications:

1. Bachelor's degree in biological sciences, zoology, botany, ecology, or a closely related field;
2. Three years of experience in field biology or current certification of a nationally recognized biological society, such as The Ecological Society of America or The Wildlife Society;
3. Have at least one year of field experience with biological resources found in or near the project area;
4. Meet the current USFWS Authorized Biologist qualifications criteria (USFWS 2008), demonstrate familiarity with protocols and guidelines for the desert tortoise, and be approved by the USFWS; and
5. Possess a California ESA Memorandum of Understanding pursuant to Section 2081(a) for desert tortoise.

<u>Verification:</u> No less than 90 days prior to the start of any project-related ground disturbing activity, the project owner shall provide the CPM and CDFG a copy of the Commission Designated Biologist (= USFWS Authorized Biologist(s)) selection for the HHSEGS project and a copy of the above specified qualifications or the qualifications as required by the federal Biological Opinion. The project owner shall submit the specified information to the CPM and CDFG within 1 (one) week of receipt from the USFWS. No site or related ground disturbing activities shall commence until the appropriate number of approved Designated Biologist(s) is/are available to be on site.

If a Designated Biologist needs to be replaced, copies of the above specified information of the proposed replacement, as well as the USFWS new designated Authorized Biologists (= Commission title of Designated Biologist) for the HHSEGS project must be submitted to the CPM and CDFG within 48 hours of receipt of USFWS's authorization of a new Designated Biologist for the HHSEGS project site. In an emergency, the project owner shall immediately notify the CPM, CDFG, and USFWS to discuss the qualifications and approval of a short-term replacement, and/or enact any

[7] USFWS <www.fws.gov/ventura/speciesinfo/protocols_guidelines/docs/dt> designates biologists who are approved to handle tortoises as "Authorized Biologists." Such biologists have demonstrated to USFWS that they possess sufficient desert tortoise knowledge and experience to handle and move tortoises appropriately, and have received USFWS approval. Authorized Biologists are permitted to then approve specific monitors to handle tortoises, at their discretion. The California Department of Fish and Game (CDFG) must also approve such biologists, potentially including individual approvals for monitors approved by the Authorized Biologist. Designated Biologists are the equivalent of Authorized Biologists. Only Designated Biologists and certain Biological Monitors who have been approved by the Designated Biologist would be allowed to handle desert tortoises.

emergency provisions as specified in the USFWS Biological Opinion for the HHSEGS project.

DESIGNATED BIOLOGIST DUTIES

BIO-2 The project owner shall ensure that the Designated Biologist performs the following during any site (or related facilities) mobilization, ground disturbance, grading, construction, operation, or other activities as otherwise directed by the CPM. The Designated Biologist may be assisted by the approved Biological Monitor(s) but remains the contact for the project owner and the CPM. The Designated Biologist Duties shall include the following:

1. Advise the project owner's Construction and Operation Managers on the implementation of the biological resources conditions of certification;
2. Approve and submit the Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) to the CPM;
3. Be available to supervise, conduct and coordinate mitigation, monitoring, and other biological resources compliance efforts, particularly in areas requiring avoidance or containing sensitive biological resources, such as special-status species or their habitat;
4. Clearly mark sensitive biological resource areas and inspect these areas at appropriate intervals for compliance with regulatory terms and conditions;
5. Inspect active construction areas where animals may have become trapped prior to construction commencing each day. At the end of the day, inspect for the installation of structures that prevent entrapment or allow escape during periods of construction inactivity. Periodically inspect areas with high vehicle activity (e.g., parking lots) for animals in harm's way;
6. Inspect heliostat fields after rain events for presence of standing water in planned retention area and document the intensity and duration of the rain event via rain collectors. At least two collectors shall be placed within the project boundaries, one in each solar field, and marked on all project planning maps. The perimeter of the ponded area shall be mapped with GPS, and all above information, including readings of rain collectors and photographic documentation must be included within Monthly Compliance Reports;
7. Determine and oversee implementation of remedial actions any time water has been observed standing onsite for 24 hours. The Designated Biologist shall initiate remedial methods no later than 24 hours after standing water has been observed on the project site. Remedial methods may include grading, pumping spraying, tilling, or any other means to disperse or ensure evaporation and/or absorption of standing water. Other remedial efforts may be determined in conjunction with CPM review and approval. Descriptions of remedial efforts, including photo documentation, and

discussion of results of remedial efforts must be included in the Monthly Compliance Report;

8. Notify the project owner and the CPM of any non-compliance with any biological resources condition of certification;

9. Respond directly to inquiries of the CPM and Biological Resources Staff regarding biological resource issues;

10. Respond immediately to reports of onsite kit fox mortality or injury, and to the extent possible, reports of dead or injured kit fox offsite and immediately adjacent the project boundaries or on access roads, notify the CDFG and CPM within 24 hours, and undertake restorative and/or disease prevention actions as specified within the American Badger and Kit Fox Management Plan, or as directed by the CDFG, with copies of all CDFG guidance provided to the CPM within 24 hours of receipt;

11. Maintain compliance with the provisions of the Avian, Bat, and Golden Eagle Protection Plans, USFWS Golden Eagle Conservation Permit (if issued), and/or any other directions from the USFWS, CDFG, or CPM with respect to golden eagle, and special-status birds and bats.

12. Maintain written records of the tasks specified above and those included in the BRMIMP. Summaries of these records shall be submitted in the Monthly Compliance Report and the Annual Compliance Report;

13. Train the Biological Monitors as appropriate, and ensure their familiarity with the BRMIMP, Worker Environmental Awareness Program (WEAP) training, and USFWS guidelines on desert tortoise surveys and handling procedures <www.fws.gov/ventura/speciesinfo/protocols_guidelines>, and; and

14. Maintain the ability to be in regular, direct communication with the CPM and representatives of CDFG and USFWS including notifying these agencies of dead or injured listed species and reporting special-status species observations to the California Natural Diversity Data Base.

<u>Verification:</u> The Designated Biologist shall submit in the Monthly Compliance Report to the CPM and copies of all written reports and summaries that document biological resources compliance activities. If actions may affect biological resources during operation a Designated Biologist shall be available for monitoring and reporting. During project operation, the Designated Biologist shall submit record summaries in the Annual Compliance Report unless his/her duties cease, as approved by the CPM.

BIOLOGICAL MONITOR(S) SELECTION AND QUALIFICATIONS

BIO-3 The project owner’s approved Designated Biologist shall submit the resume, at least three references, and contact information of the proposed Biological Monitor(s) to the CPM. The resume shall demonstrate, to the satisfaction of the CPM the appropriate education and experience to accomplish the assigned biological resource tasks. The Biological Monitor is the equivalent of the USFWS designated Desert Tortoise Monitor (USFWS 2008).

Biological Monitor(s) training by the Designated Biologist shall include familiarity with the conditions of certification, BRMIMP, WEAP, and USFWS guidelines on desert tortoise surveys and handling procedures <www.fws.gov/ventura/speciesinfo/protocols_guidelines>.

Verification: The project owner shall submit the specified information to the CPM for approval at least 30 days prior to the start of any project-related site disturbance activities. The Designated Biologist shall submit a written statement to the CPM confirming that individual Biological Monitor(s) has been trained including the date when training was completed. If additional biological monitors are needed during construction the specified information shall be submitted to the CPM and for approval at least 10 days prior to their first day of monitoring activities, or within 24 hours of receipt of USFWS decision approving acceptability as tortoise monitors, whichever comes sooner.

BIOLOGICAL MONITOR DUTIES

BIO-4 The Biological Monitors shall assist the Designated Biologist in conducting surveys and in monitoring of mobilization, ground disturbance, grading, construction, operation, and closure activities. The Designated Biologist shall remain the contact for the project owner and the CPM.

Verification: The Designated Biologist shall submit in the Monthly Compliance Report to the CPM copies of all written reports and summaries that document biological resources compliance activities, including those conducted by Biological Monitors. If actions may affect biological resources during operation of the project, a Biological Monitor, under the supervision of the Designated Biologist, shall be available for monitoring and reporting. During project operation, the Designated Biologist shall submit record summaries in the Annual Compliance Report unless their duties cease, as approved by the CPM after receiving verification from the USFWS that their services are not required for compliance with federal permits, with a copy of the USFWS decision document provided to the CPM.

DESIGNATED BIOLOGIST AND BIOLOGICAL MONITOR AUTHORITY

BIO-5 The project owner's construction/operation manager shall act on the advice of the Designated Biologist and Biological Monitor(s) to ensure conformance with the biological resources conditions of certification.

The Designated Biologist shall have the authority to immediately stop any activity that is not in compliance with these conditions and/or order any reasonable measure to avoid take of an individual of a listed species. If required by the Designated Biologist and Biological Monitor(s) the project owner's construction/operation manager shall halt all site mobilization, ground disturbance, grading, construction, and operation activities in areas specified by the Designated Biologist. The Designated Biologist shall:

1. Require a halt to all activities in any area when determined that there would be an unauthorized adverse impact to biological resources if the activities continued;

2. Inform the project owner and the construction/operation manager when to resume activities; and

3. Notify the CPM and CDFG within 24 hours if there is a halt of any activities and advise them of any corrective actions that have been taken or will be instituted as a result of the work stoppage.

If the Designated Biologist is unavailable for direct consultation, the Biological Monitor shall act on behalf of the Designated Biologist.

Verification: The project owner shall ensure that the Designated Biologist or Biological Monitor notifies the CPM immediately (and no later than the morning following the incident, or Monday morning in the case of a weekend) of any non-compliance or a halt of any site mobilization, ground disturbance, grading, construction, and operation activities. The project owner shall notify the CPM of the circumstances and actions being taken to resolve the problem.

Whenever corrective action is taken by the project owner, a determination of success or failure will be made by the CPM within five working days after receipt of notice that corrective action is completed, or the project owner will be notified by the CPM that coordination with other agencies will require additional time before a determination can be made.

WORKER ENVIRONMENTAL AWARENESS PROGRAM (WEAP)

BIO-6 The Designated Biologist shall develop and implement project-site-specific Worker Environmental Awareness Program (WEAP). The WEAP shall be administered to all onsite personnel including surveyors, construction engineers, employees, contractors, contractor's employees, supervisors, inspectors, subcontractors, and delivery personnel. The WEAP shall be implemented during site mobilization, ground disturbance, grading, construction, operation, and closure. The WEAP shall:

1. Be developed by or in consultation with the Designated Biologist, be responsive of CPM, and/or input CDFG, and consist of an on-site or training center presentation in which supporting written material and electronic media, including photographs of protected species, is made available to all participants. The training presentation shall be made available in the language best understood by the participants;

2. Discuss the locations and types of sensitive biological resources on the project site and adjacent areas, and explain the reasons for protecting these resources; provide information to participants that no snakes, reptiles, or other wildlife shall be intentionally harmed (unless posing a reasonable and immediate threat to humans);

3. Place special emphasis on desert tortoise, including information on physical characteristics, distribution, behavior, ecology, sensitivity to human activities, legal protection, penalties for violations, reporting requirements, and protection measures;

4. Provide pictures of desert tortoise, golden eagles, American badger, kit fox, and burrowing owl, provide information on sensitivity to human activities, legal protection, reporting requirements, and how to identify construction avoidance zones for these species as marked by flagging, staking, or other means, also describe the protections for bird nests and provide information as described above;

5. Provide overview [for operational staff] of potential impacts to avian species from concentrated solar flux created during operations phase, reporting requirements, and protection measures;

6. Include a discussion of fire prevention measures to be implemented by workers during Project activities and request workers to: a) use designated smoking areas and dispose of cigarettes and cigars appropriately and not leave them on the ground or buried, b) keep vehicles on graveled or well-maintained roads at all times, unless performing prescribed construction activities, to prevent vehicle exhaust systems from coming in contact with roadside weeds, c) use and maintain approved spark arresters on all power equipment, and d) keep a fire extinguisher on hand at all times;

7. Present the meaning of various temporary and permanent habitat protection measures;

8. Identify whom to contact if there are further comments and questions about the material discussed in the program; and

9. Include a training acknowledgment form to be signed by each worker indicating that they received training and shall abide by the guidelines.

The specific program can be administered by a competent individual(s) acceptable to the Designated Biologist, and documented within the Monthly Compliance Report.

Verification: At least 60 days prior to the start of any project-related site disturbance activities, the project owner shall provide to the CPM (for review and approval, and to the CDFG and/or USFWS for review and comment), electronic copies of the WEAP and all supporting written materials and/or electronic media prepared by the Designated Biologist and a resume of the person(s) administering the program. At least 30 days prior to the start of any project-related ground disturbing activities, the project owner will provide two copies of the final WEAP to the CPM and implement the training for all workers.

The project owner shall provide in the Monthly Compliance Report the number of persons who have completed the training in the prior month and a running total of all persons who have completed the training to date.

Training acknowledgement forms signed during construction shall be kept on file by the project owner for at least six months after the start of commercial operation.

Throughout the life of the project, the worker education program shall be repeated annually for permanent employees, and shall be routinely administered within one week of arrival to any new construction personnel, foremen, contractors, subcontractors, and other personnel potentially working within the project area. Upon completion of the orientation, employees shall sign a form stating that they attended the program and understand all protection measures. These forms shall be maintained by the project owner and shall be made available to the CPM upon request. Workers shall receive and be required to visibly display a hardhat sticker or certificate that they have completed the training.

During project operation, signed statements for operational personnel shall be kept on file for six months following the termination of an individual's employment.

BIOLOGICAL RESOURCES MITIGATION IMPLEMENTATION AND MONITORING PLAN (BRMIMP)

BIO-7 The project owner shall develop and implement a Biological Resources Mitigation Implementation and Monitoring Plan (BRMIMP) for the project. The BRMIMP shall incorporate avoidance and minimization measures described in final versions of the Desert Tortoise Translocation Plan, the USFWS Biological Opinion for the HHSEGS project, the Raven Management Plan, the American Badger and Kit Fox Management Plan, the Avian, Bat, and Golden Eagle Protection Plans, Burrowing Owl Impact Avoidance and Minimization Measures, and Closure, Revegetation, and Reclamation Plan.

The BRMIMP shall be prepared in consultation with the Designated Biologist and include the following:

1. All biological resources mitigation, monitoring, and compliance measures proposed by the project owner and approved by the Commission;

2. All biological resources mitigation, monitoring, and compliance measures specified in the conditions of certification;

3. All biological resource mitigation, monitoring and compliance measures required in state and federal agency terms and conditions, including but not limited to: USFWS Biological Opinion, USFWS Golden Eagle Conservation Permit (if issued), U.S. Army Corps of Engineers 404 Certification, 401 Certification from the Lahontan Regional Water Quality Control Board, California Department of Fish and Game Lake and Streambed Alteration Agreement, and a Food and Agricultural Code Section 80001 native plant harvesting permit;

4. All sensitive biological resources to be impacted, avoided, or mitigated by project construction, operation, and closure;

5. All required mitigation measures for each sensitive biological resource and remedial actions for standing water onsite, including known or suspected disease outbreaks on the project site;

6. All locations on a map, at an approved scale, of sensitive biological resource areas and two rain collectors subject to disturbance and areas requiring temporary protection and avoidance during construction and operation;

7. Aerial photographs, at an approved scale, of all areas to be disturbed during project construction activities; include one set prior to any site or related facilities mobilization disturbance and one set subsequent to completion of project construction. Provide planned timing of aerial photography and a description of why times were chosen. Provide a final accounting of the before/after acreages and a determination of whether additional habitat compensation is necessary in the Construction Termination Report;

8. Duration for each type of monitoring and a description of monitoring methodologies and frequency;

9. Performance standards to be used to help decide if/when proposed mitigation is or is not successful;

10. All performance standards and remedial measures to be implemented if performance standards are not met;

11. A discussion of biological resources-related facility closure measures; and

12. A process for proposing plan modifications to the CPM.

Verification: The project owner shall submit two copies of the draft BRMIMP to the CPM for review and approval at least 60 days prior to start of any project-related site disturbance activities. No less than 30 days prior to any project-related ground disturbing activities, the final revised BRMIMP shall be submitted to the CPM. No ground disturbance may occur prior to approval of the final BRMIMP by the CPM.

If there are any permits that have not yet been received when the BRMIMP is first submitted, these permits shall be submitted to the CPM within five days of their receipt, and the BRMIMP shall be revised or supplemented to reflect the permit condition within at least 10 days of their receipt by the project owner.

The project owner shall notify the CPM no less than five working days before implementing any modifications to the approved BRMIMP.

Any changes to the approved BRMIMP must be approved by the CPM and in consultation with appropriate agencies to ensure no conflicts exist.

Implementation of BRMIMP measures (construction activities that were monitored, species observed) will be reported in the Monthly Compliance Reports by the Designated Biologist. Within 30 days after completion of project construction, the project owner shall provide to the CPM, for review and approval, a written construction termination report identifying which items of the BRMIMP have been completed, a summary of all modifications to mitigation measures made during the project's site mobilization, ground disturbance, grading, and construction phases, and which mitigation and monitoring items are still outstanding.

GENERAL IMPACT AVOIDANCE AND MINIMIZATION MEASURES

BIO-8 The project owner shall undertake the following measures to manage the construction site and related facilities in a manner to avoid or minimize impacts to biological resources:

1. Limit Disturbance Area. The boundaries of all areas to be disturbed (including staging areas, access roads, and sites for temporary placement of spoils) shall be delineated with stakes and flagging prior to construction activities in consultation with the Designated Biologist. All disturbances, vehicles, and equipment shall be confined to the flagged areas.

2. Minimize Road Impacts. New and existing roads that are planned for construction, widening, or other improvements shall not extend beyond the flagged impact area as described above. All vehicles passing or turning around will do so within the planned impact area or in previously disturbed areas. Where new access is required outside of existing roads (e.g. new spur roads) or the construction zone, the route will be clearly marked (i.e., flagged and/or staked) prior to the onset of construction.

3. Minimize Traffic Impacts. Vehicular traffic during project construction and operation shall be confined to existing routes of travel to and from the project site, and cross country vehicle and equipment use outside designated work areas shall be prohibited. With the exception of the dirt roads that run between Tecopa Road and the project site, overland vehicle traffic shall be prohibited. The speed limit shall not exceed 25 miles per hour within the project area, on maintenance roads for linear facilities, or on dirt access roads to the HHSEGS site. Vehicles shall abide by posted speed limits on paved roads.

4. Monitor During Construction. The Designated Biologist or Biological Monitor shall be present at the construction site during all project activities that have potential to disturb soil, vegetation, and wildlife. In areas that could support desert tortoise or any other sensitive wildlife species, the USFWS-approved Designated Biologist or Biological Monitor shall walk immediately ahead of equipment during brushing and grading activities.

5. Salvage Wildlife during Clearing and Grubbing. The Designated Biologist or Biological Monitor shall salvage and relocate sensitive wildlife during clearing and grading operations. The species shall be salvaged when conditions will not jeopardize the health and safety of the monitor and relocated off-site habitat.

6. Avoid Roosting Bats. The project owner shall minimize disturbance to roosting bats. If night or day roosting bats are identified in project structures they shall not be disturbed and a 100 foot non disturbance buffer shall be placed around the bats. If the Designated Biologist, in

consultation with a qualified bat biologist, determines roosting bats consist of a non-breeding roost the individuals shall be safely evicted, under the direction of a qualified bat biologist. The CPM and CDFG shall be notified of any bat evictions within 48 hours. Maternity colonies shall not be disturbed. The CPM shall be notified within 48 hours of any active nurseries that are identified within the construction area.

7. Minimize Impacts of Transmission/Pipeline Alignments, Roads, and Staging Areas. For construction activities outside of the plant site (transmission line, pipeline alignments) access roads, pulling sites, and storage and parking areas shall be designed, installed, and maintained with the goal of minimizing impacts to native plant communities and sensitive biological resources. Transmission lines and all electrical components shall be designed, installed, and maintained in accordance with the Avian Power Line Interaction Committee's (APLIC's) *Suggested Practices for Avian Protection on Power Lines* (APLIC 2006)and *Mitigating Bird Collisions with Power Lines* (APLIC 2004)to reduce the likelihood of bird electrocutions and collisions.

8. Avoid Use of Toxic Substances. Road surfacing and sealants as well as soil bonding and weighting agents used on unpaved surfaces shall be non-toxic to wildlife and plants. Anticoagulants shall not be used for rodent control. Pre-emergents and other herbicides with documented residual toxicity shall not be used. Herbicides shall be applied in conformance with federal, State, and local laws and according to the guidelines for wildlife-safe use of herbicides in **BIO-18** (Weed Management Plan).

9. Minimize Lighting Impacts. Facility lighting shall be designed, installed, and maintained to prevent side casting of light towards wildlife habitat.

10. Cap Vertical Pipes. All vertical pipes greater than 4-inches in diameter shall be capped to prevent the entrapment of birds or bats.

11. Avoid Vehicle Impacts to Desert Tortoise. Parking and storage shall occur within the area enclosed by desert tortoise exclusion fencing to the extent feasible. No vehicles or construction equipment parked outside the fenced area shall be moved prior to an inspection of the ground beneath the vehicle for the presence of desert tortoise. If a desert tortoise is observed, it shall be left to move on its own. If it does not move within 15 minutes, a Designated Biologist or Biological Monitor under the Designated Biologist's direct supervision may remove and relocate the animal to a safe location if temperatures are within the range described in the USFWS' 2009 Desert Tortoise Field Manual (http://www.fws.gov/ventura/speciesinfo/protocols_guidelines). All access roads outside of the fenced project footprint shall be delineated with temporary desert tortoise exclusion fencing on either side of the access road, unless otherwise authorized by the CPM.

12. Avoid Wildlife Pitfalls.

a. Backfill Trenches. At the end of each work day, the Designated Biologist shall ensure that all potential wildlife pitfalls (trenches, bores, and other excavations) have been backfilled. If backfilling is not feasible, all trenches, bores, and other excavations shall be sloped at a 3:1 ratio at the ends to provide wildlife escape ramps, or covered completely to prevent wildlife access, or fully enclosed with desert tortoise-exclusion fencing. All trenches, bores, and other excavations outside the areas permanently fenced with desert tortoise exclusion fencing shall be inspected periodically, but no less than three times, throughout the day and at the end of each workday by the Designated Biologist or a Biological Monitor. Should a tortoise or other wildlife become trapped, the Designated Biologist or Biological Monitor shall remove and relocate the individual as described in the Desert Tortoise Relocation/Translocation Plan. Any wildlife encountered during the course of construction shall be allowed to leave the construction area unharmed.

b. Avoid Entrapment of Desert Tortoise. Any construction pipe, culvert, or similar structure with a diameter greater than 3 inches, stored less than 8 inches aboveground, and within desert tortoise habitat (i.e., outside the permanently fenced area) for one or more nights, shall be inspected for tortoises before the material is moved, buried, or capped. As an alternative, all such structures may be capped before being stored outside the fenced area, or placed on pipe racks. These materials would not need to be inspected or capped if they are stored within the permanently fenced area after the clearance surveys have been completed.

13. Minimize Standing Water. Water applied to dirt roads and construction areas (trenches or spoil piles) for dust abatement shall use the minimal amount needed to meet safety and air quality standards in an effort to prevent the formation of puddles, which could attract desert tortoises and common ravens to construction sites. A Biological Monitor shall patrol these areas to ensure water does not puddle and attract desert tortoise, common ravens, and other wildlife to the site and shall take appropriate action to reduce water application where necessary.

14. Minimize Standing Water in the Retention Basin. Water shall be prohibited from collecting or pooling for more than 24 hours after a storm event within the project retention basin. Standing water within the retention basin shall be removed, pumped, raked, or covered. Alternative methods or the time water is allowed to pool may be approved with the approval of the CPM.

15. Minimize Spills of Hazardous Materials. All vehicles and equipment shall be maintained in proper working condition to minimize the potential for fugitive emissions of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials. The Designated Biologist shall be informed of any hazardous spills immediately as directed in the project Hazardous Materials Plan. Hazardous spills shall be immediately cleaned up and the

contaminated soil properly disposed of at a licensed facility. Servicing of construction equipment shall take place only at a designated area. Service/maintenance vehicles shall carry a bucket and pads to absorb leaks or spills.

16. Dispose of Road-killed Animals. Road-killed animals or other carcasses detected on Tecopa Road and other project roads within one mile of the project site shall be picked up immediately and delivered to the Biological Monitor. For special-status species road kill, the Biological Monitor shall contact USFWS and CDFG within 1 working day of receipt of the carcass for guidance on disposal or storage of the carcass. The Biological Monitor shall report the special-status species record as described in Condition of Certification **BIO-2**.

17. Worker Guidelines. During construction all trash and food-related waste shall be placed in self-closing containers and removed daily from the site. Workers shall not feed wildlife or bring pets to the project site. Except for law enforcement or security personnel, no workers or visitors to the site shall bring firearms or weapons.

18. Avoid Spread of Noxious Weeds. The project owner shall implement the following Best Management Practices during construction and operation, and all other measures as required in the final approved Weed Management Plan (**BIO-18**) to prevent the spread and propagation of noxious weeds and other invasive plants:

    a. Limit the size of any vegetation and/or ground disturbance to the absolute minimum and limit ingress and egress to defined routes;

    b. Prevent spread of non-native plants via vehicular sources by implementing Trackclean™ or other methods of vehicle cleaning for vehicles coming and going from construction sites. Earth-moving equipment shall be cleaned prior to transport to the construction site; and

    c. Use only weed-free straw, hay bales, and seed for erosion control and sediment barrier installations.

19. Implement Erosion Control Measures. Standard erosion control measures shall be implemented for all phases of construction and operation where sediment run-off from exposed slopes threatens to enter "Waters of the State". Sediment and other flow-restricting materials shall be moved to a location where they shall not be washed back into the stream. All disturbed soils and roads within the project site shall be stabilized to reduce erosion potential, both during and following construction. Areas of disturbed soils (access and staging areas) with slopes toward a drainage shall be stabilized to reduce erosion potential.

20. Monitor Ground-Disturbing Activities Prior to Site Mobilization. If ground-disturbing activities are required prior to site mobilization, such as for

geotechnical borings or hazardous waste evaluations, a Designated Biologist or Biological Monitor shall be present to monitor any actions that could disturb soil, vegetation, or wildlife.

21. Control and Regulate Fugitive Dust. To reduce the potential for the transmission of fugitive dust the owner shall implement dust control measures. These shall include:

   a. The owner shall apply non-toxic soil binders, equivalent or better in efficiencies than the CARB- approved soil binders, to active unpaved roadways, unpaved staging areas, and unpaved parking area(s) throughout construction to reduce fugitive dust emissions.

   b. Water the disturbed areas of the active construction sites at least three times per day and more often if uncontrolled fugitive dust is noted.

   c. Enclose, cover, water twice daily, and/or apply non-toxic soil binders according to manufacturer's specifications to exposed piles with a 5% or greater silt content. Agents with known toxicity to wildlife shall not be used unless approved by the CPM.

   d. Establish a vegetative ground cover (in compliance with biological resources impact mitigation measures above) or otherwise create stabilized surfaces on all unpaved areas at each of the construction sites within 21 days after active construction operations have ceased.

   e. Increase the frequency of watering, if water is used as a soil binder for disturbed surfaces, or implement other additional fugitive dust mitigation measures, to all active disturbed fugitive dust emission sources when wind speeds (as instantaneous wind gusts) exceed 25 mph.

All mitigation measures and their implementation methods shall be included in the BRMIMP and implemented. Implementation of the measures shall be reported in the Monthly Compliance Reports by the Designated Biologist. Within 30 days after completion of project construction, the project owner shall provide to the CPM, for review and approval, a written construction termination report identifying how measures have been completed.

DESERT TORTOISE CLEARANCE SURVEYS AND EXCLUSION FENCING

BIO-9 The project owner shall undertake appropriate measures to manage the construction site and related facilities in a manner to avoid or minimize impacts to desert tortoise. Methods for clearance surveys, fence specification and installation, tortoise handling, artificial burrow construction, egg handling and other procedures shall be consistent with those described in the USFWS' 2009 *Desert Tortoise Field Manual*<http://www.fws.gov/ventura/speciesinfo/protocols_guidelines> or more current guidance provided by CDFG and USFWS. The project owner shall also implement all terms and conditions described in the Biological Opinion for the project prepared by USFWS. These measures include, but are not limited to, the following:

1. Desert Tortoise Exclusion Fence Installation. To avoid impacts to desert tortoises, permanent desert tortoise exclusion fencing shall be installed along the permanent, which may or may not be combined with the perimeter security fence. Temporary fencing along the underground utility corridors in California may be required for activities that require trenching and will be implemented at the approval of the CPM. The proposed alignments for the permanent perimeter fence and utility rights-of-way fencing shall be flagged and surveyed within 24 hours prior to the initiation of fence construction. Clearance surveys of the perimeter fence and utility rights-of-way alignments shall be conducted by the Designated Biologist(s) using techniques approved by the USFWS and CDFG and may be conducted in any season with USFWS and CDFG approval. Biological Monitors may assist the Designated Biologist under his or her supervision with the approval of the CPM and USFWS. These fence clearance surveys shall provide 100 percent coverage of all areas to be disturbed and an additional transect along both sides of the fence line. This fence line transect shall cover an area approximately 90 feet wide centered on the fence alignment. Transects shall be no greater than 15 feet apart. All desert tortoise burrows, and burrows constructed by other species that might be used by desert tortoises, shall be examined to assess occupancy of each burrow by desert tortoises and handled in accordance with the USFWS' 2009 *Desert Tortoise Field Manual,* or the most recent agency guidance with the approval of the CPM. Any desert tortoise located during fence clearance surveys shall be handled by the Designated Biologist(s) in accordance with the USFWS' 2009 *Desert Tortoise Field Manual* or the most recent agency guidance with the approval of the CPM.

    a. Timing, Supervision of Fence Installation. The exclusion fencing shall be installed prior to the onset of site clearing and grubbing. Fencing shall also be placed on the proposed access roads in tortoise habitat unless otherwise approved by the CPM. The fence installation shall be supervised by the Designated Biologist and monitored by the Biological Monitors to ensure the safety of any tortoise present. The CPM shall be notified within 48 hours of fence completion. If the project is constructed in phases, prior to the initiation of clearing or grubbing for each solar plant, the project owner shall enclose the boundary of the affected solar plant with chain link fencing for security purposes and permanent desert tortoise exclusion fencing.

    b. Fence Material and Installation. The permanent tortoise exclusionary fencing shall be constructed in accordance with the USFWS' 2009 *Desert Tortoise Field Manual* (Chapter 8 – Desert Tortoise Exclusion Fence) or the most recent agency guidance with the approval of the CPM.

c. Temporary Construction Activities: Temporary construction activities including staging or parking outside of the permanent fencing shall be temporarily fenced with desert tortoise fencing to fully encompass the area prior to grounds disturbing activities to prevent desert tortoise from entering the area. The fencing use of the fencing in specific areas may be adjusted in consultation with the CPM. All fencing but be installed compliant with the timing and survey requirements identified in paragraph a, above.

d. Security Gates. Security gates shall be designed with minimal ground clearance to deter ingress by tortoises. The gates may be electronically activated to open and close immediately after the vehicle(s) have entered or exited to prevent the gates from being kept open for long periods of time. Cattle grating designed to safely exclude desert tortoise shall be installed at the gated entries to discourage tortoises from gaining entry.

e. Fence Inspections. Following installation of the desert tortoise exclusion fencing for both the permanent site fencing and temporary fencing in the utility corridors, the fencing shall be regularly inspected. Any fencing, whether temporary or permanent that is installed when tortoise are active shall be inspected two to three times daily for two weeks to ensure that desert tortoise are not fence walking to the point of exhaustion or overexposure. The same process shall occur for the first two weeks of the activity period if the fence is installed during the winter. Thereafter, permanent fencing shall be inspected monthly and during and within 24 hours following all major rainfall events. A major rainfall event is defined as one for which flow is detectable within the fenced drainage. Any damage to the fencing shall be temporarily repaired immediately to keep tortoises out of the site, and permanently repaired within 48 hours of observing damage. Inspections of permanent site fencing shall occur for the life of the project. Temporary fencing shall be inspected weekly and more often, as needed where activities are occurring in the vicinity that could damage the fence. Where drainages intersect the fencing, fencing shall be during and within 24 hours following major rainfall events. All temporary fencing shall be repaired immediately upon discovery and, if the fence may have permitted tortoise entry while damaged, the Designated Biologist shall inspect the area for tortoise.

2. Desert Tortoise Clearance Surveys within the Plant Site. Following construction of the permanent perimeter security fence and the attached tortoise exclusion fence, the permanently fenced power plant site shall be cleared of tortoises by the Designated Biologist, who may be assisted by the Biological Monitors. Clearance surveys shall be conducted in accordance with the USFWS' 2009 *Desert Tortoise Field Manual* (Chapter 6 – Clearance Survey Protocol for the Desert Tortoise – Mojave Population) or the most recent agency guidance with the approval of the CPM and shall consist of two surveys covering 100% the project area by walking transects no more

than 15-feet apart. If a desert tortoise is located on the second survey, a third survey shall be conducted. Each separate survey shall be walked in a different direction to allow opposing angles of observation. Clearance surveys of the power plant site may only be conducted when tortoises are most active (April through May or September through October). Surveys outside of these time periods require approval by USFWS and CDFG. Any tortoise located during clearance surveys of the power plant site shall be relocated and monitored in accordance with the Desert Tortoise Relocation/Translocation Plan (Condition of Certification **BIO-10**).

3. <u>Burrow Searches</u>. During clearance surveys all desert tortoise burrows, and burrows constructed by other species that might be used by desert tortoises, shall be examined by the Designated Biologist, who may be assisted by the Biological Monitors, to assess occupancy of each burrow by desert tortoises and handled in accordance with the USFWS' 2009 *Desert Tortoise Field Manual*. To prevent reentry by a tortoise or other wildlife, all burrows shall be collapsed once absence has been determined. Tortoises taken from burrows and from elsewhere on the power plant site shall be relocated or translocated as described in the Desert Tortoise Relocation/Translocation Plan.

4. <u>Burrow Excavation/Handling</u>. All potential desert tortoise burrows located during clearance surveys shall be excavated by hand (unless authorized by the CPM and USFWS), tortoises removed, and the burrows collapsed or blocked to prevent occupation by desert tortoises. All desert tortoise handling and removal, and burrow excavations, including nests, would be conducted by the Designated Biologist, who may be assisted by a Biological Monitor in accordance with the USFWS' 2009 *Desert Tortoise Field Manual.*

5. <u>Monitoring Following Clearing</u>. Following the desert tortoise clearance and <u>removal</u> from the power plant site and utility corridors, workers and heavy equipment shall be allowed to enter the project site to perform clearing, grubbing, leveling, and trenching. A Designated Biologist shall monitor clearing and grading activities to find and move tortoises missed during the initial tortoise clearance survey. Should a tortoise be discovered, it shall be relocated or translocated as described in the Desert Tortoise Relocation/ Translocation Plan to an area approved by the Designated Biologist.

6. <u>Reporting</u>. The Designated Biologist shall record the following information for any desert tortoises handled: a) the locations (narrative and maps) and dates of observation; b) general condition and health, including injuries, state of healing and whether desert tortoise voided their bladders; c) location moved from and location moved to (using GPS technology); d) gender, carapace length, and diagnostic markings (i.e., identification numbers or marked lateral scutes); e) ambient temperature when handled and released; and f) digital photograph of each handled desert tortoise as described in the paragraph below. Desert tortoise moved from within

project areas shall be marked and monitored in accordance with the Desert Tortoise Relocation/Translocation Plan.

Verification: All mitigation measures and their implementation methods shall be included in the BRMIMP and implemented during project construction and operation. Implementation of the measures shall be reported in the Monthly Compliance Reports by the Designated Biologist. Within 30 days after completion of desert tortoise clearance surveys the Designated Biologist shall submit a report to the CPM, USFWS, and CDFG describing implementation of each of the mitigation measures listed above. The report shall include the desert tortoise survey results, capture, and release locations of any relocated desert tortoises, and any other information needed to demonstrate compliance with the measures described above. All of these measures will be done in accordance with the approved Desert Tortoise Relocation Plan (see Condition of Certification **BIO-10**, below).

DESERT TORTOISE RELOCATION/TRANSLOCATION PLAN

BIO-10 The project owner shall develop and implement a Desert Tortoise Relocation/Translocation Plan (Plan) that is consistent with current USFWS approved guidelines. The goal of the plan shall be to safely exclude desert tortoises from within the fenced project area and relocate/translocate them to suitable habitat capable of supporting them, while minimizing stress and potential for disease transmission. The plan shall be developed in consultation with the USFWS to ensure the document does not conflict with conditions issued under an Incidental Take Statement. The plan shall include but not be limited to:

1. Translocation and Control Locations. The plan shall identify the proposed translocation recipient sites and control area. Sites shall be ranked based on the distance from the project site; distance from known hazards such as off highway vehicle locations, busy roads, or other known treats; proximity to existing populations; and known linkage areas. Translocation sites shall consider the value for recovery of local populations. The plan shall utilize the most recent USFWS guidance on translocation that includes required siting criteria. If moved outside their home range the translocation criteria include:

    a. The translocation site supports desert tortoise habitat suitable for all life stages.

    b. Disease prevalence within the resident desert tortoise population is less than 20 percent.

    c. The site is at least 10 km from major unfenced roads or highways. Distance from roads may be reduced if the proposed action includes provisions to install and maintain desert tortoise exclusion fencing as a minimization measure.

    d. The site is within 40 km of the project site, with no natural barriers to movement between them, to ensure that the desert tortoises at the two sites were likely part of a larger mixing population and similar genetically.

e. The site occurs on lands where desert tortoise populations have been depleted or extirpated yet still support suitable habitat. Depleted areas may include lands adjacent to highways.

f. The site has no detrimental rights-of-way (ROWs) or other encumbrances.

g. The site will be managed for conservation so that potential threats from future impacts are precluded. In the project region, DWMAs, designated critical habitat units (CHUs), areas of critical environmental concern (ACECs), National Park Service lands, and BLM Wilderness Areas are managed for conservation.

2. Control Site. The plan shall consider the following USFWS guidelines for the control site.

   a. be similar in habitat type/quality, desert tortoise population size/structure, and disease status to the recipient sites;

   b. not have been previously used as a recipient site for other projects; and

   c. be a minimum distance of 10 km (6 miles) from an unfenced recipient site that has no substantial anthropogenic or natural barriers to prevent the interaction of control, resident, and translocated desert tortoises.

3. Host Population. The plan shall provide an evaluation of the habitat quality on the translocation and control sites; provide a determination of existing tortoise density, and an assessment of the sites' ability to accommodate additional tortoises above baseline conditions.

4. Holding Pens. The plan shall provide information on the type holding pens for quarantined translocated tortoises prior to their release into host populations. Pens shall be located on the project site in an area capable of ensuring the protection of the tortoises. The size of the pen shall be designed based on the expected number of desert tortoise that occur on the project site or in an area approved by the CPM. The pen shall contain adequate cover and be in an area supporting suitable soils for burrowing.

5. Tracking, Monitoring, Disease Testing, and Reporting. The plan shall provide information on the use of tracking units (GPS) on tortoises from the project site, translocation site, and control site; provide information on the short and long term monitoring and reporting of control, translocated and host populations; provide information on disease testing for long distance translocated tortoises, host, and control sites; and, identify remedial actions should excessive predation or mortality be observed. The plan shall also include provisions for removing diseased tortoises; the

development of quarantine pens; accommodating eggs hatchlings or juvenile tortoise.

<u>Verification:</u> At least 90 days prior to the start of any project-ground disturbing activity, the project owner shall submit the draft Desert Tortoise Relocation/Translocation Plan to the CPM for review and approval and to USFWS and CDFG for review and comment. No less than 30 days prior to the start of any project-ground disturbing activity, the project owner shall provide the CPM with the final version of a Desert Tortoise Relocation/Translocation Plan. No relocation/translocation activities may occur prior to approval of the final plan by the CPM. Any modifications to the approved plan shall be made only after approval by the CPM and in consultation with USFWS and CDFG.

Within 30 days after initiation of relocation and/or translocation activities, the Designated Biologist shall provide to the CPM for review and approval, a written report identifying which items of the plan have been completed, and a summary of all modifications to measures made during implementation of the plan. Written monthly progress reports shall be provided to the CPM for the duration of the plan implementation.

COMPLIANCE VERIFICATION

BIO-11 This condition of certification has been deleted.

DESERT TORTOISE COMPENSATORY MITIGATION

BIO-12 To fully mitigate for habitat loss and potential take of desert tortoise, the project owner shall provide compensatory mitigation for impacts to 3,258 acres of habitat or whatever acreage is actually impacted by the project footprint. Impacts to areas supporting Mojave Desert scrub shall be mitigated at ratio of 3:1 ratio (1580.5 acres) for and areas that support shadscale scrub communities at a ratio of 1:1 (1,616.5 acres). The total compensatory land acquisition required to mitigate impacts to desert tortoise shall be 6,358 acres or the ratio of lands actually impacted by the project footprint. The requirements for acquisition of the 6,358 acres of compensation lands shall include the following:

1. <u>Responsibility for Acquisition of Lands</u>: The responsibility for acquisition of lands may be delegated by written agreement from the CPM to a third party, such as a non-governmental organization supportive of habitat conservation. Such delegation shall be subject to approval by the CPM, in consultation with USFWS and CDFG, prior to land acquisition, enhancement, or management activities. If habitat disturbance exceeds that described in this analysis, the project owner shall be responsible for funding acquisition, habitat improvements, and long-term management of additional compensation lands or additional funds required to compensate for any additional habitat disturbances. Additional funds shall be based on the adjusted market value of compensation lands at the time of construction to acquire and manage habitat. Water and mineral rights shall be included as part of the land acquisition. Agreements to delegate land acquisition to CDFG or an approved third party and to manage

compensation lands shall be implemented within 18 months of the Energy Commission's License Decision.

2. Selection Criteria for Compensation Lands. The compensation lands selected for acquisition to meet Energy Commission and CESA requirements shall:

   a. be of equal or better habitat quality for desert tortoise and within the Eastern Mojave Recovery Unit or other location approved by the CPM in consultation with the CDFG and USFWS, with potential to contribute to desert tortoise habitat connectivity and build linkages between desert tortoise designated critical habitat, known populations of desert tortoise, and/or other preserve lands;

   b. provide habitat for desert tortoise with capacity to regenerate naturally when disturbances are removed;

   c. be near larger blocks of lands that are either already protected or planned for protection, or which could feasibly be protected long-term by a public resource agency or a non-governmental organization dedicated to habitat preservation;

   d. be connected to lands currently occupied by desert tortoise, ideally with populations that are stable, recovering, or likely to recover;

   e. not have a history of intensive recreational use or other disturbance that exceed conditions on the project site that might make habitat recovery and restoration infeasible;

   f. Compensation lands may not include existing roads in the calculations of habitat acreages;

   g. not be characterized by densities of invasive species that exceed those on the project site, either on or immediately adjacent to the parcels under consideration, that might jeopardize habitat recovery and restoration; and

   h. not contain hazardous wastes.

3. Review and Approval of Compensation Lands Prior to Acquisition. A minimum of three months prior to acquisition of the property, the project owner shall submit a formal acquisition proposal to the CPM, CDFG, and USFWS describing the parcel(s) intended for purchase. This acquisition proposal shall discuss the suitability of the proposed parcel(s) as compensation lands for desert tortoise in relation to the criteria listed above. Approval from the CPM, in consultation with CDFG and the USFWS, shall be required for acquisition of all parcels comprising the compensation acres.

4. Commission Mitigation Security: The project owner shall provide written verification to the CPM and CDFG with copies of the document(s) to the USFWS, to guarantee that an adequate level of funding is available to implement the Energy Commission Complementary Mitigation Measures described in this condition. These funds shall be used solely for implementation of the measures associated with the project. Alternatively, financial assurance can be provided to the CPM and CDFG in the form of an irrevocable letter of credit, a pledged savings account or another form of security ("security") prior to initiating ground-disturbing project activities. Prior to submittal to the CPM, the security shall be approved by CDFG and the CPM, in consultation with the USFWS, to ensure funding in the amount of $21,779,329.00. This security amount was calculated as follows and may be revised upon completion of a Property Analysis Record (PAR) or PAR-like analysis of the proposed compensation lands:

    a. land acquisition costs for compensation lands, calculated at $1,000/acre = $6,358,000;

    b. costs of initial habitat improvements to compensation lands, calculated at $250/acre = $1,589,500.00;

    c. costs of establishing an endowment for long-term management of compensation lands, calculated at $1,450/acre = $9,219,100.00;

    d. costs associated with conducting required surveys, assessments for hazardous materials, escrow fees, third party administrative costs and agency costs to accept the parcel; calculated at $4,612,729.00 (See Biological resource Table 9 for a breakdown of these costs).

5. Compensation Lands Acquisition Conditions: The project owner shall comply with the following conditions relating to acquisition of the compensation lands after the CPM, in consultation with CDFG and the USFWS, has approved the proposed compensation lands and received security as applicable and as described above.

    a. Preliminary Report: The project owner, or approved third party, shall provide a recent preliminary title report, initial hazardous materials survey report, biological analysis, and other necessary documents for the proposed acquisition acres. All documents conveying or conserving compensation lands and all conditions of title/easement are subject to a field review and approval by CDFG and the CPM, in consultation with the USFWS, California Department of General Services and, if applicable, the Fish and Game Commission and/or the Wildlife Conservation Board.

    b. Title/Conveyance: The project owner shall transfer fee title or a conservation easement to the compensation lands to CDFG under terms approved by CDFG. Alternatively, a non-profit organization qualified to manage compensation lands (pursuant to California

Government Code section 65965) and approved by CDFG and the CPM may hold fee title or a conservation easement over the habitat mitigation lands. If the approved non-profit organization holds title, a conservation easement shall be recorded in favor of CDFG in a form approved by CDFG. If the approved non-profit holds a conservation easement, CDFG shall be named a third party beneficiary. If a Security is provided, the project owner or an approved third party shall complete the proposed compensation lands acquisition within 18 months of the start of project ground-disturbing activities.

c. Initial Habitat Improvement Fund. The project owner shall fund the initial protection and habitat improvement of the compensation lands. Alternatively, a non-profit organization may hold the habitat improvement funds if they are qualified to manage the compensation lands (pursuant to California Government Code section 65965) and if they meet the approval of CDFG and the CPM. If CDFG takes fee title to the compensation lands, the habitat improvement fund must go to CDFG.

d. Long-Term Management Endowment Fund. Prior to ground-disturbing project activities, the project owner shall provide to CDFG a capital endowment in the amount determined through the Property Analysis Record (PAR) or PAR-like analysis that would be conducted for the compensation acres. Alternatively, a non-profit organization may hold the endowment fees if they are qualified to manage the compensation lands (pursuant to California Government Code section 65965) and if they meet the approval of CDFG and the CPM. If CDFG takes fee title to the compensation lands, the endowment must go to CDFG, where it would be held in the special deposit fund established pursuant to California Government Code section 16370. If the special deposit fund is not used to manage the endowment, the California Wildlife Foundation or similarly approved entity identified by CDFG shall manage the endowment for CDFG and with CDFG supervision.

e. Interest, Principal, and Pooling of Funds. The project owner, CDFG and the CPM shall ensure that an agreement is in place with the endowment holder/manager to ensure the following conditions:

   i. Interest. Interest generated from the initial capital endowment shall be available for reinvestment into the principal and for the long-term operation, management, and protection of the approved compensation lands, including reasonable administrative overhead, biological monitoring, improvements to carrying capacity, law enforcement measures, and any other action approved by CDFG designed to protect or improve the habitat values of the compensation lands.

   ii. Withdrawal of Principal. The endowment principal shall not be drawn upon unless such withdrawal is deemed necessary by the CDFG or the approved third-party endowment manager to ensure the continued viability of the species on the compensation lands. If

CDFG takes fee title to the compensation lands, monies received by CDFG pursuant to this provision shall be deposited in a special deposit fund established pursuant to Government Code section 16370. If the special deposit fund is not used to manage the endowment, the California Wildlife Foundation or similarly approved entity identified by CDFG would manage the endowment for CDFG with CDFG supervision.

iii. Pooling Endowment Funds. CDFG, or a CPM and CDFG approved non-profit organization qualified to hold endowments pursuant to California Government Code section 65965, may pool the endowment with other endowments for the operation, management, and protection of the compensation lands for local populations of desert tortoise. However, for reporting purposes, the endowment fund must be tracked and reported individually to the CDFG and CPM.

iv. Reimbursement Fund. The project owner shall provide reimbursement to CDFG or an approved third party for reasonable expenses incurred during title, easement, and documentation review; expenses incurred from other State or State-approved federal agency reviews; and overhead related to providing compensation lands.

The project owner is responsible for all compensation lands acquisition/costs, including but not limited to, title and document review costs, as well as expenses incurred from other State agency reviews and overhead related to providing compensation lands to the department or approved third party; escrow fees or costs; environmental contaminants clearance; and other site cleanup measures. The project owner shall receive a credit or refund of commission mitigation securities for all unused project areas.

Verification: No less than 30 days prior to beginning project ground-disturbing activities, the project owner shall provide written verification to the CPM that the security has been established in accordance with this condition of certification. No less than 90 days prior to acquisition of the property, the project owner shall submit a formal acquisition proposal to the CPM, CDFG, and USFWS describing the parcels intended for purchase.

The project owner, or an approved third party, shall complete and provide written verification of the proposed compensation lands acquisition within 18 months of the start of project ground-disturbing activities. Within 180 days of the land or easement purchase, as determined by the date on the title, the project owner, or an approved third party, shall provide the CPM, CDFG, and USFWS with a management plan for the compensation lands and associated funds. The CPM shall review and approve the management plan, in consultation with CDFG and the USFWS.

Within 90 days after completion of project construction, the project owner shall provide to the CPM and CDFG an analysis with the final accounting of the amount of habitat disturbed during project construction.

RAVEN MONITORING, MANAGEMENT, CONTROL PLAN AND FEE

BIO-13 The project owner shall design and implement a Raven Monitoring, Management, and Control Plan (Raven Plan) that is consistent with the most current USFWS-approved raven management guidelines. The goal of the Raven Plan shall be to minimize predation on desert tortoises by minimizing project-related increases in raven abundance. The Raven Plan shall include but not be limited to:

1. Prepare and Implement a Raven Management Plan that includes the following:

    a. Identify conditions associated with the project that might provide raven subsidies or attractants;

    b. Describe management practices to avoid or minimize conditions that might increase raven numbers and predatory activities;

    c. Describe control practices for ravens;

    d. Address monitoring and nest removal during construction and for the life of the project, and;

    e. Discuss reporting requirements.

2. Contribute to the REAT Regional Raven Management Program. The project owner shall submit payment to the project sub-account of the REAT Account held by the National Fish and Wildlife Foundation (NFWF) to support the REAT Regional Raven Management Program. The amount shall be a one-time payment of $105 per acre (3,258 acres) of permanent disturbance plus a two percent fund management fee of $348,932.00.

    For the first year of reporting the project owner shall provide quarterly reports describing implementation of the Raven Plan. Thereafter the reports shall be submitted annually for the life of the project.

Verification: At least 60 days prior to any project-related ground disturbance activities, the project owner shall submit the draft Raven Plan to the CPM for review and approval and CDFG and USFWS for review and comment. At least 30 days prior to start of any project-related ground disturbance activities, the project owner shall provide the CPM the final version of the Raven Plan. No ground disturbing activities may occur until the final plan is approved by the CPM. Any modifications to the approved Raven Plan must be approved by the CPM in consultation with USFWS and CDFG. The project owner shall notify the CPM no less than five working days before implementing any CPM approved modifications to the Raven Plan.

No fewer than 30 days prior to the start of any project-related ground disturbing activity, the project owner shall provide written verification to the CPM that the Raven Management Fee has been paid to NFWF.

Within 30 days after completion of project construction, the project owner shall provide to the CPM for review and approval a report identifying which items of the Raven Plan have been completed, a summary of all modifications to mitigation measures made during the project's construction phase, and which items are still outstanding.

AMERICAN BADGER AND DESERT KIT FOX MANAGEMENT PLAN

BIO-14 The owner shall prepare and implement an American Badger and Desert Kit Fox Management Plan. The plan shall be prepared in accordance with the most current CDFG guidelines for these species. The Management Plan must be approved by the CPM prior to implementation, and shall contain the following provisions:

Preconstruction surveys and mapping efforts: biological monitors shall perform pre-construction surveys for badger and kit fox dens in the project area, including areas within 250 feet of all project facilities, utility corridors, and access roads. If dens are detected, each den shall be classified as potentially active, or known active, including characterization of den type for kit fox (natal, pupping, likely satellite, atypical) per CDFG and/or CPM guidance, and mapped along with major project design elements.

Directions for collapse of inactive dens. Inactive dens that would be directly impacted by construction activities shall be excavated by hand and backfilled to prevent reuse by badgers or kit fox. Potentially and known active dens shall not be disturbed during the whelping/pupping season (approximately February 1 – September 30). A den may only be declared "inactive" after three days of monitoring via camera(s) and tracking medium have shown no kit fox or American badger activity.

Monitoring requirements:potentially and definitely active dens that would be directly impacted by construction activities shall be monitored by the Biological Monitor for three consecutive nights (during weather conditions favorable for detection) using a tracking medium (such as diatomaceous earth or fire clay) and/or infrared camera stations at the entrance. If no tracks are observed in the tracking medium or no photos of the target species are captured after three nights, the den shall be excavated and backfilled by hand. Backfilling dens ensure no badgers or kit fox are trapped in the den.

Passive relocation strategies: the management plan shall contain, at a minimum, several strategies to passively relocate animals from the site. These methods may entail strategic mowing, fencing, or other feasible construction methods to assist in moving animals offsite toward desirable land. The plan shall also detail methods used to discourage occupation of dens within the project site, such as use of noisemakers, citronella-based chemical deterrents, strobe lighting, ect., and shall incorporate temperature constraints if requested by the CPM or CDFG. The Plan shall address location of preferred offsite movement of animals, based on CDFG data and land ownership. Private land is to be avoided to the maximum extent practicable. The Plan shall also indicate that passive hazing is not to be used at natal dens, and shall include guidelines specific to determining when kit fox pups are functioning independently, and when passive relocation strategies may be safely implemented. The Plan shall also prescribe use of buffer zones around dens to protect against accidental collapse or crushing by people or equipment.

Kit fox disease prevention measures. The Designated Biologist shall notify the CDFG and CPM within 24 hours if a dead kit fox is found or appears sick. The plan must also detail a response to a kit fox injury, including a necropsy plan, reporting methods, and scope of adaptive methods in the event of a known or suspected outbreak. The project owner will pay for any necropsy work.

Verification: At least 60 days prior to any project-related ground disturbing activity, the project owner shall submit an American badger and desert kit fox management plan to the CPM for review and approval and to CDFG for review and comment. No less than 30 days prior to any ground disturbing activity, the project owner shall provide one copy of the final approved plan to the CPM and implement the plan.

The project owner shall submit a report to the CPM and CDFG within 30 days of completion of badger and kit fox surveys. The report shall describe survey methods, findings, provide preliminary classification of dens and rationale, and map dens along with project features. Results of ongoing monitoring and relocation efforts shall be reported in the Monthly Compliance Reports. The project owner shall provide the CPM 24 hour notice before excavating a den classified as natal.

AVIAN, BAT, AND GOLDEN EAGLE PROTECTION PLANS

BIO-15 The project owner shall implement the following measures to monitor, mitigate and adaptively manage operational impacts to birds and bats.

1. Monitoring Study: The project owner shall prepare and implement a monitoring study to monitor the death and injury of birds and bats caused by collisions with project facilities including heliostats and solar receiver tower, injury caused by flying through concentrated solar energy within the solar field, or other project-related causes of injury or mortality including the gen-tie line and evaporation ponds. The study design shall be based on the USFWS's Monitoring Migratory Bird Take at Solar Power Facilities: An Experimental Approach (Nicolai et al 2011) or more current guidelines if available. Visual surveillance of the heliostat field shall be incorporated into study design, with the intent of documenting species and flight behavior of birds entering heliostat field, measuring elevation at which birds are flying, and documentation of effects of solar flux exposure. Special effort shall be made to collect the carcass of any bird observed colliding with project features or coming to the ground within the project boundaries, including recording Global Positioning Satellite (GPS) data. The Monitoring Study shall be subject to review and approval by the CPM in consultation with CDFG and USFWS, shall be incorporated into the project's BBCS and BRMIMP, and implemented by the Designated Biologist in coordination with the project owner, CPM, CDFG, and USFWS. The study shall be implemented, for a period of not less than 5 years (60 months) total, including the entire construction phase and not

less than 2 years during the operational phase and shall continue until the CPM concludes, in consultation with the other agencies, that the cumulative monitoring data provide sufficient basis for estimating long-term bird mortality for the project. Compensatory mitigation, if required by the CPM, shall be developed using results of the monitoring study, and in consultation with the USFWS and CDFG.

The Monitoring Study shall also detail disposition of avian and bat carcasses. All carcasses found on the solar field should be collected, labeled, and stored in a freezer. The Monitoring Study shall provide techniques and protocols to follow in proper techniques for collection, processing, and preservation of carcasses; and specifically, shall specify that flight feathers must be plucked and bagged separately from the carcass. Feather samples are not to be frozen or refrigerated. Carcass and feather samples shall be provided to the CPM or CPM's designee upon request. The CPM shall receive notification within 24 hours of detection of a threatened, endangered, or special status bird or bat carcass, and procedures to report other mortality or sublethal injury will also be included in the Monitoring Study.

2. Bird and Bat Conservation Strategy (BBCS): The project owner shall prepare and implement a Bird and Bat Conservation Strategy adopting **BIO-16**, and all applicable guidelines recommended by the USFWS (2010e) or more current guidelines that may be released. The BBCS will describe all proposed measures to minimize death and injury of birds or bats from (1) collisions with facility features including the heliostats, power towers, and gen-tie line towers or transmission lines and (2) concentrated solar energy (flux) present in the airspace over each heliosat field, and require implementation of conservation actions in response to bird, bat, and golden eagle mortality.

3. Eagle Conservation Plan (ECP): The project owner shall prepare and implement an Eagle Protection Plan adopting all applicable guidelines recommended by the USFWS (2011b) or more current guidelines that may be released. The ECP may be prepared as a stand-alone document or it may be included as a chapter within the BBCS. The ECP shall describe all available baseline data on golden eagle occurrence, seasonality, activity, and behavior throughout the project area and vicinity. The ECP shall outline a study protocol to include annual pedestrian and/or helicopter surveys of golden eagle breeding sites within a 10 mile radius of the project site, to be reviewed and approved by the CPM, in consultation with the USFWS.

   The ECP shall describe all proposed measures to minimize death and injury of eagles from (1) collisions with facility features including the heliostats, power towers, and gen-tie line towers or transmission lines, electrocutions on transmission lines or other project components, and (3) concentrated solar flux created over the solar field. The ECP shall specify the project owner's anticipated take of golden eagles. The ECP shall provide an inventory of existing electrical distribution lines within a 20-mile radius of the project site that do not conform to APLIC (2006) design standards to prevent golden eagle electrocution. The inventory shall identify the owner or operator and estimate the number of non-conforming poles for each distribution line. The ECP shall specify that for each anticipated project-related take of a bald or golden eagle, 11 utility poles will be retrofitted to APLICstandards within one year of the take.

The ECP shall also include any feasible modifications to proposed plant operation to avoid or minimize focusing heliostats at standby points and, instead, move heliostats into a stowed position or another alternative configuration when the power plant is in partial standby mode. The ECP also shall identify any additional feasible conservation measures to minimize collisions and exposure to solar flux. The ECP shall provide a reporting schedule for all monitoring or other activities related to bird or bat conservation or protection to be taken during project construction or operation. The ECP shall be subject to review and approval by the CPM in consultation with CDFG and USFWS, and shall be incorporated into the project's BRMIMP and BBCS, and implemented.

Verification: The draft Monitoring Study, BBCS and ECP shall be submitted to the CPM for review in consultation with CDFG, and USFWS, and shall be finalized by the project owner and submitted to the CPM and other agencies no less than 30 days prior to construction. At least 30 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM, CDFG, and USFWS with the a final draft of all three documents, as reviewed and approved by the CPM in coordination with the other agencies. The project owner shall obtain the CPM's written approval of the Monitoring Study, BBCS and ECP prior to the start of any project-related ground disturbance activities.

The project owner shall provide the CPM with copies of any written or electronic transmittal from the USFWS indicating the status of Monitoring Study, BBCS and ECP review and any permit that may be required, and any follow-up actions required by the applicant, within 30 days of receiving such transmittal from USFWS.

Methods and results of the Monitoring Study shall be submitted to the CPM in Monthly and Annual Compliance Reports throughout the course of the study and until the CPM, in consultation with the other agencies, concludes that the cumulative monitoring data provide sufficient basis for estimating long-term bird mortality for the project. The Reports will include all monitoring data required as part of the monitoring program.

Each year throughout the minimum 5 year monitoring period, the Designated Biologist shall submit an Annual Report to the CPM, CDFG, and USFWS by January 31 of each calendar year, summarizing all available bird and bat mortality data (species, date and location collected, evidence of injury and cause of death) collected over the course of the year. The report shall provide any recommendations for future monitoring and adaptive management actions. The report also shall summarize any additional wildlife mortality or injury documented on the project site during the year, regardless of cause. The Annual Report shall be subject to review and approval by the CPM in consultation with CDFG and USFWS. The project owner shall submit revisions within 30 days of receiving written comments from the CPM. At the direction of the CPM, in consultation with the other agencies, the study period will be extended based on data quality and sufficiency for analysis or if needed to document efficacy of any adaptive management measures undertaken by the project owner. If a carcass of a golden eagle or any state or federally listed threatened or endangered species is found at any time, the project owner or Designated Biologist shall contact CDFG and USFWS within one working day of receipt of the carcass to report the mortality and for guidance on disposition of the carcass.

PRE-CONSTRUCTION NESTING BIRD SURVEYS

BIO-16 Pre-construction nest surveys shall be conducted if construction activities will occur from February 1 through August 15. The Designated Biologist or Biological Monitor conducting the surveys shall be experienced bird surveyors and familiar with standard nest-locating techniques. Surveys shall be conducted in accordance with the following guidelines:

1. Surveys shall cover all potential nesting habitat in the project site and within 500 feet of the boundaries of the plant site and linear facilities;

2. At least two pre-construction surveys shall be conducted, separated by a minimum 10-day interval. One of the surveys shall to be conducted within the 10 days preceding initiation of construction activity. Additional follow-up surveys may be required if periods of construction inactivity exceed one week in any given area, an interval during which birds may establish a nesting territory and initiate egg laying and incubation;

3. If active nests are detected during the survey, a no-disturbance buffer zone (protected area surrounding the nest, the size of which is to be determined by the Designated Biologist in consultation with CDFG, USFWS, and CPM) and a monitoring plan shall be developed. The nesting bird plan shall identify the types of birds that may nest in the project area, the proposed buffers, monitoring requirements, and reporting standards that will be implemented to ensure compliance with the Migratory Bird Treaty Act and Fish and Game Codes 3505 and 3505.3. Nest locations shall be mapped using GPS technology and submitted, along with a weekly report stating the survey results, to the CPM; and

4. The Designated Biologist shall monitor the nest until he or she determines that nestlings have fledged and dispersed. Activities that might, in the opinion of the Designated Biologist and in consultation with the CPM, disturb nesting activities shall be prohibited within the buffer zone until such a determination is made.

Verification: At least 10 days prior to the start of any project-related ground disturbance activities, the project owner shall provide the CPM a letter-report describing the findings of the pre-construction nest surveys, including the time, date, and duration of the survey; identity and qualifications of the surveyor(s); and a list of species observed. If active nests are detected during the survey, the report shall include a map or aerial photo identifying the location of the nest and shall depict the boundaries of the no-disturbance buffer zone around the nest. All nest avoidance measures will be implemented and reported in the Monthly Compliance Report.

BURROWING OWL IMPACT AVOIDANCE, MINIMIZATION, AND COMPENSATION MEASURES

BIO-17 The project owner shall implement the following measures to avoid and offset impacts to burrowing owls:

1. Pre-Construction Surveys. Concurrent with desert tortoise clearance surveys the Designated Biologist shall conduct pre-construction surveys for burrowing owls within the project site and along all linear facilities in accordance with CDFG guidelines (CDFG 2012). Pre-construction surveys for burrowing owls shall occur no more than 30 days prior to initiation of ground disturbance or site mobilization activities. The survey area shall include the Project Disturbance Area (the Project Disturbance Area means all lands disturbed in the construction and operation of the HHSEGS Project) and surrounding 500 foot survey buffer where access is legally available.

2. Implement Impact Avoidance Measures. If an active burrowing owl burrow is detected within 500 feet from the Project Disturbance Area the following avoidance and minimization measures shall be implemented:

    a. Establish Non-Disturbance Buffer. Fencing shall be installed at a 250-foot radius from the occupied burrow to create a non-disturbance buffer around the burrow. The non-disturbance buffer and fence line may be reduced to 160 feet if all project-related activities that might disturb burrowing owls would be conducted during the non-breeding season (September 1st through January 31st). Signs shall be posted in English and Spanish at the fence line indicating no entry or disturbance is permitted within the fenced buffer.

    b. Monitoring: If construction activities would occur within 500 feet of the occupied burrow during the nesting season (February 1 – August 31st) the Designated Biologist or Biological Monitor shall monitor to determine if these activities have potential to adversely affect nesting efforts, and shall implement measures to minimize or avoid such disturbance.

3. Prepare Burrowing Owl Relocation and Mitigation Plan. The project owner shall prepare and implement a Burrowing Owl Relocation and Mitigation Plan, in addition to the avoidance measures described above. The final Burrowing Owl Relocation and Mitigation Plan shall be approved by the CPM, in consultation with USFWS and CDFG, and shall:

    a. Identify and describe potential relocation sites on lands controlled by the applicant and describe measures to ensure that burrow installation or improvements would not affect sensitive species habitat or existing burrowing owl colonies in the relocation area;

    b. Provide guidelines for creation or enhancement of at least two natural or artificial burrows per relocated owl, including a discussion of timing of burrow improvements, specific location of burrow installation, and burrow design. Design of the artificial burrows shall be consistent with CDFG guidelines (CDFG 2012) and shall be approved by the CPM in consultation with CDFG and USFWS;

c. Passive relocation sites shall be in areas of suitable habitat for burrowing owl nesting, and be characterized by minimal human disturbance and access. Relative cover of non-native plants within the proposed relocation sites shall not exceed the relative cover of non-native plants in the adjacent habitats;

d. Provide detailed methods and guidance for passive relocation of burrowing owls occurring within the Project Disturbance Area; and

4. Acquire Compensatory Mitigation Lands for Burrowing Owls. For the purposes of the FSA staff is assuming that a minimum of two burrowing owl territories would be lost on the project site. Assuming the project will result in the loss of two territories (each with a territory of 300 acres (CDFG 2012) the Project owner shall acquire, in fee or in easement, 600 acres of land the total compensatory requirements for this project will be based on the number of burrowing owls determined during pre-construction surveys but shall be no less than two territories described in this condition.

   The project owner shall provide funding for the enhancement and long-term management of these compensation lands. The acquisition and management of the compensation lands may be delegated by written agreement to CDFG or to a third party, such as a non-governmental organization dedicated to habitat conservation, subject to approval by the CPM, in consultation with CDFG and USFWS prior to land acquisition or management activities. Additional funds shall be based on the adjusted market value of compensation lands at the time of construction to acquire and manage habitat. In lieu of acquiring lands itself, the Project owner may satisfy the requirements of this condition by depositing funds into the Renewable Energy Action Team (REAT) Account established with the National Fish and Wildlife Foundation (NFWF), as described in Section 3.i. of Condition of Certification **BIO-12**.

   Criteria for Burrowing Owl Mitigation Lands. The terms and conditions of this acquisition or easement shall be as described in Paragraph 1 of **BIO-12** [Desert Tortoise Compensatory Mitigation], with the additional criteria to include: 1) the mitigation land must provide suitable habitat for burrowing owls, and 2) the acquisition lands must either currently support burrowing owls or be within dispersal distance from an active burrowing owl nesting territory (generally approximately 5 miles). The burrowing owl mitigation lands may be included with the desert tortoise mitigation lands ONLY if these two burrowing owl criteria are met. If the burrowing owl mitigation land is separate from the acquisition required for desert tortoise compensation lands, the Project owner shall fulfill the requirements described below in this condition.

<u>Security.</u> If burrowing owl mitigation land is separate from the acreage required for desert tortoise, the project owner or an approved third party shall complete acquisition of the proposed compensation lands prior to initiating ground-disturbing Project activities. The project owner shall provide financial assurances to the CPM and CDFG to guarantee that an adequate level of funding is available to implement the Energy Commission Complementary Mitigation Measures described in this condition. These funds shall be used solely for implementation of the measures associated with the project. Alternatively, financial assurance can be provided to the CPM and CDFG in the form of an irrevocable letter of credit, a pledged savings account or another form of financial security ("security") prior to initiating ground-disturbing project activities. Prior to submittal to the CPM, the security shall be approved by CDFG and the CPM, to ensure funding in the amount of $1,185,000.00. This security amount was calculated as follows and may be revised upon completion of a Property Analysis Record (PAR) or PAR-like analysis of the proposed compensation lands:

a. land acquisition costs for compensation lands, calculated at $1,000/acre = $600,00.00;

b. costs of initial habitat improvements to compensation lands, calculated at $250/acre = $150,000.00;

c. costs of establishing an endowment for long-term management of compensation lands, calculated at $1,450/acre = $870,000.00.

d. costs associated with conducting required surveys, assessments for hazardous materials, escrow fees, third party administrative costs and agency costs to accept the parcel; calculated at $585,000.00 (See Biological resource Table 9 for a breakdown of these costs).

The final amount due will be determined by the PAR analysis conducted pursuant to **BIO-12**.

<u>Verification</u>: If staff determines that compensatory mitigation is required, the project owner will provide the CPM with verification that security has been provided prior to the start of any project-related ground disturbance activities.

If pre-construction surveys detect burrowing owls within 500 feet of proposed construction activities, the Designated Biologist shall provide to the CPM, CDFG and USFWS documentation indicating that non-disturbance buffer fencing has been installed at least 10 days prior to the start of any construction-related ground disturbance activities. The project owner shall report monthly to the CPM, CDFG, and USFWS for the duration of construction on the implementation of burrowing owl avoidance and minimization measures. Within 30 days after completion of construction the project owner shall provide to the CPM, CDFG and USFWS a written construction termination report identifying how mitigation measures described in the plan have been completed.

If pre-construction surveys detect burrowing owls within the Project Disturbance Area, the project owner shall notify the CPM, CDFG and USFWS no less than 10 days of completing the surveys that a relocation of owls is necessary. The project owner shall do all of the following if relocation of one or more burrowing owls is required:

1. Within 30 days of completion of the burrowing owl pre-construction surveys, submit to the CPM, CDFG and USFWS a Burrowing Owl Relocation and Mitigation Plan.

2. No later than 30 days prior to the start of construction-related ground disturbing activities, the project owner shall provide written verification to the CPM of the establishment of the financial security in accordance with this condition of certification.

3. Within 90 days of the land or easement purchase, as determined by the date on the title, the project owner shall provide the CPM with a management plan for review and approval, in consultation with CDFG and USFWS, for the compensation lands and associated fund.

4. No less than 90 days prior to acquisition of the burrowing owl compensation lands, the project owner, or an approved third party, shall submit a formal acquisition proposal to the CPM, CDFG, and USFWS describing the parcel intended for purchase. At the same time the project owner shall submit a PAR or PAR-like analysis for the parcels for review and approval by the CPM, CDFG and USFWS.
5. No later than 18 months after the start of construction-related ground disturbance activities, the project owner shall provide written verification to the CPM, CDFG and USFWS that the compensation lands or conservation easements have been acquired and recorded in favor of the approved recipient.

6. By January 31st of each year following construction for a period of five years, the Designated Biologist shall provide a report to the CPM, USFWS, and CDFG that describes the results of monitoring and management of the burrowing owl relocation area, if applicable. The annual report shall provide an assessment of the status of the relocation area with respect to burrow function and weed infestation, and shall include recommendations for actions the following year for maintaining the burrows as functional burrowing owl nesting sites and minimizing the occurrence of weeds.

WEED MANAGEMENT PLAN

BIO-18 To minimize the potential indirect effects of weeds on biological resources adjacent to the project, the project owner shall submit a draft Weed Management Plan subject to review and approval by the CPM. The general objective of the Weed Management Plan shall be to: 1) manage or contain weed species of greatest environmental concern for the life of the project to prevent their spread into adjacent offsite habitat, and 2) prevent the accidental introduction of new weed species from contaminated vehicles and equipment entering the site during construction or soil disturbing activities

"Target" weed species for long-term containment shall include any weed occurring within the WMAs described above that meet the following definition: a) California Invasive Plant Council (Cal-IPC) "High"-rank weeds; b) California

Department of Food & Agriculture (CDFA) and Nevada Department of Agriculture (NDA) “A”-rated and “B”-rated weeds, and c) all weeds on the Federal weed list. Only the species of greatest environmental concern and/or limited distribution onsite shall be mandated for eradication. Weed management is not required for common and widespread weed species.

The draft weed management plan shall include the following:

1. Weed Plan Requirements. The draft plan shall include the following information: a) specific weed management objectives and measures for each target non-native weed species; b) description of the baseline conditions; c) map of the weed management and monitoring areas showing locations of existing populations of target weeds; d) weed risk assessment based on Cal-IPC[8],Nature Conservancy[9]; BLM, or other acceptable criteria, and e) measures that would be used to contain, manage, or monitor identified priority weed species; f) measures that would be used to prevent the introduction and spread of weeds on vehicles, equipment, and materials (e.g., infested seed, straw, gravel, etc.); g) measures to minimize the risk of unintended harm to wildlife and other plants from weed control activities; h) monitoring and surveying methods; and i) reporting requirements.

2. Avoidance and Treatment of Dense Weed Populations. The draft plan shall include guidelines for avoiding or treating dense populations of the weed species identified as priorities for containment. If grading and construction cannot avoid the worst, they shall be contained by one of the following methods: a) requiring tires of vehicles and equipment operating in infested areas to be cleaned before leaving the infested area; b) treating the infested areas in the season prior to construction and spraying the new crop of plants that emerge in early spring, c) removing the upper 2 inches of soil and disposing it offsite at a sanitary landfill or other site approved by the County Agricultural Commissioner, or d) burying the infested soil, e.g., under the solar facility or in a pit, and covering the infested soil with at least three feet of uncontaminated soil.

3. Cleaning Vehicles and Equipment. The draft plan shall include specifications and requirements for establishing a cleaning station for removal of weed seed and weed plant parts from vehicles and equipment entering and leaving the site. Vehicles and equipment working in weed-infested areas (including previous job sites) shall be required to clean the equipment tires, tracks, and undercarriage before entering the project area and before moving from infested areas of the project site to uninfested

[8] Warner, Peter J., Carla C. Bossard, Matthew L. Brooks, Joseph M. DiTomaso, John A. Hall, Ann M. Howald, Douglas W. Johnson, John M. Randall, Cynthia L. Roye, Maria M. Ryan, and Alison E. Stanton. 2003. *Criteria for Categorizing Invasive Non-Native Plants that Threaten Wildlands.*California Exotic Pest Plant Council and Southwest Vegetation Management Association. 24 pp. Online:.

[9] Morse, L.E., J.M. Randall, N. Benton, R. Hiebert, and S. Lu. 2004. *An Invasive Species Assessment Protocol: Evaluating Non-Native Plants for Their Impact on Biodiversity.*[v1]. The Nature Conservancy. Arlington, Va. Online: http://www.natureserve.org/library/invasiveSpeciesAssessmentProtocol.pdf

areas. Cleaning shall adequately remove all visible dirt and plant debris. Cleaning using hand tools, such as brushes, brooms, rakes, or shovels, is preferred. If water must be used, the water/slurry shall be contained to prevent seeds and plant parts from washing into adjacent habitat.

4. Treatment of Weed Populations near Special-status Plants. The draft plan shall include a requirement to prioritize the containment of invasive non-native weeds onsite that occur onsite and within 100 feet of any of the nine offsite special-status plant occurrences immediately adjacent to the project boundary. The draft plan shall also include measures for preventing accidental harm to the adjacent offsite occurrences during spraying or other weed management activities according to the guidelines in #6, below. The plan shall not include spraying or mechanical treatments of common and widespread weeds around the perimeter to avoid harming wildlife; the focus shall instead be on spot treatment of new outbreaks and small populations of the most invasive species, and according to the guidelines for wildlife-safe herbicide use described under #7 and #8, below.

5. Employee Weed Awareness Training. A program shall be developed and incorporated into the WEAP and BRMIMP to train construction and operation employees to recognize the most common and most invasive species in the area, how to avoid contaminating vehicles and equipment, how to avoid spreading weeds offsite or introducing new weed species onsite, and how to protect wildlife and adjacent offsite special-status plant occurrences from accidental harm during weed management activities. Employees shall be trained to understand the common vectors and conduits for spread, the economic and ecological impacts of weeds, and trained on procedures for reporting infestations.

6. Compensate Local Agencies for Increased Weed Monitoring and Abatement. The project owner and the Inyo/Mono Agricultural Commissioner shall establish an amount for a fee to be paid annually by the project owner to the local agency for increased offsite monitoring and abatement costs resulting from the construction and operation of the project. A summary of California's weed laws is available online: <http://www.cdfa.ca.gov/plant/ipc/encycloweedia/winfo_weedlaws.htm>

7. Safe Use of Herbicides. The draft plan shall include a list of herbicides and soil stabilizers that will be used on the project with manufacturer's guidance on appropriate use. The draft plan shall indicate under what circumstances herbicides will be used, and what techniques will be used to avoid chemical drift. Guidance for safe herbicide use is available in *Safe Herbicide Handling in Natural Areas* (Hillmer et al. 2003). Only weed control measures for target weeds with a demonstrated record of success shall be used, based on the best available information from sources such as The Global Invasive Species Team "Invasipedia"[10], Cal-IPC Invasive

[10] http://wiki.bugwood.org/Invasipedia

Plant Profiles[11],and the California Department of Food & Agriculture Encycloweedia[12].

8. Weed Control Methods. The methods for weed control described in the draft plan shall meet the following criteria:

   a. Manual: Seed heads and plants removed manually must be disposed of in accordance with guidelines from the Inyo County Agricultural Commissioner (or Clark or Nye County commissioners if disposed in Nevada).

   b. Chemical: Herbicides known to have residual toxicity, such as soil fumigants, pre-emergent herbicides and pellets shall not be used. In sensitive areas immediately adjacent to offsite special-status plant occurrences, sprayers shall be operated at low pressure or with a shield attachment to control drift, and spraying conducted on windless days;

   c. Biological: Biological methods, if used, shall be subject to agency review to avoid inadvertent naturalizing, hybridizing with native species;

   d. Mechanical: Mechanical trimmers shall not be used during periods of high fire risk or shall only be implemented during early morning hours when the fire risk is lowest. Contact information for the local fire department and Cal-Fire shall be clearly posted at all times. A live water supply, shovels, and fire extinguishers shall be available at all times during mowing and other mechanical weed controls.

Verification: At least 90 days prior to the start of any project-ground disturbing activity, the project owner shall submit the draft Weed Management Plan to the CPM for review and approval. No less than 30 days prior to the start of any project-ground disturbing activity, the project owner shall provide the CPM with the final version of the Weed Management Plan. Any modifications to the approved plan shall be made only after approval by the CPM.

No less than 60 days prior to start of any project-related ground disturbance activities, the project owner shall provide the CPM with a copy of an agreement between the project owner and local agricultural commissioner(s) regarding compensation for increased weed monitoring and abatement costs, and provide written evidence that the first annual fee has been paid.

Within 60 days after completion of project construction, the project owner shall provide to the CPM for review and approval a written report identifying which items of the Weed Management Plan have been completed, a summary of all modifications to mitigation measures made during the project's construction phase, and which items are still outstanding.

[11] http://www.cal-ipc.org/ip/management/plant_profiles/index.php

[12] http://www.cdfa.ca.gov/plant/ipc/encycloweedia/encycloweedia_hp.htm

As part of the Annual Compliance Report, each year following construction the Designated Biologist shall provide a report to the CPM that includes: a) a summary of the results of noxious weed surveys and management activities for the year; b) discussion of whether weed management goals and objectives for the year were met; c) documentation that weeds targeted for containment did not spread offsite (beyond existing background levels for species that also occur offsite); documentation that methods were employed to prevent accidental harm to adjacent sensitive resources, and d) recommendations for weed management activities for the upcoming year.

SPECIAL-STATUS PLANT IMPACT AVOIDANCE AND MINIMIZATION MEASURES

BIO-19 The project owner shall prevent accidental impacts to special-status plant occurrences offsite that are in close proximity to project activities through the measures described below. The project owner is not responsible for managing or monitoring special-status plant occurrences offsite. The project owner shall incorporate all measures for protecting special-status plants in close proximity to the site into the BRMIMP (BIO-7). These measures shall include the following elements:

a. <u>Modify construction techniques</u>: Incorporate modifications to construction techniques to avoid accidental and indirect impacts to special-status plants around the project perimeter. Examples include: limiting the width of the work area; adjusting the location of staging areas, lay downs, secondary access roads; and modifying the location of discharge points of any diverted channels to maintain existing surface drainage patterns.

b. <u>Establish Environmentally Sensitive Areas (ESAs)</u>. Prior to the start of any ground- or vegetation-disturbing activities, the Biological Monitor shall establish special-status plants located outside of the project and adjacent to the project boundary as temporary Environmentally Sensitive Areas (ESAs) to protect the offsite occurrences from accidental impacts during construction and operation. The adjacent offsite occurrences shall be marked at the project boundary with temporary construction fencing and temporary signage during construction activities in close proximity to the offsite occurrences. The adjacent offsite occurrences shall also be clearly depicted on construction drawings as ESAs.

c. <u>Worker Environmental Awareness Program (WEAP).</u> The WEAP **(BIO-6)** shall include a requirement for informing employees and contractors about the presence of adjacent offsite special-status plant occurrences and components specific to protection of special-status plants as outlined in this condition.

d. <u>Herbicide and Soil Stabilizer Drift Control Measures</u>. Special-status plant occurrences shall be protected from herbicide as described in the Weed Management Plan (**BIO-18**), and shall also be protected from fugitive dust and soil stabilizer drift..

e. Avoid Weed Contaminated Erosion and Sediment Control Materials. Any seed mixes used for erosion control shall not include invasive plants. Erosion-control seed mixes, straw, and other mulches, if used, shall be certified weed-free. These specifications shall be incorporated in the Drainage, Erosion, and Sedimentation Control Plan required under **SOIL-1**.

f. Locate Staging, Parking, Spoils, and Storage Areas Away from Special-Status Plant Occurrences. Spoil piles, equipment, vehicles, and materials storage areas, parking areas, equipment and vehicle maintenance areas, and wash areas shall be placed at least 100 feet from any offsite special-status plant occurrences.

g. Monitoring and Reporting Requirements. The Designated Biologist shall conduct regularly scheduled monitoring of the ESAs and other measures designed to protect adjacent offsite special-status plant occurrences during construction activities in close proximity. The monitoring report shall include: a) dates of worker awareness training sessions and attendees; b) map showing the location of all special-status plant occurrences within 100 feet of the project boundary (including linears and access roads); c) location and description of avoidance measures implemented; d) description of the status, health, and threats to special-status plant occurrences adjacent to the project boundary; e) location description of any unanticipated or unpermitted adverse impacts to occurrences and remedial action taken; and f) outstanding follow-up items and recommendations for remedial action in the next year.

Verification: The Monthly Compliance Reports prepared by the Designated Biologist during construction shall include documentation that the special-status plant avoidance and minimization measures were implemented as described in this condition.

The project owner shall submit a monitoring report every year for the life of the project according to the specifications listed above to monitor effectiveness of protection measures for all avoided special-status plants to the CPM.

SPECIAL-STATUS PLANT COMPENSATORY MITIGATION PLAN

BIO-20 To mitigate for significant impacts to special-status plants that occur on the project site, the project owner shall implement mitigation to offset the impact as described below. One or more mitigation options could be implemented to fulfill the mitigation ratios and requirements described below. These options include: a) acquisition of mitigation lands containing viable occurrences that meet the criteria and performance standards described below, and protecting those occurrences in perpetuity under a conservation easement, or b) restoration of at-risk occurrences according to the criteria and performance standards described below. The project owner shall provide funding for the acquisition and long-term maintenance and management of the acquired lands as described below.

1) Compensatory Mitigation Ratio for Compensation Lands. Significant impacts to four species (gravel milk-vetch, Wheeler's skeletonweed, Torrey's joint-fir, and Preuss' milk-vetch) shall be mitigated by acquiring and preserving offsite occurrences under a permanent conservation easement. Three offsite occurrences shall be protected for every S1 ("critically imperiled") species affected and two offsite occurrences protected for every S2 ("imperiled") species affected. Range ranks (e.g., an S1S2 rank) shall defer to the more imperiled rank. Acquisition lands containing more than one of the affected species shall be credited for both species. Integration of special-status plant mitigation land with other mitigation lands is described below.

   The compensation lands selected for acquisition must meet the following selection criteria: a) the compensation lands selected for acquisition shall be occupied by the target plant population and shall be characterized by site integrity and habitat quality adequate to sustain the population, and b) shall be of equal or better habitat quality than that of the affected occurrence. The occurrence of the target special-status plant on the proposed acquisition lands should be viable, stable or increasing.

2) Review and Approval of Compensation Lands Prior to Acquisition. A Draft Special-status Plant Mitigation Plan (Plan) shall be prepared subject to review and approval of the CPM prior to acquisition. The Draft Plan shall discuss the suitability of the proposed parcel(s) as compensation lands for special-status plants in relation to the criteria listed above. The project owner shall submit the final Plan and formal acquisition proposal to the CPM describing the parcel(s) intended for purchase, and must be approved by the CPM.

3) Management Plan. The project owner, or approved third party as described below under "Title and Conveyance", shall prepare a management plan for the compensation lands in consultation with the entity that will be managing the lands. The goal of the management plan shall be to support and enhance the long-term viability of the target special-status plant occurrences. The management plan shall also include long-term monitoring and reporting on the implementation, effectiveness and compliance with the conservation goals and objectives of the mitigation. The Management Plan shall be submitted for review and approval to the CPM.

4) Integrating Special-Status Plant Mitigation with Other Mitigation Lands. If all or any portion of the acquired Desert Tortoise, Waters of the State, or other required compensation lands meets the criteria above for special-status plant compensation lands, the portion of the other species' or habitat compensation lands that meets any of the criteria above may be used to fulfill that portion of the obligation for special-status plant mitigation. Mitigation obligations for special-status plants shall not be fulfilled by nesting with other mitigation lands if the lands do not meet all the criteria and performance standards described in this condition.

Potential mitigation lands containing more than one of the significantly affected species would be credited for both species, i.e., one parcel could be used to fulfill the mitigation obligations for more than one special-status plant species providing the parcel met all the selection criteria.

5) Compensation Lands Acquisition Requirements. The project owner shall comply with the following requirements relating to acquisition of the compensation lands after the CPM, has approved the proposed compensation lands:

   a. Preliminary Report. The project owner, or an approved third party, shall provide a recent preliminary title report, biological analysis, and other necessary or requested documents for the proposed compensation land to the CPM. All documents conveying or conserving compensation lands and all conditions of title are subject to review and approval by the CPM.

   b. Title/Conveyance. The project owner shall acquire and transfer fee title to the compensation lands, a conservation easement over the lands, or both fee title and conservation easement, as required by the CPM. Any transfer of a conservation easement or fee title must be to a non-profit organization qualified to hold title to and manage compensation lands (pursuant to California Government Code section 65965), or to CDFG or other public agency approved by the CPM. If an approved non-profit organization holds fee title to the compensation lands, a conservation easement shall be recorded in favor of the deed holder approved by the CPM. The CPM may require that another entity approved by the CPM be named a third party beneficiary of the conservation easement. The project owner shall obtain approval of the CPM of the terms of any transfer of fee title or conservation easement to the compensation lands.

   c. Initial Protection and Habitat Improvement. The project owner shall fund activities that the CPM requires for the initial protection and habitat improvement of the compensation lands, if habitat improvement is necessary. These activities will vary depending on the condition and location of the land acquired, but may include: initial enhancement (e.g., signs, fencing, protection from off-road vehicles); restoration actions needed to maintain the viability of the occurrences (e.g., removal of invasive species, barricading and decommissioning off-road vehicle trails, protection from herbivores, managing public access, enforcement); and monitoring and reporting on implementation, effectiveness and compliance with the conservation goals and objectives of the mitigation. For determining the amount of security, the cost of these activities would use the estimated cost per acre for Desert Tortoise mitigation as a best available proxy. The actual costs will vary depending on the measures that are required for the compensation lands and shall be determined by a PAR or similar analysis. A non-profit organization or another public agency may hold and expend the habitat improvement funds if it is qualified to manage the compensation lands (pursuant to California Government Code section 65965), and if it meets the approval of the CPM.

d. Property Analysis Record. Upon identification of the compensation lands, the project owner shall conduct a Property Analysis Record (PAR) or PAR-like analysis to establish the appropriate amount of the long-term maintenance and management fund to pay the in-perpetuity management of the compensation lands. The PAR or PAR-like analysis must be approved by the CPM before it can be used to establish funding levels or management activities for the compensation lands.

e. Long-term Maintenance and Management Funding. The project owner shall deposit into an account managed by a land trust or other non-profit organization to fund a capital long-term maintenance and management fee (endowment) in the amount determined through the Property Analysis Record (PAR) or PAR-like analysis conducted for the compensation lands. The CPM may designate another non-profit organization to hold the long-term maintenance and management fee if the organization is qualified to manage the compensation lands in perpetuity.

f. Interest, Principal, and Pooling of Funds. The project owner shall ensure that an agreement is in place with the long-term maintenance and management fund (endowment) holder/manager to ensure the following requirements are met:

   i. Interest. Interest generated from the initial capital long-term maintenance and management fund shall be available for reinvestment into the principal and for the long-term operation, management, and protection of the approved compensation lands, including reasonable administrative overhead, biological monitoring, improvements to carrying capacity, law enforcement measures, and any other action that is approved by the CPM and is designed to protect or improve the habitat values of the compensation lands.

   ii. Withdrawal of Principal. The long-term maintenance and management fund principal shall not be drawn upon unless such withdrawal is deemed necessary by the CPM or by the approved third-party long-term maintenance and management fund manager, to ensure the continued viability of the target species on the compensation lands.

   iii. Pooling Long-Term Maintenance and Management Funds. An entity approved to hold long-term maintenance and management funds for the project may pool those funds with similar funds that it holds from other projects for long-term maintenance and management of compensation lands for special-status plants. However, for reporting purposes, the long-term maintenance and management funds for this project must be tracked and reported individually to the CPM.

g. Other Expenses. In addition to the costs listed above, the project owner shall be responsible for all other costs related to acquisition of compensation lands and conservation easements, including but not limited to the title and document review costs incurred from other state agency reviews, overhead related to providing compensation lands to an approved third party, escrow fees or costs, environmental contaminants clearance, and other site cleanup measures.

h. Mitigation Security. The project owner shall provide financial assurances to the CPM to guarantee that an adequate level of funding is available to implement any of the mitigation measures required by this condition that are not completed prior to the start of ground-disturbing project activities. Financial assurances shall be provided to the CPM in the form of an irrevocable letter of credit, a pledged savings account or another form of financial security ("Security") approved by the CPM. The estimated acquisition costs and amount of the security shall be calculated based on the estimated cost per acre for Desert Tortoise mitigation as a best available proxy. The actual costs to comply with this condition will vary depending on the actual costs of acquiring compensation habitat, the costs of initially improving the habitat, and the actual costs of long-term management as determined by a PAR report. Prior to submitting the Security to the CPM, the project owner shall obtain the CPM's approval of the form of the Security. The CPM may draw on the Security if the CPM determines the project owner has failed to comply with the requirements specified in this condition. The CPM may use money from the Security solely for implementation of the requirements of this condition. The CPM's use of the Security to implement measures in this condition may not fully satisfy the project owner's obligations under this condition, and the project owner remains responsible for satisfying the obligations under this condition if the Security is insufficient. The unused Security shall be returned to the project owner in whole or in part upon successful completion of the associated requirements in this condition.

2. Compensation through Restoration of At-Risk Occurrences. As an alternative or adjunct to acquisition of compensation lands, the project owner may undertake or fund habitat enhancement or restoration for at-risk occurrences of the target special-status plant species. Examples of suitable restoration projects include but are not limited to the following: a) control of unauthorized vehicle use into an occurrence; b) control of invasive non-native plants that pose an immediate threat to an occurrence; c) fencing to exclude grazing by wild burros or livestock from an occurrence; d) protection from other herbivores (e.g. lagomorphs) if

damaging to the occurrence, or e) restore lost or degraded hydrologic or geomorphic functions critical to the species (e.g., restoring previously diverted stream flows, removing obstructions to the wind sand transport corridor above an occurrence, or increasing groundwater availability for dependent species). Ex-situ mitigation through transplanting or replacement planting is not an acceptable mitigation option due to the high rate of failure.

i. Performance Standards. If the project owner elects to undertake a habitat enhancement project for mitigation, the project must meet the following performance standards: The proposed enhancement project shall achieve rescue of an off-site occurrence that is currently assessed, based on the NatureServe threat ranking system, with one or more of the following: a) long-term decline >30%; b) an immediate threat that affects >30% of the population, or c) has an overall threat impact that is High to Very High. "Rescue" would be considered successful if it achieves an improvement in the occurrence trend to "stable" or "increasing" status, or downgrading of the overall threat rank to slight or low (from "High" to "Very High").

ii. Mitigation Security. The project owner shall provide financial assurances to the CPM to guarantee that an adequate level of funding is available to implement the restoration project. Financial assurances shall be provided to the CPM in the form of an irrevocable letter of credit, a pledged savings account or another form of financial security ("Security") approved by the CPM. The amount of the security shall be based on the estimated total cost for the restoration project, including implementation, monitoring, and contingency measures. The implementation and monitoring of the restoration may be undertaken by an appropriate third party, or the project owner may fund an agency to implement the restoration, subject to approval by the CPM. Any restoration undertaken on private lands must be protected in perpetuity under a conservation easement.

iii. Prepare Restoration Plan. If the project owner elects to undertake a restoration project for mitigation, they shall submit a Restoration Plan to the CPM for review and approval. The Restoration Plan shall include each of the following components:

   i. Goals, Objectives, and Performance Standards. Define the goals of the restoration or enhancement project and a measurable course of action developed to achieve those goals. The objective of the proposed habitat enhancement plan shall include restoration of a target special-status plant occurrence that is currently threatened with a long-term decline. The proposed enhancement plan shall achieve an improvement in the occurrence trend to "stable" or "increasing" status, or downgrading of the overall threat rank to slight or low (from "High" to "Very High").

   ii. Baseline, Historical, and Desired Conditions. Provide a description of the pre-project baseline conditions (prior to the start of restoration), an estimate of the pre-impact historical conditions (before the site was degraded by weeds or grazing or ORV, etc.), and the desired conditions.

iii. Site Characteristics. Describe other site characteristics relevant to the restoration or enhancement project (e.g., composition of native and pest plants, topography and drainage patterns, soil types, geomorphic and hydrologic processes important to the site or species).

iv. Ecological Factors. Describe other important ecological factors of the species being protected, restored, or enhanced such as total population, reproduction, distribution, pollinators, etc.

v. Methods. Describe the restoration methods that will be used (e.g., invasive exotics control, site protection, seedling protection, propagation techniques, etc.) and the long-term maintenance required. The implementation phase of the enhancement must be completed within five years.

vi. Budget. Provide a detailed budget and time-line, and develop clear, measurable, objective-driven annual success criteria.

vii. Monitoring. Develop clear, measurable monitoring methods that can be used to evaluate the effectiveness of the restoration and the benefit to the affected species. The Plan shall include a minimum of five years of quarterly monitoring, and then annual monitoring for the remainder of the enhancement project, and until the performance standards for rescue of a threatened occurrence are met. At a minimum the progress reports shall include: quantitative measurements of the projects progress in meeting the enhancement project success criteria, detailed description of remedial actions taken or proposed, and contact information for the responsible parties.

viii. Reporting Program. The Plan shall ensure accountability with a reporting program that includes progress toward goals and success criteria. Include names of responsible parties.

ix. Contingency Plan. Describe the contingency plan for failure to meet annual goals.

x. Long-term Protection. Include proof of long-term protection for the restoration site. For private lands this would include conservations easements or other deed restrictions; projects on public lands must be protected under a Wilderness designation, ACEC, DWMA, National Park or State Park lands.

3. Preservation of the Germplasm of Affected Special-Status Plants. This is not an alternative to mitigation by acquisition or restoration, but is a required contingency measure for all significantly affected special-status plants as a contingency in the event of mitigation failure. Mitigation by acquisition or restoration shall also include seed or propagule collection from the affected special-status plants population onsite prior to

construction to conserve the germplasm and provide a seed source for restoration efforts. The seed shall be collected under the supervision or guidance of a reputable seed storage facility such as the Rancho Santa Ana Botanical Garden Seed Conservation Program, San Diego Natural History Museum, or the Missouri Botanical Garden. The costs associated with the long-term storage of the seed shall be the responsibility of the Project owner. Any efforts to propagate and reintroduce special-status plants from seeds in the wild shall be carried out under the direct supervision of specialists such as those listed above and as part of a Restoration Plan approved by the CPM.

4. <u>Criteria for Adjusting Mitigation Ratio for Torrey's joint-fir.</u> Due to the uniquely high potential for finding many additional Torrey's joint-fir occurrences (see Special-status Plant Impacts subsection for explanation), the project owner may conduct pre-construction surveys before June 1, 2013, focused on Torrey's joint-fir. Surveys must be conducted onsite as well as offsite. If the discovery of new occurrences in fall 2012 or spring 2013 results in a downgrading of the CNDDB Element Rank from an S1 to S2, the species will be mitigated as an S2 species (see subparagraph #1). If the new occurrences result in a downgrading from S1 to S3 ("vulnerable but not under immediate threat of extinction"), AND the proportion of the statewide distribution affected by the project is less than 10 percent, then mitigation for Torrey's joint-fir shall no longer be required.

<u>Verification:</u> No fewer than 90 days prior to the start of project ground-disturbing activities, the project owner shall submit to the CPM for review and approval a conceptual proposal for mitigation by one or both of the two methods described in this condition (acquisition and restoration) that meets the criteria and performance standards described above, and according to the mitigation ratios described above.

The project owner shall provide the CPM, no less than 30 days prior to the start of any project related ground-disturbing activities, written verification that an approved financial security in accordance with this condition of certification has been established.

No later than June 15 of the first summer following the Final Decision, the project owner shall provide the CPM documentation that seed or other propagules have been collected for all the affected species and submitted to either Rancho Santa Ana Botanical Garden Seed Conservation Program, San Diego Natural History Museum, or the Missouri Botanical Garden.

No later than 30 days following the discovery of any new occurrences of Torrey's joint-fir, the project owner shall submit raw GPS data, metadata, and CNDDB field forms to the CPM. The project owner shall immediately provide written notification to the CPM, CDFG and/or USFWS and BLM if it detects a state- or federal-listed plant species.

Prior to acquisition of the property, the project owner shall submit a formal acquisition proposal to the CPM describing the parcels intended for purchase, or final restoration plan, according to the minimum requirements for a plan described above.

The project owner, or an approved third party, shall complete and provide written verification of the proposed compensation lands acquisition no later than 18 months following the start of project ground disturbing activities. Within 180 days of the land or easement purchase, as determined by the date on the title, the project owner, or an approved third party, shall provide the CPM, with a management plan for the compensation lands and associated funds. The CPM shall review and approve the management plan.

No fewer than 30 days after acquisition of the property the Project owner shall deposit the funds required for long term management, as described above, and provide proof of the deposit to the CPM.

The Project owner or an approved third party shall complete the acquisition and all required transfers of the compensation lands, and provide written verification to the CPM of such completion no later than 12 months after the start of Project ground-disturbing activities. If NFWF or another approved third party is being used for the acquisition, the Project owner shall ensure that funds needed to accomplish the acquisition are transferred in timely manner to facilitate the planned acquisition and to ensure the land can be acquired and transferred prior to the 18-month deadline. If habitat enhancement is proposed, no later than six months following the start of ground-disturbing activities, the Project owner shall obtain CPM approval of the final Habitat Enhancement/Restoration Plan, prepared in accordance with Section D, and submit to the CPM or a third party approved by the CPM Security adequate for long-term implementation and monitoring of the Habitat Enhancement/Restoration Plan.

Restoration activities shall be initiated no later than 12 months following the start of construction. The implementation phase of the enhancement project shall be completed within five years of initiation. Until completion of the five-year implementation portion of the enhancement action, a report shall be prepared and submitted as part of the Annual Compliance Report. This report shall provide, at a minimum: a summary of activities for the preceding year and a summary of activities for the following year; quantitative measurements of the Project's progress in meeting the enhancement project success criteria; detailed description of remedial actions taken or proposed; and contact information for the responsible parties.

BOTANIST QUALIFICATIONS AND DUTIES

BIO-21 The project owner's approved Designated Biologist shall oversee the selection and hiring of qualified botanist(s) to implement the tasks in **BIO-18** (Weed Management Plan), **BIO-19** (Special-status Plant Avoidance and Minimization Measures), **BIO-20** (Special-status Plant Compensatory Mitigation), and **BIO-23** (Groundwater-dependent Vegetation Monitoring) specified below that must be accomplished by a qualified botanist. All other tasks described in these measures not contained in the list below may be accomplished by the Designated Biologist. The Designated Biologist shall submit to the CPM for approval the resume, at least three references, and contact information for the qualified botanist(s) to fulfill the tasks below. The resume(s) shall demonstrate, to the satisfaction of the CPM the appropriate education and experience to accomplish the assigned botanical resource tasks.

Botanist(s) must meet the following minimum qualifications:

1) Demonstrated knowledge of: a) general plant taxonomy and natural community ecology; b) familiarity with the plants of the area, including special status species; and c) familiarity with natural communities of the project area;

2) At least five years experience conducting floristic field surveys;

3) At least five years experience working in the California Desert region;

4) Familiarity with the appropriate state and federal statutes related to plants and protocols or guidelines for conducting botanical inventories; and

5) At least five years experience analyzing the impacts of development on native plant species and natural communities.

Tasks requiring a qualified botanist shall include the following:

1) Advise the project owner's construction and operation managers, and the Designated Biologist on the implementation of botanical resource conditions of certification;

2) Conduct and/or train, supervise and coordinate botanical resources compliance efforts in close proximity to special-status plant occurrences as described in **BIO-18** (Weed Management Plan) and **BIO-19** (Special-status Plant Avoidance and Minimization Measures);

3) Mark special-status plant occurrences in close proximity to the project and inspect these areas at appropriate intervals for compliance with conditions of certification affecting or relating to special-status plants as described in **BIO-19**;

4) Prepare the Weed Management Plan as described in **BIO-18** and conduct the surveying and annual monitoring required in the plan;

5) Consult and/or prepare the Special-status Plant Compensatory Mitigation plans for restoration and/or proposals for acquiring compensation lands, and conduct annual monitoring required in the plans; and

6) Conduct and/or train and supervise the Designated Biologist in the implementation of **BIO-23** (Groundwater-dependent Vegetation Monitoring).

Verification: At least 60 days prior to construction-related ground disturbance, the project owner shall submit the resume to the CPM for a botanist to conduct the tasks described above under tasks #1 and #2. Once approved, the project owner shall provide written verification to the CPM that the qualified botanist is available to implement the required mitigation measures during construction. No construction-related ground disturbance, site mobilization, grading, boring, trenching, chemical spraying, or weed management within 100 feet of a special-status plant occurrence shall commence until an approved botanist has surveyed and marked the special-status plant occurrences adjacent to the project as Environmentally Sensitive Areas as described in **BIO-19** (Special-status Plant Avoidance and Minimization Measures).

STATE WATERS COMPENSATORY MITIGATION AND IMPACT AVOIDANCE & MINIMIZATION MEASURES

BIO-22 To satisfy requirements of California Fish and Game Code sections 1600 and 1607, the project owner shall implement measures contained herein for: 1) compensating unavoidable impacts to all Waters of the State located within the project footprint, and 2) for avoiding and minimizing accidental, incidental and indirect impacts to waters located outside the project footprint. For purposes of this condition, “project footprint” means all lands contained within the boundaries of the project components, including access roads, utility and transmission alignments, staging areas, and temporary construction areas. Avoidance and minimization measures for work within or adjacent to waters shall be implemented during construction, operation, and decommissioning, including site mobilization.

1. Complete and Submit Section 1600 Notification Form and Fees. Coordinate with CDFG to submit a formal 1600 application and associated fees. Submit a final revised state waters delineation report to include additional features identified during the field verification of the state waters delineation.

2. Compensatory Mitigation. The project owner shall acquire and preserve under a permanent conservation easement a parcel or parcels of land that contain jurisdictional state waters in an amount equal to the area of state waters delineated within the project footprint and mitigated at a ratio of 2:1 (two acres for every acre of state waters onsite) for permanent impacts to habitat functions and values. This ratio assumes that impacts to the hydrologic and geomorphic functions will be minimized by not diverting streams around the site in artificial channels. If the channels are diverted around the site, the mitigation ratio shall increase to a ratio of 3:1. The project owner shall provide associated funding for the long-term stewardship of the acquired lands, as specified below.

    a. Selection Criteria. Compensation lands for impacts to state waters shall meet the following criteria:

        i. Located in California and within the Pahrump Valley Hydrologic Unit. If the project owner demonstrates that suitable compensation lands are not available within Pahrump Valley, lands may be acquired in California Valley, or the California portions of Sandy (Mesquite) Valley and Stewart Valley or other adjacent watersheds.

        ii. Contain waters in a general physiographic setting similar to the affected waters (i.e., alluvial fan washes) or that provide similar habitat function and values. Proposed mitigation sites shall be described in terms of habitat function and values, in the context of the habitat function and values that were impacted at the project site, in a proposal submitted to the CEC and subject to approval by the CPM in consultation with CDFG;

iii. Contain waters of a similar or better quality than the affected waters. Subject to review and approval of the CPM in consultation with CDFG, lands degraded by unauthorized off-road vehicles (ORV) may be considered if the project owner can demonstrate that the unauthorized ORV can be excluded and controlled with road decommissioning and signage;

iv. Contain waters that are hydrologically unimpaired upstream by dams or diversions. Subject to review and approval of the CPM in consultation with CDFG, impaired waters may be considered if it can be demonstrated that the hydrologic functions can be restored and are accompanied by a restoration proposal;

v. Do not contain hazardous wastes that cannot be removed; and

vi. Contain water and mineral rights as part of the acquisition, unless the CPM, in consultation with CDFG, agrees in writing to the acceptability of the land.

b. Integrating Special-Status Plant Mitigation with Other Mitigation Lands. Any portion of the acquired Desert Tortoise or other required compensation lands meets the criteria above for state waters may be used to fulfill that portion of the obligation for state waters mitigation.

c. Security for Implementation of Mitigation: The project owner shall provide financial assurances to the CPM to guarantee that an adequate level of funding is available to implement the acquisitions and enhancement of state waters as described in this condition. These funds shall be used solely for implementation of the measures associated with the project. Financial assurance can be provided to the CPM in the form of an irrevocable letter of credit, a pledged savings account or Security prior to initiating ground-disturbing project activities. Prior to submittal to the CPM, the mitigation security shall be approved by the CPM, in consultation with CDFG. The final amount due shall be determined by updated appraisals and the PAR analysis conducted pursuant to **BIO-12** (Desert Tortoise Compensatory Mitigation).

d. Prepare Management Plan for Stewardship of Acquired Lands: The project owner shall submit a draft State Waters Mitigation Management Plan subject to review and approval by the CPM and CDFG. The goal of the plan is to protect the integrity of the washes and their habitat functions and values from unauthorized ORV and other threats, or to restore degraded functions and values as described in #2 (a) above.

Acquired lands must be protected in perpetuity under a conservation easement as described in **BIO-12** (Desert Tortoise Compensatory Mitigation).

e. Compensation Lands Acquisition Requirements. The project owner shall comply with the requirements relating to acquisition of the compensation lands described in **BIO-12** (Desert Tortoise Compensatory Mitigation).

3. Avoidance and Minimization Measures. The measures described below shall be implemented during construction, operation, and closure for any project-related activity that may directly or indirectly affect offsite waters adjacent to the project boundary, and to minimize impacts to the hydrologic and geomorphic functions of waters onsite, including water quality. Such activities include ground or vegetation disturbing activities, weed and vegetation management activities, and pre-construction mobilization. The project owner shall provide a discussion of work in or adjacent to Waters of the State, and the avoidance and minimization measures employed to protect offsite waters from accidental or indirect effects in the Annual Compliance Reports.

a) Guidelines for Stream Crossings. The project owner shall minimize disturbance to surface drainage patterns and sediment transport in watercourses downstream of the project. Arizona crossings shall be employed for improvements to project access roads wherever such crossings do not present a safety hazard and where the roadbed elevation allows the construction of such crossings. Crossings shall be constructed to accommodate the full natural width of the channel (bank-to-bank) for single-thread channels, and the full width of the floodplain for braided distributary channels. Streams that have been graded for temporary construction access shall be restored to original contours and surface drainage patterns and shall be stabilized according to specifications in **SOIL-1**.

b) Diffuser Design. For any diverted watercourse, the project owner shall maintain pre-development surface drainage patterns downstream of the project, in location and approximate volume of flows. Flows shall not be discharged indiscriminately as sheet flow across the entire length of the diffusers, irrespective of the natural surface drainage patterns, but shall instead be designed to discharge within existing watercourse boundaries downstream, or within the active floodplain of braided distributary stream types.

c) Documentation at the Site and Project Entry. The project owner shall provide a copy of this condition from the Energy Commission Decision to all contractors, subcontractors, and the owner’s project supervisors and Designated Biologist. Copies shall be readily available at work sites at all times during periods of active work and must be presented to any CDFG personnel upon demand. The CPM reserves the right to issue a stop work order or allow CDFG to issue a stop work order after giving notice to the project owner and the CPM, if the CPM in consultation with CDFG, determines that the project owner has breached any of the terms or conditions or for other reasons, including but not limited to the following:

i) The information provided by the project regarding impacts to waters of the state is incomplete or inaccurate;

ii) New information becomes available that was not known in preparing the terms and conditions; or

iii) The project or project activities as described in the Staff Assessment have changed.

d) Best Management Practices. During construction, operation, closure, and pre-construction mobilization, the following Best Management Practices (BMPs) shall be implemented to avoid accidental impact during construction or indirect effects to state waters:

i) During the pre-construction planning stage identify gravel storage areas, staging areas, access roads, parking, turnarounds, and equipment refueling & maintenance areas to minimize impacts to any delineated state waters outside of the permitted work area. Staging, storage, equipment maintenance and re-fueling shall be located a minimum of 30 feet from the uphill side of streams and their active floodplain to protect water quality downstream. The boundaries of those work areas shall be clearly marked on all final site plan and construction drawings.

ii) Prior to the start of construction, establish the stream zones offsite or outside the permitted work area that are adjacent to work activities as Environmentally Sensitive Areas (ESAs). No earth-moving activities, vegetation removal, vehicles, heavy equipment, material storage, equipment maintenance or re-fueling, or other construction activities shall be permitted within the ESAs. Work shall not begin until the boundary of the ESAs are delineated on the ground with orange safety netting where they occur adjacent to work activities (e.g., along the project boundary) under supervision of the Biological Monitor. The ESAs shall be depicted on all final maps and specifications.

iii) Construction activities shall be timed with awareness of precipitation forecasts, and shall be started only if the local weather forecast predicts no probability of rain for a period of 72 hours. Construction activities shall cease and water quality, erosion and sediment control measures shall be implemented prior to storm events to prevent erosion and sedimentation, and contamination of stormwater runoff. Activities outside of the sensitive areas described above are not confined to this time period, but at no time shall heavy equipment operate during wet weather.

iv) The project owner shall minimize road building, construction activities and vegetation clearing on streams within the site wherever possible by limiting the width of the work area. Access to the site shall be on existing access roads.

v) In the event of wet weather, the project owner shall not allow water containing mud, silt, or other pollutants from grading, aggregate washing, or other activities to enter streams outside the permitted work area, or be placed in locations that may be subjected to storm runoff. Prior to the start of work, including any equipment move-on or materials storage, install silt-fencing, straw bales, sediment catch basins, straw or coir logs or rolls, or other sediment barriers to keep erodible soils and other pollutants from entering state waters outside the permitted work area. Extra sediment, pollutant, and erosion control materials shall be stockpiled onsite to address any unanticipated rain events, problems and emergencies.

vi) No broken concrete, debris, soil, silt, sand, gravel, rubbish, cement or concrete wash water, oil or petroleum products, or other contaminants shall be allowed to enter into, or placed where it may be washed by rainfall or runoff into waters of the state outside the permitted work area. The contractor shall immediately contain and clean up any petroleum or other chemical spills with absorbent materials such as sawdust or cat litter. For other hazardous materials, follow cleanup instructions on the package.

e) Changes of Conditions. A formal notification shall be provided to the CPM and CDFG if a change of conditions is identified. As used here, change of condition refers to the process, procedures, and methods of operation of a project; the biological and physical characteristics of a project area; or the laws or regulations pertinent to the project as defined below. A copy of the change of conditions notification shall be included in the annual reports or until it is deemed unnecessary by the CPM, in consultation with CDFG. A change in biological conditions includes, but is not limited to, the following: the presence of biological resources within or adjacent to the project area, whether native or non-native, not previously known to occur in the area; or the presence of biological resources within or adjacent to the project area, whether native or non-native, the status of which has changed to endangered, rare, or threatened, as defined in section 15380 of Title 14 of the California Code of Regulations. A change in physical conditions includes, but is not limited to, the following: a change in the morphology of a river, stream, channel or lake, such as the lowering of a bed or scouring of a bank, or substantial changes in stream form and configuration caused by storm events; the movement of a river or stream channel to a different location; a reduction of or other change in vegetation on the bed, channel, or bank of a drainage; or changes to the hydrologic regime such as fluctuations in the timing or volume of water flows in a river or stream.

f) Legal Conditions: a change in legal conditions includes, but is not limited to, a change in Regulations, Statutory Law, a Judicial or Court decision, or the listing of a species, the status of which has changed to endangered, rare, or threatened, as defined in section 15380 of Title 14 of the California Code of Regulations.

Verification: No less than 60 days prior to beginning project ground-disturbing activities, the project owner shall provide to the CPM design drawings of drainage diffusers or other discharge points depicting how these structures restore pre-development drainage patterns (location and volume of flows) to any watercourses located downstream of the project boundaries. At the same time the project owner shall provide design drawings for temporary and permanent stream crossings.

No less than 30 days prior to the start of construction-related ground disturbance activities, the project owner shall provide written verification (i.e., through incorporation into the BRMIMP) to the CPM that the above BMPs will be implemented. No later than 60 days prior to beginning ground-disturbing activities, a formal 1600 application and fees shall be submitted to CDFG, and the project owner shall provide the CPM a copy of the 1600application and verification of payment of CDFG 1600 fees. A copy of the final state waters delineation shall be incorporated into the BMIMP.

The project owner shall provide the CPM, no less than 30 days prior to the start of any project related ground-disturbing activities, written verification that an approved security for compensatory mitigation in accordance with this condition of certification has been established. The financial security will be used to purchase compensatory habitat for impacts to state waters and must be accomplished no later than 18 months from the start of any project-related construction activities. A copy of the final recorded deed showing transfer of mitigation land or documentation of other approved mitigation transaction as approved by the CPM.

No less than 90 days prior to the acquisition of the compensation lands, the project owner shall submit a formal acquisition proposal, including PAR analysis, to the CPM and CDFG. The draft State Waters Mitigation Management Plan shall be provided to the CDFG and CPM no less than 60 days after acquisition of the compensation lands.

GROUNDWATER-DEPENDENT VEGETATION MONITORING PLAN

BIO-23 The project owner shall prepare and implement a draft and final Groundwater-dependent Vegetation Monitoring Plan (Vegetation Monitoring Plan) that, in conjunction with the Groundwater Monitoring, Mitigation, and Reporting Plan (**WATER SUPPLY-4**), will protect groundwater-dependent ecosystems (GDEs) within the influence of the project pumping wells from the impacts of project-related groundwater drawdown. The plans require monitoring to track the impacts of pumping to groundwater levels as they develop during the life of the project, and define triggers for adaptive management to be implemented if data indicate impending adverse effects.

The project owner shall submit a draft Vegetation Monitoring Plan to the CPM for review and approval by the CPM, in consultation with the BLM Nevada and BLM California State Lead for Soil, Water, Air and Riparian Programs, the BLM Southern Nevada District and Barstow District Hydrologist and Botanist, and Inyo County Water Department. The Vegetation Monitoring Plan shall meet the performance standards, monitoring objectives, and guidelines for content of the plan and monitoring methods specified in this condition.

If water level monitoring, as described in **WATER SUPPLY-4**, identifies a projected 0.5 foot or greater water level decline at the property boundary due to project pumping, the project owner shall cease pumping and reduce or modify pumping to restore water levels to pre-threshold levels unless evidence, subject to review and approval by the CPM, in consultation with the parties listed above, demonstrates the drawdown trigger was exceeded due to factors other than the project pumping *and* the project did not contribute to the drawdown. Alternatively, the project may provide evidence through vegetation monitoring and soil coring described in this condition, and through updated predictive hydrologic trend analysis, that a greater drawdown will meet all performance standards contained in this condition for avoiding significant adverse impacts to groundwater-dependent vegetation.

1. Trigger for Adaptive Management. If water levels in either of the Power Block 1 or Power Block 2 Onsite Monitoring Wells identify a projected 0.5 foot or greater water level decline at the property boundary due to project pumping during construction or operation, as described in **WATER SUPPLY-4**, the project owner shall stop project pumping until the project owner provides evidence, subject to approval by the CPM, can demonstrate:

   a) the pumping can be reduced or modified to maintain groundwater levels above the 0.5 ft. drawdown threshold at the project boundary; or

   b) the drawdown trigger was exceeded due to factors other than the project pumping and the project did not contribute to the drawdown; or

   c) through vegetation monitoring and soil coring described in this condition, and predictive water level trend analysis described in **WATER SUPPLY-4**, subsection C.2, that a greater groundwater drawdown will not result in significant adverse impacts to the groundwater dependent vegetation.

2. Peer Review. The draft Vegetation Monitoring Plan shall undergo a peer review by three or more recognized experts in the development of sampling and monitoring plans for plant populations; responses of desert phreatophytes (groundwater-dependent plants) to drought stress or groundwater depletion; and biostatistics. The peer reviewers shall be selected and organized by the CPM, in consultation with the BLM Nevada and BLM California state leads for Soil, Water, Air and Riparian Programs, and the BLM Southern Nevada District and BLM Barstow District

Hydrologist and Botanist, and Inyo County Water Department. The cost of the peer review shall be paid by the project owner. The peer review panel described above is required only for the review of the draft Vegetation Monitoring Plan; all other approvals shall be made by the CPM, in consultation with BLM and Inyo County as described in this condition.

3. Monitoring Objectives and Performance Standards. The goal of the monitoring is to avoid impacts to the mesquite habitats and other nearby GDEs from project groundwater pumping before it results in any plant mortality or any drawdown-related stress from which the GDEs cannot recover fully within one season following detection, and based on the techniques for field measurements and establishing normal seasonal variation and variability between populations described in this condition under "Field Techniques". The objectives of the Vegetation Monitoring Plan shall be to monitor the project effects of groundwater pumping on GDEs at a level of detail necessary for: a) protecting GDEs from significant adverse effects; b) distinguishing project effects from the effects of background trends or normal seasonal variation; and c) distinguishing project effects from natural variability between populations or monitoring plots. Distinguishing project water level effects from background effects or the effects of nearby wells shall be accomplished through the monitoring plan described in **WATER SUPPLY-4**.

4. Definitions. "Sampling", as used in this condition, is the process of selecting a part of something with the intent of showing the quality or nature of the whole. "Baseline monitoring" is the assessment of existing (pre-pumping) conditions to provide a standard, or baseline against which future change is measured. "Normal seasonal variation" in vegetation attributes shall be established by comparing attributes in vegetation between the peak growing season and the hottest and driest time of year. "Variability within the population" shall be established by measuring differences in the vegetation attributes between plots. "Groundwater-dependent vegetation" shall include any plant communities dominated or obligate or facultative "phreatophytes" (groundwater-dependent plant). GDEs include these plant communities and aquatic habitats that are groundwater-supported, such as seeps and springs. A "significant adverse effect to the GDEs" shall be defined as the level of drought stress from which a groundwater-dependent species or habitat cannot fully recover in one season following detection.

5. Minimum Standards for Revising Drawdown Trigger. As described in **WATER SUPPLY-4** subsection C.5, and in this condition under "Trigger for Adaptive Management", the water level-based trigger for adaptive action may be revised in 0.5-foot increments if the project owner can demonstrate that a groundwater drawdown greater than 0.5 feet will not result in significant adverse impacts to the groundwater-dependent vegetation. Modification of the drawdown trigger requires consideration of the following evidence: a) observed water level changes in monitoring wells; b) quantitative field measures of groundwater-dependent vegetation

response to lowering water tables as described in this condition; c) observations of rooting depths from soil cores, as described in this condition; d) updated predictive hydrologic trend analyses from well data collected during project operation, as described in **WATER SUPPLY-4**; and e) hydrogeologic variability between populations or monitoring plots. BLM and Inyo County shall be consulted regarding the resetting of the adaptive action trigger.

Alternately, the pumping can be reduced or modified to maintain groundwater levels above the 0.5 ft. drawdown threshold at the project boundary. Using methods described in **WATER SUPPLY-4** for statistical trend analysis of monitoring well data, the project must provide evidence, subject to approval by the CPM in consultation with BLM and Inyo County, of the maximum pumping rate that will not exceed the maximum drawdown indicated by the data for the life of the project.

6. Prepare an Updated Inventory and Map of Groundwater-dependent Species and Ecosystems (GDEs). The map of GDEs prepared for this project (CH2 2011c, Data Response Set 1A, Figure D48-1), shall be amended to include seeps and springs identified by BLM or through ground surveys and any plant community dominated by obligate or facultative phreatophytes. The map shall be accompanied by a list of all obligate and facultative phreatophytes contained in each GDE. Phreatophytes observed in the project botanical resource study area include (but are not limited to): honey mesquite (*Prosopis glandulosa*); four-wing saltbush (*Atriplex canescens*); allscale (*A. polycarpa*); spiny saltbush (*A. spinescens*); bush seep-weed (*Suaeda moquinii*); desert baccharis (*Baccharis sergiloides*); alkali goldenbush (*Isocoma acradenia*); the non-native salt cedar (*Tamarix* spp.).

7. Permanent Monitoring Plots. The vegetation monitoring shall be conducted within GDEs located: a) east of the project and nearest to the project boundary, as depicted in HHSEGS Data Response Set 1A, Figure D48-1 (CH2 2011c), and b) within the BLM Stump Spring ACEC and between the ACEC and the project pumping wells. No GDEs occur within the project boundary and monitoring plots shall not be located in upland plant communities that are not groundwater-dependent.

8. Baseline and Long-term Data Collection. Baseline data shall be collected at all vegetation monitoring sites beginning as soon as feasible upon project approval to facilitate the determination of background trends (decline) from other sources, including climate conditions. Data on existing or baseline conditions shall be updated each year until a drawdown is detected at the project boundary to establish any background trends. Future change is compared against the baseline, and adjusted for any background decline, such as a regional drop in water levels or vegetation decline from climate conditions established in the baseline trend. Data collection shall continue for the life of the project unless the CPM determines, in consultation with BLM Nevada and BLM California state

leads for Soil, Water, Air and Riparian Programs, BLM Southern Nevada District and BLM Barstow District Hydrologist and Botanist, and Inyo County Water Department, that if no project-related drawdown is detected at the project boundary and not expected based on refined hydrologic trend analysis, or pumping ceases and groundwater levels have returned to baseline levels, the project may stop or reduce its monitoring obligation.

9. Timing. Vegetation monitoring shall be conducted twice annually during the same two week time period during the peak growing period and during the hottest and driest time of year locally. Timing of well monitoring shall be conducted as described in **WATER SUPPLY-4**.

10. Monitoring Controls. The "controls" shall consist of the data collected at plots during the baseline (pre-pumping) data collection period and compared against future change following the start of pumping. Because of the potential for variability in GDE characteristics and depth to groundwater among the different monitoring plot locations, the study design shall treat the monitoring plot and corresponding control (i.e., baseline data from the same plot) as a pair, rather than comparing the mean of all treatment plots to the mean of all control plots. Appropriate statistical methods shall be used to analyze the differences between the control and monitoring plots (for example, a one-tailed paired-sample statistical test (Manly 2008)[13].

11. Field Techniques for Measuring Vegetation Response to Drought Stress. Vegetation monitoring shall employ only sensitive, reliable, and objective field measures of drought stress that can detect the earliest warning signs of an adverse effect. These include: 1) xylem (stem) water potential; 2) gas exchange rate, and 3) transpiration rate. Ecophysiological thresholds shall be established only after field calibrating the measurements to establish normal seasonal variation, and variability between plots or populations. The Vegetation Monitoring Plan must demonstrate knowledge of the biology of the species and their morphological responses to stress. Photo monitoring shall not be considered an acceptable monitoring method but may be useful to aid in the presentation of monitoring results. Field techniques that rely on visual estimates shall not be used. The draft Plan shall describe how the data will be recorded in the field, processed and stored.

12. Minimum Standards for Sampling Design. The sample size and sampling design shall be sufficient to achieve adequate statistical power of 90 percent or better, with a Type I error rate (false-change error rate) of 10 percent or less. The minimum detectable change, or biologically significant change in vegetative measurements of drought stress, shall be established by conducting measurements in the field as described under "Field techniques" in this condition, and calibrated or adjusted for normal seasonal variation and variability between plots.

[13] Manly 2008 – Manly, B., *Statistics for Environmental Science and Management* (2nd ed), CRC Press/Chapman and Hall, 292 pp.

Following collection of the first year baseline data, statistical analysis shall be conducted to refine the power analysis and evaluate the adequacy of the sampling design. If the analysis of baseline data (at the near-project plots and reference plots) indicates that the sampling design is insufficient to achieve adequate statistical power, the design shall be modified (for example, by adding additional monitoring sites or reducing the deviation among sampling units) to attain the desired level of precision. The sampling design shall be informed by *Measuring and Monitoring Plant Populations* (Elzinga et al. 1998)[14] and *Sampling Vegetation Attributes* (Coulloudon et al. 1999)[15]. The draft Vegetation Monitoring Plan shall also describe how groundwater elevation monitoring data collected pursuant to **WATER SUPPLY-4** would be used to interpret the vegetation data.

13. Soil Core Sampling. Subject to approval by BLM or other appropriate local, state, or federal permit requirements, soil core samples may be collected from the GDEs on BLM lands offsite to establish the rooting depth of the mesquite and other phreatophytes. The coring method must provide a continuous core that will provide visual examination of roots and root nodules, soil profile, and soil moisture.

14. Parties Responsible for Monitoring. All data collection shall be conducted or supervised by a qualified botanist (**BIO-21**). The Designated Biologist may conduct monitoring under the training and supervision of a qualified botanist. Monitoring data shall be quality-checked annually by the CPM, in consultation with BLM Nevada and BLM California, and the Inyo County Water Department.

15. Access to Monitoring Data. Copies of monitoring reports and data shall be available to the CPM and BLM at all times. The CPM reserves the right to issue a stop pumping order after giving notice to the project owner if the CPM determines the monitoring data provided is incomplete or inaccurate.

16. Semi-Annual Monitoring Report. Monitoring Reports shall be submitted to the CPM, BLM Nevada and BLM California state leads for Soil, Water, Air and Riparian Programs, the BLM Southern Nevada District and BLM Barstow District Hydrologist and Botanist, and Inyo County Water Department twice annually and shall include: names and contact information for the responsible parties and monitoring personnel; description of sampling and monitoring techniques used for each attribute; results of the vegetation and groundwater level monitoring; comparison of predicted versus actual water table declines; trends and other analyses based on the statistical tests and methods described in this condition and in the final Vegetation Monitoring Plan; photos; and

[14]Elzinga, C.L., D.W. Salzer, and J.W. Willoughby. 1998. *Measuring and monitoring plant populations.* BLM Technical Reference 1730-1, Denver, CO. 477 pages.

[15]Coulloudon et al. 1999.*Sampling Vegetation Attributes*. BLM Technical Reference 1734-4.National Business Center, Denver, CO. 158 p.

conclusions and recommendations. The first Annual Monitoring Report shall also include an appropriate statistical analysis of baseline monitoring data to assess whether the sampling design was adequate to attain sampling precision as described above, and how the study design was adjusted to ensure performance standards were met.

Verification: No less than 90 days prior to start of any project-related groundwater pumping, the project owner shall provide a draft Groundwater-dependent Vegetation Monitoring Plan to the CPM for peer review. The project owner shall revise the final draft based on the recommendations of the peer review within 45 days, and submit the final draft to the CPM for review and approval, in consultation with BLM Nevada and BLM California state leads for Soil, Water, Air and Riparian Programs, and the BLM Southern Nevada District and BLM Barstow District Hydrologist and Botanist, and Inyo County Water Department.

Collection of baseline monitoring data shall begin the first spring or fall following the Final Decision.

The Vegetation Monitoring Plan semi-annual monitoring reports shall be provided to the CPM, BLM Nevada and BLM California state leads for Soil, Water, Air and Riparian Programs, and the BLM Southern Nevada District and BLM Barstow District Hydrologist and Botanist, and Inyo County Water Department no more than 90 days following the collection of spring and fall monitoring data and every spring and fall thereafter for the life of the project.

BIO-24 **DELETED (SEE BIO-23)**

IN-LIEU FEE AND ADVANCED MITIGATION OPTION

BIO-25 The project owner may choose to satisfy certain compensatory mitigation obligations identified for desert tortoise, burrowing owls, special status plants, and jurisdictional waters by paying an in lieu fee to the Department of Fish and Game pursuant to Fish and Game code sections 2069 and 2099, or the Advanced Mitigation option available through the California Department of Fish and Game's Advanced Mitigation Program established by Senate Bill X8 34. If the project owner chooses to satisfy its mitigation obligations through this program, the advance mitigation lands shall meet the criteria as stated in all applicable compensation conditions of certification in the Commission Decision.

Verification: If electing to use this option, the project owner shall notify the CPM that it has chosen to take advantage of the options available through the Department of Fish and Game's program. If approved by the CPM and CDFG, the project owner shall provide written verification that adequate funds have been provided to CDFG to meet the mitigation requirements identified in the Commission Decision and that the advanced mitigation lands meet selection criteria as stated in all applicable compensation conditions of certification in the Commission Decision. As with the other compensatory mitigation, this compensatory mitigation must be completed within 18 months of the start of any project-related ground disturbing activity.

If the project owner chooses the Advance Mitigation option, the owner shall submit to the CPM a copy of the final recorded deed showing transfer of mitigation land or other mitigation transaction documentation as approved by the CPM, within 60 days of CDFG finalizing land transactions.

FACILITY CLOSURE, REVEGETATION, AND RECLAMATION PLAN

BIO-26 The project owner shall develop and implement a Closure, Revegetation and Reclamation Plan (Plan) for the reclamation/revegetation of the project site and other facilities at the time that the facility is decommissioned, or otherwise ceases to be operational, and shall establish site-specific criteria for evaluating and monitoring compliance with the approved reclamation plan. The plan will guide site restoration and closure activities, including methods proposed for revegetation of disturbed areas immediately following construction and rehabilitation and revegetation upon closure of the facility. The plan must address all revegetation, reclamation, and other required facility closure activities pursuant to the Inyo County Renewable Energy Ordinance (Title 21) provisions. In the case of unexpected closure, the plan should assume restoration activities could possibly take place prior to the anticipated lifespan of the plant. The plan shall include but is not limited to the following elements:

1. Plan Purpose: The plan shall explicitly identify the objective of the revegetation plan to be re-creation of the types of habitats lost during construction and operation of the proposed solar energy facility. The final revegetation plan shall include introduction of mid- to late-successional species to ensure revegetation/reclamation success.

2. Standards/Monitoring: Performance standards for success thresholds, weed cover, performance monitoring methods and schedule, and maintenance monitoring.
3. Baseline Surveys – Methods to perform baseline vegetation surveys for planning restoration efforts, with a level sufficient to collect data necessary to prepare the Plan.
4. Seed Handling: Methods for seed collection, testing and application.
5. Soil Preparation: If determined necessary by baseline surveys conducted pursuant to part 3 (above). Soil descriptions, compaction measurements, mulch application, soil storage, seed farming, mycorrhizal inoculation, biological crust collection, or other soil preparations may be included as part of the Plan.
6. Weed Management. Discussion of scope, duration, success criteria, and monitoring of weed management activities shall be included in the Plan.

Verification: At least one year prior to planned closure and decommissioning, the project owner shall submit to the CPM for review and approval, in consultation with the Inyo County Planning Department, a draft plan. The project owner shall incorporate all required revisions submit a final plan to the CPM no less than 90 days prior to the start of ground disturbing activities associated with project closure and decommissioning activities.

Any modifications to the plan shall be made only after consultation and approval of the CPM, in consultation with the Inyo County Planning Department. The project owner shall notify the CPM no less than 90 days before implementing any proposed modifications to the plan.

Within 30 days after completion of project construction for each phase of development, the project owner shall provide to the CPM a written report identifying which items of the Closure, Revegetation and Reclamation Plan have been completed, a summary of all modifications to mitigation measures made during the project's construction phase, and which items are still outstanding.

REFERENCES

The tn: 00000 in the references below indicates the transaction number under which the item is catalogued in the Energy Commission's Docket Unit. The transaction number allows for quicker search and retrieval of individual items docketed for a case or used for ease of reference and retrieval of exhibits cited in briefs and used at Evidentiary Hearings.

Abella et al. 2008 – Abella, S. R., J. E. Spencer, J. Hoines, C. Nazarchyk, *Assessing an exotic plant surveying program in the Mojave Desert, Clark County, Nevada, USA.* In: Environmental Monitoring and Assessment. Springer Netherlands. DOI 10.1007/s10661-008-0263-0.

Ahlborn 2000 – Ahlborn, G., *Species Account for Kit Fox (Vulpes macrotis)*. California Wildlife Habitat Relationships System, California Department of Fish and Game, California Interagency Wildlife Task Group.

Allen et al. 2010 – Allen, Edith B., L. E. Rao, R.J. Steers, G.S. Tonnesen, and Robert F. Johnson, *Impacts of Anthropogenic Nitrogen Deposition on Invasive Species and Fire Risk in California Deserts*. 35th Annual Meeting and Symposium of the Desert Tortoise Council. Ontario, California.

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Bleich, Vern, California Department of Fish and Game. Various telephone and email communications withwith Carol Watson, California Energy Commission, regarding Nelson's bighorn sheep. December 2011 through April 4, 2012).

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Froend, Ray, Professor, University of Australia, School of Natural Sciences, Centre for Ecosystem Management, Centre of Excellence in Ecohydrology, Edith Cowan University. Various electronic communications with Carolyn Chainey-Davis, California Energy Commission, regarding management of groundwater pumping for minimizing impacts to groundwater-dependent ecosystems, and review of a permit condition for monitoring impacts of groundwater pumping on vegetation for the Palen Solar Power Project. August-October 2010.

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Moore, Tonya, Biologist, California Department of Fish and Game. Telephone communications with Chris Huntley, California Energy Commission, regarding translocation mortality for the Calico Solar Project November 2010.

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Stromberg, Juliet, Plant Ecologist and Associate Professor, Arizona State University, various electronic communications with Carolyn Chainey-Davis, California Energy Commission, regarding design and adequacy of the permit condition for monitoring impacts of groundwater pumping on vegetation, Hidden Hills Solar Electric Generating System project, and the Palen Solar Power Project, mesquite rooting depths, and field techniques for monitoring early responses of mesquite to declining water tables. August 2010, and May to August 2012.

Sudmeier, Glenn, California Department of Fish and Game, retired annuitant and member of Society for Conservation of Bighorn Sheep, with Carol Watson, California Energy Commission. Telephone discussion of bighorn sheep presence within Pahrump Valley and surrounding environs; and presence of intermountain movement corridors. Telephone communication and electronic review of FSA bighorn sheep impact analysis. September 5, 2012.

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APPENDIX BIO1 - BIOLOGICAL RESOURCES
RISK ASSESSMENT OF AVIAN EXPOSURE TO CONCENTRATED SOLAR RADIATION

Testimony Of
Rick Tyler, Geoff Lesh PE, Alvin Greenberg Ph.D., William E. Hass MS

SUMMARY OF CONCLUSIONS

The risk assessment examines the potential effect of avian exposure to concentrated solar radiation. Staff examines the nature and probability of adverse effects to birds, when exposed to concentrated solar electromagnetic radiation, including infrared, visible and ultraviolet light.

Staff's analysis of avian exposure to concentrated solar radiation indicates that a threshold of safe exposure does not exist above a solar flux density of 4 kilowatts per square meter or kW/m^2 for a one-minute exposure. The analysis also indicates that both the Hidden Hills and Rio Mesa facilities pose significant risk to avian populations that may encounter the air space in the facilities where concentrated flux density is above the safe levels, potentially resulting in avian morbidity and mortality. The available data regarding avian impacts is very limited; however, such data does provide at least some perspective regarding potential for impact.

There are significant questions regarding extrapolation from the available information regarding avian impacts. The most vexing is the complete absence of data that would allow estimation of avian morbidity. Staff's assessment provides estimates of exposure and dose that can lead to injury and late fatality. In addition, there are major unknowns in estimation of differences in avian populations from one site to the next. These limitations in the available data require exercise of considerable judgment in extrapolation of data from one site to another. However, the errors introduced by the lack of site specific data are likely to be small in comparison to the absence of morbidity estimates and effects of dramatically increased potential exposure duration resulting from the increased volume of the air space affected by concentrated solar flux at commercial-sized facilities like Hidden Hills as compared to pilot-scale facilities.

Staff reviewed the following list of submittals provided by Bright Source regarding potential for impacts on avian resources as a result of potential exposure to concentrated solar flux. While providing descriptions of the heat flux field strengths around the solar receiver steam generator tower, the references are unpublished, lack peer review, are of very limited duration, and are from facilities that are much smaller than the proposed facility with regard to observed adverse avian effects of concentrated solar radiation.

Bright Source contends based on this information that the proposed Hidden Hills Project poses no significant risk to birds that would be exposed to the concentrated flux field associated with the project. They also contend that $50kW/m^2$ is a safe level of exposure for a duration of 30 seconds and that exposures to lower flux densities are without consequence. Staff disagrees with these conclusions, and provides its own independent analysis, with references, of the potential for impacts on avian resources associated with the proposed Hidden Hills Project.

1. BS 2012a – Bright Source (tn 63357). Rio Mesa Solar Electric Generating Facility CEC Biological Resources Workshop Presentation, dated January 6, 2012. Submitted to CEC Docket Unit on January 12, 2012.
2. BS 2012c – Bright Source/T. Stewart (tn 63365). Rio Mesa Avian Survey Counterproposal, dated January 12, 2012. Submitted to CEC Docket Unit on January 13, 2012.
3. ESH 2012a – Ellison Schneider & Harris, LLP/C. Ellison (tn 63475). Bright Source Comments on Issues Identification Report, dated January 30, 2012. Submitted to CEC Dockets Unit on January 30, 2012.
4. CBD 2012a – Center for Biological Diversity/L. Belenky (tn 63521). Comments on Issues Identification Report, dated January 31, 2012. Submitted to CEC / Dockets Unit on February 2, 2012.
5. FWS 2012a - Fish and Wildlife Services (tn 63565) Rio Mesa Golden Eagle Survey Clarification, dated January 31, 2012. Submitted to CEC Dockets Unit on February 6, 2012.
6. ESH 2012b – Ellison Schneider & Harris, LLP (tn 63956) Applicant's Notice Pursuant to 20 C.C.R. § 1716(f) For California Energy Commission's Staff Data Request Set 1A, dated March 2, 2012. Submitted to CEC Dockets Unit on March 2, 2012.
7. URS 2012a – URS/A. Leiba (tn 64060) Applicant's Data Response to Data Request Set 1A, dated March 8, 2012. Submitted to CEC Dockets Unit on March 8, 2012.
8. BS 2012m – Bright Source (tn 64467) Biological Workshop Presentation, dated March 13, 2012. Submitted to CEC Dockets Unit on March 28, 2012.
9. EHS 2012c – Ellison Schneider & Harris/C. Ellison (tn 64093) Applicant's Opening Brief for March 19, 2012. Status Conference, dated March 9, 2012. Submitted to CEC Dockets Unit on March 9, 2012.
10. CBD 2012c – Center for Biological Diversity/L. Belenky (tn 64173) Center for Biological Diversity Data Request, dated March 15, 2012. Submitted to CEC Dockets Unit on March 16, 2012.
11. URS 2012c – URS/A. Leiba (tn 64722) Response to Center for Biological Diversity Data Request, dated April 12, 2012. Submitted to CEC Dockets Unit on April 12, 2012.
12. URS 2012e – URS/A. Leiba (tn 64814) Supplemental Response, dated April 16, 2012. Submitted to CEC Dockets on April 16, 2012.
13. MDM 2012a – Michael D. McCrary, etal. (tn 64807) Avian Mortality at a Solar Energy Power Plant, accepted January 24,1986. Submitted to CEC Dockets Unit on April 17, 2012.
14. BS 2012r – Bright Source (tn 65431) Applicant's Supplemental Response to Data Requests, Set 1B, 143 and 144, dated May 23, 2012. Submitted to CEC Dockets Unit on May 23, 2012.
15. ESH 2012c – Ellison Schneider & Harris, LLP (tn 65696) Applicant's Notice – Staff's Data Requests Set 2A, dated June 8, 2012. Submitted to CEC Dockets Unit on June 8, 2012.
16. ESH 2012e – Ellison Schneider & Harris, LLP (tn 65745) Applicant's Supplemental Notice for CEC Staff's Data Requests Set 2A, dated June 13, 2012. Submitted to CEC Dockets Unit on June 13, 2012.
17. BS 2012u – Bright Source/ T. Stewart (tn 66280) Applicant's Response to Data Requests, Set 2A, #159 dated July 20, 2012. Submitted to CEC Dockets Unit on July 20, 2012.

18. BS 2012v – BrightSource (tn 68364) Applicant Submitted Power Point Presentation (Flux Impacts on Avian Species) for August 28, 2012 Joint Workshop on Rio Mesa SEGF and Hidden Hills SEGS , dated August 28, 2012. Submitted to CEC Dockets Unit on November 5, 2012.
19. BS 2012w – BrightSource (tn 68360) Applicant Submitted Slide on Dr. Pleguezuelos' Conclusions at GEMASolar Plant in Andulusia, Spain, for August 28, 2012 Joint Workshop on Rio Mesa SEGF and Hidden Hills SEGS. Submitted to CEC Dockets Unit on November 5, 2012.
20. BS 2012u – Bright Source/ T. Stewart (tn 66280) Applicant's Response to Data Requests, Set 2A, #159 dated July 20, 2012. Submitted to CEC Dockets Unit on July 20, 2012.
21. BS 2012v – BrightSource (tn 68364) Applicant Submitted Power Point Presentation (Flux Impacts on Avian Species) for August 28, 2012 Joint Workshop on Rio Mesa SEGF and Hidden Hills SEGS , dated August 28, 2012. Submitted to CEC Dockets Unit on November 5, 2012.
22. BS 2012w – BrightSource (tn 68360) Applicant Submitted Slide on Dr. Pleguezuelos' Conclusions at GEMASolar Plant in Andulusia, Spain, for August 28, 2012 Joint Workshop on Rio Mesa SEGF and Hidden Hills SEGS. Submitted to CEC Dockets Unit on November 5, 2012.
23. BS 2012x – BrightSource (tn 68294) Applicant Supplemental Avian Study Information – 1: Assessment of Potential Impacts to Birds from Solar Thermal Power Plant, Dimona Israel; 2: Environmental Impact of the GEMASOLAR Thermosolar Plant on the Bird Community in the Monclova Surrounding Area (Fuentes de Andalucía, Seville, Spain, Juan M Pleguezuelos, Granada, 08-23-2012); 3: Impact of the GEMASOLAR Solar Power Plant (La Monclova, Fuentes de Andalucía, Province of Seville) on the Bird Population, Report 4 (September 2010): Nesting avifauna in the study area during the plant construction phase (March – July 2009-2010); 4: Impact of the GEMASOLAR Solar Power Plant (La Monclova, Fuentes de Andalucía, Province of Seville) on the Bird Population,
24. CH2 2012qq- CH2MHill/j. Carrier (tn: 68630) Data Response, Set 3. 11/21/2012
25. SJ 2012a- Dr. Johnsen Ph.D (tn 68785) Dr. Johnsen's Presentation at December 5, 2012 Joint Rio Mesa SEGF and Hidden Hills SEGF Workshop Submitted to CEC Docket Unit On December 5, 2012.

SETTING

Concentrating solar thermal power plants, like Hidden Hills and Rio Mesa, collect ambient solar radiation and concentrate it onto a solar receiver to generate steam for the steam turbine generator. The concentration of the solar radiation creates a range of solar radiation flux densities between the solar receiver steam generator located atop the power tower and the reflecting mirrors arrayed on the ground. At ground level, nominal solar radiation, or solar energy per unit area, is about 1 kilowatt per square meter (kW/m^2). At the solar receiver steam generator, the reflected concentrated solar radiation is about 600 kW/m^2.

However, because the heliostat mirror arrays do not form a continuous reflective surface across the solar field due to gaps from roads or non-uniform spacing due to terrain or maintenance spacing, the solar flux density does not increase linearly with increasing elevation up to the maximum at the receiver. Gaps in the mirror array result in discontinuities in flux overlaps at elevations closer to the mirrors.

The applicant provided flux density modeling results of the proposed Rio Mesa solar flux fields in response to Staff Data Request 159. Staff relied upon these modeling results for this analysis, but has not been provided the necessary information to independently verify the modeling results. Consequently, staff's analysis remains subject to additional information and analysis of the flux fields. Nevertheless, as expected, values are low near the surface of the mirrors and increase in a non-linear manner in close proximity to the receiver. When the mirrors are concentrating sunlight onto the receiver, the shape of the higher flux regions between the receiver and mirror is an inverted cone, with a small section at the receiver that broadens as you descend towards the solar field. When the mirrors are directed off the receiver in standby mode, the shape of the higher flux regions are like two cones, one facing downward towards the mirrors and one upward away from the focal point (BS 2012u, Fig. 5).

Note that our sun emits a broad spectrum of radiation, including radio waves, visible light, and x-rays. The earth's atmospheric layers filter much of the radiation, diminishing and/or eliminating certain wavelengths particularly in the ultraviolet (UV) spectrum. And the solar field heliostat mirrors further diminish the reflected solar radiation of the shorter (e.g., UV) wave lengths.

It may not be obvious to the reader what the nature of these various flux intensities is, or at what point they could become dangerous. It is instructive because typically people are unaware of the level of flux exposure they are undergoing, aside from being under a sunny clear sky (a level of 1 kW/m^2), whether it is near a fireplace, radiant heater, or other warm device. Thus, to give some perspective to the lower range of values discussed herein, the following **Appendix BIO1 Table 1** (Drysdale 1998, p. 61) shows the effects of thermal radiation (flux) on various organic materials. Reported experiments have shown that several polymeric materials can be heated to beyond 300°C by radiant flux levels ranging from 11 to 15 kW/m^2. Similarly, experiments have shown that wood can be heated to 350 °C by 12 kW/m^2 and to 600°C by 28 kW/m^2 (Drysdale 1998, p. 221, Table 6.5). Staffs notes that these effects are for still air, and surface temperatures would be reduced somewhat in moving air.

Appendix BIO1 Table 1 Effects of thermal radiation

Radiant Heat flux (kW/m^2)	Observed effect
0.67	Summer sunshine in UK[a]
1	Maximum for indefinite skin exposure
6.4	Pain after 8 s skin exposure[b]
10.4	Pain after 3 s skin exposure[a]
12.5	Volatiles from wood may be ignited by pilot after prolonged exposure
16	Blistering of skin after 5 s[b]
29	Wood ignites spontaneously after prolonged exposure[a]
52	Fibreboard ignites spontaneously in 5 s[a]

[a]D. I. Lawson (1954) [b]S.H. Tan (1967)
The data quoted for human exposure are essentially in agreement with information given by Purser (1995) and Mudan and Croce (1995)

Table source: Drysdale 1998, An introduction to Fire Dynamics, 2nd Ed., by Dougal Drysdale, Publ. John Wiley and Sons, 1998, Table 2.8, P. 61

HIDDEN HILLS

The Hidden Hills Solar Electric Generating System (HHSEGS) would be located on Old Spanish Highway, near the community of Charleston View on approximately 3,277 acres (5.12 square miles) of privately owned land in Inyo County, California, adjacent to the Nevada border. The project site is approximately 8 miles south of Pahrump, Nevada, and approximately 45 miles west of Las Vegas, Nevada.

HHSEGS would consist of two 250 MW solar plants. Each solar plant would use heliostats which are elevated mirrors mounted on a pylon to focus the sun's rays on one solar receiver steam generator (SRSG) or receiver atop a 750-foot tall solar power tower near the center of each solar field. In each solar plant, one Rankine-cycle steam turbine would receive steam from the SRSG (or solar boiler) to generate electricity. The solar field and power generation equipment would start each morning after sunrise and would shut down when insolation[1] drops below the level required keeping the turbine online, or during upsets and emergencies.

Each of the heliostat assemblies would be composed of two mirrors, each approximately 12 feet high by 8.5 feet wide with a total reflecting surface of approximately 204 square feet (19 square meters – m^2). Each heliostat assembly would be mounted on a single pylon, along with a computer-programmed aiming control system that directs the motion of the heliostat to track the movement of the sun. The 85,000 heliostats have an effective total reflective area of approximately 1.7 million m^2. These heliostats concentrate solar radiation on the solar receiver boiler and superheater sections (the SRSG is four -sided, with boiler tube walls on the outside to be heated by the concentrated solar radiation).

The receiver absorbs the concentrated radiation from the heliostats and transfers the resultant heat into water and steam in steel tubes at the receiver surface. The efficiency of the Rankine-cycle (steam cycle) is about 43 percent under optimum conditions (summer mid-day). This equates to a solar energy transfer of about 610 million watts (610 MW) between the heliostats and the receiver. While the concentration to an energy density of 600 kW/m^2 is roughly analogous to focusing a 3 inch magnifying glass down to a 1/8 inch point, the power tower does not focus the reflected sun to a point, but rather overlays thousand of heliostat reflections onto the boiler tube walls of the receiver.

The total concentrated solar energy of 610 MWhr is approximately equal to burning 17,000 gallons of gasoline per hour. The solar flux density is intense enough that if the water and steam in the boiler were to stop flowing and the heliostats remained focused on the receiver, it would be destroyed in a short period of time.

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[1] **Insolation** is a measure of solar radiation energy received on a given surface area and recorded during a given time. It is also called solar irradiation and expressed as hourly irradiation if recorded during an hour, daily irradiation if recorded during a day.

RIO MESA

The Rio Mesa Solar Electric Generating Facility (RMSEGF) is very similar to the Hidden Hills facility and consists of two 250-megawatt (MW) (nominal) solar concentration thermal power plants situated on the Palo Verde Mesa in Riverside County, California, 13 miles southwest of Blythe, and is located partially on private land and partially on public land administered by BLM. Design aspects of the RMSEGF are essentially the same as for the HHSEGS.

ANALYTICAL APPROACH

Staff's analysis includes the following analytical steps in estimating the avian mortality and morbidly from exposure to concentrated solar radiation:

a. Hazard Assessment -- the determination of whether a particular environmental exposure is or is not causally linked to particular health effects on the receptors

b. Dose-Response Assessment -- the determination of the relation between the magnitude of exposure and the probability of occurrence of the health effects in question

c. Exposure Assessment -- the determination of the extent of receptor exposure before or after application of regulatory controls

d. Risk Characterization -- the description of the nature and often the magnitude of receptor risk.

e. Analysis of Uncertainty -- Uncertainty represents a discussion of the gaps in knowledge about factors such as adverse effects or exposure levels which may be reduced with additional study. Generally, risk assessments carry several categories of uncertainty, and each merits consideration. Measurement uncertainty refers to the usual error that accompanies scientific measurements -- standard statistical techniques can often be used to express measurement uncertainty. An amount of uncertainty is often inherent in environmental sampling. There are likewise uncertainties associated with the use of scientific models, e.g., dose-response models, models of the physical environment, the assumed values of material properties that may vary in nature or not be well characterized, the probability of occurrence of particular circumstances, etc.

Birds are exposed to this concentrated solar radiation when they enter the flux field and receive the incident radiant energy that is reflected from the array of heliostats on the ground. The radiant energy that exists in the flux field is converted to heat when it is absorbed on any solid opaque surface that receives the transmission of the radiant energy through an otherwise transparent medium (air).

The absorption efficiency of radiant flux is governed by the emissivity of the surface of the object that receives it. Emissivity can range from 0 to 1 with 0 representing perfect reflection of all the incident radiation and 1 representing complete absorption and conversion to heat. It is also governed by the angle of incidence between the radiant flux and the surface that receives it. A mirror is an example of a surface with a low emissivity (typically below 0.05) absorbing and converting to heat less than 5 percent of the incident light. Black pavement is an example of a surface with high emissivity (about 0.95) absorbing 95 percent of the incident light. This is the reason that blacktop becomes so hot when exposed to sunlight.

In actual circumstances the rise in temperature of a surface exposed to radiant flux is often diminished by the transfer of heat to the surrounding air from that surface. This is typically referred to as convective heat transfer. The amount of heat removed by convection is governed by the speed and turbulence of the air passing over the surface and the temperature difference between the air and the heated surface. In the case of birds, the speed of flight through the air is equivalent to a velocity of air over the surface.

The convective heat transfer between bird feathers and the ambient air is analogous to the convective heat transfer between the heated boiler tubes in the receiver and the water and steam flowing in the receivers at the Hidden Hills and Rio Mesa power plants. In the absence of this continuous convective heat removal by the water and steam inside the boiler tubes (i.e. if the tubes were too empty) the temperature of the boiler tubes would rise rapidly to a new higher equilibrium temperature much higher than the normal 540 ^{o}C operating temperature. The surface of the receiver would be damaged unless the incident radiation is removed by putting the heliostats in a standby mode whereby radiant flux is no longer directed on to the receiver.

The potential for injury to birds that fly through a concentrated solar flux field results from heating of the outer surface feathers and subsequent conduction of heat into the exposed feathers causing breakdown of their molecular structure. Conduction is the transfer of heat into a solid object due to the temperature difference between the object and its surroundings. While exposure could also cause a rise in body temperature it is likely that severe damage to the outer feathers would occur much more quickly as a result of the insulating effect of the plumage covering the bird's body.

In this analysis, staff has attempted to estimate levels of exposure to concentrated radiant flux that are safe and would result in little or no damage to exposed birds. It can then be concluded that exposures above such safe levels would result in irreversible and potentially significant impact to exposed birds that enter the flux field.

HAZARD ASSESSMENT

While the highest flux density occurs at the surface of the receiver, high concentration solar flux densities also occur in other parts of the air space above the heliostats, ranging continuously from 1 up to 600 times the background solar radiation of about 1 kW per square meter (1.0 kW/m^2). The applicant's response to Data Request 159 (BS 2012u) provides maps of flux densities throughout the air space above the Rio Mesa Solar fields. Similar flux density fields will exist at the proposed Hidden Hills facility.

When high solar flux densities impinge on objects, for example, a bird's flight feathers (primary, secondary, and tail feathers), the solar radiant flux is converted to heat, which can cause damage resulting in injury or death depending on the exposure level and duration of exposure (i.e. dose). For example, for exposed (bare) human skin, at an exposure level of 5 kW/m^2, first-degree burns would occur within 20 seconds of continuous exposure; second-degree burns would occur within 30 seconds; and third-degree burns would occur within 50 seconds with a 1 percent fatality rate. Because feathers are effectively dead structural protein similar to hair without nerves and other physiological activity, bare human skin is more sensitive than avian feathers to the effects of thermal radiation but does serve as a useful comparison.

Exposures of birds to concentrated solar flux did actually occur at the Solar One facility near Daggett California (McCrary et. al. 1986). Birds were found dead on the site that had clear evidence of thermally induced damage to flight feathers caused by exposure to concentrated solar flux. The birds had near complete removal of both barbules and barbs of flight feathers leaving only the rachis (the main central shaft of the flight feather) remaining. This suggests that the flight feathers had reached temperatures in excess of 300 ^oC and demonstrates the potential for damage to flight feathers resulting from exposure to concentrated solar flux. The barbules, which comprise the major resistance to air flow through surface of the feather, are essential to the creation of lift by wing flapping. The barbules are very small (less than 1/1000 of an inch thick) and have very low mass. Thus, damage to barbules from exposure to concentrated flux will be virtually instantaneous, and damage to barbs, feathers and birds very likely.

DOSE RESPONSE ASSESSMENT

This assessment provides an analysis of the potential damage to flight feathers of the bird associated with exposure to concentrated solar flux. Staff has determined that damage to surface feathers is one of the most sensitive types of adverse effects that can occur in avian species from such exposure. Staff's dose response assessment provides analysis of the relationship of potential feather damage associated with increasing levels of concentrated radiant flux exposure. Staff's analysis identifies levels of concentrated solar flux exposure that are just below the levels that could cause irreversible damage to flight feathers as the criteria to establish safe avian exposure levels.

Bird feathers are composed predominantly of keratin which is a naturally occurring polymeric protein chain. These polymer chains of keratins also form secondary structures creating hard natural fibers (for example hair and wool) and hard fibrous sheets (for example feathers, claws, nails, and hooves). The keratin in feathers is the beta form of keratin, or β-keratin. It has a macromolecular secondary form resulting from folding and cross linking at the edges of the poly peptide polymer primary chains. The β-keratin in feathers also typically contains small amounts of both loosely bound water and more tightly bound water that exists in the molecular structures of the secondary proteins (Conn et al 1987 pages 84-99) (Mazur and Harrow 1968 pages 61-72) (Greenwold and Sawer 2010 page1).

The structural properties (strength, stiffness, elasticity etc.) of the keratin that makes up feathers is central to the feathers function in flight (Bachmann et. al. 2007) (Bachmann an Wagner 2011) (Videler 2005 pages 46 -55). Intact keratin structure is also essential to maintenance of the feather's aerodynamic shape and surface smoothness. Both structural and molecular changes occur when keratin is exposed to temperatures above about 160 ^{o}C (Takahashi et. al. 2004) (Senoz.et.al. 2011) (Istrate et. al. 2011). Alpha and Beta keratin from wool, hair, and feathers have remarkably similar thermal decomposition characteristics (Brebu et. al. 2011).

At ambient, atmospheric pressure, feathers lose unbound water before the feather surface temperature can rise above 100 ^{o}C. Unbound water can also be lost through evaporation at temperatures below 100 ^{o}C with low relative humidity. Heating above 100 ^{o}C in the absence of water is often referred to as heating in the dry state. Keratin is more resistant to thermal degradation when heated in a dry state than in a wet state (Takahashi et. all 2004). Because unbound water cannot exist in the keratin at temperatures above 100 ^{o}C at ambient atmospheric pressure, exposures to concentrated radiant solar flux at ambient conditions will result in dry heating.

Loss of water that is unbound (not molecularly bound) is reversible. Typically the presence of unbound water would result in a transient period before temperatures inside the feather would rise upon heating above 100 ^{o}C due to latent heat required to vaporize the unbound water. However, in the environment of the project site in summer the elevated ambient temperatures and low humidity would suggest very low moisture content in the feathers of indigenous birds, particularly for the flight feathers.

At about 160 ^{o}C, bonds in the molecular structure of secondary proteins are broken leading to loss of structural integrity of the β-keratin molecular structure and a permanently weakened feather. The keratin begins to melt at about 250 ^{o}C. At temperatures of 250 to 450 ^{o}C, bonds in the primary polymer protein chains are broken into smaller molecular compounds through pyrolysis (Senoz et. al. 2011) (Brebu et. al. 2011). When temperatures reach 450 to 500 ^{o}C, keratin will almost completely break down and carbon will be the primary constituent of what remains.

Once bonds on the ends of the protein chains are broken, damage to the keratin is not reversible and thus the structural properties of the secondary proteins and ultimately the exposed feathers are adversely affected. This breaking of the chemical bonds that secure the secondary molecular structure of keratin, which leads to structural changes without affecting the primary protein chains is referred to as denaturing (Istrate 2011) (Takahashi et. al. 2004). This is very similar to the boiling of an egg where the protein structures in the albumin (egg whites) are permanently changed but the basic protein chains are not disrupted. Ultimately the level of damage to the flight feathers will be a function of both the magnitude of exposure and its duration. The dose will thus have units of kilowatt-seconds per square meter or kW-s/m^2.

Based on the results of staff's thermodynamic equilibrium analysis discussed below, exposure to solar flux greater than 4kW/m^2 can result in temperatures above 160 ^{o}C with 60 seconds of exposure. Exposure of 4kW/m^2 can be considered a no observed adverse effect level (NOAEL). Exposures above this level can compromise the keratin molecular structure of a bird's flight feathers, therefore potentially causing irreversibly weakening of feathers leading to an irreversible adverse impact on the feathers. While molting may ultimately replace some damaged feathers, it will in most cases not occur for some time after that damage occurs. Feathers, in which the quill was heated enough to damage the follicle from which the feather grows, might not get replaced during molt.

EXPOSURE ASSESSMENT

To estimate exposure staff modeled the change in surface temperature of flight feathers of a bird during flight when the bird's feathers are exposed on their underside to a concentrated flux in a solar heliostat field. The intensity of exposure depends on the path the bird traverses from the point where it enters a space with concentrated flux until it exits that space. The figures in the applicant's response to Data Request 159 (BS 2012u) are contour plot depictions of concentrated flux density isopleths indicating the locations of flux density levels of 5, 10, 25, 50, 100, and 150 kW/m^2.

To evaluate the potential for damage, it is necessary to convert the radiant flux to a resultant increase in the temperature at the surface of the exposed feathers. During flight, concentrated solar radiation is reflected from the heliostats on to the bottom surface of the feather, causing heating of the surface. The rate of heating depends upon the intensity, or flux, and how fast the surface is simultaneously being cooled. By summing the heat being gained from the incoming flux together with the heat losses occurring through convection and radiation, the resulting feather surface temperature can be estimated.

Potential cooling of the exposed feather surface results from the ongoing heat loss from the bottom surface of the wing feather by multiple mechanisms. The most important of these is convection of heat to the air stream passing under the wing bottom surface (at the bird's air speed). Additional losses include re-radiation of heat (energy) from the hot surface, and by conduction of heat through the feather to its backside, where it can be lost through convection to the air stream passing over the top side of the feather, but only for those areas of the backside that are exposed to topside airflow. Staff has assumed that most flux-exposed feathers will have much of their backside surfaces covered by either other feathers or body skin. Therefore, for purposes of conducting a worst-case risk analysis, staff has ignored the potential heat loss mechanisms of back-side convection and back-side re-radiation (i.e. heat loss from the top of the wing). Staff modeled convective loss from the wing using a heat transfer coefficient from a flat or cambered plate assuming laminar flow over the plate (McArthur 2008, Mueller 1999, Pelletier and Muller 2000, Tucker 1987, Tucker and Parrot 1969). Approximation of a wing using a flat or cambered plate model is the accepted method of modeling fluid flow over wings and is, therefore, also the best method for modeling heat transfer to and from a wing, particularly on the underside where there is no issue of flow separation from the wing surface (Ward 1999), (Withers 1981), Holman 1976), (Incroera 2007), Cengel 2007), (MERM 2001).

These loss mechanisms depend upon the difference between the surface temperature of the feather and the temperature of the ambient air, and they increase in effectiveness as the temperature difference increases. Thus, as the feather surface temperature heats from solar radiation exposure, the heat losses increase until they collectively match in their heat loss rate, the heat gain rate caused by the concentrated solar radiation. At that point the surface temperature stabilizes, and becomes what is called “steady-state.” Due to the extremely small size and low mass density of the keratin micro structures that make up the surface of the feather, at realistic bird flight speeds in the gradually changing solar flux densities of a solar field, surface temperatures reach to within a few degrees of this steady-state temperature virtually instantaneously. During realistic flight conditions in the power plant’s solar field, flux densities change continuously with location, so any sudden change is an unrealistic simplification of actual conditions experienced in flying through the air space having concentrated flux densities.

Because changes in flux density occur gradually during flight, there are no large “step changes”, so temperature rise-times for re-equilibration to changing flux levels can be ignored. After conducting dynamic analyses and examination of several plausible flight paths and comparing those results to the simple assumption of instantaneous equilibrium, staff used the assumption of instantaneous equilibrium to establish safe exposure criteria as this assumption created little error in the result. Assuming instantaneous equilibrium eliminates the dependence on flight path in analyzing potential avian exposures to concentrated solar radiation. **Appendix BIO1 Tables 1** and **2** below provide estimates of equilibrium temperatures for a range of plausible exposure intensities and exposure conditions, a flight speed of 18 miles-per-hour (about 8 meters-per-second), an ambient temperature of 45 ^{o}C, and at incidence angles of 0 degrees and 71 degrees off-perpendicular to the feather surfaces.

Appendix BIO1 Figures 1 through **4** below show the results of dynamic modeling of a range of plausible flight paths. The simplification of using instantaneous equilibrium, allows staff to reduce multiple variables (flux level, emissivity, angle of incidence, flight speed, path through solar field) down to a simpler set of only two variables (flux level and exposure time). Equilibrium surface temperatures are also largely dependent on the cord length of the bird wing (i.e. the distance from the front of the wing to the trailing edge). **Appendix BIO 1 Figure 5** provides an analysis of flux levels causing 160 ^{o}C surface temperatures for different cord lengths and flight speeds. The vast majority of bird species fly within a range of 6 to 16 meters-per-second (Videler 2005 Pages 154 and 155) (Alerstam et. al.)). During flap gliding flight, birds fly at the lower end of the range. Therefore, staff used a flight speed of 8 meters-per-second or 18 miles-per-hour.

Dynamic modeling was conducted by choosing several plausible straight-line flight paths through the solar field, utilizing the isopleth solar field diagrams provided by the applicant. This was be done by re-calculating the feather surface temperature at one-hundredth of a second intervals along a presumed flight path by adjusting for the incoming radiant flux and convective and radiative loses that would be occurring at each interval using the assumed ambient air temperature, flight speed, and incidence angle, etc.

Staff used linear interpolation to estimate flux intensities between isopleths, then plotted temperature on a continuous basis during the flight path through the field. Points where exposure resulted in estimated surface temperatures above 160 ^{o}C, and 300 ^{o}C were noted. **Appendix BIO1 Tables 2** and **3** provide estimates and comparisons of maximum surface temperatures reached based on varying flux densities, and flight paths to assumed steady-state exposure to flux levels.

Appendix BIO1 Table 2 Feather Surface Temperatures vs Flux Intensity

Flux Intensity (kW/m^2)	Steady State Temp (deg C)	Flight Condition		
		Directly at Tower Temp (deg C)	Tangent to 100yds off Tower (deg C)	Flying upward near tower (deg C)
1	80	70	68	60
5	170	160	160	140
10	260	240	240	160
25	430	360	410	220
50	610	600	na	410
100	810	740	na	Na
150	950	930	na	Na

All at 18mph, View factor = 1 (Angle of incidence = 0 deg)

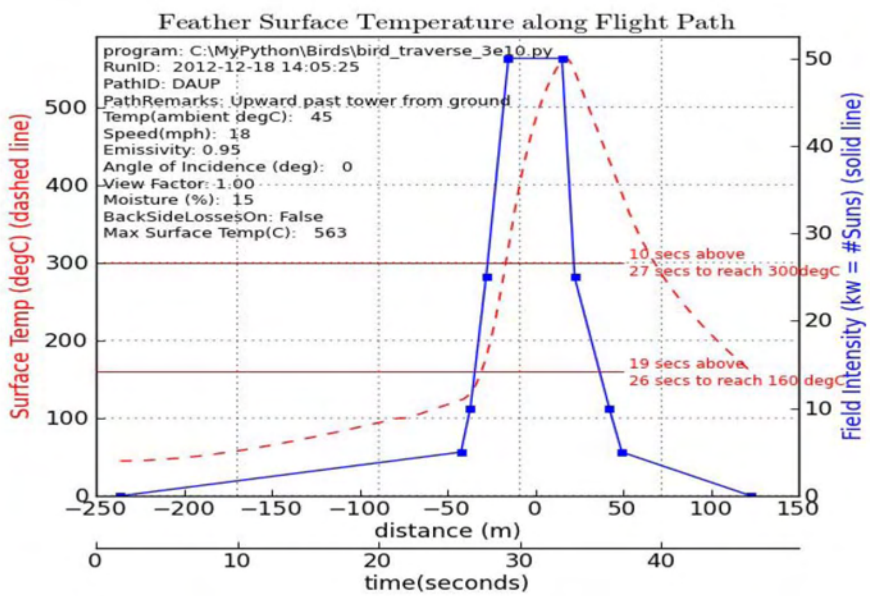
Appendix BIO1 Table 3 Feather Surface Temperatures vs Flux Intensity

Flux Intensity (kW/m^2)	Steady State Temp (deg C)	Flight Condition	
		Directly at Tower Temp (deg C)	Tangent to 100yds off Tower (deg C)
1	60	54	55
5	90	87	88
10	130	120	120
25	220	160	200
50	340	330	na
100	500	380	na
150	600	500	na

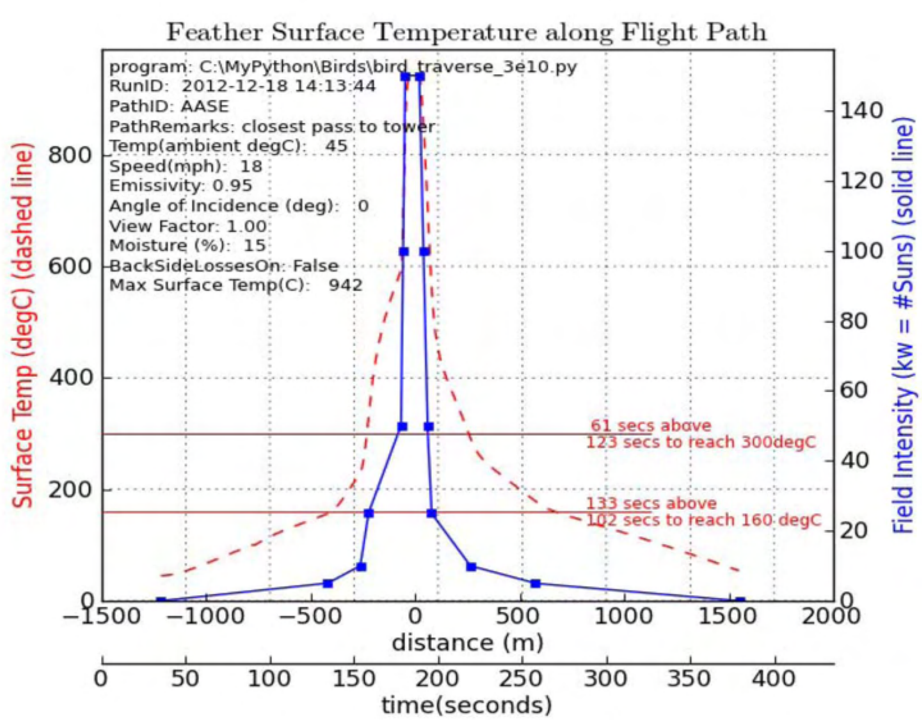
All at 18mph, View factor = 0.33 (Angle of incidence = 71 deg)

Staff modeled absorption of flux by the feather to occur in the initial half-thickness of material, at and just beneath the surface of the feather. The resultant heating is the cause of the temperature rise in the feather material and of the subsequent damage to the fragile keratin structures and molecules that provide the structural integrity of feathers.

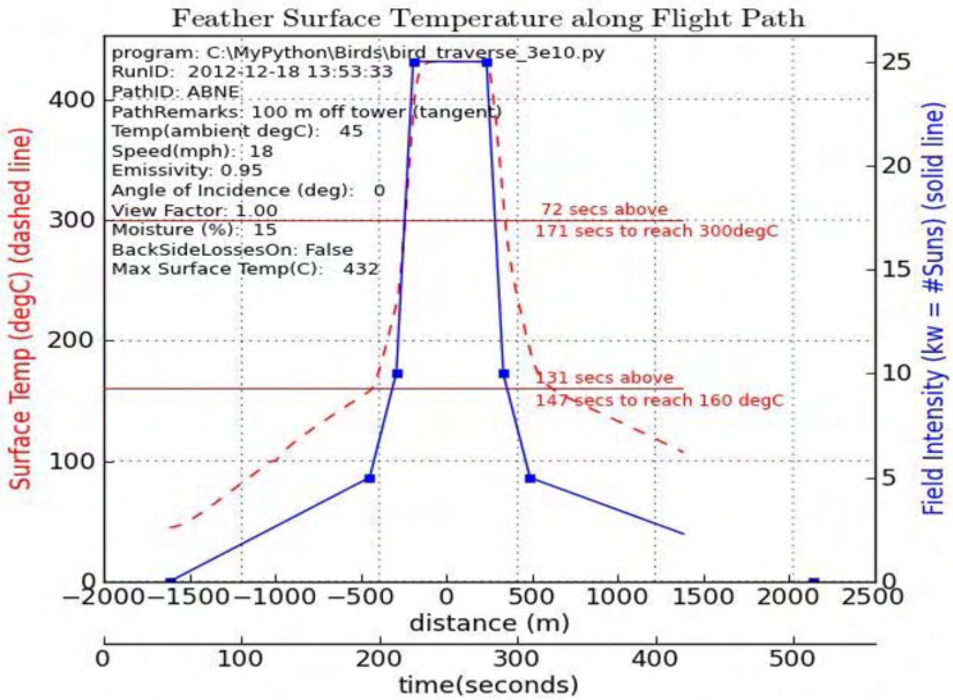
Appendix BIO1 Figure 1 Path is from ground up past tower receiver while operating at full load



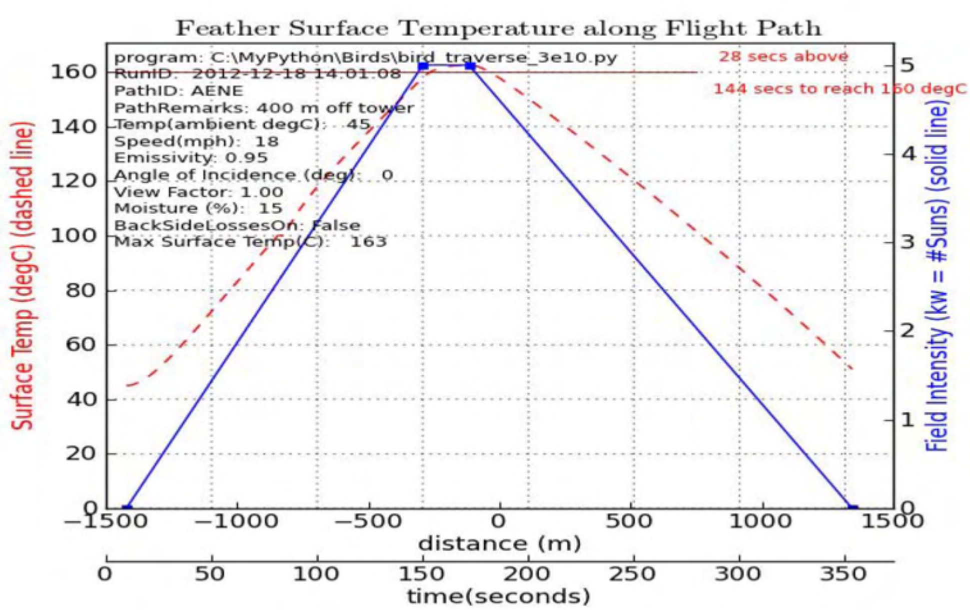
Appendix BIO1 Figure 2 Path is straight line from edge of solar field going close b**y tower to opposite edge of field**



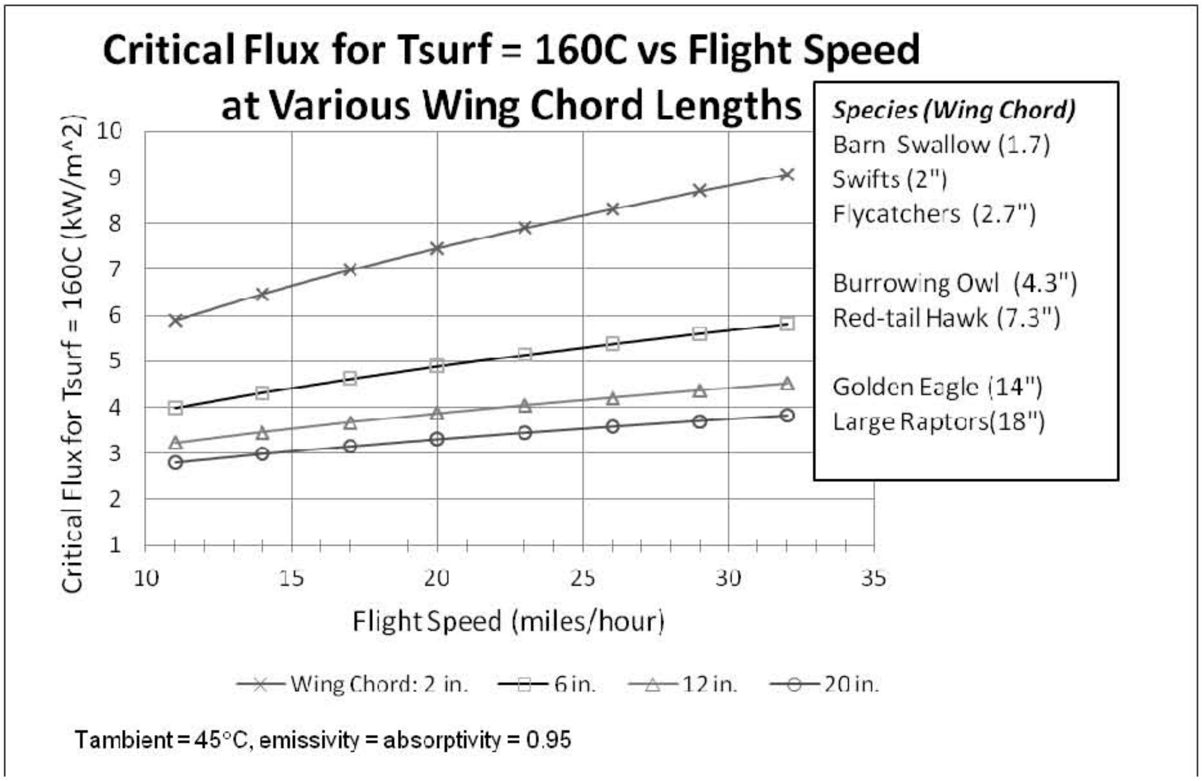
Appendix BIO1 Figure 3 Flight path is straight line tangent to circle with radius of 100 meters around tower



Appendix BIO1 Figure 4 Flight path is tangent to circle with radius of 400 meters



Appendix BIO1 Figure 5 Critical Flux Levels for Tsurf = 160°C vs Wing Chord



Appendix BIO2 provides documentation of the equations, calculations, and source codes for programs used to produce staff's results.

CHARACTERIZATION OF RISK

In flying completely across areas of the facility with flux densities above 5kW/m^2, maximum distances would be between 900 to 1000 meters. At a flight speed of 4.5 meters per second (about 10 miles per hour), the flight would take about 200 seconds and at 18 meters per second (about 40 miles per hour) it would take about 50 seconds to traverse 900 meters. During such flight, the bird would receive exposures ranging from 5 kW/m^2 up to possibly 500 kW/m^2 of varying duration depending on the flight path taken. This exposure including heat loss mechanisms and duration is integrated along the flight path to obtain a time / temperature profile. Integrating flux level and duration along the flight path provides an exposure dose.

As stated previously, when the exposure and duration are sufficient to cause the feather to reach temperatures above 160 ^{o}C, the bird would suffer some level of irreversible damage to feathers that are critical to its ability to fly. This damage can lead to secondary effects such as collision with towers, heliostats and the ground if damage is sufficient to impair normal flight, or even the ability to become and remain air-borne.

Feather damage that results in impairment of flight capability could also decrease the bird's overall probability of survival and life expectancy. For birds of prey, the ability to carry small animals that are caught could be severely compromised leading to potential malnutrition or even starvation of the bird or its young. The carrying of prey significantly increases load-carrying demands placed on the wings and critical flight feathers. For other birds, damaged feathers will impair their ability to forage or to flee predators.

In conducting any risk assessment where fatality is used as the metric to evaluate risk to an exposed population the analyst should always be cognizant that the existence of fatality implies the high likelihood of a significantly higher number of injuries (i.e. morbidity). The ratio of morbidity to mortality can range from less than 5 to one to over 100 to one for different hazards and levels of injury deemed significant. For example, for every death from an explosion, one should expect about 5 serious injuries (K.T. Bogen, E.D. Jones 2005) (Stellman 1998, Table 39.10). For hazards that result in direct trauma to the exposed receptor there is a general relationship of level of damage and level of energy or power to which the receptor is exposed (Frank P. Lees 1980). McCrary did not, nor would it have been practical, to survey a region of sufficient size surrounding the project to account for scavenging of injured birds or latent fatality offsite. Thus staff cannot, based on available data, define morbidity due to exposure to concentrated solar radiation from actual survey data. Staff believes that the hazard to birds from this facility is most analogous to explosive hazards as both have high energy or power levels at a central point with energy levels decreasing exponentially with distance radially from the center. Based on this analogy the level of seriously injured birds for every death is likely to be between 5 and 10.

Thus, the potential damage caused by avian exposure to concentrated solar flux can range from minor impairment (and potentially leading to death) to near immediate fatality depending on the dose received. Low doses of 5 kW/m^2 to 15 kW/m^2 for short exposure periods may not cause effects that are observable to the naked eye but could nonetheless result in significant flight impairment. For example if a significant portion of the feather barbules (the fragile micro structure between barbs) (See Reddy and Yang 2007) were lost the feather's structural integrity would be impaired. Because loss of barbules would significantly compromise integrity of a large portion of the feathers surface area, the differential pressure between the top and bottom of the feather necessary to produce lift and thrust (Videler 2005 Page 55) will also be compromised (Werner and Patone 1998). Such impairment could reduce the bird's level and climbing flight speeds. Longer but still short term exposures to the 10 to 25 kW/m^2 flux densities could cause nearly complete loss of barbules or even complete feather vanes on one or both sides of the rachis and result in loss of flight capability and inability to remain airborne. Staff has identified 4kW/m^2 as a safe level for short exposures (less than 60 seconds). This level of exposure should not result in any damage to flight feathers.

Using the only available data on avian mortality, provided by (McCrary et. al. 1986), staff estimates that the proposed Hidden Hills and Rio Mesa facilities could each result in avian mortality in excess of 22 times that of the Solar One facility previously studied based on linear extrapolation from total relative mirror surface area of the two facilities. This extrapolation is based on mirror area as collision with mirrors played a major role in the total avian fatalities documented at the Solar One facility. It should be noted that the

McCrary study provides no data to assess avian morbidity. It should be recognized that estimates of avian mortality that ignore excess morbidity will necessarily underestimate ultimate fatality that will be associated with that excess morbidity (i.e. latent fatality). It should also be noted that damage to flight feathers could be cumulative if flights through concentrated flux are repeated. Such factors would be expected to contribute to substantial underestimation of avian impacts.

In addition to these concerns extrapolation from a 10 MW pilot plant to a 250 MW facility with many thousands of heliostats and a much taller receiver tower “may produce non-linear increases in the rate of avian mortality when compared to Solar One…” according to McCrary. Also, the volume of the air space with solar flux densities greater than 4 kW/m^2 (i.e. the hazardous air space) would increase with increasing power output rating or solar field size, increasing the likelihood of avian exposure. The effect of a larger volume of the proposed projects would have a greater effect on bird mortality and morbidity given that exposure duration at high intensities would be much greater.

To evaluate the potential for non-linear effect of scale-up in facility size from a pilot scale to a commercial scale, staff estimated the relative volume of air space and relative dose for both a facility the size of Solar One and Hidden Hills/Rio Mesa (see **Appendix BIO1 Figures 5** and **6**) below. Staff chose a range of plausible straight-line flight paths past a Rio Mesa-like facility re-scaled to the reduced size of the Solar One heliostat field having a heliostat field of approximately one-fourth the diameter of Rio Mesa. Three paths were taken from this Solar One model: one having a closest approach distance to the tower at the radius of the 5 kW/m^2 isopleth, another at one-half of that closest approach distance, and a third at one-fourth of that closest approach distance, providing three hypothetical flight paths at distances of 120 feet, 60 feet and 30 feet from the assumed center of the receiver tower. Exposure doses were calculated using these three flight paths at Solar One. Staff then calculated the comparative doses associated with the analogous three hypothetical flight paths, again at distances of 120 feet, 60 feet and 30 feet from the center of the receiver tower at the Rio Mesa facility. **Appendix BIO1 Tables 4** and **5** below provide the results of this comparative analysis.

The volume of the flux field at the Hidden Hills / Rio Mesa size facility with concentrated flux above 5 kW/m^2 is about 20 times larger than the similar flux field volume of the Solar One size facility. The magnitude of the doses resulting from flights at the same distances from the receiver towers described above is between 5 and 6 times larger at the Rio Mesa-size than at the Solar One-sized facility. The product of increased dose and volume is about 100 times larger at Hidden Hills / Rio Mesa as compared to Solar One. This analysis confirms the validity of McCrary’s concern regarding the potential for non-linear increase in scaling of adverse effects on avian populations associated with exposure to concentrated solar flux from scale up of a small 10 MW pilot plant like Solar One to a 250 MW or greater facility like Hidden Hills / Rio Mesa.

Table 4 Comparison of Dose Resulting From Flight Paths at Equal Distance from the Center of Each Receiver Tower (view factor 1.0)

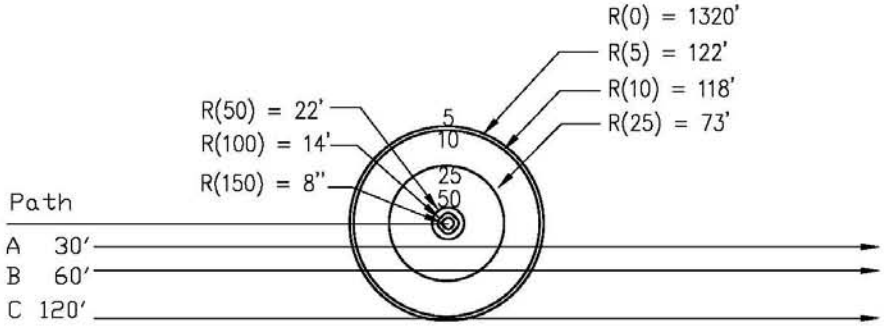
ViewFactor= 1.0 Speed = 18 mph	Path closest approach to tower (feet)	Max flux (kW/m^2)	Exposure time (secs)	Total Dose ($kW\text{-}secs/m^2$)	Dose above Threshold ($kW\text{-}secs/m^2$)
Rio Mesa	30	100	372	2000	1400
	60	50	372	1800	1200
	120	25	372	1500	900
Solar One	30	25	100	400	250
	60	25	100	370	220
	120	5	100	240	80
Solar One Standby Points[1]	NA	1500	0.3	440	440

1. assumes flight speed of 18mph through 8ft flight path

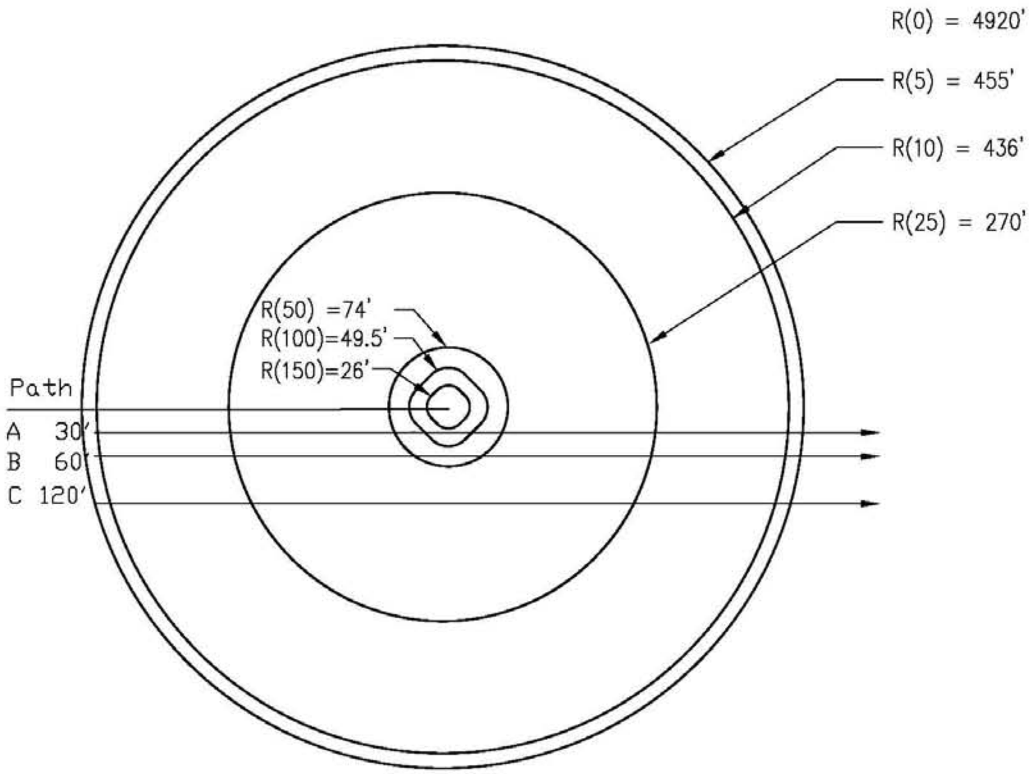
Table 5 Comparison of Dose Resulting From Flight Paths at Equal Distance from the Center of Each Receiver Tower (view factor 0.33)

View Factor=0.33 Speed = 18 mph	Path closest approach to tower (feet)	Max flux (kW/m^2)	Exposure time (secs)	Total Dose ($kW\text{-}secs/m^2$)	Dose above Threshold ($kW\text{-}secs/m^2$)
Rio Mesa	30	100	372	650	380
	60	50	372	580	300
	120	25	372	480	210
Solar One	30	25	100	130	60
	60	25	100	120	50
	120	5	100	80	0

COMPARATIVE FLIGHT PATHS FOR SOLAR ONE & RIO MESA/HIDDEN HILLS



Appendix BIO1 Figure 5 SOLAR ONE - FLUX ARRAY AT TOWER



Appendix BIO1 Figure 6 RIO MESA / HIDDEN HILLS - FLUX ARRAY AT TOWER

ANALYSIS OF UNCERTAINTY

There are significant uncertainties associated with staff's analysis of risk to avian plumage potentially resulting from exposure to concentrated solar flux. Evaluation of the relative sensitivity to various inputs to the thermodynamic equilibrium calculation indicates that the orientation of the bird in the flux field causes the greatest effect on the resultant radiant exposure. This is the result of the strong effect of the angle of incidence on effective flux density. This is reflected in the view factor of the incident rays on the surface (i.e., the angle of the rays to the object's surface). The view factor used in staff's model can vary from about 0.25 to 1 depending on the bird's orientation in the radiant field. This can result in a fourfold change in effective exposure level between level flight and flight that causes the feathers to be perpendicular to the incident solar radiation.

The choice of chord length of the potentially exposed bird wing has the next largest effect on the estimated feather surface temperature. Cord lengths for potentially exposed birds range from about 2 to about 20 inches with the longest cord lengths resulting in the most impact. Choice of chord length can change the analysis outcome by about a factor of three.

The choice of flight speed of the bird is also an important variable in estimation of the resultant surface temperature reached. A decrease in flight speed from 40 miles per hour to 20 miles per hour would increase resultant relative surface temperature rise by about 50 percent. This is the result of decreased convective heat transfer from the feather surface to the ambient air at lower flight speeds.

The emissivity (the fraction of the incident radiation that is absorbed or not reflected from the surface) of the feather would also affect the resultant temperature. However, staff used an emissivity of 0.95 as a plausible worst case eliminating the potential variability associated with differences in emissivity of different feathers. It should also be noted that the micro structure of the feathers may allow radiant energy to penetrate deeply into the feather below the boundary of the outer surface. For example the radiant energy could first contact the barbules that are well within the feather. This could substantially reduce the effect of convection and substantially increase the rate of temperature rise on these surfaces. If this does in fact occur, staff's analysis could substantially underestimate the effect of flight feather damage associated with exposure to concentrated flux.

It is also conceivable that conduction of heat down the quill of the feather could result in damage to the follicle resulting in complete loss of the feather and loss of ability to re-grow a new feather during subsequent molting cycles.

Another uncertainty is the effect of exposure of the feather surface to UV radiation with concurrent exposure to high temperatures. Staff was not able to include the potential effect of increased keratin molecular bond scission that could be associated with concurrent exposures. Such exposure could result in adverse effects on keratin integrity at lower surface temperatures than would otherwise be required, accelerating the rate of damage.

Exposure to summer ambient conditions mid-day results in exposure to solar flux of 1 kW/m^2, and is thus the base line beyond which excess damage can occur. Preexisting exposure of 1 kW/m^2 with or without the existence of the proposed facilities places a lower limit on exposure. An exposure to 5 kW/m^2 is the lowest exposure that results in a surface temperature of 160 ^{o}C which can be considered a lowest observed adverse effect level (LOAEL). Use of an uncertainty factor greater than 5 and a LOAEL of 5 kW/m^2 would render the exposure criteria moot as it would require exposure to remain below the preexisting background of 1kW/m^2. Exposures below 4 kW/m^2 did not result in surface temperatures of above 160^{o} C and can be considered a NOAEL. Use of an uncertainty factor of 2 and a LOAEL of 5 kW/m^2 results in an estimated safe exposure level of 2.5 kW/m^2. Based on this analysis, staff estimates that a one-time exposure to a solar flux density between 2.5 kW/m^2 and 4 kW/m^2, for a duration not exceeding 1 minute or so, would cause little if any damage to flight feathers and can be considered safe.

CONCLUSIONS

Staff's analysis of avian exposure to concentrated solar radiation indicates that a threshold of safe exposure does not exist above a solar flux density of about 4 kW/m^2. The analysis also indicates that both the Hidden Hills and Rio Mesa facilities pose potentially significant risk to avian populations that may encounter the air space in the facilities where concentrated flux density is above staff's estimated safe levels, resulting in avian morbidity and mortality. The available data regarding avian impacts is very limited; however, such data does provide at least some perspective regarding potential for impact.

There are significant questions regarding extrapolation from the available information regarding avian impacts. The most vexing is the complete absence of data that would allow estimation of avian morbidity (i.e. reliable dose response data). Staff's assessment provides estimates of exposure and dose that can lead to injury and late fatality. In addition, there are major unknowns in estimation of differences in avian populations from one site to the next. These limitations in the available data require exercise of considerable judgment in extrapolation of data from one site to another. However, the errors introduced by the lack of site specific data are likely to be small in comparison to the absence of morbidity estimates and effects of dramatically increased potential exposure duration resulting from the increased volume of the air space affected by concentrated solar flux of the proposed project.

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APPENDIX BIO2 - PROCEDURAL MODEL AND CALCULATIONS USED TO ESTIMATE AVIAN EXPOSURE TO CONCENTRATED SOLAR RADIATION

FOR HIDDEN HILLS BIOLOGY RESOURCES APPENDIX BIO1

Introduction

A surface exposed to and thus absorbing incident concentrated solar flux will convert the absorbed flux to heat and rise in temperature until it reaches a thermal equilibrium with its surroundings, including the incident flux. The heat loss mechanisms of convection and radiation will increase their rate of removing heat from the surface until they together match the rate of incoming heat from the incoming solar flux, then the temperature will stabilize. The stable temperature at which this thermal equilibrium occurs is determined by the level of incoming solar flux and parameters that affect the loss mechanisms such as flight speed, ambient temperature, and the view factor. Thus it is possible to, within a reasonable degree of accuracy (with some dependence on materials and circumstances), to relate an incoming solar flux level to the steady-state temperature to which a material surface may rise.

To determine this relationship between solar flux and temperature, staff modeled the temperature response of exposed feather surfaces to concentrated solar flux using a dynamic iterative method that allows for the examination of the various mechanisms of cooling that begin to operate when the material is heated. This method allows for the variation of material properties and allows examination of changing external conditions (e.g. flux levels with position). Transient responses of the material being heated (i.e. the time needed for the material to respond to those changes of external conditions) can also be examined to see how quickly the surface temperature rises and falls.

The surface temperature model is driven by the incoming thermal radiation (flux) to the surface. The absorbed flux causes the absorbing material (the feather in this case) to rise in temperature. The rising temperature causes the material to heat to a temperature above its surroundings, and so the material starts to lose heat back to its surroundings through convection and re-radiation. These three mechanisms are well understood and characterized and can be found in nearly any college level textbook on heat transfer and fluid mechanics (Holman 1976) (Incropera 2007) (Cengel 2007) (MERM 2001).

The model assumes that the material being heated maintains its integrity throughout the modeled flight path regardless of temperatures predicted so that potential temperature rise and response to changing input flux can be observed. The observation of steady-state as well as transient responses help to verify that the model is responding according to well established and verified expected thermal behaviors.

In the real world, most organic materials will begin to decompose (pyrolize) at some elevated temperature (about 160 °C for keratin, the material of feathers), and the material's properties (mass, thickness, stiffness, composition, toughness, brittleness, density, dimensions, etc.) will begin to change. Shrinkage and melting of filamentary structures is expected to occur by approximately 300 °C. Upon reaching a temperature of 400 °C the remaining material would be mostly carbon and have little if any remaining structural integrity. Therefore, for the purpose of risk assessment to evaluate potential damage to feathers, accurately predicting temperatures very much over 300 ^{o}C is not meaningful. By then the keratin will have pyrolized and out-gassed most of its volatile components leaving behind a mostly carbonaceous material. For more information and references on this see **APPENDIX BIO1**. References listed throughout this document refer to the list of references published at the end of **APPENDIX BIO1.**

The following is an outline of the logical steps through which the computerized model proceeds to predict the temperature response of a feather-covered surface (i.e. bird's wing) as it flies along some chosen path above and across a solar concentrated flux field. Some assumptions regarding the material properties and the actual scenario must be made, and attempts have been made to choose reasonable and realistic values and cases for use in conducting a risk assessment of avian exposure to concentrated flux.

Outline of Steps Followed in Bird Flight Model (with references where applicable)

1) Set path conditions

   a) Pick a straight-line path through the applicant-provided flux map (provided in **Response to Data Request, Set 2A, #159**). Note: The diagram used for cross-field paths and to get location and flux density values along that path is included in the top half of the applicant's Figure 3, page 9 of the data response. Most paths were directed northeast, passing at some selected distance of nearest approach to the tower on its northwest side.

   b) Measure the distances to each of the flux contours across the heliostat field

      i) Assume flux = 0 at edge of field, linearly interpolated elsewhere between flux levels indicated on the diagram. (Note: Where paths penetrated inside an indicated contour, but did not penetrate the next higher contour before passing the tower, flux levels were not taken to increase beyond the last penetrated contour. This assumption would tend to underestimate the actual maximum flux level along the path.)

      ii) Make a linear interpolation table of distance and path / flux level. This table is comprised of two vectors (nSunsVect and distData) included for each path shown in the **pathData()** section of the computer program code. The paths modeled are mostly straight lines crossing the solar field coming within some selected nearest approach distance to the solar receiver tower. One reported path involves a short path upward from the ground near the tower at an angle of approximately 45 degrees, to simulate a bird leaving the ground, and flying up through the flux pattern to a level above the tower.

2) Set environmental and flight conditions

   a) Ambient temperature Tambient = 45°C (113 °F). This is a temperature that is near the expected maximum, but which would still be expected to occur several times during the summer months. Ultimately, a shift in the assumed ambient temperature affects the flux-exposed equilibrium temperature by an amount similar to the temperature shift for temperature of interest (less than 300 °C). Thus, an ambient temperature shift of 4 °C, would affect the flux level to reach 160 °C on a surface by about 0.2 kW/m^2.

   b) Flight speed V = 18 mph is used in the risk assessment. This is a speed, within the lower-middle range of speeds (Alerstam 2007) that would be expected of birds at these solar sites.

   c) Angle of incidence of flux to feather surface (angle from perpendicular incidence) "offVert". Values used were (a) 71 degrees as a likely angle to the underside of a horizontal surface (e.g. bird wing) estimated from applicants flux maps, and (b) 0 degrees as there would always be some portion of the surface of any three-dimensional object (e.g. bird) exposed to the flux at this angle.
   The term "vew factor" is equal to the trigonometric cosine of the incidence angle, (i.e. cosine(offVert angle)) is used to indicate the heating "effectiveness" of incident flux on a surface.

   d) Wing chord length (distance from leading to trailing edge of a wing) "L" (6 inches was chosen as representative), is a factor used in determination of the fluid mechanics-related Reynolds number, and thus is a factor in whether airflow over the wing surface is laminar or turbulent, which in turn affects rate of convective cooling of the surface. The L = 6" assumption yields a Reynolds number of approximately 70,000, well within the range spanning bird flight (Videler 2005, p. 17). With the commonly used for air flow over a wing "external flow over a flat plate" analogy model (Ward 1999), the resulting Reynolds number for the underside of the wing remains well below the accepted critical value of 500,000 where air flow would be expected to become turbulent. For all considered cases of bird flight, the air flow passing the underside of the wing is considered to be laminar (Withers 1981). This choice drives the equations used for determining the appropriate convective heat transfer coefficient (Holman 1976) (Incropera 2007) (Cengel 2007) (MERM 2001).

3) Assume feather's physical properties

   a) Thickness = 600 microns (assumed)

   b) Optical emissivity = 0.95 (assumes a dark colored bird) (Ward 1999) Staff assumes for this risk assessment that the absorbance coefficient for solar flux will be the same as the emissivity of the surface for re-radiation of infrared radiation. This assumption is based on reported data on values reported for black plumage, the effects of dirt on surfaces, and the properties of the feathers structure (Quintiere 1974, Osorio 2002, Bass 1995).

c) Optical transmissivity = 0 (assumes incident flux does not pass through without being blocked and absorbed)

d) Optical absorption depth = 0.5 (Assume incident flux is absorbed in first half of thickness)

e) Mass density of solid keratin = 1.3e3 kg/m^3 Ref: (Munn 2009)

f) Void density (to account for the open keratin structure of feathers) (assumed to be 50% of volume). Note that the density characteristics affect transient effects (the timing) of the heating effects, but not the steady-state temperatures used for this risk assessment.

g) Mass density per unit area of plumage = half that of solid keratin to account for void volume of feather structure (See note above on effect of void density).

h) Thermal conductivity of keratin = 0.05 W/m-K Ref: (Dawson 1999), (Baxter 1946),(Martinez 2012)

i) Thermal conductivity of plumage = 0.074 W/m-K Ref: (Walsberg 1988)

j) Moisture level delays heating by adding water mass to the plumage that must be heated to 100 °C. Heating beyond 100 °C, is further delayed as the water consumes and carries away heat during its evaporation. This effect is minor (on the order of 2-3 seconds) for the flight paths modeled.

4) Set initial conditions:

a) Tsurf = Tambient (Assume initial surface temperature is at the ambient air temperature.)

b) Qin = 0 (Solar radiation arriving at the top of the wing surface directly from the sun, is not considered in this analysis).

c) t = 0

5) Start clock (intervals of dt). Repeat the following steps for each clock tick interval, until all way across the heliostat field. Output and graph are stored in viewable files. See Hidden Hills **Appendix BIO1 Figures 1** thorough **4** and **Appendix BIO1 Tables 2** and **5** for examples:

a) Calculate new time (t) from clock ticks by adding dt (the time interval)

b) Calculate position along path
X = V * t where t = elapsed time, V = flight speed

c) Calculate flux Level from position by interpolation between flux contours (from applicant)

d) Calculate solar energy received in from Flux Level, emissivity, view factor, transmissivity

Qin = 1000 * (SunsIn+1) * emissivity * viewFactor * (1 - transmissivity)
Ref: MERM 2001, p. 37-2, eqtn. 37.8

e) Calculate hot-side convective energy losses
Qv = h * (Tsurf - Tambient) Ref: MERM 2001, p. 36-3, eqtn. 36.14

f) Calculate hot-side re-radiative losses energy losses
Qrad = SBsigma * emissivity * ($Tsurf^4$ - $Tambient^4$) Ref: MERM 2001 p. 37-4, eqtn 37.14

g) If backside of plumage is uncovered (i.e. feather is solely protruding without being covered on front or back side by either plumage or flesh), calculate conductive-convective combination losses as:
Qcomb = (Tsurf-Tamb) / (thkPlumage * (1-abDepth) / kPlumage + 1/h) going through the feather with heat going out to the air flowing over the backside of the feather (Holman 1976 p. 29); (this option not used for the conservative general case of this analysis)

if backside of feather is covered by other feathers or the bird's body, set Qcomb = 0. (option used in this analysis)

h) Calculate energy change during interval as Qnet = Qin – Qv – Qcomb – Qrad

i) Calculate change in surface temperature during interval
dT = Qnet * dt / (CpPlumage * mDryfeather + CpWater * mWater)
ref: MERM 2001, p. 34.15
Note: Possible moisture in the feather is accounted for by making the incoming flux warm its mass as well as the feather's, until 100 °C. At 100 °C, temperature rise is stalled until the water has been vaporized from the liquid state, then is assumed to be released to the atmosphere. A moisture level of constituting 15 percent of the mass of the dry feather is assumed.

j) Calculate new surface temperature Tsurf = Tsurf + dT

k) Repeat the loop until path has traversed the solar field.

BIRD FLIGHT MODEL MATERIAL PROPERTIES ASSUMPTIONS WITH REFERENCES

FOR HIDDEN HILLS BIOLOGY RESOURCES APPENDIX BIO1

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```
Selected code extractions showing values used, and source references

# bird plumage characteristics

    Tskin = 41                  #  degC assumed body temperature of bird

    transmissivity = 0.0        # of bird plumage
```

```
emissivity = 0.95           # of bird feather  ref: Ward 1999, Wolf 2000

kPlumage = .074             #  W/m-K plumage thermal conductivity   ref: Walsberg 1988

rhoPlumage = 1.3e3 *.5      #  density in kg/m^3 (keratin density is assumed halved by void
                                                    density)

thkPlumage =    60e-5       #  meters

CpPlumage =     1.53e3      #  J/kg-K

abDepth = .5                # fraction of plumage thickness that
                               absorbs the Qin flux

Tsurf =  Tamb               # start here for initial temp

mDryFeather = rhoPlumage * thkPlumage   # feather mass in kg/m^2

mWater = waterFraction * mDryFeather    # water mass per unit area
                                         (kg/m^2 )  adds mass to feathers

m = mDryFeather + mWater      #water absorbs heat until 100C

#initialized constants and parameters

viewFactor = math.cos(offVert * math.pi/180.)

L = L / 39.4        # Convert from inches to meters

Pr = 0.705          # Prantl number (dimensionless) air       ref: MERM App 35.D

V =  Vmph / 2.237   # convert flight speed from mph to meters/sec

airVis = 1.78e-5    # air kinematic viscosity at 49°C         ref: MERM App 35.D

kAir = .028         # air thermal conductivity W/(m-degK)     ref: MERM App 35.D

Qthresh = 4000.     # in watts/m^2 (staff-determined)

Reynolds = V * L / airVis     # Ref: MERM 2001, p. 36-4 eq. 36.18

Nu = 0.664 * Reynolds**0.5 * Pr**(.33333333)    #Nusselt number  Ref: MERM 2001, p. 36-4 eq.
36.18

h = kAir * Nu / L             # convective heat transfer coeff   Ref: MERM 2001, p. 36-3
eq.36.14

SBSigma = 5.6704e-8           #  W/(m^2 * K^4) Stephan-Boltzman constant Ref: MERM 2001, p.
37-2
```

The following source code listing contains the computer model used for the risk assessment. It is written in the Python Open Source Programming Language, Version 2.7.2. An interpreter for executing the code is available at http://www.python.org/ . This program code was designed and written by staff for this particular project-specific risk assessment, and should not be considered a general purpose heat transfer modeling code. Lines and portions of lines that begin with a ‘#’ mark are comment lines for use in understanding the code. The code is included here for completeness in discussing staff's analytical method and assumptions. No user manual has been written.

Printed in mono-spaced font for readability of computer code.

Source Code

```
# heat rise of bird surface temperature
# bird_traverse_3e10.py  10/28/2012  Geoff Lesh
# added: option for backside losses
def pathData():

    global distVect, nSunsVect, towerLocation, waterFraction, offVert, runID, emissivity,Tamb, ,\
           pathID, pathRemarks

    #findPathID = 'modelRMOff30'
    #findPathID = 'modelRMOff120'
#

    ##if findPathID == 'modelRMOff30':
    #scale =  12/39.4  #meters real world per feet scale
    #pathID = 'modelRMOff30'
    #pathRemarks = 'Modeled RM Off Tower 30 ft'
    #towerDist = 0
    #nSunsVect = (0,   5,      10,     25,     50,     100,100,50,25,10,5,0)
    #distData=   [ -4920,-454,-435,-268,-68,-39,     39,68,268,435,454,4920] # units in feet



    ##if findPathID == 'modelRMOff60':
    #scale =  12/39.4  #meters real world per feet scale
    #pathID = 'modelRMOff60'
    #pathRemarks = 'Modeled RM Off Tower 60 ft'
    #towerDist = 0
    #nSunsVect = (0, 5, 10, 25, 50, 50, 25, 10, 5, 0)
    #distData=   [ -4920,-451,-432,-263,-43,43,263,432,451,4920] # units in feet


    ##if findPathID == 'modelRMOff120':
    #scale =  12/39.4  #meters real world per feet scale
    #pathID = 'modelRMOff120'
    #pathRemarks = 'Modeled RM Off Tower 120 ft'
    #towerDist = 0
    #nSunsVect = (0,   5,      10,     25,     25,10,5,0)
    #distData=   [ -4919,-439,-419,-242,242,419,439,4919] # units in feet


    ##if findPathID == 'modelS1Off30':
    #scale =  12/39.4  #meters real world per feet scale
    #pathID = 'modelS1Off30'
    #pathRemarks = 'Modeled S1 Off Tower 30 ft'
    #towerDist = 0
    #nSunsVect = (0,   5,      10,     25,     25,10,5,0)
    #distData=   [ -1320,-118,-114,-67,67,114,118,1320] # units in feet

    ##if findPathID == 'modelS1Off60':
     #scale =  12/39.4  #meters real world per feet scale
     #pathID = 'modelS1Off60'
     #pathRemarks = 'Modeled S1 Off Tower 60 ft'
     #towerDist = 0
     #nSunsVect = (0,  5,      10,     25,     25,10,5,0)
```

```
     #distData=   [ -1319,-106,-102,-42,42,102,106,1319] # units in feet

    ##if findPathID == 'modelS1Off120':
    #scale =  12/39.4  #meters real world per feet scale
    #pathID = 'modelS1Off120'
    #pathRemarks = 'Modeled S1 Off Tower 120 ft'
    #towerDist = 0
    #nSunsVect = (0.,  5.,     5.,0.)
    #distData=   [ -1315,-22,22,1315] # units in feet

    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale

    ###flying upward  Note: this path has its own scale!
    #scale=300 / 16.7  #meters Real world per cm on map: map data is in same cm.
    #pathID =  'DAUP'
    #pathRemarks = 'Upward past tower from ground'
    #towerDist = 13.15
    #nSunsVect = (0,5,10,25,50,50,25,10,5,0)
    #distData=   [0,10.8,11.1,11.6,12.3,14,14.4,15.5,15.9,20]  #cm of scale #

    #pathID = 'Constant 1KW'
        #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #pathRemarks = 'Constant 1KW'
    #towerDist = 24.3
    #nSunsVect = (0,1,1,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #

    #pathID = 'Constant 5KW'
    #pathRemarks = 'Constant 5KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,5,5,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #

    #pathID = 'Constant 8KW'
    #pathRemarks = 'Constant 8KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,8,8,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #


    #pathID = 'Constant 10KW'
    #pathRemarks = 'Constant 10KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,10,10,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #


    #pathID = 'Constant 25W'
    #pathRemarks = 'Constant 25KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,25,25,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #
```

```
    #pathID = 'Constant 50KW'
    #pathRemarks = 'Constant 50KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,50,50,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #

    #pathID = 'Constant 100KW'
    #pathRemarks = 'Constant 100KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,100,100,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #

    #pathID = 'Constant 150KW'
    #pathRemarks = 'Constant 150KW'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,150,150,0)
    #distData=   [16.95,17.0, 31.2, 31.25]  #cm of scale #


    #pathID = 'AASE'
    #scale=1500./7.7   # meters real world per cm on scale
    #pathRemarks = 'closest pass to tower'
    #towerDist = 21.55
    #distData=   [15.3, 19.4, 20.2, 20.4, 21.2, 21.25, 21.3, 21.65, 21.75, 21.85, 21.95, 22.9,
24.5, 29.5]  #cm of scale # path A1 next to tower
    #nSunsVect = (0,5,10,25,50,100,150,150,100,50,25,10,5,0)
# path A1 next to tower

    #pathID = 'ABNE'
    #pathRemarks = '100 m off tower (tangent)'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 20.0
    #nSunsVect = (0,5,10,25,25,10,5,0)                                         # path ABNE 100
m off tower
    #distData=   [11.7, 17.7, 18.5, 19.0, 21.2, 21.7, 22.5, 31.0]  #cm of scale #        path
ABNE 100 m off tower

    pathID = 'ACNE' #
    pathRemarks = '200 m off tower'
    scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    towerDist = 20.1
    nSunsVect = (0,5,10,10,5,0)                                      # path acNE 200 m off tower
    distData=   [12.2,18.2,19.4,19.7,22.7,29.9]  #cm of scale #        path acNE 200 m off tower

    #pathID = 'ADNE'
    #pathRemarks = '300 m off tower'
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 21.0
    #nSunsVect = (0,5,10,10,5,0)                                      # path ADNE 300 m off
tower
    #distData=   [13.7,19.3,22.3,23.,23.5,31.0]  #cm of scale #        path ADNE 300 m off tower

    #pathID = 'AENE'
    #pathRemarks = '400 m off tower'
```

```
    #scale=1500./7.7   # meters real world per cm on scale This is general scale for path not
having their own scale
    #towerDist = 24.3
    #nSunsVect = (0,5,5,0)                                       # path AENE 400 m off tower
    #distData=   [17., 22.8, 23.7, 31.2]  #cm of scale #        path AENE 400 m off tower

    if 1:
        distOffSet=distData[0]   # gets subtracted from initial and all values of distData
        towerLocation= (towerDist - distOffSet) * scale
        checkdata = len(distData)== len(nSunsVect)
        print 'Checkdata:  %s'%checkdata
        if not checkdata:
            print 'distData size: %s'%len(distData)
            print 'nSunsVect size: %s'%len(nSunsVect)
            raise Exception( 'Data vector lengths do not match.  Quitting. See output file.'  )
            #sys.exit()
        else:
            for i in zip(distData,nSunsVect):
                print i
            distVect  = tuple( scale * (i - distOffSet) for i in distData)  # in meters
            #distVect = tuple( scale * (i - towerDist) for i in distData)   # in meters centered
at tower

def userData():
    global Tamb, Tskin, dt, emissivity, offVert, L, V, nSteps, waterFraction,
maxDistance,waterFraction, offVert, RunID, emissivity,Tamb, V ,\
           pathID, Vmph, maxTime, transmissivity,backSideLossesOn
    nSteps= 44000
    dt = .01              # seconds, recheck frequency = clock tick
    Tamb = 49.            # degC
    waterFraction = .15   # mass of water

    offVert = 0.          # degrees  angle of incidence  Usually 0 or 71
    L = 6.                # inches wing length front to back
    Vmph = 18.            # mph bird flight speed
    maxDistance = 3000    # meters
    maxTime =  800        # seconds
    backSideLossesOn = False  # True turns on heatloss through backside as Qcomb + QradBackside

def setConstants():  # initialize

    #initialize   constants  and data vectors
    viewFactor = math.cos(offVert * math.pi/180.)
    L = L / 39.4        # Convert from inches to meters
    Pr = 0.705          # Prandtl number for air (dimensionless)
    heatVapWater = 2257 # kJ/kg Heat of vaporization of water
    V =  Vmph / 2.237   # convert from mph to meters/sec
    airVis = 1.78e-5    # Air kinematic viscosity (m^2/s)
    kAir = .028         # air thermal conductivity (W/(m-degK))
    Qthresh = 4000.     # watts/m^2
    Reynolds = V * L / airVis     # Reynolds number  (dimensionless)
    Nu = 0.664 * Reynolds**0.5 * Pr**(.33333333)    #Nusselt number (dimensionless)
    h = kAir * Nu / L             # convective heat transfer coeff (W/m^2 - K)
    SBSigma = 5.6704e-8           # Stephan-Boltzman constant (W/(m^2-K^4))
    CpWater = 4.1813e3            # heat capacity of liquid water (J/kg-K)
    HvWater = 2257e3              # entalpy of vaporization for water (J/kg)

    # bird plumage characteristics
    Tskin = 41                    #  bird body temperature degC
    transmissivity = 0.0          #  of bird feather (dimensionless)
    emissivity = 0.95             #  of bird feather (dimensionless)
    kPlumage = .074               #  (W/m-K) plumage thermal conductivity
    rhoPlumage = 1.3e3 *.5        #  density in kg/m^3
```

```
    thkPlumage =    60e-5         #  meters          ref:
    CpPlumage =     1.53e3        #  J/kg-K          ref:
    abDepth = .5                  # fraction of plumage thickness absorbing the flux (assumed)
    Tsurf =  Tamb                 # start here for initial temp
    mDryFeather = rhoPlumage * thkPlumage   # feather mass in kg/m^2
    mWater = waterFraction * mDryFeather    # water mass per unit area (kg/m^2 )adds mass to
plumage


        t=0               # initialize start time
        timeTo160 = -99
        timeAbove160 = 0
        timeTo300 = -99
        timeAbove300 = 0
        #maxTsurf = 0
        lHit160 =  False
        lHit300 = False
        if mWater > 0:
            lFeatherIsDry = False
        else:
            lFeatherIsDry = True
        doseTotal = 0
        doseBefore160 = 0
        doseAbove160 = 0
        doseAbove300 = 0
        doseAboveThresh = 0

def qDotIn(d):
    global i, distVect, nSunsVect
    intensity = np.interp(d,distVect,nSunsVect)
    return intensity

def mainLoop():
    # input data
    ## could add 1 sun to backside then add convection and conduction

    for i in range(1,nSteps):  # i is clock ticks
        t = i*dt   #new time
        d = t*V    #new distance


        Qrad = SBSigma * emissivity * ((Tsurf+273)**4 - (Tamb+273)**4)# (Watts/m^2)re-Rad of
                                                                          energy absorption

        Qv =   h * (Tsurf - Tamb)                    # 'Front' surface convection in Watts/m^2
        #Qc =   kPlumage * (Tsurf - Tskin)           # in Watts conduction to body (not used with
                                                       Qcomb)

        if backSideLossesOn:
            Qin = 1000 * (SunsIn+1) * emissivity * viewFactor * (1 - transmissivity) # in Watts
            Qcomb = (Tsurf-Tamb) / (thkPlumage * (1-abDepth)/kPlumage + 1/h) # combined
'backside' conduction + convection in Watts/m^2
            Tbackside = Qcomb/h + Tamb # temperature of back side of feather
            QradBackSide = SBSigma * emissivity * ((Tbackside + 273)**4 - (Tamb + 273)**4)  # in
Watts/m^2  Rad of energy absorption
            Qnet = Qin - Qv  - Qrad - Qcomb - QradBackSide                                 # net
heat gain during clock tick (W/m^2)

        elif not backSideLossesOn:
            Qin = 1000 * SunsIn * emissivity * viewFactor * (1 - transmissivity)           # in
Watts
            Qnet = Qin - Qv - Qrad                                                         # net
heat gain during clock tick (W/m^2)
```

```
            Tbackside = Tsurf
            Qcomb = 0

        if Tsurf >= 100. and not lFeatherIsDry:    #evaporate any remaining water and subtract
its mass
            dmWater = Qnet / HvWater               # potential water that could be evaporated off
            if dmWater <= mWater:                  # all remaining heat to be used to remove
water so temp won't rise (i.e. too much water)
                Qnet -= dmWater * HvWater          #Qnet is zeroed
                mWater -= dmWater                  # adjust for water removed

            else:
                Qnet -= mWater * HvWater           # remaining water is evaporated with energy
left over (limited to mWater not dmWater)
                mWater = 0
                lFeatherIsDry = True               # feather is now dry

        dTemp = Qnet * dt / ( CpPlumage * mDryFeather* abDepth + CpWater * mWater * abDepth )
#change in temp of feather surface (front side) during clock tick (assumes all mass participates)
            #fixme

        Tsurf += dTemp  #new temp

        doseTotal += Qin * dt

        if Tsurf > 160:
            doseAbove160 += Qin * dt
        if Tsurf > 300:
            doseAbove300 += Qin * dt
        if Qin > Qthresh:
            doseAboveThresh += Qin * dt

        #t +=  dt  #new time
        tSecsVect.append(t)
        TsurfVect.append(Tsurf)
        pathDistVect.append(d)
        IntensityVect.append(SunsIn)


        if lHit160 and Tsurf >= 160:
            timeAbove160 +=dt

        if lHit300 and Tsurf >= 300:
            timeAbove300 +=dt


        if Tsurf>=160 and not lHit160:
            lHit160=True
            timeTo160 = t

        if not lHit160:
            doseBefore160 += Qin * dt

        if Tsurf >= 300 and not lHit300:
            lHit300 = True
            timeTo300 = t


        print '%6.1f  , %6.1f,    %6.1f,   %9.1f,   %9.1f,  %9.1f, %9.1f, %9.1f, %9.1f, %9.1f'\
              %(t, d, SunsIn, Tsurf, Tbackside, Qin, Qnet, Qv, Qcomb, Qrad)

    maxSurfTemp =  max(TsurfVect)
    textLines=[]
```

```
    textLines.append(['RunID: %s'%runID])
    textLines.append(['PathID: %s'%pathID])
    textLines.append(['PathRemarks: %s'%pathRemarks])
    textLines.append(['Temp(ambient degC): %4.0f'%Tamb])
    textLines.append(['Speed(mph): %3.0f'%Vmph])
    textLines.append(['Emissivity: %4.2f'%emissivity])
    textLines.append(['Angle of Incidence (deg): %3.0f'%offVert])
    textLines.append(['View Factor: %4.2f'%viewFactor])
    textLines.append(['Moisture (%%): %3.0f'%(waterFraction * 100)])

    textLines.append(['PlumageThk (mils): %8.1f'%(thkPlumage * 39400)])  #converting from meters
to mils
    textLines.append(['BackSideLossesOn: %s'%(backSideLossesOn)])  #converting from meters to
mils
    textLines.append(['Max Surface Temp(C): %5.0f'% maxSurfTemp])

    print
    for  line in textLines: #
        print line[0]

    print
    print    'Time to  Time above  Time to  Time above (secs)'
    print    '   160C        160C     300C        300C'
    print    ' %5.0f       %5.0f    %5.0f       %5.0f'%(timeTo160, timeAbove160, timeTo300,
timeAbove300)
    print
    print 'h (convection coeff)(W/m^2-K): %7.1f'%h
    print 'Reynolds number:              %9.1f'%(Reynolds)
    print 'Max Surface Temp reached:         %5.0f'% maxSurfTemp
    print 'Flight Speed (ft/min):          %7.1f (%7.1f mph)'% (Vmph*5280/60., Vmph)
    print 'Total flight time (secs):       %7.0f'%(t)
    print 'Dose_total (kW-secs/m^2):       %7.1f'% (doseTotal/60000.*60)
    print 'DoseBefore160 (kW-secs/m^2):    %7.1f'% (doseBefore160/60000.*60)
    print 'DoseAbove160 (kW-secs/m^2):     %7.1f'% (doseAbove160/60000.*60)
    print 'DoseAbove300 (kW-secs/m^2):     %7.1f'% (doseAbove300/60000.*60)
    print 'DoseAboveThresh (kW-secs/m^2):  %7.1f'% (doseAboveThresh/60000.*60)


def makePlot():
    global pathDistVect, IntensityVect, TsurfVect, tSecsVect, towerLocation,
distVect,waterFraction, offVert, runID,emissivity,Tamb, V ,\
           pathID,Vmph,pathRemarks, viewFactor, timeTo160, timeAbove160, timeTo300,
timeAbove300,maxSurfTemp, fname, textLines


    newIntensity = [a for a in IntensityVect]
    pathDistVectMod = [a- towerLocation for a in  pathDistVect]
    distVectMod = [a- towerLocation for a in  distVect]  # these are the markers for the field
map countour measurements
    #tSecsVectMod =  [a- towerLocation/V for a in  tSecsVect]
    maxIntensity = max(newIntensity)
    plt = matplotlib.pyplot

    host = host_subplot(111, axes_class=AA.Axes)
    plt.subplots_adjust(right=0.75)
    plt.subplots_adjust(bottom= 0.180)

    par1 = host.twinx()
    par2 = host.twiny()

    offset = 60
    new_fixed_axis = par2.get_grid_helper().new_fixed_axis
    par2.axis["bottom"] = new_fixed_axis(loc="bottom",
```

```
                                    axes=par2,
                                    offset=(0, -35))

    par2.axis["bottom"].toggle(all =  True)
    par2.axis["top"].toggle(all =  False)


    host.set_ylim(0, maxSurfTemp*1.05)
    par1.set_ylim(0,1.05*maxIntensity)
    host.set_xlabel("distance (m)")
    host.set_ylabel("Surface Temp (degC) (dashed line)")
    par2.grid(True)
    par1.set_ylabel("Field Intensity (kw = #Suns) (solid line)")
    par2.set_xlabel("time(seconds)")

    p1, = host.plot(pathDistVectMod, TsurfVect,'r--')
    p2, = par1.plot(pathDistVectMod,newIntensity)# , label="kW (= Suns)")
    p3, = par2.plot(tSecsVect, TsurfVect, alpha=0)# ,label="time")
    p4, = par1.plot(distVectMod, nSunsVect, 's', markersize=4,
markerfacecolor='blue',markeredgecolor='blue')
    if timeTo160 > 0:
        jjl=host.axhspan(160,160,0.0,0.75,color='r', linewidth=.5)
        jj2=par2.text(tSecsVect[int(len(tSecsVect)*.83)],156,'%4.0f secs to reach 160
degC'%timeTo160,color='r', horizontalalignment='left',
                verticalalignment='top', fontsize = 'x-small')#,transform = host.transAxes)
        jj2=par2.text(tSecsVect[int(len(tSecsVect)*.83)],164,'%4.0f secs
above'%timeAbove160,color='r', horizontalalignment='left',
                verticalalignment='bottom', fontsize = 'x-small')#,transform = host.transAxes)


    if timeTo300 > 0: #p = plt.axhspan(0.25, 0.75, facecolor='0.5', alpha=0.5)
        Tval=300
        jjl=host.axhspan(Tval,Tval,0.0,0.75,color='r', linewidth=.5)
        jj2=par2.text(tSecsVect[int(len(tSecsVect)*.83)],Tval-4,'%4.0f secs to reach
300degC'%timeTo300,color='r', \
                      horizontalalignment='left',
            verticalalignment='top', fontsize = 'x-small')#,transform = host.transAxes)
        jj2=par2.text(tSecsVect[int(len(tSecsVect)*.83)],Tval+4,'%4.0f secs
above'%timeAbove300,color='r', horizontalalignment='left',
            verticalalignment='bottom', fontsize = 'x-small')#,transform = host.transAxes)

    #par1.set_ylim(0, 4)
    #par2.set_ylim(1, 65)


    host.axis["left"].label.set_color(p1.get_color())
    par1.axis["right"].label.set_color(p2.get_color())

    par2Span=(host.axis()[1]-host.axis()[0])/V
    par2.set_xlim(0,par2Span)

   ##plt.title(r'$\mathrm{Histogram\ of\ IQ:}\ \mu=100,\ \sigma=15$')
    plt.title(r'$\mathrm{Feather\ Surface\ Temperature\ along\ Flight\ Path\ }$')



    for  line in enumerate(textLines): #
        ##incr x, incr y
        host.text(0.01, .98-line[0]*.036,line[1][0], \
            horizontalalignment='left',
            verticalalignment='top',
            fontsize = 9,
            transform = host.transAxes)
```

```
    fullFname=str('c:\\mypython\\birds\\%s.png'%fname)
    myStr='saved to '+ fullFname
    print myStr
    plt.savefig('c:\\mypython\\birds\\%s.png'%fname)
    #plt.show()
    appfile= "c:\\program files\\quicktime\\pictureviewer.exe "

    subprocess.Popen([appfile, fullFname] )
    #plt.show()  #Tk causes prolems? after second plot won't close!

if __name__ == "__main__":

    try:
        import math
        import sys
        import datetime
        import math
        import numpy as np
        import matplotlib
        import matplotlib.pylab
        from mpl_toolkits.axes_grid1 import host_subplot
        import mpl_toolkits.axisartist as AA
        from datetime import datetime
        import subprocess
        runID = '%20s'%str(datetime.now())[:19] #'Dummy' #fixme
        fname=runID.replace(':','')
        fname2=fname.replace('.','')
        fname='Bird'+fname2

        textFileName=str('c:\\mypython\\birds\\%s.txt'%fname)
        print 'output is being redirected to : %s'%textFileName
        sys.stdout = open(textFileName,'w')

        print datetime.now().ctime()
        print 'This text file: %s'%textFileName
        print 'program: sys.argv[0] = %s'%sys.argv[0]



        userData()
        setConstants()
        pathData()
        mainLoop()
        sys.stdout = sys.__stdout__
        print 'Time(s)   Dist(m)    Tsurf(C)     Intensity(suns)'
        for a in zip(tSecsVect,pathDistVect,TsurfVect, IntensityVect):
            print '%6.1f  , %6.1f  , %6.1f  ,   %5.1f'%a # (a[0],a[1],a[2])

        print

        for  line in textLines: #
            print line[0]

        print
        print    'Time to  Time above  Time to  Time above (secs)'
        print    '   160C        160C     300C        300C'
        print ' %5.0f       %5.0f    %5.0f       %5.0f'%(timeTo160, timeAbove160, timeTo300,
timeAbove300)
        print
        print 'Max Surface Temp(C):             %5.0f'% maxSurfTemp
        print 'Reynolds number:               %9.1f'%(Reynolds)
```

```
    print 'h (convection coeff)(W/m^2-K): %7.1f'%h

    print 'Flight Speed (ft/min):           %7.1f (%3.1f mph)'% (Vmph*5280/60., Vmph)
    print 'Total flight time (secs):     %7.0f'%(t)
    print 'Dose_total (kW-secs/m^2):       %7.1f'% (doseTotal/60000.*60)
    print 'doseBefore160 (kW-secs/m^2):    %7.1f'% (doseBefore160/60000.*60)
    print 'DoseAbove160 (kW-secs/m^2):     %7.1f'% (doseAbove160/60000.*60)
    print 'DoseAbove300 (kW-secs/m^2):     %7.1f'% (doseAbove300/60000.*60)
    print 'DoseAboveThresh (kW-secs/m^2):  %7.1f'% (doseAboveThresh/60000.*60)
    print 'BackSideLossesOn: %s'%(backSideLossesOn)

    makePlot()
    print 'This text file: %s'%textFileName

    print 'program: sys.argv[0] = %s'%sys.argv[0]

finally:
    sys.stdout = sys.__stdout__  #restore stdout back to normal
    print "done."
```

BIOLOGICAL RESOURCES

	List of Comment Letters	Biological Resources Comments?
1	Inyo County	X
2	Bureau of Land Management	X
3	National Park Service	
4	The Nature Conservancy	X
5	Amargosa Conservancy	X
6	Basin & Range Watch	X
7	Pahrump Paiute Tribe	X
8	Richard Arnold, Pahrump Piahute Tribe	X
9	Big Pine Tribe of Owens Valley	X
10	Intervenor Cindy MacDonald	X
11	Intervenor Center for Biological Diversity	X
12	Intervenor, Old Spanish Trail Association	
13	Applicant, BrightSource Energy, Inc.	X

Comment #	DATE	COMMENT TOPIC	RESPONSE
1	**July 17, 2012**	**Inyo County**	
1.8		Inyo County states objection to the location of mitigation lands in Inyo County.	The Commission acknowledges the limited quantities of privately held lands in Inyo County and appreciates the comments and concerns regarding the proposed mitigation strategy identified in the PSA and FSA. As identified in Condition of Certification BIO-12 the selection criteria for land acquisition for desert tortoise is not restricted to Inyo County but encompasses lands in California that occur within the Eastern Recovery unit or other lands approved by the CPM in consultation with the regulatory agencies. This will allow flexibility should the applicant elect to purchase lands outside of Inyo County.
1.18		Add new Condition to enhance public land for mitigation purposes.	The use of public lands for mitigation purposes is presented on pages 4.2-85 and 4.2-86 of the PSA. The current mitigation approach is required to mitigate the direct loss of habitat to desert tortoise from the development of the proposed project. This section identifies that in order to fully mitigate impacts to desert tortoise mitigation lands must be preserved and managed for the sole benefit of the target species. Land acquisition and preservation removes existing threats to resources on the acquired lands and is considered an important mechanism to achieving the full mitigation standard. However, land acquisition alone is inadequate if the land is not managed and enhanced for the benefit of the species. Condition of Certification BIO-12 requires the acquisition, enhancement, and long term preservation and management for the benefit of desert tortoise and other associated wildlife and vegetation. While staff concurs that further benefits to desert tortoise could be achieved through land management actions, most public lands, with the exception of wilderness areas, are managed for multiple public uses that can accommodate actions inconsistent with established mitigation requirements. Mitigation for non-listed CEQA species, such as non-listed special-status plants, is more flexible,

1.19		Revise BIO-22 to enhance public lands rather than use private lands for compensatory mitigation.	Thank you for your comment. The discussion regarding the use of public lands for compensatory mitigation is described in response to comment 1.18.
1.21		Revise BIO-18 to include the Inyo/Mono Agricultural Commissioner when developing annual fees.	Thank you; BIO-18, subsection 6, was revised as suggested.
1.22		Revise BIO-23 per language provided.	BIO-23 subparagraph "Definitions" was revised as suggested, with several additions.
1.23		Replace subparagraph 3 of BIO-23 with provided language.	The BIO-23 subparagraph on "Thresholds" was revised as suggested, with the exception that a drawdown threshold based on rooting depths of mesquite cannot be established without examining soil cores and monitoring the mesquite response to a declining water table. Mesquite is a deep-rooted species that roots at variable depths depending on the soil profile, soil chemistry, depth to water table, soil oxygen, maximum effective rooting depth relative to existing background groundwater declines, and other factors. There are a few atypical examples of mesquite rooting to depths near 60 meters, but 15 meters is more typical and rooting may be limited to as little as 3m in settings with restrictive soil layers (Stromberg pers. comm.; and others). Because of the geologic and hydrogeologic complexity of the project vicinity, staff expects that rooting depths are quite variable and no single threshold could be applied without resulting in unintended mesquite losses, and no studies have been conducted in the area that could inform such a threshold. Staff did an extensive literature review prior to the PSA, and consulted several recognized experts in groundwater pumping impacts on southwestern phreatophytes (see Stromberg pers. comm.; Wilhoughby pers. comm; Keeler-Wolf pers. comm.; Froend pers. comm.; Showers pers. comm., and others. See also Silva et al. 1989; Martinez et al. 2009; Crampton et al. 2006; Stromberg et al. 1992; Fisher et al. 1973; Heitschmidt et al. 1988; Ansley et al. 1989; Steinberg 2001; Phillips 1963; Virginia et al. 1976; and Bleby et al. 2010). BIO-23 was revised, however, to include a provision for revising the drawdown threshold when evidence is provided, based on soil core investigation and monitoring, that a different threshold is warranted, subject to review and approval by the CPM in consultation with BLM and the Inyo Water Department.

1.24		Revise BIO-23 subparagraph 13 per provided language.	COC BIO-23 included a requirement to map groundwater-dependent vegetation and springs within the 1-foot drawdown contour in Water Supply Figure 23 (see BIO-23 subparagraph 14, PSA p. 4.2-238-239). However, the recommended additional language was accepted, with a few additions, and added to BIO-23 in the FSA.
1.25		Revise the first 2 paragraphs of BIO-24 per provided language.	Thank you; BIO-24 has been revised accordingly.
1.26		Revise the first 2 paragraphs of BIO-24 verification language per provided language.	Thank you; BIO-24 has been revised accordingly.
1.27		Revise BIO-26 verification language as directed.	Condition of certification LAND-2 addresses the financial assurances related to project closure and decommissioning. Please refer to condition of certification LAND-2 (Land Use Section) and BIO-26 for revised language regarding development of draft and final closure plans. The Energy Commission would issue final approvals.
1.73a		Management of wildlife is compliant with Policy 8.1	Thank you for your comment. This information will be provided to the decision makers.

1.83a		Project is noncompliant with Goal WR-3; groundwater drawdown may impact vegetation in the region.	Staff accepted many of the Water Department's suggested edits to BIO-23, with the exception of the comment uner 1.23. Staff discussed the differences, and to the satisfaction of the Inyo County Water Department. With the revisions, conditions of certification are compliant with Inyo County General Plan Goal WR-3, and will ensure the project protects and restores environmental resources in Inyo County from significant adverse effects of groundwater withdrawal.
1.83a		Project is noncompliant with Policy BIO-1.2/Preservation of Riparian Habitat and Wetlands	With the FSA revisions to BIO-23 and BIO-24 suggested by Inyo County (and others), the project is compliant with Inyo County General Plan Policy BIO-1.2 for Preservation of Riparian Habitats and Wetlands, and will ensure the project protects and restores environmental resources in Inyo County from significant adverse effects of groundwater withdrawal.
1.84b		Groundwater drawdown may significantly impact the Stump Springs ACEC and other dependent vegetation (Policy BIO-1.2)	Staff accepted the new or revised conditions of certification with the following exceptions: see responses to comment 22 and comment 23. Staff discussed the differences with Inyo County's water department, and concluded that with the revisions to COC BIO-23 and COC BIO-24 the conditions of certification are now compliant with Inyo County General Plan Policy BIO-1.2. The revisions to BIO-23 and BIO-24 will ensure that the project preserves and protects important riparian areas and wetlands identified by the County (Stump Springs ACEC).
1.85		If offset mitigation for sensitive species is infeasible, then the project impacts may be significant and immitigable.	The PSA and FSA contain several compensatory mitigation requirements. The project owner will have the opportunity to mitigate offsite for project impacts via condition BIO-17. Offsite mitigation that fully mitigates effects of solar flux on avian species has not been identified by staff or applicant, and staff believes the project may not achieve federal LORS compliance. The Committee has the responsibility of ultimately determining the significance of the LORS violation.
1.91a		Condition BIO-23 needs clarification of methodology and declaration of thresholds.	BIO-23 was revised to provide greater clarification and more sensitive field measures of drought-stress, based on consultation with Stromberg (pers. comm.) and others.
1.91b		Applicant should be allowed to resume pumping if a factor other than pumping can be shown to contribute to groundwater drawdown.	BIO-24 was revised with a provision that if adequate evidence was provided, based on monitoring data, that the project was neither the cause nor a contributor to a drawdown, the project could resume pumping, subject to the CPM approval, in consultation with BLM Nevada and BLM California soil and water state leads, and botanists, and the Inyo County Water Department.
1.91c		The use of reference plots in monitoring groundwater dependent vegetation must be enhanced.	The use of reference plots was revised in BIO-23; background trends can be established from baseline data collected at the near-project plots and a trend determined by updating the baseline annually until the groundwater monitoring wells show a project-related drawdown at the project boundary.

1.91d		The project owner should prepare an inventory of groundwater dependent habitat.	The applicant submitted a detailed mapping of groundwater-dependent vegetation in Data Response Figure 48-1 (CH2 2011g.). BIO-23 was revised according to the suggested edits, with a few additions. Staff disagrees, however, that -- in the absence of site-specific studies -- that a single quantitative threshold can be uniformly applied across the study area for any given resource due to the geologic and hydrogeologic complexity, and past and present groundwater use. Consequently, staff chose a more conservative approach and established a threshold based on the smallest detectable and statistically significant drawdown. BIO-24 was revised, however, with a provision that if adequate evidence was provided, based on future monitoring data, that the project was neither the cause nor a contributor to a drawdown, the project could resume pumping, or reduce or modify pumping to sustainable levels, subject to the CPM approval, in consultation with BLM Nevada and BLM California soil and water state leads, and botanists, and the Inyo County Water Department.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
2	**July 16, 2012**	**Bureau of Land Management**	
2.1		The cumulative effects analysis should take into account all proposed development within the groundwater basin…	Staff contacted BLM Nevada and BLM California for a list of cumulative renewable energy projects, and other projects affecting the local groundwater aquifer; these cumulative impacts were quantified quantitatively in the Water Supply section of the PSA and FSA. A qualitative cumulative effects analysis of other past and present groundwater impacts, including historical impacts from agricultural pumping, were analyzed thoroughly in the "Cumulative Impacts" section (a separate chapter, see PSA pp. 4.2-168-171.
2.2		Requests additional clarification of BIO-23, and how a 20% decline in vegetation vigor would be determined.	Stromberg and Wilhoughby (pers. comm.) felt a 20 percent decline in biomass and crown density (vigor indicators) was a good threshold *assuming* the water table would recover immediately after pumping stopped. Hydrogeologists from CDFG (Custis pers. comm.), Inyo County, and others indicated a high probability that the water table would not recover immediately. Consequently, monitoring guidelines were revised to utilize more sensitive field measures, i.e., earlier warning signs, including xylem (stem) water potential, gas exchange rate, and transpiration rate. However, the threshold was revised, based on consultation with Inyo County hydrologists and others to require pumping to stop if the groundwater trigger alone is exceeded: See the specific threshold language in BIO-23 and BIO-24.
2.2		BLM objects to 2-parameter threshold and recommends trigger based on drawdown or vegetation impacts.	Similar comments were received from Inyo County Water Department and others. BIO-23 and BIO-24 thresholds were modified to require pumping stop if the drawdown trigger alone is exceeded, at which point the project must provide evidence, based on monitoring data, that the project was not the cause or that a reduced or modified pumping would not exceed the threshold. Monitoring wells located between the project boundary and project wells will provide the project with ample lead time, or warning of an impending drawdown sufficient to exceed the threshold.

Comment #	DATE	COMMENT TOPIC	RESPONSE
4	**July 21, 2012**	**The Nature Conservancy**	
4.12		TNC objects to the trigger conditions of BIO-23 and BIO-24	Thank you. Similar comments were received from BLM, Inyo County, and others. More sensitive field measurements of drought-stress were added based on consultation with Stromberg (pers. comm.). However, the threshold was revised to require the project stop, reduce, or modify pumping based only on exceedance of the 0.5 ft drawdown at the project boundary. Please see WATER SUPPLY Condition of Certification **WS-6.**
4.12a		Lag time after reaching 20% vegetation decline will allow further degradation of the ecosystem	Stromberg and Wilhoughby (pers. comm.) felt a 20 percent decline in biomass and crown density (vigor indicators; not indicators of plant mortality) was a good threshold *assuming* the water table would recover immediately after pumping stopped. Hydrogeologists from CDFG (Custis pers. comm.), Inyo County, and others indicated a high probability that the water table would not recover immediately. Consequently, the threshold was revised based on more sensitive measures, i.e., earlier warning signs, and to require pumping to stop if the groundwater trigger alone is exceeded. The project can then provide evidence, subject to approval by the CPM in consultation with BLM and Inyo County hydrologists and botanists, and based on monitoring using more sensitive field measurements, that the 0.5 ft. drawdown is not causing an adverse effect. See specific language in **BIO-23** regarding thresholds.
4.13		TNC objects to 2-parameter threshold and recommends basing remedial action on drawdown alone.	Inyo County, BLM, and The Amargosa Conservancy expressed similar concerns about the potential for the 2-parameter threshold to result in unintended adverse effects. The BIO-23 and BIO-24 triggers were revised to address these concerns. See the revised threshold in **BIO-23**.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
5	**July 21, 2012**	**The Amargosa Conservancy**	
5.2a		States that only 1 trigger, a decline in monitoring well levels is necessary before shutting off pumps.	Inyo County, BLM, and The Nature Conservancy expressed similar concerns about the 2-parameter threshold. The trigger in BIO-23 and BIO-24 were revised accordingly. See specific language in **BIO-23** regarding thresholds.

Comment #	DATE	COMMENT TOPIC	RESPONSE
6	**July 23, 2012**	**Basin and Range Watch**	
6.23		Stump Springs could be impacted by invasive weeds	Staff consulted BLM on strategies to address the potential for the spread of weeds into adjacent BLM lands from contaminated vehicles (project employees and contractors) using area roads. Condition of Certification BIO-18 (Weed Management Plan) was revised to address this additional concern, and includes requirements for cleaning vehicles and equipment operating in infested areas, and worker awareness training about weeds, their consequences, common vectors, and how to avoid inadvertent spread of weeds on, for example, contaminated vehicles and equipment. BIO-18 also includes a requirement to compensate the local agricultural commissioners for increased monitoring and abatement costs for weeds introduced on area roads from project employees and contractors commuting from areas with known infestations of A-rated (highly invasive) pest plants (Pahrump and Las Vegas areas).
6.24		Requests Swainson's hawk be added to the species list for the project	Thank you for the supplemental information regarding the observation of Swainson’s hawk at Stump Springs. Surveys conducted by the applicant in support of the application for certification including avian point counts and golden eagle surveys did not detect this species at the project site. Nesting habitat for this species is not present on the project site however nesting could occur in areas outside the project footprint. Staff reviewed the photos provided in the comment letter and consulted with ornithology experts familiar with the ecology of this species. Based on this review staff is unconvinced that the bird is a Swainson’s hawk. Some of the prominent features of this species were not detected. A concise list of these is provided below. These include: 1. Yellow eyes (gray or blue-gray in juveniles, brown in adults); 2. Lack of apparent chest markings; 3. A slight hint of a belly (lower abdomen) band in the ground-perched individual; 4. Lack of apparent terminal tail band in the individual perched atop the small tree; and 5. Barring of the undersides of the primaries and secondary feathers seem far less heavily streaked than would be expected of a Swainson’s hawk.
6.25		Provides photos of a juvenile raptor observed at the site, and requests that Swainson's hawk be added to the project's species list	See response to comment 6.24.

6.26		Provides a reference for solar flux mortality	The applicant has investigated effects of concentrated solar energy on bird carcasses and presented its findings to staff during a workshop on August 28, 2012. Carcasses of three species (chickens, doves, and quail) were exposed to various energy flux level for periods of 10 to 30 seconds. Burned or singed feathers and discolored or dried muscle tissue were observed in the carcasses exposed for 20 to 30 seconds to flux levels above 50 kW/m2. These effects were not observed in carcasses exposed to lower flux levels for the same intervals. No data on longer exposures were available. The applicant notes that feather temperatures in living birds probably would not reach the same temperatures during the same exposure periods due to convective heat dissipation by air motion surrounding them. Staff believes that the levels of feather and tissue damage reported for these exposures at 50 kW/m2 or above would be likely to kill living birds. In addition, staff believes that shorter exposures at these energy flux levels would be likely to cause other tissue or feather damage that could impair flight or vision or cause physiological effects and ultimately cause or contribute to mortality from other causes (e.g., reduce ability to forage, escape from predators, or thermoregulate). Staff also believes that longer exposures to lower energy flux levels are likely to cause feather damage or physiological effects.
6.27		States that HHSEGS may impact birds that use the relic white fir forest on Kingston Peak.	Staff agrees that it is possible for avian species within the project vicinity to be potentially impacted from collision, electrocution or solar flux.
6.28		The PSA fails to analyze flux on individual species	The PSA presented adequate information on solar flux based on the best available information. However, the FSA was revised to provide greater disclosure and specificity for individual birds.
6.29		Requests a study on which birds could be impacted by flux, and requests flux be considered	Please see response to comment 6.28.
6.3O	Requests solar flux impacts be studied during operatic		Condition of certification **BIO-15** requires the project owner to comply with the provisions of an Avian, Bat, and Golden eagle Protection Plan. This includes a monitoring program to evaluate the effects of solar flux on birds from the operation of the facility.
6.31		Mitigation for golden eagle has not yet been developed	The PSA presented a variety of mitigation to reduce impacts to nesting birds and golden eagles. Specific mitigation regarding this species is included in Condition of Certification BIO-15 which requires the development of an Eagle Management Plan which provides prescriptive actions to enhance habitat or reduce threats to this species.

6.32		Bighorn sheep utilize the project site and the project will serve as a barrier.	Bighorn sheep are known from the project region and have been documented to use valley floors to support intermountain movement. As described in the PSA the site has not been classified as an important or designated movement corridor rather as an area likely subject to periodic use by bighorn sheep. The presence of a horn fragment and potential pellets were identified in Section 5.2.6.7.3 of the AFC and support the periodic use of the site by this species. However, there is no indication the site is an important pathway nor will the project pose a complete barrier to movement. Suitable habitat will remain north and south of the project post development.
6.33		A study and monitoring plan for bighorn sheep movement corridors should be implemented	Impacts of the proposed project would not pose a complete barrier to dispersal for this species and the project is not located in a constrained linkage area. Please see response to comment 6.32 for additional information on bighorn sheep.
6.34		Kit fox should be treated as a potential species of special concern	For the purposes of the PSA this species is being treated as sensitive in accordance with the regulations identified in Title 14. Staff disclosed potential; project impacts and PSA presents reasonable minimizations measures to avoid the loss of this species.
6.35		The applicant should be required to test for canine distemper in kit fox, and develop further plans.	Condition of certification **BIO-14** currently requires the applicant to fund disease testing for sick or injured kit fox.
6.36		Mitigation for shadscale scrub should be at a 3:1 ratio.	The Commission recognizes the importance of fully mitigating impacts to desert tortoise in compliance with the requirements of the California Endangered Species Act. However, the Commission believes that the mitigation ratios identified in the PSA are adequate to mitigate project impacts to desert tortoise. Staff considered a wide range of biotic and abiotic factors when developing the mitigation approach for desert tortoise. These included but were not limited to the existing vegetation communities; annual plant composition; percentage and distribution of weeds; presence of soil crusts; level of site disturbance; soil composition; proximity to adjacent lands supporting desert tortoise populations; and proximity to developed lands. Staff took into consideration the number and distribution of desert tortoise on the project site; the landscape level scale of the project; the projects location; the sites importance for connectivity and regional movement and gene flow; and the cumulative effects of other projects. Staff weighed these factors in the development of mitigation ratios in light of the fact that project development ultimately results in a net loss of habitat range wide. To address this loss the Conditions of Certifications identified in the PSA, including **BIO-8, BIO-9, BIO-10, BIO-12,** and **BIO-13**, require a combination of minimization, salvage, and relocation activities; land acquisition, preservation and enhancement; and management activities such as regional raven control. Staff considers these measures to be adequate to fully mitigate impacts of the proposed project to desert tortoise.

6.37		Expresses concern over state law and moving tortoise near the NV border.	Desert tortoise will not be transported across State lines. Currently, any desert tortoise that is translocated to lands east of the site will be placed on a segment of land located in California that is contiguous with natural lands located in Nevada. Staff considers the ecological value of this approach to be feasible provided the desert tortoises are not diseased and the land maintains a reasonable level of protection from future development.
6.38 NEW		Provides several new species of rare plants for the project species list.	Twenty-seven of the species on the list provided by the commentor were not on the applicant's table of special-status potentially occurring on the project (DR 63 1-A, Appendix B, Table B). The surveys for special-status plants were comprehensive and conducted in accordance with California Department of Fish and Game and California Native Plant Society botanical survey guidelines. Because the surveys were floristic, spanned several years, and included spring and fall surveys, and crews were highly qualified, it can be assumed that any additional species not on the original target list, if present, would have been detected. Nevertheless, the applicant indicated they would address these additional species in a data response.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
7		**Pahrump Paiute Tribe**	
7.7 NEW		Concerns about displacement of wildlife (all animals) and mortality associated with displacement. Also concerned about groundwater use and its impact on springs, and the cumulative effects of groundwater use. Request involvement in the development of plans and mitigation	Thank you for the comment regarding the displacement of wildlife. In an effort to minimize project related impacts to wildlife from displacement the PSA identified a series of conditions that provide for the salvage, relocation and preservation of natural lands for the benefit of both plant and wildlife species. Conditions of certifications **BIO-8, BIO-9, BIO-10, BIO-12,** and **BIO-13,** require a combination of minimization, salvage, and relocation activities; land acquisition, preservation and enhancement; and management activities to ensure the land is persevered and managed to foster the long term survival of wildlife. Currently, these plans are reviewed by the State and federal wildlife agencies and approved by the Commission. The Commission believes the plans will receive adequate review by the natural resources agencies and will be available for review by the public once they are completed. Staff shares the Pahrump Paiute Tribe's concerns about groundwater impacts and cumulative impacts to springs. The PSA and FSA (Biological Resources and Water Supply sections) conclude that the project pumping alone, and the cumulative impact of all area projects on groundwater, springs, and mesquite are significant. Conditions of certification **BIO-23**, and **WATER SUPPLY-6** will ensure the project's effects are not significant by requiring monitoring of vegetation and groundwater levels, and if a 0.5 ft. drawdown threshold at the project boundary is exceeded, the project must stop pumping. Pumping cannot resume unless the project provides evidence, subject to review and approval by the CPM in consultation with hydrologists and botanists from BLM and the Inyo Water Department, that the drawdown is not affecting the mesquite, or that a reduced pumping amount is sustainable. Staff welcomes the Tribe's input on the plans and mitigation developed to protect wildlife, groundwater, and the important resources supported by groundwater. See also **WATER SUPPLY-8** in the Water Supply section of the FSA.

Comment #	DATE	COMMENT TOPIC	RESPONSE
8	**July 23, 2012**	**Richard Arnold, Pahrump Paiute Tribe**	
8.8		Local populations of bighorn sheep must be protected and preserved.	Bighorn sheep are known from the project region and have been documented to use valley floors to support intermountain movement. As described in the PSA, the site is not located in an important or designated movement corridor but may support periodic use by bighorn sheep. Staff considers the current conditions of certification identified in the PSA to be adequate to reduce impacts to bighorn sheep.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
9	**July 21, 2012**	**Big Pine Tribe of Owens Valley**	
9.2		Groundwater use may impact desert vegetation and other sensitive plant associations.	Staff recognizes the importance of the mesquite habitats to wildlife, to local biodiversity, to resource agencies and the public, as well as the cultural significance of the species. Concerns about impacts to these groundwater-dependent ecosystems have been expressed by nearly every commenter: BLM California; BLM Nevada; Inyo County; the Pahrump Paiute Tribe; Nevada Department of Wildlife; Basin & Range Watch; The Nature Conservancy; Amargosa Conservancy; Center for Biological Diversity; Nye County Water District; local resident Cindy Macdonald, and others. Staff considered all comments -- scoping comments and PSA comments -- and consulted numerous experts in the development of the conditions of certification **BIO-23** (Groundwater-dependent Vegetation Monitoring). Staff has incorporated many of the recommendations into the analysis and revised conditions in the FSA. Staff is confident that the revised conditions will ensure these important resources are protected. Please also see response to comment 14.5 from the Pahrump Paiute Tribe.
9.3		States that groundwater drawdown impacts to vegetation are significant and the groundwater monitoring plan is insufficient to prevent this.	A similar concern about the threshold in **BIO-23** and **BIO-24** from the PSA was expressed by several commenters. The 20 percent decline in mesquite vigor referred to in the PSA is a measure of drought stress in individual mesquite; not a measure of plant mortality or a decline in the total vegetative cover of mesquite. The experts consulted by staff in the development of that threshold believe it is a non-lethal threshold from which the mesquite could readily recover. However, this was based on the assumption that the groundwater levels would recover to pre-threshold levels within a year or two following cessation of pumping. In recognition of the possibility that groundwater levels may not restore that quickly, staff has identified -- based on consultation with recognized experts -- other more sensitive measures of drought stress, i.e., the earliest warning signs and the most objective quantifiable indicators.

Comment #	DATE	COMMENT TOPIC	RESPONSE
10	**July 21, 2012**	**Intervenor Cindy MacDonald**	
10.1 (PAGE 1-1)		Significance thresholds are not quantified.	The threshold for determining significance are based on the biological resources present or potentially present within the proposed project area in consideration of the proposed projects effects to those resources. Generally, the thresholds for determining significance are based on Appendix G of the CEQA Guidelines (CCR 2006) and performance standards or thresholds identified by the Energy Commission staff. The determination of whether a project has a significant effect on biological resources is based on the best scientific and factual data that could be reviewed for the project.
10.2		What criteria were used to develop significance thresholds, and subsequent evaluation of mitigation efficacy.	Significance thresholds are based on if a fair argument can be made that the project will result in substantial adverse effects to a given resource. See Response to Comment 10.1 for further information regarding significance thresholds.
16.1 (P 3-24)		Are impact studies of dust, emissions, and dust suppressant on desert tortoise available.	The Commission is aware of a number of studies, including the Desert Tortoise Recovery Plan, which acknowledge the detrimental effects of fugitive dust to desert tortoise. As described in the PSA dust would pose a potential impact to species occurring on and adjacent to the project area. Project related effects of dust to desert tortoise and their habitat were considered a significant impact in the PSA and Conditions of Certification were proposed to reduce or minimize these impacts. Condition of Certification BIO-8 contains a variety of requirements to reduce and control fugitive dust. The condition also specifies the use on non-toxic soil binders to reduce the potential for ingestion by desert tortoise. On site monitoring and reporting would also be required to reduce the potential for large dust plumes occurring outside the project area.
16.2 (pg 3-24)		What is the zone of impact to tortoise and other species from project emissions.	The PSA addresses potential impacts to a variety of plant, animal, and vegetation communities that occur on and adjacent to the project site. Project impacts include an analysis to desert tortoise that are directly lost on the project site or indirectly to lands adjacent to the site. Desert tortoise or other species that are in close the proximity to the project site have the potential to incur a higher degree of direct and indirect impacts from disturbance, dust, noise, or weeds. For the proposed project a specific buffer was not identified however surveys for desert tortoise included zone of influence surveys in order to ascertain the distribution of animals in adjacent lands. Similarly, surveys for burrowing owls included all areas within 150 meters of the project boundary. Generally staff considers the project buffer on a species specific basis and considers the type of resource, distribution, and the species or communities tolerance of disturbance to direct and indirect impacts. For desert tortoise staff considered animals detected by the applicant within the 150 meter buffer to warrant consideration in the PSA.

17.2 (pg 3-27)		Are there any types of vegetation potentially affected by nutrient absorption (Nox)	Please see rare plant discussion.
17.9 (pg 3-27)		Could the project potentially reduce pollinators, thereby affecting pollination of food crops	Although Solar flux created by the project has the potential to adversely affect insects it is unlikely to result in any large scale meaningful loss to insect populations in the region. Animal pollinators in North America include bees, butterflies, moths, wasps, beetles, ants, bats, and hummingbirds (Black et al. 2009). In a review of research addressing the reproductive requirements of twenty-six rare or endangered plants species in the western United States, Tepedino et al. (1997) found that in order to set fruit most of the plants required pollination, usually by native bees. Most native bees are relatively low flying and would not likely be adversely affected by the solar flux. The most likely adverse effect would be from habitat degradation, mowing, herbicide application and dust. For agricultural processes honey bees provide the bulk of crop pollination in the United State, yet the number of managed bee hives has declined by 60 percent in the United States since 1950 (Winfree et al. 2007. Nonetheless, recent research(much of it in Yolo County) on crop pollination, has demonstrated that native bees also make a significant contribution to crop pollination-in some cases providing all of the pollination required when enough habitat is available (Greenleaf and Kremen 2006, Klein et al. 2007). Based on this information it is unlikely the project would result in offsite effects to pollinators. <u>Literature cited</u>: Black, H, S., Shepard, M., Vaughan, M., LaBar, C., and Hodges, N. 2009. Yolo County natural Heritage Program (HCP/NCCP) Pollinator Conservation Strategy prepared by the Xerces Society for Invertebrate Conservation Portland Oregon and Sacramento California. Greenleaf, S. S., and C. Kremen. 2006. Wild bees enhance honey bees' pollination of hybrid sunflower. Proceedings of the Royal Society (Series B) 103(37): 13890-13895. Klein, A.M., Vaissiere, J. H. Cane, I Steffan-Dewenter, S. A. Cunningham, C. Kremen and T. Tscharntke. 2007 Importance of pollinators in changing landscapes for world crops. Proceedings of the Royal Society-B Biological Sciences 274 (1608): 303-313. Tepedino, V, J. 1979. The importance of bees and other insect pollinators in maintaining floral species composition. In Great Basin naturalist memoirs no. 3: the endangered species: a symposium; 7-8 Dec 1978. Pp. 39-150 Provo: Brigham Young University. Winfree, R., N. M. Williams, J. Dushoff, and C. Kremen. 2007. Native bees provide insurance against ongoing honey bee losses. Ecology Letters 10: 1105-1113.
10.3 (pg 20-1)		How can the project be screened in a way that won't attract wildlife.	Staff does not consider the use of vegetation to screen the project to pose a significant additional risk to wildlife when compared to the expected operational effects to wildlife. While it is likely that some disturbance tolerant species will nest in the trees used to screen the facility the prohibition on trees recommended by the commenter is not warranted.

10.4		How many trees would be required to screen the project and what is water requirement.	The landscaping plan for the proposed project has not been finalized. This information including the type of trees proposed for screening will be identified prior to the operation of the facility.
10.5		Do special status plants on or adjacent the project site require pollinators?	With the exception of the Torrey's joint-fir (Ephedra torreyana), which is wind-pollinated, all of the remaining 10 species are insect-pollinated. In a review of research addressing the reproductive requirements of twenty-six rare or endangered plants species in the western United States, Tepedino et al. (1997) found that in order to set fruit most of the plants required pollination, usually by native bees. Please see response to comment 17.9 for further information.
10.6		Would pollination still occur in the event the project is permitted and built?	Staff consulted University of California, Davis entomologist and professor Lynn Kimsey regarding potential impacts to pollinators (Kimsey pers. comm.). Dr. Kimsey noted that any of the rare plant pollinators, which would be primarily bees, would fly at elevations below approximately 10 feet above ground level (below the mirrors) unless they were pollinating trees. Because none of the special status plant species are trees, and no trees occur on the site (with the exception of a few scattered low-growing mesquite less than 8 ft high) impacts to special status species' pollinators would not be significant. Additionally, no special-status plant mitigation will occur within the heliostat fields. Plant occurrences within the solar fields are presumed to be significantly affected due to long-term indirect effects from mowing, mirror-washing, dust control, alteration of the surface hydrology, herbicide drift, shading. These impacts will be mitigated offsite through preservation or restoration (see **BIO-19** and **BIO-20**). Dr. Kimsey noted that some dispersing forms, such as dragon flies, painted lady butterflies could be affected, but the impact on painted ladies would not be significant "because they migrate north out of much of the desert areas." Based on the wide variety of pollinators that occur in the desert staff expects that pollination will continue to occur. For additional information please see response to comment 17.9.
3.1 (pg 20-5)		How many fairy shrimp species and occurrences exist in Pahrump Valley	A review of existing literature did not find any comprehensive study describing the species of fairy shrimp expected to occur in the Pahrump Valley. However, approximately 23 species of fairy or brine shrimp are known to occur in California (Bauder et al. 1998) and five species are known from 100 miles from the project site (Eriksen and Bell, 1999). These include, ranging from farthest to closest, the giant fairy shrimp (Branchinecta gigas), Colorado fairy shrimp (Branchinecta coloradensis), San Francisco brine shrimp (Artemia franciscana), versatile fairy shrimp (Branchinecta lindahli), and the alkali fairy shrimp (Branchinecta mackini). Tadpole fairy shrimp (Lepidurus lemmoni) are also known from Nevada and are common in plays across the great basin. None of these species have California or federal status. Based on the photo included by the commenter it is likely the shrimp identified as most similar to a tadpole fairy shrimp. Based on the known distribution and habitat requirements of sensitive fairy shrimp; the PSA found that sensitive species were not likely to occur on or near the proposed project site. Literature Cited:

3.2 (pg. 20-5)		What habitat elements could protected species of fairy shrimp utilize on the project site.	In arid climates, such as that found in the Mojave desert, fairy shrimp inhabit pools that may last from as little as three days to as long as four months, with much more variable levels of dissolved salts than found in pools that found in humid climates (Brown and Carpelan 1971). It is possible that during periods of heavy or prolonged rainfall that small depressions, road ruts or gullies may support conditions that allow for the presence of common fairy shrimp. It is also likely that fairy shrimp occur in the dray lake west of the project site and that portions of the project site are periodically inoculated with cysts carried by mammals or shorebirds. Therefore it is possible small pooled areas could support fairy shrimp during extremely wet years. In response to these and other comments staff conducted biological surveys to investigate the potential for the presence of pooled areas after recent July monsoonal activity. Staff inspected the site after a minimum one-inch rainfall event and did find small pooled areas; however most of these pools had lost standing water within 24 hours. Nonetheless without extensive sampling it is not possible to determine whether fairy shrimp are present on the project site. Staff considered the low number of potential pooled areas and the fact that sensitive fairy shrimp do not occur in the region to not warrant additional studies on the project site. Based on the known distribution and habitat requirements of sensitive fairy shrimp; the PSA found that protected fairy shrimp were not likely to occur on or near the proposed project site.
3.3 (pg. 20-5)		Would installation of the project result in permanent loss of shrimp on the project site.	Construction of the proposed project could result in the loss of fairy or tadpole shrimp should they occur on the project site. However, the PSA concluded that listed or sensitive fairy shrimp are not expected to be present and the site does not support large playas or pooled areas important for the conservation of these species.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
11	**July 23, 2012**	**Intervenor Center for Biological Diversity**	
11.12		The PSA fails to quantify kit fox density on the project site.	The PSA provides adequate information to analyze project level effects to desert kit fox. Neither CEQA (Pub. Resources Code §21000 et seq.), nor the CEQA Guidelines (14 Cal. Code Regs §14000 et seq.), require that protocol level surveys be performed and incorporated into a Draft EIR. Association of Irritated Residents v. County of Madera (2003) 107 Cal.App.4th 1383. As described in the PSA, the "environmental setting" is based on expert review and analysis of existing information provided by the applicant. Desert kit fox is known to occur on the project site and the applicant mapped potential burrows during previous surveys of the project site. Staff also noted the presence of this species on the site and acknowledges that population densities likely vary on an annual basis as a result of prey base, presence of coyotes and existing mortality. For the purposes of the PSA it is not required to account for every animal on the project site. Staff has treated this species as sensitive in accordance with the regulations identified in Title 14 and the PSA presents reasonable minimizations measures to minimize the loss of this species. Further, a complete assessment of all potential dens for this species will be mapped prior to project disturbance.

11.13		Kit fox should be fitted with radio trackers during passive relocation.	Under current CDFG regulations these animals may not be trapped by the project owner. Condition of Certification **BIO-14** provides for the development of a kit fox management plan to monitor the effects of passive relocation and to respond to potential disease outbreaks.
11.14		The project will result in the displacement of kit fox and further spread canine distemper.	The PSA acknowledges the project will displace desert kit fox and result in a net loss of habitat for this species. However, it is unknown and speculative if the project will either result in the manifestation or spread of distemper. However, to monitor the possible consequences of this threat the PSA included Condition of Certification **BIO-14** which requires monitoring, adaptive methods to reduce this threat.
11.15		The PSA fails to quantify kit fox territories or provide avoidance measures.	The PSA provides adequate information to analyze project level effects to desert kit fox and has provided conditions of certification to reduce potential impacts to this species. For further information please see response to comment 11.12.
11.16		The desert tortoise on the project site constitute a unique genetic group, and must have minimization/mitigation measures in place.	The information regarding the unique ecology and genetics of desert tortoise located in the Eastern Mojave Recovery Unit recovery unit was reviewed by staff and is referenced in the PSA. As identified in the USFWS Recovery Plan (USFWS 2011) the recovery unit designation does not afford the species additional legal protection. However, staff considered a variety of factors in the development the adequate conditions of certification that would be required to fully mitigate impacts to desert tortoise. This included the data provided by Murphy et al (2007) regarding the statement “that integral to desert tortoise recovery is maintaining the genetic variability of the species and sufficient ecological heterogeneity within and among populations.” The PSA has proposed extensive mitigation requirements including, preconstruction surveys, fencing, translocation and the acquisition of compensatory lands at ratios ranging from 1:1 for shadscale communities to 3:1 for areas supporting relatively intact creosote bush scrub communities. Based on these and other factors staff considers the proposed Conditions of Certification to fully mitigate impacts to desert tortoise and their habitat.
11.17		If desert tortoise are translocated, a monitoring or research study should be implemented per the USFWS's recommendations as augmentation.	The commenter states the USFWS Desert Tortoise Recovery Office’s Scientific Advisory Committee states that “translocation is fraught with long-term uncertainties…and therefore, any translocations should be accompanied by specific monitoring or research to study the effectiveness or success of the translocation…..” The PSA acknowledges this concern and includes this language in the analysis of potential impacts to desert tortoise from translocation activities. The PSA also provides information from the USFWS and other researchers that suggest translocation may be an effective management tool to minimize impacts to desert tortoise from development projects under certain circumstances. In order to minimize impacts to desert tortoise that are present in the project area the PSA indicates that any translocation activities would be required to comply with the provisions of an agency approved and adopted translocation plan. This plan is a requirement of Condition of Certification BIO-10 which specifies a series of reporting, tracking, monitoring, and disease testing. In addition, this plan is expected to follow the most recent guidelines on translocation. Staff considers the existing conditions of certification to be adequate and considers translocation to be an accepted tool for minimizing project related impacts to desert tortoise on the project site.

11.18		A project alternative should be developed, or higher survey standards applied; impacts to tortoise are not identified due to failure to develop a translocation plan.	The current PSA includes alternatives that have reduce impacts to biological resources. This includes a reasonable range of alternatives as defined in CEQA. As with any alternatives analysis the Commission must consider impacts to the suite of issue areas. Surveys completed by the applicant complied with the USFWS's recommended guidelines for conducting surveys in desert tortoise habitat. The estimates of adult and subadult desert tortoise were presented by the applicant in the AFC and further estimates were calculated by staff to represent the theoretical numbers of juveniles and eggs that may occur on the project site. While the applicant is currently suggesting that the initial numbers used to calculate desert tortoise may overestimate the number of desert tortoise on the project site; staff maintains the original estimates are valid based on the expected use of the site by desert tortoises in adjacent areas. As presented in the PSA these calculations are only theoretical estimates of the expected number of desert tortoise that could be present and are presented using the best available scientific data on this species. Staff disagrees that the submittal of a completed translocation plan is required for the analysis of impacts to desert tortoise. The commenter stated that the conditions of certification in the PSA improperly defer mitigation by requiring the completion of future plans. The commission considers the conditions of certification in the PSA to be legally adequate and the analysis reflects a good faith effort to investigate and disclose environmental impacts of the proposed project (see CEQA Guidelines § 15003 (i) & 15144) and used survey information provided by the applicant. The PSA also identified conditions of certification that require the preparation of a more precise plans after certification of the FSA, which is acceptable under CEQA provided that practical considerations make it difficult to develop the plan at this stage of the planning process and the agency "commits itself to eventually devising mea¬sures that will satisfy specific performance criteria articulated at the time of approval" (Sacramento Old City Association v. City Council (1991) (229 Cal.App.3d 1011, 1028 1029). See also CEQA Guidelines (14 Cal. Code Regs 15123.4 (a) (1) (B)), which provides that mitigation measures may specify performance standards that would mitigate the significant effect of the project and that may be accomplished in more than one specific way. In addition, the desert tortoise translocation plan would also require coordination with the USFWS and would likely be a condition of the Biological Opinion.
11.19		A desert tortoise translocation plan should incorporate USFWS' latest guidance.	Thank you for the comment regarding the Translocation Plan. As specified in Condition of Certification BIO-10 the project owner is required to develop and implement the plan consistent with current USFWS approved guidelines. The intent of the condition is to utilize the most recent guidance available at the time of the licensing. As this Plan will be developed in consultation with the USFWS no revision to the condition has been made.
11.2O		Four recommendations are provided to augment a desert tortoise translocation plan.	Staff considers the development and implementation of the proposed Translocation Plan specified in Condition of Certification BIO-10 to be consistent with current USFWS approved guidelines. Therefore the recommended changes have not been adopted.

11.21		A mitigation ratio of 5:1 is necessary to mitigate impacts to desert tortoise.	The Commission recognizes the importance of fully mitigating impacts to desert tortoise in compliance with California Endangered Species Act requirements. However, the Commission disagrees with the contention that the mitigation ratios identified in the PSA are not adequate to mitigate project impacts to desert tortoise. Staff considered a wide range of biotic and abiotic factors when developing the mitigation approach for desert tortoise. These included but were not limited to the existing vegetation communities; annual plant composition; percentage and distribution of weeds; presence of soil crusts; level of site disturbance; soil composition; proximity to adjacent lands supporting desert tortoise populations; and proximity to developed lands. Staff also took into consideration the number and distribution of desert tortoise on the project site; the landscape level scale of the project; the projects location; the sites importance for connectivity and regional movement and gene flow; and the cumulative effects of other projects. Staff weighed these considerations in the development of mitigation ratios in light of the fact that project development ultimately results in a net loss of habitat range wide. To address this loss the Conditions of Certifications identified in the PSA, including BIO-8, BIO-9, BIO-10, BIO-12, and BIO-13, require a combination of minimization, salvage, and relocation activities; land acquisition, preservation and enhancement; and management activities such as regional raven control. Staff considers these measures to fully mitigate impacts of the proposed project to desert tortoise.
11.22		Bighorn sheep movement corridors must be avoided.	Bighorn sheep are known from the project region and have been documented to use valley floors to support intermountain. As described in the PSA the site has not been classified as an important or designated movement corridor rather as an area likely subject to periodic use by bighorn sheep. The presence of a horn fragment and potential pellets were identified in Section 5.2.6.7.3 of the AFC support use of the site by this species. However, the project site is located several miles away from the adjacent mountains which are used for spring forage; and while bighorn sheep may use any portion of the desert floor for intermountain movement the project will not act as a complete barrier to sheep movement.
11.23		What effect might project construction (specifically heliostats) have on bighorn sheep.	The use of this technology has not been well studied and it is speculative whether the reflectivity from the heliostats will adversely bighorn sheep in the adjacent mountains. Due to the position of the heliostats it is likely that bighorn sheep will not be exposed to damaging levels of solar flux.
11.24		Requests an analysis of effects of groundwater drawdown on bighorn sheep water sources.	The PSA adequately addressed potential impacts to bighorn sheep from the potential reduction in groundwater levels.

11.25		Rare plants must be avoided or other conservation sites must be selected.	After analysis of the spring 2012 survey results, staff concluded that impacts to four species were significant --- and mitigable. Avoidance within the solar fields is not an acceptable mitigation option due to the likelihood of long-term decline from indirect effects. There are adequate opportunities for offsite mitigation through preservation and restoration, however. This was analyzed by examining field forms and database reports of site quality and threats, and through a GIS analysis of ownership and management threats and opportunities. **BIO-20** (Special-status Plant Compensatory Mitigation) requires offsite mitigation for impacts to four of the 11 species through preservation or restoration. The condition includes specifications for site selection criteria, mitigation ratios, and performance standards. **BIO-19** (Special-Status Plant Avoidance & Minimization Measures) contains BMPs for protecting the nine rare plant occurrences in very close proximity to the project. The threat of indirect impacts from weeds is addressed in **BIO-18** (Weed Management Plan), and BIO-8 and BIO-18 include measures for fire prevention (accidental fire can have catastrophic ecological consequences in the desert). Staff considered avoidance along the eastern boundary but concluded that because the avoided area would be situated along a strip between the project and the stateline and a different habitat type (dunes versus the gravelly creosote bush scrub where rare plants are thriving), it lacked the connectivity and sustainability that preservation of other offsite occurrences could provide; occurrences better situated to protect the california range of those species. To address the net loss of the project site occurrences, the project could restore any of the at-risk occurrences (according to specific criteria contained in **BIO-20**) or mitigate through acquisition and preservation under a conservation easement at a ratio of three occurrences for each S1-rank species, and two occurrences for every S2-rank species. Mitigation would occur locally, largely, as that is where most of the offsite occurrences were found, i.e., in Pahrump Valley, Mesquite Valley, California Valley, Stewart and Chicago valleys.
11.26		Transplantation of rare plants should be accompanied by a monitoring plan, and made publically available.	Staff considers transplantation an unacceptable strategy for mitigation because of the high rate of failure of such plantings across the state, and because the strategy is untested for the affected species. **BIO-20** requires mitigation in the form of offsite preservation and restoration, and includes performance standards, monitoring and reporting requirements for restoration projects, and selection criteria for preservation (acquisition). All plans, which are subject to review and approval of the CPM (in consultation with Energy Commission botanists) will be made publicly available on the Compliance page of the project website. The adequacy of the conditions can be assessed through the detailed specifications and performance standards. The **FSA** includes a detailed description of the methods staff used to assess significance and the potential for offsite mitigation.
11.27		Seed collection and curation should be added to existing protective measures.	Staff agrees that seed collection and curation should be added as a contingency measure and BIO-20 has been revised accordingly.

11.28		Burrowing owl data on territories is unclear. A management plan for burrowing owl must be made publically available.	The applicant provided supplemental information regarding burrowing owl surveys including a Draft Burrowing Owl Mitigation Plan in Data Response 2e. This plan is available on the project website and will be reviewed by staff prior to its adoption as a component of Condition of Certification **BIO-17**. Staff reviewed these reports and concluded that it was not possible for the applicant to conclude that the site does not support breeding owls. Although avian point counts were conducted near areas where burrowing owl sign was observed, and no owls were detected during these surveys, the observations were not completed in accordance to CDFG and Burrowing Owl Consortium standards. Information provided by the applicant in Data Response 2e did indicate that CDFG suggested that since the site has been documented to support burrowing owls additional surveys to establish their breeding was not waranted. The PSA documents this information and concludes that in accordance with the previous observations burrowing owls are present on the project site at least seasonally and compensatory mitigation is required for the loss of foraging habitat. Although the applicant suggested that between two and five territories may occur on the project site the PSA concluded that because territories often overlap and are usually much larger in arid climates the project should provide compensatory mitigation for a mini mum of two territories.
11.29		How will golden eagle forage habitat be mitigated.	The PSA acknowledges that the construction of the proposed project will result in the net loss of foraging habitat for golden eagles. To off-set the loss of habitat the project owner is required to obtain compensatory mitigation lands for desert tortoise. This requires the acquisition, enhancement, and long term management of existing lands. The intent of the measure is to reduce threats to those lands and increase the potential prey base for eagles. Condition of Certification **BIO-15** also requires the project owner to develop and implement a management plan for golden eagles. This will include specific enhancement actions, mechanisms to reduce threats to golden eagles, and long term monitoring for collision, electrocution, or mortality from solar flux.
11.3O		Golden eagles' behavior can be impacted by project construction/operation, and must be mitigated.	The PSA addressed project level impacts to golden eagles and provided Conditions of Certification to reduce those threats where possible. For additional information please see response to comment 11.29.
11.31		The PSA fails to analyze impacts of solar flux on golden eagles.	The PSA presented an analysis of operational effects to birds including the risk of collision, electrocution, and solar flux. Although the analysis does not specifically address each species of bird the content focuses on the breadth of species which may occur in the project area. However, in to address the comment the FSA will include revised language on direct, indirect, and operational impacts to golden eagles.
11.32		The PSA failed to address transmission line impacts to golden eagles.	Please see response to comment 11.31.

11.33		The CEC must consider alternatives that would minimize impacts to golden eagle.	CEQA states that an EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives (CEQA Guidelines 15126.6(a)).The PSA presents a reasonable range of alternatives that would have varying effects to golden eagles and other biological resources. This included one alternative located in an area of degraded farm land. However, for many species, including the golden eagle, their wide distribution and use of open plant communities limits the ability to avoid impacts to this species.
11.34		Impacts to groundwater dependent vegetation in the Amargosa Valley must be evaluated; currently mitigation and analysis is incomplete.	The **FSA** and PSA include an inventory of the groundwater-dependent resources throughout the Amargosa Basin and Death valley Regional Groundwater Flow System. The analysis of potential impacts to groundwater in a wider context is available in the Water Supply section of the FSA. The analysis of impacts to Amargosa Valley is not as extensive as the analysis for the local groundwater-dependent resources because Water Resources staff concluded there would not be a significant impact to groundwater in areas distant from the project.
11.35		Mitigation for the desert tortoise must occur within the Eastern Mojave Recovery Unit.	Condition of Certification **BIO-12** requires the project owner to acquire compensatory mitigation lands for desert tortoise in the Eastern Mojave Recovery Unit or other location approved by the CPM in consultation with the CDFG and USFWS. This flexibility was provided in order to allow the regulatory agencies and the applicant to select lands that are deemed important to contribute to desert tortoise connectivity and because there may be a shortage of available mitigation lands within Inyo County. Provided the lands meet the requirements of the CDFG and USFWS staff considers this a viable mitigation option at this time. Staff also considers the nesting of mitigation to be appropriate should the lands support the target species and its habitat.
11.36		A potential mitigation site should be monitored prior to acquisition to determine species density.	The preservation of offsite lands is an acceptable mitigation strategy for the purposes of CEQA (see CEQA Guidelines, Section 15370) and the PSA is not required to include an analysis of the exact locations of proposed mitigation lands (see California Native Plant Society v. City Rancho Cordova [March 24, 2009] 172 Cal. App. 4th 603); however, Condition of Certification **BIO-12** outline specific performance standards for mitigation lands including: requirements for acreage, types of habitat to be protected, the potential locations, and minimum qualifications of conservation easement holders. The condition does not require the completion of protocol surveys prior to adoption provided the lands meet the basic criteria and are approved by the CPM in consultation with the CDFG and USFWS.
11.37		Mitigation offsets must be managed by a competent land management entity.	Condition of Certification **BIO-12** requires that the project owner transfer the title or conservation agreement of the mitigation lands to CDFG or other non-profit organization. Condition of Certification **BIO-12** does not authorize the use of public lands (i.e., lands held by the BLM) for mitigation purposes.

11.38		Management plans referenced in the PSA are not yet available for public review.	The required plans identified by the commenter are not deferred mitigation. The Conditions of Certification which require the completion of various plans or studies are legally adequate and reflects a good faith effort to investigate and disclose environmental impacts of the project (see CEQA Guidelines § 15003 (i) & 15144). The analysis used all available resources to determine where additional surveys are required in the future. The PSA also identified Conditions of Certification that require the preparation of a more precise plan after certification of the FSA, which is acceptable under CEQA provided that practical considerations make it difficult to develop the plan at this stage of the planning process and the agency "commits itself to eventually devising measures that will satisfy specific performance criteria articulated at the time of approval" (Sacramento Old City Association v. City Council (1991) (229 Cal.App.3d 1011, 1028 1029). See also CEQA Guidelines (14 Cal. Code Regs 15123.4 (a) (1) (B)), which provides that mitigation measures may specify performance standards that would mitigate the significant effect of the project and that may be accomplished in more than one specific way. In addition, the applicant has provided draft forms of the Burrowing Owl Mitigation Plan and Bird Monitoring study.
11.39		Is identical to comment 11.38.	See comment 11.38
11.42		Impacts to waters of the state are significant and alternative sitting must be considered.	Staff and CDFG agree that impacts to Waters of the State are significant. Staff coordinated with the CDFG regional office and the Lake and Streambed Alteration Program (LSA) in the analysis of impacts, the verification of the delineation, and the development of mitigation requirements contained in **BIO-22** (State Waters Compensatory Mitigation). The waters will be mitigated at a ratio of 2:1 within the Pahrump Hydrologic Unit or adjacent basins and, combined with other measures for protecting downstream and upstream waters from indirect effects, will ensure the impacts are mitigated to a level less than significant.
11.46		Cumulative impacts to desert tortoise stemming from translocation must be addressed. Cumulative impacts to bighorn sheep and groundwater pumping must also be addressed.	The PSA considered the cumulative project effects to desert tortoise and acknowledges that translocation of desert tortoise may occur for some of the proposed projects. However, without project specific data the conclusions drawn would be speculative. Nonetheless, the Commission considers the cumulative impact analysis presented in the PSA to be adequate and comply with the requirements of CEQA.

11.47		The Desert Renewable Energy Conservation Plan (DRECP) has identified the project site as a location for conservation.	Staff reviewed the preliminary maps for the DRECP and the site appears to be east of the proposed conservation area. However, even if the project site was proposed within an identified area of Conservation Opportunity, this would not preclude permitting or construction of the facility. Project analysis is completed on a case by case bases and compensatory mitigation is developed for each area. Projects located in conservation areas will likely have higher mitigation ratios because of the proposed conservation value of the area.
11.48		The PSA fails to evaluate the DRECP as a LOR.	The DRECP is currently in a draft form and has not yet been adopted by the REAT agencies.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
13	**July 23, 2012**	**Applicant, BrightSource Energy, Inc.**	
13.1		What performance thresholds does the PSA use, and how should Appendix G be applied.	The lead agency has the discretion to identify the significance criteria for a given project and develop thresholds for significance. Section 15064(b) of the CEQA guidelines identifies that "The determination of whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on scientific and factual data. An ironclad definition of significant effect is not always possible because the significance of an activity may vary with the setting. For example, an activity which may not be significant in an urban area may be significant in a rural area." For the case of the HHEGS project staff utilized a variety of factors in determining whether a project would be a significant impact. This includes but was not limited to the scale and magnitude of the project; the current status, range, and population of the resource; the temporal effects to the specific resource; and whether the project would result in long term cumulative effects. In addition, staff relied on precedent from previous projects completed by the Commission and other lead agencies; existing management plans; polices, and professional experience.

13.2		The site is more disturbed than the PSA acknowledges	The PSA presented a thoughtful and accurate description of the physical and biological characteristics that are present on the project site. The biological resource section of the PSA based this information on data provided by the applicant in the AFC, supplemental biological technical reports, aerial photography, and physical inspections of the project site. The PSA describes the physical setting objectively and does not suggest the site supports a pristine desert ecosystem. However, although the AFC indicates the site has been previously disturbed and developed for a housing subdivision only a portion of the site appear to have been subject to ground disturbance. These include a network of roads, an orchard, a small area surrounded by an earthen berm, and several larger areas that indicate either grading or agriculture. The new data provided by the applicant regarding disturbed areas will be incorporated into the FSA after a review of the updated calculations. Staff also objects to the applicant's mischaracterization of habitat quality on the project site. Despite the presence of weeds which are acknowledged in the PSA as locally abundant in some areas, most of the lands present on the project site are relatively intact and are characterized by areas supporting biotic soil crusts, native shrub cover, and a diverse assemblage of annual plant life. Most of the heavily disturbed areas are located along the primary access roads that form a grid pattern across much of the site; however, lands within the existing road system continue to support large areas of native vegetation. For example, Section 5.2.6.3.1 of the AFC indicates that for creosote bush scrub communities " the understory consists of a large variety of mainly annual forbs, a few species of native grasses, and a few species of non-native grasses" . Staff confirmed this during biological surveys of the project site and a review of the annual plant species detected during botanical surveys conducted by the applicant. In addition, based on a review of information provided in the AFC approximately 131 native annuals and shrubs occur on the project site.
			This includes approximately ten plants considered rare by the California Department of fish and Game and California Native Plant Society. Similarly, approximately 63 species of birds, 18 reptiles, and nine mammals were detected or expected to occur on the project site. Notwithstanding the presence of invasive weeds, and some heavily disturbed areas a large the presence and distribution of native plants and animals indicates the site supports a fairly diverse assemblage of wildlife which are not associated with more heavily disturbed areas. In regards to habitat for the desert tortoise the commenter suggests that the existing levels of weeds and disturbance renders portions of the site unsuitable for desert tortoise. Staff presented a discussion of weeds and their adverse effects to both desert ecosystems and the desert tortoise in the PSA. However, only limited areas of the projects site are infested to levels that would likely preclude use by desert tortoise. As previously described most of the project site still supports a broad assemblage of native annuals and perennial plant species. While weeds do reduce habitat value there is no data available which supports the applicants position that the abundance of weeds on the project site excludes use by desert tortoise.

13.3		The site is not a bighorn corridor.	Bighorn sheep are known from the project region and have been documented to use valley floors to support intermountain. As described in the PSA the site has not been classified as an important or designated movement corridor rather as an area likely subject to periodic use by bighorn sheep. The presence of a horn fragment and potential pellets were identified in Section 5.2.6.7.3 of the AFC and support use of the site by this species. The contention presented by the commenter that the horn may have been dragged or deposited at the project site by predators, storm flows, or other mechanisms is speculation and not supported by other data. Further the argument that multiple pellet piles for bighorn sheep were not observed may have merit; however there is no indication that survey crews were focusing on the detection of bighorn sheep scat. As noted in the AFC the pellets and horn fragment were detected as incidental observations during botanical surveys. Regarding the recent observation of potential bighorn sheep by residents of Charleston View; staff considers the observations legitimate and not inconsistent with sporadic use of the valley floor to support intermountain movement.
13.4		Mitigation for desert tortoise should be negotiated further, and a revised translocation plan will be submitted to the Energy Commission.	Staff reviewed the proposed compensatory mitigation plan for desert tortoise provided by BSE and determined the plan has some merit but was overly dismissive of habitat quality and potential use of the site by desert tortoise. However, staff would consider continued negotiations on this subject. For additional discussion on this subject please refer to Report of Conversation (ROC) Monasmith C Huntley TN-66649.pdf. on the Commission web site. Additional language regarding mitigation and translocation is presented in the FSA.
13.5		The PSA does not treat species correctly pursuant to ESA and CESA.	The PSA properly evaluated project level impacts to common, sensitive and listed plants and wildlife. Where impacts were considered significant Conditions of Certification were recommended to reduce or minimize adverse effects to these species. In some circumstances this included the acquisition and management of compensatory mitigation lands. The PSA does not attempt to bundle mitigation together or require the applicant to mitigate collectively. Rather the PSA allows nesting of mitigation where land acquisition required to mitigate for desert tortoise may also satisfy mitigation requirements for species such as rare plants, owls, or State waters.

13.6		The FSA should not declare a species rare unless the statement is supported.	The PSA properly evaluated project level impacts to common, sensitive and listed plants and wildlife. Where impacts were considered significant Conditions of Certification were recommended to reduce or minimize adverse effects to these species. Staff considers landscape level project effects to many common species to pose a significant impact and have the potential to cumulatively effect the populations of some species.
13.7		BrightSource does not agree with descriptions of certain plants are "rare"	“Rare” and “rarity” are generic, commonly used terms in the scientific literature used to describe scarcity, a statement about the geographic distribution and population sizes of a particular species. The terms “threatened” and “endangered” typically refer to human activities and other processes that are increasing a species’ vulnerability to extinction, and the degree of endangerment. Rarity is based upon patterns of distribution and abundance. There are three basic kinds of rarity based on these two factors: 1) restricted in distribution, but locally abundant (e.g., Pahrump Valley buckwheat); 2) more widespread, but never abundant; and 3) localized and not abundant. The affected species’ rarity and endangerment is clearly demonstrated in Biological Resources Table 15, and in the spatial representation of these species’ highly restricted range in California (Biological Resources Figure X). The case for rarity and concern is also reflected in the CNDDB Element Rank, an index of extinction risk within the state.

13.8		Significant criteria were incorrectly applied to plants on the project site.	CEQA provides protection not only for State-listed or Federally-listed species, but "also for any species that can be shown to meet the criteria for listing (CEQA Guidelines Section 15380(d)) "*A species not included in any listing identified in subdivision (c) shall nevertheless be considered to be endangered, rare or threatened, if the species can be shown to meet the criteria in subdivision (b).* " CEQA requires a "mandatory finding of significance" for special-status species that meet CEQA's definition of "rare" or "endangered," regardless of their formal listing status under the Native Plant Protection Act (NPPA), California Endangered Species Act (CESA) or any other law: "*When any of the following conditions occur the lead agency shall find that a project may have a significant effect on the environment which will require a Mandatory Finding of Significance...When a project has the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare or threatened species.*" Cal. Code Regs., tit. 14, § 15380, subds. (b) and (d). The CEQA Guidelines are located at Cal. Code Regs., tit. 14, § 15000 et seq. The CEQA Guidelines independently define a species to be "rare" when "either: (A) Although not presently threatened with extinction, the species is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens; or (B) The species is likely to become endangered within the foreseeable future throughout all or [a] significant portion of its range and may be considered "threatened" as that term is used in the Federal Endangered Species Act." (Cal. Code Regs., tit. 14, § 15380, subd. (b)(2).) CEQA independently defines a species to be "endangered" when "its survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors . . . ." (Cal. Code Regs., tit. 14, § 15380, subd. (b)(1).) The project would eliminate a substantial portion of the entire California range of four species (gravel milk-vetch; Wheeler's skeletonweed; Preuss' milk-vetch, and Torrey's joint-fir); with impacts ranging from 18% to 50% of all documented occurrences in California for species whose entire distribution is limited to 19 to 25 occurrences in a very small region of the eastern Mojave. The degree of the impact, relative to the entire California distribution is shown in Biological Resources Table 15 and depicted spatially in Biological Resources **Figures 9 and 10.**

13.9		Different data sources are used in determinations of "rare" for plants.	The applicant incorrectly states that "The CNDDB process is well-documented in the PSA, though the reliance on NatureServe to access CNDDB information is new" and "the California Native Plant Society list process is not well-described". The NatureServe rank is, in fact, synonymous with the CNDDB rank and CNPS rank have been included in the CNDDB reports and CDFG Special Plants List since the early 1980s (Bittman pers. comm.). The CNDDB Element Rank (NatureServe rank) is described in the PSA on page 4.2-131 and in the CDFG *Special Plants List (* CNDDB 2012b). The definitions of the ranks are provided in the footnotes to Biological Resources Table 15 (PSA p. 4.2-134). The applicant incorrectly states that the CNPS (CRPR) listing process is not well documented. PSA page 4.2-131 summarizes the process "The Rare Plant Status Review groups—a consortium of over 300 botanical experts from government, academia, non-governmental organizations, and private consultants—is jointly managed by CNPS and CDFG; the "CNPS List" rank assignments are the product of a collaborative effort and not solely a CNPS assignment." The CNPS website , a site familiar to the applicant's botanical consultants and accessible to the general public, provides over 18 pages of details on the Rare Plant Program and Rare Plant Status Review Groups, including: the rare plant status review process; the relationship between CNPS and CDFG in establishing the lists, or ranks; staff and leadership; the Rare Plant Program Committee; contact information; a flow chart of the process; instructions for recommending an addition, list change, deletion, or name change; a description of the regional plant status review groups; a description of the rare plant status review public forum; and sample forms for proposed additions and proposed status changes. CDFG, BLM, USFWS, California Board of Forestry and other agencies have long regarded CNPS as an authority on rare and endangered plants of California. The CNPS *Inventory* is considered by CDFG and other agencies as a primary source of information for determining whether non-listed plants meet CEQA's independent definitions of "rare" and "endangered," thus triggering a mandatory finding of significance, environmental review, and the implementation of all feasible mitigation measures to reduce or avoid impacts to such special-status, non-listed plants.

13.1O		Condition BIO-19 should be deleted.	Condition of Certification BIO-19 merely specifies best management practices (BMPs) to be implemented *onsite* that will protect the nine rare plant occurrences offsite - and in close proximity to the project boundary - from the indirect effects of operation, including: the spread of weeds already present onsite; chemical drift relating to weed management and dust control; fugitive dust from mowing and road maintenance, increased risk of wildfire from project operation and increased traffic on area roads; sedimentation of washes offsite from erosion of channels onsite and upstream, and other impacts discussed under "Indirect Impacts to Special Status Plants". A map showing the location of the vulnerable offsite rare plant occurrences near the project boundary is provided in Biological Resources Figure 10. The avoidance measures in BIO-19 are standard BMPs for protecting oaks, streams, wetlands, and other sensitive resources adjacent to work activities, and recommended in the Energy Commission BMP Manual (CEC 2010). A similar condition was adopted for at least three other Energy Commission-licensed projects (Blythe, Genesis, Palen) to protect rare plants adjacent to the project boundary.
13.11		Mitigation ratios for plants are not legally supported.	The four (of 11) species determined to require mitigation are among the most imperiled of the non-listed species in California, as indicated by the CNDDB Element Rank (NatureServe rank), and documented in CNDDB (2012a),the CNPS *Inventory* (CNPS 2012), and the Consortium of California Herbaria (CCH 2012). Staff provided a clear, science-based justification for the mitigation of rare plants based on CNDDB Element Rank in the FSA. Staff chose to use these ranks as a basis for the mitigation ratios because they are an index of a species' extinction risk, based on rarity, threats, and population trend based on a widely recognized methodology used by CNDDB and other natural heritage programs around the world (Master et al. 2009). The same mitigation strategy and a similar condition of certification was required to minimize special-status plant impacts on at least three other Energy Commission-licensed projects (Blythe, Genesis, Palen). **BIO-20** requires the project acquire and preserve 3 offsite occcurrences for every S1-rank ("critically imperiled") species affected, and 2 offsite occurrences for every S2-rank ("imperiled") species affected. **BIO-20** also includes an option for mitigation through restoration of an at-risk population.
13.12		Condition BIO-21 should be deleted.	**BIO-21** (Botanist Qualifiecations) lists six specific mitigation measures that require implementation by a qualified botanist; all other mitigation measures relating to plants may be carried out by the Designated Biologist. It is not a full time position; it merely indicates which taks require expertise, and lists the minimum qualifications. **BIO-21** was revised to allow for more tasks to be carried out by the Designated Biologist, as requested by the applicant in the July 2, 2012 public workshop.

13.13		The PSA is overly conservative in treatment of burrowing owl.	Burrowing owls are considered a species of special concern (CSC) by the CDFG and are treated accordingly in the PSA. As defined by the CDFG a species is considered a CSC if it meets a set of criteria that include but are not limited to "is experiencing, or formerly experienced, serious (noncyclical) population declines or range retractions (not reversed) that, if continued or resumed, could qualify it for State threatened or endangered status." The species are also protected by both the federal Migratory Bird Treaty Act and relevant CDFG codes including 3503 and 3503.5. As such the PSA identifies potential impacts to this species on the project site in accordance with CEQA and provides conditions of certification to reduce but not avoid impacts to the species. The applicant also suggests that burrowing owl is common based on their distribution and due to the fact they are commonly detected during surveys for other energy commission projects. Notwithstanding the current conservation designation assigned to this species by the CDFG and BLM habitat for burrowing owls continues to be lost through development. A ranking of the most important threats to the species included loss of habitat, reduced burrow availability due to rodent control, and pesticides (James and Espie 1997). In addition, in a 2003 report by the U.S. Fish and Wildlife Service, breeding burrowing owls were thought to be largely extirpated during the last 10-15 years from multiple areas in California, including Napa, Marin, San Francisco, Santa Cruz, and Ventura counties, coastal San Luis Obispo county and Coachella Valley (http://burrowingowlconservation.org/PR12-09-2010.html). The observation of this species on other Energy Commission projects in no way substantiates the claim by the applicant that this species is abundant in California. The applicant indicated that the requirement for the acquisition of 600 acres of compensatory mitigation is unprecedented. Staff acknowledges that the current approach to mitigation has not been applied to previous Energy Commission Projects. The current mitigation approach was developed after review of The Staff Report on Burrowing Owl Mitigation (CDFG 2012) which indicates that "reversing declining population and range trends for burrowing owls will require implementation of more effective conservation actions, and evaluating the efficacy of the Departments' existing recommended avoidance, minimization and mitigation approaches for burrowing owls. The requirement in the PSA based the mitigation requirement on a subset of the potential home range of burrowing owls in an arid ecosystem. Because burrowing owls can exhibit high site-fidelity and reuse burrows year after year (County of Riverside 2008), replacing a portion of the realized home range was determined to be an effective strategy for reducing project impacts to this species. Citations: James, P.C., and R.H.M. Espie. 1997. "Current Status of the Burrowing Owl in North America: An Agency Survey." Journal of Raptor Research 9:3–5.
13.14		The PSA did not identify what "groundwater dependent vegetation" is.	The PSA explicitly defines "groundwater-dependent vegetation" on page 4.2-37 to 44 of the PSA, beginning with a discussion of characteristic groundwater-dependent habitats, and then describing in detail the groundwater-dependent resources contained within an approximate 5 mile radius of the project. A list of groundwater-dependent plant species known to occur in the 5-mile area centered on the project was provided in subparagraph 14 of Condition of Certification **BIO-23** (Groundwater-dependent Vegetation Monitoring). The list of plant species contained in **BIO-23** has been added to the setting section of the FSA, as well as definitions of "obligate" versus "facultative" groundwater-dependent species.

13.15		CEQA analysis should not be performed for project effects occurring in Nevada.	This issue was addressed by the Commissioner's in the "ORDER RE: APPLICANT'S MOTION IN LIMINE" dated and posted October 2, 2012 (Docket No. 11-AFC-02).From the Order: "This [Public Resources Code section 21080(b)(14)] does not exempt in-state project activities whose impacts are only felt out-of-state. For example, if a project dug a well inside California and the project's water consumption from the well caused an impact in another state but not in California, then that out-of-state impact must be analyzed under CEQA because the impact was generated in California."
13.16		The PSA requires the project to monitor groundwater with a precision that is not possible. The requirement to monitor is unprecedented.	The applicant incorrectly states that groundwater level monitoring requires a precision that is not possible (staff responded to the same comment at the June 14, 2012 public workshop), and in the Water Supply sections of the PSA and FSA. Water Resources staff concluded that because water levels on the project site are stable (unlike offsite wells in other parts of the basin), the 0.5 foot drawdown can be detected with nearly 100 percent confidence. The requirement to monitor groundwater impacts and to stop, modify, or reduce pumping if demonstrated by monitoring to adversely affect sensitive resources is hardly unprecedented. Not only was an almost identical condition imposed on another Energy Commission-licensed project (Palen Solar Power Project) – a project that was ultimately financed – but it is now common practice to require monitoring, management, and mitigation plans for groundwater impacts; so common that the term "3M plans" is used by practitioners (Harrington pers. comm.; Custis pers. comm.). As an example, the monitoring plan for the Coso Hay Ranch Water Extraction Project in Inyo County requires monthly monitoring at 10 well locations for the life of the 30-year project, identifies triggers at each well, some as low as 0.2 ft, and specifies that pumping must stop, change, or reduce pumping: "Requiring that observed drawdown values [at intervening monitoring wells],over time be kept below these defined trigger levels would provide an early warning system, allowing for the system operations to *change, to reduce or stop pumping* before maximum acceptable drawdown levels propagated down the valley to Little Lake."
13.17		BIO-23 is over conservative in its approach to groundwater monitoring.	As indicated under comment 13.16, above, requirements for groundwater monitoring are not unprecedented; nor is the scale of the groundwater monitoring specified "astounding"; in addition to a nearly identical condition adopted for an Energy Commission-licensed project, similar monitoring plans have been imposed by the County of Inyo (Harrington pers. comm.). The monitoring requirements in **BIO-23** and **WATER SUPPLY-8** (Groundwater Level Monitoring) are consistent with the specifications for monitoring recommended by hydrologists from BLM Nevada and BLM California, Inyo County, The Nature Conservancy, and Amargosa Conservancy (BLM 2012a; BLM 2012b; Inyo 2012a; Inyo 2012b; TNC 2012b; ARM 2012a).
13.18		Conditions BIO-23 and BIO-24 should be deleted.	Comment noted.

13.19		Condition BIO-22 reflects inaccurate acreages of waters of the State.	The PSA was clear that the total acres of state waters on the project was a preliminary figure, pending a field verification of the delineation. Staff and CDFG conducted a field verification and identified a number of new, previously unmapped features. Additionally, the delineated road puddles and roadside ditches with no hydrologic connection to a stream were removed from the total. The applicant has since revised the delineation maps and calculated new acreage totals (23.21 ac. jurisdictional state waters onsite; 0.45 ac. upstream of the project and within CA).
13.20		The PSA overstates potential project effects upon desert washes.	CDFG typically requires 3:1 mitigation for permanent impacts and 1:1 mitigation for temporary impacts (Vyverberg pers. comm). The FSA acknowledges that the project will maintain at least some portion of the hydrologic functioning of the stream by not diverting them around the site. This is reflected in the reduction of the mitigation from 3:1 to 2:1. However, staff and CDFG are united in their assessment that habitat functions and values will be eliminated for all but the most disturbance-tolerant species due to perimeter exclusion fencing, partial grading, noise, glare, and human disturbance, vegetation mowing, etc.
13.21		Avian survey information is complete.	In response to staff questions the applicant continues to provide additional data regarding solar flux modeling, avian risk and potential mortality associated with the facility. This information will be included in the **FSA**.

13.22		Solar flux impacts will not be "substantial".	The applicant has provided a variety of useful information regarding potential impacts to birds from solar flux. This includes a study that investigated effects of concentrated solar energy on bird carcasses presented during a workshop conducted on August 28, 2012. Staff considers the data useful but not conclusive. Carcasses of three species (chickens, doves, and quail) were exposed to various energy flux level for periods of 10 to 30 seconds. Burned or singed feathers and discolored or dried muscle tissue were observed in the carcasses exposed for 20 to 30 seconds to flux levels above 50 kW/m2. These effects were not observed in carcasses exposed to lower flux levels for the same intervals. No data on longer exposures were available. The applicant notes that feather temperatures in living birds probably would not reach the same temperatures during the same exposure periods due to convective heat dissipation by air motion surrounding them. Staff believes that the levels of feather and tissue damage reported for these exposures at 50 kW/m2 or above would be likely to kill living birds. In addition, staff believes that shorter exposures at these energy flux levels would be likely to cause other tissue or feather damage that could impair flight or vision or cause physiological effects and ultimately cause or contribute to mortality from other causes (e.g., reduce ability to forage, escape from predators, or thermoregulate). Staff also believes that longer exposures to lower energy flux levels are likely to cause feather damage or physiological effects. Based on staff's understanding of energy flux intensity and exposure times, staff believes that birds flying for short periods through energy flux exceeding about 25 kW/m2 will likely suffer significant damage to flight feathers, eyes, or skin so that they will be unable to survive longer than a few days. Staff does not have estimates of potential bird mortality however staff considers it likely that some loss will occur either through collision, electrocution or from exposure to solar flux. Therefore staff concludes that project effects are substantial and warrant mitigation. Additional language regarding solar flux is presented in the FSA.
13.23		Responses to staff's questions regarding flux are comprehensive.	Comment noted.

13.24		Avian issues are treated too conservatively.	Project related impacts to birds from collision, electrocution, and solar flux are presented using the best available information and relevant scientific literature. The conclusions presented in the report are valuable but irrelevant in the context of the project specific analysis. The fact that the study cites collisions with buildings and windows and the predation risk from domestic cats to be the primary sources of avian mortality does not diminish the projects potential to result in the loss of both common and protected bird species. Considering the vast areas of the United States that have been developed and the millions of house cats that predate birds it is not surprising theses sources pose risks to birds. The further contention that the project will result in a lower risk to birds than a wind farm may be accurate but depends on many factors including siting, scale of the project, and the type of wind turbines that are used at the site. In addition this technology has not been extensively studied and there does not appear to be any rigorous scientific studies to support this claim. Where data on bird mortality is available, bird mortality was found to occur both through collision with heliostats and from exposure to solar flux (McCray et al., 1986). Based on bird use in the project area including the presence of golden eagles staff considers the potential risk to birds from collision and solar flux to be appropriately addressed in the PSA and pose a significant impact to common and sensitive birds.
13.25		Desert kit fox will not be hunted for fur.	The PSA does not treat the desert kit fox as a State Fully Protected Species pursuant to Fish and Game Code Sections 3511, 4700, 5050 and 5515 or as a State listed species protected under Fish and Game Code 2050 et seq. For the purposes of the PSA this species is being treated as sensitive in accordance with the regulations identified in Title 14. While staff acknowledges that the project owner does not intend to conduct hunting or trapping on the project site the PSA presents reasonable minimizations measures to avoid the loss of this species.
13.26		The project is not located within NEMO.	The PSA acknowledges the HHSEGS facility site is located on private lands and not subject to the NEMO. The text will be clarified on the PSA.
13.27		The California Desert Conservation Area Plan does not apply to the project.	The PSA acknowledges the HHSEGS facility site is located on private lands. The text will be clarified on the PSA.
13.28		No wild and scenic rivers exist within the project area.	The PSA included a discussion of potential ground water related impacts to Wild and Scenic Rivers. No changes have been made to the PSA.
13.29		Applicant notes that badger may be "taken".	The American badger is a California species of special concern and is treated accordingly in the PSA. Although hunting of this species is allowed, Section 465 of the Fish and Game Code (Method of Take) describes the legally approved methods of take. As described in the Fish and Game Code furbearing mammals may be taken only with a firearm, bow and arrow, or with the use of dogs, or traps in accordance with the provisions of Section 465.5 of these regulations and Section 3003.1. The reference to unlimited take of this species is not relevant to the analysis of potential impacts to this species under CEQA.
13.30		CDFG code was incorrectly referenced.	The incorrect reference to American badger as a fully protected species in the PSA will be corrected.

13.31		Add provided language.	The recommend language was added to the FSA.
13.32		Add provided language regarding bird nests.	The recommend language was added to the FSA.
13.33		Add provided language regarding Migratory Bird Treaty Act.	The recommend language was added to the FSA.
13.34		Add language regarding the California Native Plants Act	The recommend language was added to the FSA.
13.35		Please refer back general comments regarding project size.	The FSA will be revised to include a description of land disturbance provided by the applicant. For the purposes of the PSA and FSA temporary impacts to desert tortoise habitat have been treated as permanent due to the temporal loss of habitat and extremely long recovery times required in desert ecosystems.
13.36		Please update pipeline description.	The FSA will be revised to include this information.
13.37		Please update transmission system description.	The FSA will be revised to include this information.
13.38		Add a temporary construction well to the FSA.	The FSA will be revised to include this information.
13.39		Revise ACEC description.	The FSA will be revised to include this information.
13.40		The land for the proposed project site is not abandoned.	The FSA will be revised to clarify the orchard has been left fallow and the site remains largely undeveloped.
13.41		Acreages in the PSA were incorrect.	The FSA will be revised to include this information; however preliminary data was based on the contents of the AFC.
13.42		Revise acreages in the FSA.	The FSA will be revised to include this information.
13.43		Revise sentence regarding native vegetation.	The FSA will be revised to include this information.
13.44		Describe why a developed project site would not be suitable habitat for wildlife.	The conclusions drawn in the PSA are accurate and are based on the basic tenants of ecology and conservation biology. An analysis of these effects is described in detail in the PSA under Project Operation Impacts and Mitigation. This includes the rational for lost functional values to wildlife, including numerous scientific citations describing the ecological effects of roads, noise, lighting, and weed management activities.

13.45		The FSA must include data on nest failure.	The FSA will provide additional language regarding human and disturbance related effects to birds. However, disturbance and human intrusion near nest sites are well studied and has been documented to reduce nest success in many birds. Some of the studies that have correlated human intrusion with degree of reproductive success for birds include Reijnen et al. (1995), Gramza (1967), Ellison and Cleary (1978), Tremblay and Ellison (1979), Westmoreland and Best (1985), Rodgers and Smith (1995), Gutzwiller et al. (1997), Swarthout and Steidl (2003), Weidinger (2008), and Grubb et al. (2010). <u>Citations</u>: Ellison, L. N., and Cleary, L. 1978. Effects of human disturbance on breeding of Double-crested Cormorants. Auk 95:510–517. Gramza, A. F. 1967. Responses of brooding nighthawks to a disturbance stimulus. Auk 84:72–86. Gutzwiller,K. J., Kroese, E. A., Anderson, S. H., and Wilkins, C. A. 1997. Does human intrusion alter the seasonal timing of avian song during breeding periods? Auk 114:55–65. Grubb, T. G., DeLaney, D. K., Bowerman, W. W., and Werda, M. R. 2010. Golden eagle indifference to heli-skiing and military helicopters in northern Utah. Journal of Wildlife Management 74:1276–1285. Reijnen, R., Foppen, R., Braak, C.T., and Thissen, J. 1995. The effects of car traffic on breeding bird populations in woodland: III. Reduction of density in relation to the proximity of main roads. Journal of Applied Ecology 32:187–202. Rodgers, J. A., and Smith, H. T. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. Conservation Biology 9:89–99. Swarthout, E. C. H., and Steidl, R. J. 2003. Experimental effects of hiking on breeding Mexican spotted owls. Conservation Biology 17:307–315. Tremblay, J., and Ellison, L. N. 1979. Effects of human disturbance on breeding of Black-crowned Night Herons. Auk 96:364–369. Weidinger, K. 2008. Nest monitoring does not increase nest predation in open-nesting songbirds: Inference from continuous nest-survival data. Auk 125:859–868.
13.46		Construction effects on common wildlife are insignificant.	The PSA concluded that impacts to common wildlife were significant due to the large scale land use conversion and expected mortality to common wildlife. The lead agency has great discretion in the determination of significance under CEQA. Based on the potential impacts to common wildlife the PSA concluded that impacts were significant. Please note that while Conditions of Certification were applied to salvage wildlife compensatory land acquisition was not required for common species.

13.47		The site has only two plant communities.	The site does include more than two plant communities according Sawyer et al. (2009). Creosote bush scrub and shadscale scrub are two broad plant community descriptions when mapped according to Preliminary Descriptions of the Terrestrial Natural Communities of California by Holland (1986). However surveys conducted by staff noted that each of the two dominant plant communities varied across the site both in species composition and diversity of dominant shrub cover. At the association level at least one sensitive plant community Creosote bush scrub/big galleta was also noted.
13.48		Revise sentence regarding diversity of mammalian species detected on the project site.	The site does appear to support a wide variety of mammals. As identified by the applicant 12 species of mammals were noted on the project site. This included a range of species from small pocket mice to larger carnivores. In addition, staff observed weasel scat on lands due east of the project site. The PSA language regarding well represented is not intended to suggest the site supports unique assemblages of mammals but rather acknowledges the number and type of mammals present.
13.49		Bobcat do not use the project site.	The PSA erroneously suggested that bobcat were observed on the site. This fact will be rectified in the FSA. However, there is no reason why this species would not be a periodic to routine visitor at the project site. The species is known from the region and would be expected to forage within the community types present on the project site.
13.50		Revise FSA description of bat species survey data.	The FSA will be revised to include this information.
13.51		Pallid bat use the project site.	The FSA will be revised to include this information.
13.52		There is no evidence that bats could roost on solar structures.	Bats are known to roost on a variety of manmade structures including bridges, buildings, bell towers, under the eaves of houses and water tanks. Because of the size and scale of the project staff included this language to ensure that roosting bats, should they use the project site, are afforded protection.
13.53		The project would not impact the Amargosa Wild and Scenic River	Please refer to staff's analysis of the project's groundwater pumping impacts on the Amargosa Wild and Scenic River (Water Supply section of the FSA).
13.54		The HHSEGS project poses no collision threat to bats.	The PSA acknowledges that due to the unique ecology of most bats; project construction is unlikely to result in direct mortality. However, pallid bats, which forage on the ground, will incur a loss of habitat. In addition, while bats generally are capable of avoiding structures through the use of echolocation, bats still periodically collide with facility structures during inclement weather.
13.55		There is a difference between tortoise in Nevada and tortoise occurring in California.	The PSA correctly identifies where desert tortoise occur on and near the project site. Staff considers desert tortoise found within 150 meters of the project site to have the potential to utilize home ranges that include portions of the project site.

13.56		Mesquite thickets are not scientifically shown to be of importance in the greater ecosystem.	The importance of mesquite habitats -- in all forms -- is a matter of empirical fact, supported by the literature, and by resource agency policy and practice. All mesquite in southern Nevada, and particularly the mesquite in Pahrump Valley and Stump Springs, are recognized conservation priorities in the BLM-sponsored "Mesquite-Acacia Conservation Management Strategy (Crampton et al. 2006), adopted for the Clark County Multiple Species Habitat Conservation Plan. The applicant has provided no evidence to support this arbitrary and unsupported statement.
13.57		There is not "an abundance" of prey onsite for bats.	The FSA will be revised to further describe the sites value to bats.
13.58		Tecopa Road should not be fenced with desert tortoise fencing.	The FSA will be revised to further describe the location of proposed desert tortoise fencing. Staff does not believe that fencing on the south side of Tecopa Road is warranted.
13.59		Revise language regarding applicant's proposed use of an onsite retention area.	The FSA will be revised to clarify the retention pond would hold water only after significant rainfall events.
13.6		The project will not cause an increase in polarized light.	The PSA attempts to provide a thorough discussion of the potential effects of the projects to birds from collision. Polarized light may not pose a significant concern for the project however the PSA discloses potential effects from this effect. Nonetheless studies conducted at other facilities using reflective technologies cite collision as a source of bird mortality. Considering the heliostats would likely reflect conditions including clouds or a darkened sky there does appear to be potential for birds to mistake the site for a pool of water.
13.61		Update project acreages relative to desert tortoise impacts.	The FSA will be revised to include the disturbance acreage provided by BSE.
13.62		Revise sentence regarding desert tortoise.	The FSA will be revised to clarify this statement.
13.63		Please refer to applicant's comments regarding desert tortoise population estimate.	The PSA based the estimate of potential desert tortoise on the project site on information identified in Section 5.2.6.2 (Federally Listed Desert tortoise Protocol Survey). Staff acknowledges the approach of not including animals found adjacent to the site in the calculations; however this rationale disregards the fact that desert tortoise in adjacent areas likely use the site as a component of their home range and may use burrows on the project site. As the numbers reflect only an estimate of the potential desert tortoise that may occur on the project site staff considers the approach to be biologically sound and appropriate for the FSA.
13.64		Please refer to applicant's comments regarding desert tortoise population estimate.	Please see response to comment 13.4.
13.65		The applicant will submit a revised desert tortoise translocation plan.	Staff looks forward to working with BSE to develop an effective desert tortoise Translocation Plan.

13.66		Please refer to applicant's comments regarding desert tortoise population estimate.	Please see response to comment 13.4.
13.67		The project would not attract nuisance predators.	The PSA accurately presents information addressing existing nuisance predators that are present in the project area. Specifically, page 4.2-92 of the PSA (Ravens, Coyotes, and other Predators) describes the existing subsidized predators that occur near the community of Charleston View. Staff also considers the project to pose an additional attractant to ravens and other predators from road kill, trash, and the creation of perch and nesting sites.
13.68		Burrowing owl likely do not occupy the project site long-term.	Burrowing owl and their sign was detected on the project site during surveys desert tortoise conducted by the applicant. In addition, these burrows were revisited during winter months. What is not clear is if the applicant returned to the burrows to evaluate if any of the burrows supported breeding birds. However, there is some indication that supplemental surveys to detect breeding were not conducted as the site was considered to support burrowing owls. Nonetheless the FSA will be revised to clarify the potential use of the site by burrowing owls.
13.69		The developed project would provide habitat for birds.	The PSA accurately reflects the expected post development landscape and potential use by resident and migratory birds. With the exception of disturbance tolerant species the site is expected to have lost functional value for most nesting and foraging birds.
13.7		LORS with "may" in them are speculative.	Staff considers the large scale loss of foraging habitat to pose a substantial risk to golden eagles. The USFWS considers that foraging habitat loss may be interpreted as take under the Bald and Golden Eagle protection Act if it causes territory abandonment or reduced productivity. Staff believes the large scale loss of habitat could result in the loss of reproductive output or other lost fitness; however staff acknowledges it would be difficult to attribute the loss to the proposed project. Staff concludes that the loss of foraging habitat would be significant under CEQA but would not constitute take under state or federal LORS.
13.71		No residual impacts to golden eagles would occur if the project were developed.	Staff considers the potential risk of collision, electrocution, loss of habitat and risk of solar flux to be significant under CEQA. Staff believes the use of anti-perch devices and other mechanisms to be valuable and required to minimize impacts to golden eagles. However, the potential loss of birds would remain significant after mitigation.
13.72		Update FSA with spring 2012 nesting surveys.	The FSA will be updated with this information.
13.73		Remove reference to an evaporation pond.	The FSA will be updated with this information.
13.74		Only 3 eagles were seen at the same time on the project site.	The FSA will be updated with this information. However, use of the site by golden eagles is not in dispute. The surveys conducted by the applicant provide only a limited sampling time. Golden eagles have been observed by staff immediately adjacent to the site and soaring east of the project area. Additionally, applicant consultants docketed **FIGURE 30** -- a pair of golden eagles observed 1/11/2 along Stateline Road adjacent to the proposed project site.
13.75		The loss of forage is unimportant to golden eagle.	The project will result in the direct loss of over 3,000 acres of foraging habitat for this species. Staff considers this a significant impact under CEQA. Please see response to comment 13.70 for further information regarding the loss of golden eagle foraging habitat.

13.76		Clarify statements regarding mitigation of loss of golden eagle foraging habitat.	The language regarding significance conclusions will be revised in the FSA.
13.77		Bighorn sheep do not use the Stump Springs ACEC.	Thank you for the information regarding bighorn sheep. It is not clear whether bighorn sheep use the spring at Stump Springs or water in the adjacent drainages. Use of the spring would pose a predation risk to the animals due to the heavy brush cover which sheep often avoid.
13.78		The site is not a bighorn sheep corridor.	Bighorn sheep are known from the project region and have been documented to use valley floors to support intermountain. However, the PSA does not suggest the site is an important corridor for movement. Please see response to comment 13.2 for additional information regarding bighorn sheep.
13.79		Bighorn sheep do not cross Tecopa Road.	Staff disagrees with the assertion that bighorn sheep would not cross Tecopa Road for intermountain movement. Bighorn sheep may use almost any portion of the desert floor for movement and are known to cross major highways and existing roads.
13.80		The project owner is unwilling to pay for necropsy of dead kit fox found on the project site.	The PSA acknowledges the project will displace desert kit fox and result in a net loss of habitat for this species. However, it is unknown and speculative if the project will either result in the manifestation or spread of distemper. However, to monitor the possible consequences of this threat the PSA included condition of certification **BIO-14** which requires monitoring and adaptive methods to reduce this threat. As a condition of **BIO-14** disease testing may be required if animals succumb during project activities.
13.81		Provides data on kit fox behavior and habitat use patterns.	Thank you for the information regarding desert kit fox. The FSA will be revised to include the applicability of BLM lands east of the project site for desert kit fox.
13.82		Applicant states that badger may be "taken".	Please see response to comment 13.29.
13.83		Applicant presents a different interpretation of kit fox legal status.	Please see response to comment 13.25.
13.84		Please provide evidence that mammals are in high density on the project site.	The site does appear to support a wide variety of mammals and numerous rodent burrows. As identified by the applicant 12 species of mammals were noted on the project site. This included a range of species from small pocket mice to larger carnivores. In addition, dense concentrations of burrows, to numerous to count, were routinely observed across the site. Staff did not conduct small mammal trapping or complete a census of burrow. However, it is clear that small mammal density across much of the site is high.
13.85		Applicant is confused about what further information could have been collected for kit fox.	Staff considers the existing information on desert kit fox to be adequate for the purposes of the FSA. Additional data acquisition will be required as a component of Condition of Certification **BIO-14.**
13.86		Revise discussion of desert washes per provided language.	Thank you for the clarification; however, the acreages have been revised to reflect the additional and previously unmapped washes documented by staff during the field verification of the state waters delineation on August 1-2, 2012, and the removal of the artificial features on roads.

13.87		BIO-22 should be deleted.	Comment noted.
13.88		Applicant disputes potential for washes upstream of the project site to be impacted by project construction.	Staff agrees that the upstream portion of the delineated streams located in Nevada are not state waters. However, staff included the small portion of upstream waters (0.45 ac.) located in California that are immediately adjacent to the project boundary and pipeline alignment, and will be indirectly affected by the project. Construction of the pipeline would require trenching through many of these washes. Indirect impacts to the habitat functions and values of the adjacent streams are also expected during operation from human disturbance, noise, glare, lighting, and potential head-cutting or erosion immediately above the pipeline trench.
13.89		Revise discussion of state waters delineation.	Regarding the indirect effects of the project that extend across the state line into Nevada, staff maintains that 1) consistent with the CEQA Guidelines and statutory provisions, our analysis does not consider the impacts of projects or portions of parts of projects (in this case, the project linears in Nevada); however, our analysis does include analysis and mitigation for impacts of the power plant on both sides of the border
13.90		Revise sentence regarding waters of the U.S.	Thank you; the language was revised in the FSA as suggested.
13.91		Revise statement regarding Porter-Cologne Water Quality Control Act.	Agreed; Porter-Cologne was the authorizing legislation for the Water Quality Control Act, which is more correctly referenced as California Water Code Division 7. Water Quality Act, and the Waters of the State definition is section 13050(e). The language has been revised in the FSA.
13.92		Revise statement regarding onsite storm water retention.	The applicant's Drainage, Erosion, and Sedimentation Control Plan (DESCP) indicates the project would use strategically placed sediment controls in addition to the retention area at the western boundary. Staff understands the controls would not be placed within the retention area; however, staff expected that stone filters and check dams "strategically placed throughout the project site" would mean placement near the power blocks and perhaps and in spot locations in the solar fields. These would reduce sediment transport from one portion of the project to the other. Otherwise, there may be a significant build-up of sediment near the western boundary over time. Water Resources staff indicated they would still expect that stone filters and check dams "strategically placed throughout the project site to avoid blocking drainage pipes and changing the flood characteristics of the retention area.
13.93		Provides revisions to Table 2.	The acreages were revised in the PSA to reflect the most current figures for state waters, which include the additional and previously unmapped washes documented by staff during the field verification of the state waters delineation on August 1-2, 2012, and removal of the road puddles and unconnected roadside ditches originally delineated as state waters.
13.94		Provides revision to regulatory authority over desert washes.	The language was revised to include the federal Clean Water Act, as suggested. However, the proposed edit relating to mesquite woodland was rejected; this issue is discussed in detail in the FSA.

13.95		Provides revisions to the desert wash discussion.	The definition of a stream in Title 14, Section 1.72 of the California Code of Regulations (CCR) is not the definition used by Fish and Game Code (F&GC) Section 1600 *et seq*. *The Section 1.72 definition was developed to address a specific sports fish issue that came before the Fish & Game Commission*; note that while the definition does speak to periodic and intermittent flow, *Section 1.72 is limited to fish-bearing or aquatic life-bearing streams*.
13.96		Provides revisions to discussion of U.S. Army Corp correspondence.	More importantly, rather than limiting CDFG jurisdiction to fish-bearing streams alone, F&GC Chapter 6, Fish and Wildlife Protection and Conservation, Section 1600 *et seq* was enacted to provide for the conservation of fish *and* wildlife resources associated with stream ecosystems. The F&GC further defines fish *and* wildlife to include: *all wild animals, birds, plants, fish, amphibians, invertebrates, reptiles, and related ecological communities, including the habitat upon which they depend for continued viability* (FGC Division 5, Chapter 1, section 45, and Division 2, Chapter 1, section 711.2(a), respectively). *Fish means wild fish, mollusks, crustaceans, invertebrates, or amphibians, including any part, spawn or ova thereof* (FGC, Division 5, Chapter 1, section 45).
13.97		Revise acres of state jurisdictional waters.	The language was revised in the PSA to reflect URS Corporation as the author of the delineation report (not CH2M Hill). However, the proposed edit to total acres of state waters is not consistent with the total established in the field verification (see comment 13.86).
13.98		Revise citation.	The citation for the delineation report in the PSA was revised as suggested (to "URS 2012").
13.99		Revise language regarding the 401 certification for the project.	This section was revised instead to reflect the results of staff and CDFGs field verification of the state waters delineation
13.1		Revise citation.	The citation was revised as suggested.
13.101		Disputes loss of habitat function and values. Correct acres of state waters impacted by the proposed project.	The importance of ephemeral desert washes is undisputed; it is well-documented in the literature, the sum of which represents decades of observations and surveys (Levick et al. 2008; Baxter 1988; Kirkpatrick et al. 2007; Kubick & Remsen 1977; Tomoff 1977; Daniels & Boyd 1979, and others); observations that are also consistent with staff's observations during multiple site visits by staff and CDFG biologists. The burden of proof is on the applicant to substantiate any assertion that -- contrary to the body of scientific body of knowledge -- these ephemeral streams have no value to wildlife. This comment was addressed in detail under 13.19 and 13.20.
13.102		Revise acreages of waters of the U.S.	As stated in the FSA and under comment 13.20, the project would maintain a portion of the hydrologic and geomorphic functions of the washes by allowing them to pass through the site, rather than diverting them around the project in an artificial channel; however, the habitat functions and values would be eliminated for most wildlife due to perimeter exclusion fencing, partial site grading, road construction and maintenance, vegetation maintenance, spraying, noise, glare, and human disturbance. Staff and CDFG consider this a significant impact

13.103		Revise sentence regarding importance of washes.	Staff rejects the proposed edit; this issue has been addressed in more detail under comments 13.19, 13.20, and 13.101, and in the FSA.
13.104		Provides suggested revisions and disputes staff's recommended mitigation ratio for waters of the state.	This argument was addressed by staff under comment 13.20. Fish and Game Code (FGC) Section 1605 assumes implicitly that some form of mitigation will likely be part of *any* Lake and Streambed Alteration Agreement issued for a project (Vyverberg pers. comm.). Combined with CDFGs policy that there be no net loss of riparian/riverine habitat - which includes desert washes and the vegetation that occurs along the washes - means that if a project results in a loss of one acre of stream then a minimum of two acres of compensatory stream mitigation are *required* to satisfy the no net loss goal. In practice, compensatory mitigation is typically mitigated at a minimum mitigation-to-effect ratio of 3:1 for permanent effects and 1:1 for temporary effects (*ibid.*)
13.105		Revise statement regarding Proposed edit accepted; the revised language is contained on	Proposed edit accepted; the language was revised in the FSA.
13.106		Mitigation is inappropriate unless functions are demonstrated.	This issue was addressed in detail under comments 13.19, 13.20, and 13.101.T he applicant has not provided any evidence to substantiate any assertion that -- contrary to the body of scientific body of knowledge about the habitat functions and values of ephemeral desert streams (Levick et al. 2008; Baxter 1988; Kirkpatrick et al. 2007; Kubick & Remsen 1977; Tomoff 1977; Daniels & Boyd 1979, and others) that the these ephemeral streams have no value to wildlife. The wildlife connection is presumed by CDFG and the agency will require compensatory mitigation for the washes under the authority of California Fish and Game Code (FGC), which links stream protection with the presence of fish or wildlife habitat. F&GC further defines fish and wildlife to include: "...all wild animals, birds, plants, fish, amphibians, invertebrates, reptiles, and related ecological communities, including the habitat upon which they depend for continued viability." (FGC, Division 5, Chapter 1, section 45, and Division 2, Chapter 1, section 711.2(a), respectively). "Fish means wild fish, mollusks, crustaceans, invertebrates, or amphibians, including any part, spawn or ova thereof." (FGC, Division 5, Chapter 1, section 45)
13.107		Applicant disagrees with staff's valuation of ephemeral stream values.	See comment above.

13.108		Provides suggested revisions to discussion of state and federally-regulated waters	Fish and wildlife resources are held in trust for the people of the State by and through the California Department of Fish and Game (Department) (FGC § 711.7). The Department is responsible for conserving, protecting, and managing fish, wildlife, native plants, and the habitat necessary for biologically sustainable populations of these species (FGC § 1802). FGC Sections 1600-1616 were enacted to conserve the natural resources associated with streams (and lakes), and the code sections are implemented by the Department through its Lake and Streambed Alteration (LSA) Program. Streams that are afforded protection under FGC Section 1600 et seq are those bodies of water associated with a local biological community, or that contribute to the chemical, physical, or biological integrity of downstream waters or ecosystems. Whether flow is ephemeral, intermittent or perennial, streams, their sources (e.g., swales, springs, ponds, lakes, marshes, wetlands, or other such features), floodplains, and associated ecosystems (i.e., the living flora and fauna, and physical processes that sustain their habitats) are all considered integral parts of a stream system and are extended protection accordingly. These comments have been addressed in more detail under comments 13.19, 13.20, 13.86-13.106.
13.109		Revise discussion of waters of the U.S.	Agreed; the language in the FSA was revised accordingly. Compensatory mitigation for the project impacts to desert washes is required for state waters impacts; not waters of the U.S.
13.110		Revise acreages of impacted state waters.	Staff disagreed with the total acres of state waters shown in the State Waters Delineation report (URS 2012). The total shown in the FSA (23.21 ac.) reflect additional, previously unmapped washes found by staff and CDFG during the field verification of the delineation, and the removal of non-jurisdictional features..
13.111		Provides a reference	Agreed; the citation was revised in the FSA as suggested (URS. 2012. BrightSource Energy Hidden Hills Solar Project, Inyo County, CA Preliminary Delineation of Jurisdictional Waters of the State. March 20, 2012. (Submitted as Attachment DR8-1, Data Response, Set 1C-2).
13.112		Revise Findings of Fact	Proposed edit accepted; the language was revised in the FSA.
13.113		Revise waters of the state acreage	See response to comment 13.11, above.
13.114		Revise findings for plant communities' value	Staff disagreed with the proposed changes in the PSA regarding the discussion of habitat value and movement.
13.115		Revise findings for bighorn sheep	Please see response to comment 13.
13.116		Revise findings of fact for groundwater dependent ecosystems.	Comment noted.

13.138		State groundwater table elevation in relation to mesquite vegetation.	The position of the groundwater table relative to the effective rooting depth of the mesquite can only be determined through groundwater monitoring, combined with vegetation monitoring or soil core samples (**BIO-23**, **WATER SUPPLY-4**). No previous studies have been conducted in the area east of the project; nor has the applicant provided any direct evidence. This is the basis for staff's recommendations for groundwater monitoring, and vegetation monitoring to monitor the effects of a declining water table, and/or soil core sampling. Regarding concerns about natural variations in water levels, Water Resources staff responded to the same comment during the June 14, 2012 public workshop. Water Resources staff stated it is the offsite wells east of the fault zone and in other parts of the valley that fluctuate; not the wells onsite (the trigger will be measured at the project boundary, on the stable side of the fault). Because water levels onsite are stable, (unlike offsite wells in other parts of the basin), the 0.5 foot drawdown can be detected with nearly 100 percent confidence.
13.139		PSA needs to included aquifer performance test results.	See comment 13.138, above, regarding groundwater information for the site and areas to the east. The groundwater analysis puts emphasis on the "region" because it is contained within the cone of depression (drawdown zone) identified in the applicant's groundwater analysis and staff's independent analysis of the project pump test results, and it is an area that supports extensive groundwater-dependent vegetation, as well as seasonal springs. Regarding the comment about what constitutes "onsite" versus "offsite", the PSA clearly states on page 4.2-18 that only two communities are present onsite -- creosote bush scrub and shadscale scrub – and on PSA page 4.2-20 "No mesquite-dominated habitats were mapped within the project boundary with the exception of a few scattered [mesquite]." Nevertheless, the statement was repeated in the several additional places in the FSA to address the applicant's concern.
13.140		PSA discussion must not emphasize regional context of groundwater.	See comments 13.138 and 13.139, above.

13.141		BIO-18 is too difficult to implement.	A very similar condition of certification was adopted for several Energy Commission-licensed projects (palen, Blythe, and Genesis projects). The guidelines in the condition are consistent with guidelines for weed plans by BLM and The Nature Conservancy (BLM 1992; Tu & Meyers-Rice 2001; Hilmer & Liedtke 2003). The applicant's proposed edits to BIO-18 (Weed Management Plan) were discussed in the July 2, 2012 public workshop. Staff accepted several but not all of the proposed edits. For example, additional language regarding an emphasis on the weed species of greatest ecological concern (versus common ubiquitous weed species) was accepted; it is a widely accepted approach to weed management. The accepted edits are incorporated into the revised BIO-18 in the FSA.
13.142		Data collection for special status plant species is ongoing.	Staff first raised the concern about recent additions to the CNDDB and CNPS inventory (CNPS 2012) in the PSA. It is not unreasonable to assume the possibility that newly added species—particularly species that are not even in the past or current state floras (Hickman 1993; Baldwin et al 2011), such as Torrey's joint-fir. However, two years of extensive offsite surveys have now been conducted to determine if these species were more common than previously understood, including the spring 2012 surveys, the results of which have been considered and addressed in the FSA. The applicant is now asking for another round of surveys following the publishing of the FSA (fall 2012) and a second round following the Final Decision (spring 2013). Staff concluded that surveys were adequate to determine if the four significantly affected species were more common, with one exception: --Torrey's joint-fir – because: 1) it was just added to the CNDDB and CNPS Inventory (CNPS 2012) in January 2012; and 2) the species was not known to occur in California before it was discovered on the project site, and it is not included in the state flora (Baldwin et al. 2011). This means, in this unique case, there is a high potential that it may have been overlooked by other surveyors, an opinion shared by at least one other recognized local expert (Silverman pers. comm.). Currently, only one round of surveys has been conducted to assess the size of the species' population in California. BIO-20 includes a provision that if many new occurrences are found in fall 2012 or spring 2013 that results in a downgrading of the CNDDB Element Rank from an S1 to an S3 ("vulnerable but not under immediate threat of extinction"), and the proportion of the statewide distribution affected by the project is less than 10 percent, the mitigation requirement for that species would be dismissed.
13.143		Provides a clarification of site geomorphology.	

13.144		Delete "scrubs [plural]"; replace with "scrub".	Edit accepted; the language was revised accordingly in the FSA.
13.145		No evidence exists to support that mesquite are stressed by groundwater pumping.	The comment the applicant is objecting to (was informed by the BLM document Conservation Management Strategy for Mesquite and Acacia Woodlands in Clark County, Nevada (Crampton et al. 2006) and literature on the groundwater declines in the Pahrump area during the last century: Harrill (1986); Malmberg (1967); Buqo (2004), and Comartin (2010). “Many local springs experienced precipitous water table declines and ultimately stopped flowing as a result of groundwater depletion in the middle of the last century (Harrill 1986; Malmberg 1967; Buqo 2004; Comartin 2010). Before extensive agricultural development, the Pahrump Valley playa area (northwest of the project) contained some phreatophytic vegetation. Groundwater pumping in the Pahrump Valley for agriculture (predominantly alfalfa and cotton) peaked in 1968 and there was a significant downward trend in static water levels between the years 1953 and 1996, based on an analysis of 651 wells within 1 mile of a mesquite woodland (Crampton et al. 2006). Groundwater withdrawals accompanying large-scale agricultural development caused some major springs in the area to stop flowing during this period of groundwater withdrawal. Some springs eventually recovered after some the pumping stopped (Moreo et al. 2003). Historically, Manse and Bennetts Springs discharged along the base of the broad alluvial fans at the foot of the Spring Mountains. Groundwater withdrawal in the valley caused these springs to cease flowing in the 1970s. In the late 1990s, after the heavy agricultural pumping stopped, Manse Spring began to flow again. Other springs have not recovered.” Groundwater pumping and water level declines are documented to have caused the decline or death of mesquite in many areas of the southwest (Sawyer et al. 2009; Judd et al. 1971; Webb & Leake 2006; Stromberg pers. comm.; Keeler-Wolf pers. comm.).
13.146		Vegetation monitoring isn't proportional to the projected impact.	See response to comment 13.135.

13.147		Nomenclature for mesquites needs to be standardized.	Many of the applicant's comments on vegetation communities and their nomenclature are based on the incorrect application of old and obsolete classification systems and concepts no longer in usage in California. The CDFG Vegetation Program was consulted for information on the conservation status and classification of mesquite in California. The Senior Vegetation Ecologist (Keeler-Wolf pers. comm.) affirmed that the mesquite-dominant habitats (alliances) in California are classified as "Honey Mesquite Alliance" under the classification system used in California, not "thickets" or "bosque" or "woodland"; the state and national standard is based on dominant species, not on habitat structure. Under the US National Vegetation Classification system (USNVC) (a system still in development), honey mesquite alliances fall under several different "Ecological Systems" including "North American Warm Desert Riparian Low Bosque & Shrubland Group" (Keeler-Wolf pers. comm.). This might explain why BLM uses the term "bosque" to describe the mesquite habitats east of the project. In the Mesquite-Acacia Conservation Management Strategy (CMS) (Crampton et al. 2006) prepared for and adopted by the Clark County Multiple Species Habitat Conservation Plan, commissioned by BLM, the mesquite are referred to as "woodlands" throughout the study area, which includes the stands near the project. The management plan also notes that the southern portion of the Pahrump "Metapatch" (aggregation of smaller patches) known as Stump Spring is "...distinct from the rest of the region in topography, hydrology, soils and mesquite growth form...Many of these woodland patches are comprised of shrubby dune mesquite; however, larger shrubs and trees grow along the deeply eroded wash." (Crampton et al. 2006). Regardless of the terminology used, the conservation status of Stump Spring ACEC, the mesquite-dominant habitats north of the ACEC and east of the project, and the value of the habitats to wildlife, are a constant; the ACEC and the entire Pahrump Valley metapatch are identified conservation priorities in the Mesquite-Acacia Conservation Management Strategy (Crampton et al. 2006). BLM is in the process (early planning stages) of developing an additional ACEC that would encompass the mesquite habitats just east of the project (Poff pers. comm.). The importance of mesquite to wildlife are described in more detail under "Setting: Groundwater-dependent Ecosystems". Biological Resources Figure 4 contains photos of the mesquite habitats characteristic of the incised washes east of the project site.
13.148		Nomenclature for mesquites needs to be verified by other experts.	See comment 13.147, above.
13.149		Revise PSA language regarding mesquites.	The reference to m,esquite in the study area was revised to read "Sensitive plant communities *potentially* indirectly affected by the proposed project groundwater pumping....", and added "Groundwater-dependent communities (mesquite-dominant habitats) do not occur onsite except as a few scattered small stands. Offsite, the nearest mesquite habitats occur within 500-1000 feet of the eastern project boundary, predominantly in a shrubby form on coppice dunes."

13.150		Applicant questions the necessity of mitigating for Larrea-pleuraphis vegetation type.	During the field verification of the state waters delineation conducted by staff and CDFG on August 1-2, staff documented a one-acre stand of the creosote bush-galleta grass association (*Larrea tridentata/Pleuraphis rigida association*) -- a rare natural community --along the eastern boundary, where it occurs as an upland (non-riparian) habitat. Because the habitat does not occur along the washes, staff is not treating it as a feature subject to jurisdiction under Fish and Game Code. Although it is still considered a rare natural community (Sawyer et al. 2009) from a CEQA perspective, a one acre loss of a S3-ranked community ("vulnerable" but not imperiled) would not be significant and no mitigation is recommended.
13.151		The discussion of mesquite communities is confusing.	Page 4.2-20 of the PSA clearly states that “No mesquite woodlands were mapped within the project boundary, with the exception of a few scattered trees.” Nevertheless, the statement has repeated in the introduction to “Sensitive Plant Communities”, and the bulleted list of sensitive communities further subdivided as suggested to address the applicant’s concern.
13.152		Please add suggested language regarding mesquite.	See comment 13.151, above. The PSA clearly stated "The mesquite-dominated habitats closest to the project occur as lower-growing shrublands”. Nevertheless, to further address the applicant's concern, the language was revised to read “ ...as a shrub-like, rather than tree-like growth form, on the dunes east of the project.”
13.153		Add citiations supporting conclusions regarding mesquite and groundwater pumping.	The PSA never states that sand accumulation is a potential cause of mesquite die-off. The definition of coppice dunes was cited in the PSA (Huang et al. 2011) from Huang, P.M, Li, Y., and M.E. Summer, Handbook of Soil Sciences: Properties and Processes [2nd ed.] CRC Press, 2011. The citation was included in the References subsection of the PSA [pp. 4.2-256]. It is an industry standard, included in the USDA soil science reading list. The specific statement “If the sand accumulates faster than the plant can grow, however, the plant will die, and the dune will usually be deflated (wind-eroded and moved downwind) is from the U.S. Army Corps of Engineers description of coppice dunes <http://www.agc.army.mil/research/products/desert_guide/lsmsheet/lscopp.htm>
13.154		Please have document reflect that mesquite coppices are clones.	This is already implied on page 4.2-21 in the PSA “This same process fostered the development of ancient creosote bush clones (McAuliffe et al. 2007). Clones (off-shoots from a single parent that are genetically identically and connected to the older, original, and now dead parent plant) may reach ages of several thousand years and are most common in places where fluvial and aeolian deposition has repeatedly occurred throughout the Holocene (ibid.). Clones in such locations are derived from plants that originally established on surfaces of older, now buried surfaces.”
13.155		Mesquites present offsite are not bosques.	This distinction was clearly stated in the PSA (page 4.2-21). See also comment 13.147.

13.156		Clarify the importance of mesquite in Nevada.	The project is located on the California side of the California-Nevada state line. Groundwater-dependent vegetation occurs within 500-100 ft of the eastern boundary of the project, in Nevada, within the groundwater pumping cone of depression identified by the applicant in the AFC (HHSEGS 2011a, Appendix 5.15D) and in staff's independent groundwater analysis (Water Supply section of the FSA). The issue of analyzing and mitigating the impacts of California projects in Nevada is addressed by the Commissioner's in the "ORDER RE: APPLICANT'S MOTION IN LIMINE" dated and posted October 2, 2012 (Docket No. 11-AFC-02). From the Order: "This [Public Resources Code section 21080(b)(14)] does not exempt in-state project activities whose impacts are only felt out-of-state. For example, if a project dug a well inside California and the project's water consumption from the well caused an impact in another state but not in California, then that out-of-state impact must be analyzed under CEQA because the impact was generated in California." The PSA clearly states, in numerous locations, the planning documents that identify the mesquite habitats as a conservation priority (PSA p. 4.2-21, last paragraph of the subsection "Mesquite Woodlands and Mesquite Dune Scrub", also PSA p. 4.2-39-42; 143; 149). They are also referenced in the BLM comment letter from March 12, 2012 (BLM 2012a): "The local mesquite bosques, including Stump Spring ACEC, are located in both Nevada and California. These bosques are considered an important type of riparian habitat, getting their water from the shallow basin-fill aquifer. In 2006, the BLM developed a Conservation Management Strategy for Mesquite and Acacia Woodlands in Clark County, Nevada. This strategy identified the mesquite bosques located in the Pahrump Basin as a high priority area for conservation actions..." From the Summary of the Conservation Management Strategy (Crampton et al. 2006): "Mesquite and acacia woodlands are of significant biological importance, providing habitat to many wildlife species in southern Nevada, including several species covered under the Clark County Multiple Species Habitat Conservation Plan (MSHCP). A number of covered plant species also co-occur with these woodlands. The extent and condition of woodlands, however, is severely impacted by the diverse activities of a growing human population. In response, the development of a Mesquite-Acacia Conservation Management Strategy (eMS) was mandated in the MSCHP, with the goal of bringing the best available scientific information to bear on the protection and management of these woodlands and their associated species in Clark County......In order for the CMS to satisfy the stated objectives ofthe MSCHP with regards to protecting covered species and their habitats, three Conservation Goals were developed: 1) To restore and maintain mesquite and acacia woodlands to the extent (area) they covered in year 2000 (inception of MSCHP), by protecting all woodlands on public land from habitat loss and acquiring (directly or with conservation partners and/or easements) as many woodlands as possible from private owners; 2) To restore and sustain mesquite and acacia woodlands in a healthy ecological condition (active recruitment of new plants, large trees with few stems, ability to support moderate mistletoe infection); 3) To maintain stable or increasing populations of mesquite- and acacia-dependent and associated species.
13.157		Make nomenclature updates for Hymenoclea.	Thank you; the language was revised in the FSA as suggested.
13.158		Revise summary language.	Edit accepted; the language was revised in the FSA as proposed.
13.159		Add text regarding invasive weed survey data.	Edit accepted; the language was revised in the PSA as proposed.

13.160		Clarify how the incremental effect of noxious weeds from this project was considered cumulatively considerable.	The PSA includes a 17-page analysis of cumulative impacts (PSA pp. 155-174). The cumulative impact analysis methods are discussed in three pages (PSA pp.155-157), and invasive weeds are discussed on pages 165-167 of the cumulative effects analysis.
13.161		Revise special status plants language.	The language was instead revised to reflect staff's analysis of the spring 2012 special-status plant survey results. The analysis concluded impacts were significant to four species (gravel milk-vetch; Wheeler's skeletonweed; Preuss' milk-vetch; Torrey's joint-fir), and that the impact could be mitigated offsite through acquisition and preservation, or restoration. Staff's analysis included an analysis of ownership and management threats and opportunities and the feasibility of offsite mitigation.
13.162		Delete compensation for special status plants.	Mitigation ratios are developed based on a combination of 1) the degree of rarity and extinction risk, as defined in the CNDDB (NatureServe) Element Rank, and 2) on agency policy and practice for species mitigation. Staff provided a clear, science-based justification for the mitigation of rare plants based on CNDDB Element Rank. Staff chose to use these ranks as a basis for the mitigation ratios because they are an index of a species' extinction risk, based on rarity, threats, and population trend based on a widely recognized methodology used by CNDDB and other natural heritage programs around the world (Master et al. 2009).
13.163		Revise discussion of halogeton infestations.	According to the California Department of Food and Agriculture (CDFA) website, halogeton is still an A-rated pest plant. The CDFA definition of the A rating: "A" = A pest of known economic or environmental detriment and is either not known to be established in California or it is present in a limited distribution that allows for the possibility of eradication or successful containment. A-rated pests are prohibited from entering the state because, by virtue of their rating, they have been placed on the of Plant Health and Pest Prevention Services Director's list of organisms "detrimental to agriculture" in accordance with the FAC Sections 5261 and 6461. The only exception is for organisms accompanied by an approved CDFA or USDA live organism permit for contained exhibit or research purposes. If found entering or established in the state, A-rated pests are subject to state (or commissioner when acting as a state agent) enforced action involving eradication, quarantine regulation, containment, rejection, or other holding action." Condition of Certification **BIO-18** (Weed Management Plan) requires plans include a "weed risk assessment based on Cal-IPC or Nature Conservancy criteria" (PSA pp. 4.2-215). BLM and CDFA have also created science-based, transparent, decision-making tools to help land managers prioritize weed populations for eradication. These ranking tools typically assess the relative impact, potential spread, and the cost and feasibility of eradication for each population; thus, the condition allows the project to systematically target weed infestations by putting their limited resources into populations known to cause the highest impacts and that are most feasible to eradicate.

13.164		Quality of habitat is affected by the presence of onsite weeds.	The presence of invasive weeds onsite is discussed throughout the PSA and FSA. However, the mere presence of weeds does not diminish the value of the habitat. Staff conducted a methodical field review of habitat quality and found that most areas still had good species diversity and were only lightly infested, or the ecological consequences still minor. The abundance and distribution of rare plants and native species diversity in the eastern half of the project is a testament to the habitat quality. The western portion of the project is more infested; however, there are still large areas where the native species diversity is largely unaffected and the habitat functional. Representative photos of the habitat quality in the western and eastern portions of the project area provided in **Biological Resources Figures 2 and 3**.
13.165		Noxious weeds exist both on and off the project site.	It is true that noxious weeds already occur offsite in the immediate vicinity of the project, particularly in disturbed areas and roadsides. However, staff is also concerned about the spread of weeds into the currently uninfested areas in the project vicinity; spread that can occur over many miles on contaminated vehicles and equipment. This concern was also expressed by the Inyo-Mono County Agricultural Commissioner (INYO 2012a).
13.166		Onsite noxious weed control is not possible.	Condition of Certification BIO-18 requires the project to manage weeds for "containment"; not eradication, which is infeasible in most cases, or would require heavy widespread use of herbicides. BIO-18 also guides the Plan to do a weed risk assessment to prioritize weed management activities on those species with the greatest ecological consequences or feasibility for containment. Small infestations of highly invasive weeds, however, can and should be eradicated.
13.167		Revise discussion of habitat degradation.	See comment 13.164.
13.168		Control of noxious weeds offsite is not feasible.	**BIO-18** does not require the project to control weeds offsite.
13.169		Special status plants within the project boundaries will not be avoided.	Onsite avoidance is not specified in either BIO-19 (Special-status Plant Avoidance and Minimization) or **BIO-20** (Special-status Plant Compensatory Mitigation). **BIO-18** (Weed Management Plan) specifies that invasive weeds onsite that occur in close proximity to the nine occurrences of rare plants just off the project boundary should be a management priority.
13.170		Revise discussion of noxious weeds and where they've been identified to exist.	The descriptions of these two species on PSA page 4.2-22-23 clearly state the two additional species of concern to the Inyo/Mono Counties Agricultural Commissioner were not found onsite; however, the FSA to revised to include the suggested subheading.

13.171		Revise sentence regarding Torrey's joint-fir.	This comment includes suggested additions/revisions to the special-status plant sections based on the results of the spring 2012 surveys. While staff has not yet received a final special-status plant report, the applicant has submitted the field data forms, GIS shape files, and displayed the data for staff on various GIS layers during two recent meetings, and answered questions regarding field methods, to facilitate staff's analysis of impacts. Staff accepts the proposed edit based on this evaluation of the raw data. CNDDB has updated the Element Rank (NatureServe rank) for all 11 species based on the spring 2012 data.
13.172		Eleven special status plant species occur on the project site.	Staff revised the reference to the total number of special-status species from 10 to 11 based on the applicant's recent confirmation of an eleventh species – Torrey's joint-fir. The reference to eight species in on PSA page 4.2-134 and is a correct reference to the total number of species with a CRPR 2 rank. No references to "nine species" were found.
13.173		Natureserve plant rankings may change as data is collected.	Staff coordinated with CNDDB to update the Element Rank (NatureServe rank) upon receipt of the applicant's 2012 survey in July-August to ensure the ranks used in the analysis and mitigation were current and reflect all new survey data. The new ranks are show in Biological Resources Table 3 and 15, and in all subsequent references to the ranks.
13.174		Revise discussion of special status plant impacts.	Edit accepted; the language was revised in the FSA.
13.175		Remove references to a mitigation ratio within the FSA.	The PSA stated in numerous locations that the special-status plant analysis was ongoing, that the PSA analysis was preliminary and would be revised upon receipt of the spring 2012 survey results. The FSA reflects new data from the spring surveys. Compensatory mitigation will be required for four species. See response to comment 13.162 regarding justification and precedent for the mitigation ratios.
13.176		Revise date that applicant performed reconnaissance-level surveys.	Edit accepted; the language in the PSA was revised accordingly.
13.177		Confirm Natureserve status codes for shadscale scrub.	CNDDB was not asked to update this status code because mitigation for shadscale scrub is based on the loss of habitat for the state and federal listed desert tortoise; not because of its CNDDB rank.
13.178		Add the status code for Torrey's joint-fir.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 data.
13.179		Use California Rare Plant Rank as opposed to the California Native Plant Society rankings.	Staff chose to use the old name ("CNPS List") in the PSA because the CRPR rank is quite new and unfamiliar to most readers. However, the new name "CRPR Rank" has been added to the FSA and the name change explained in the analysis.
13.180		Revise dates of special status plant surveys.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 data.

13.181		Revise text regarding performance of special status plant surveys.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 information on survey methods.
13.182		Add language regarding the description of Androstephium.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 information on survey methods.
13.183		Add language regarding Androstephium survey results.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 information on survey methods.
13.184		Revise the discussion of the Nye milkvetch.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 data and the applicant's conversation with the Nevada Natural Heritage Program (the CNDDB equivalent in Nevada).
13.185		Add language regarding Preuss' milkvetch.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 information on survey methods.
13.186		Add language regarding gravel milkvetch.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 information on survey methods.
13.187		Add language to description of Tidestrom's milkvetch.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 information on survey methods.
13.188		Revise discussion of Wheeler's skeletonweed.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 information on survey methods.
13.189		Revise discussion of Wheeler's skeletonweed.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 information on survey methods.
13.190		Add language regarding purple-nerve spring parsley.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 information on survey methods.
13.191		Discussion of Pahrump Valley buckwheat appears to be missing text.	Edit accepted; thank you for bringing this to our attention. The language in the PSA was also revised to reflect the new spring 2012 data.
13.192		Add language regarding the Pahrump valley buckwheat.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 data.
13.193		Add language regarding the Pahrump valley buckwheat.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 data.
13.194		Add discussion of surveys for Selinocarpus.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 data.
13.195		Update nomenclature for Selinocarpus.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 data.
13.196		Revise discussion of ephedra species identified onsite.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 data.

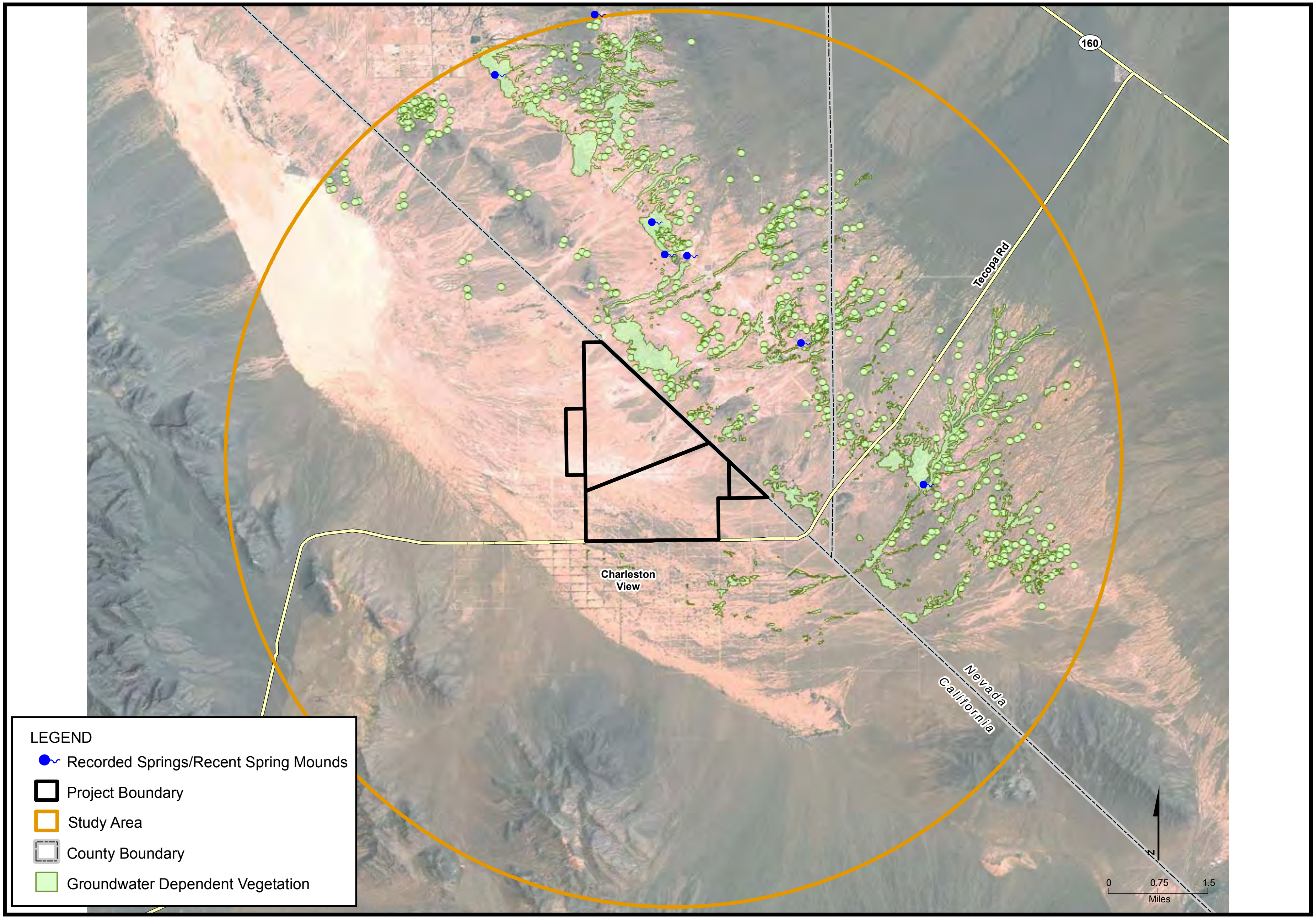
13.197		Update discussion of ephedra with 2012 survey data.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 data.
13.198		Revise discussion to reflect that 11 special status plant species have been found onsite.	Edit accepted; the language in the PSA was revised to reflect the new spring 2012 data.
13.199		Clarify what is a substantial loss of plant occurrences.	The question is answered quantitatively in Biological Resources Table 15, and in narrative under "Direct Impacts". The project would eliminate between 18 percent and 50 percent of all the known occurrences in California of four of the 11 special-status plant species that occur onsite. The PSA was clear that the analysis was preliminary, pending the results of spring 2012 surveys (PSA p. 4.2-9; 130; 137) and that the final analysis would consider a range of factors, not just rarity (PSA p. 4.2-137-138). The final analysis in the FSA reflects the results of the spring 2012 offsite surveys.
13.20		Clarify what is a significant impact for plant species.	See the comment above and the discussion of significance under "Conclusions and Discussion of Special-status Plant Mitigation".
13.201		BIO-20 is infeasible.	The comment is referring only to the metric for establishing mitigation security in **BIO-20** (Special-status Plant Compensatory Mitigation"). The compensatory mitigation ratios are clearly stated in the condition, and are based on the CNDDB Element Rank (Nature Serve rank), an index of extinction risk based on a nationally accepted methodology. **BIO-20** requires acquisition and preservation of 3 offsite occurrences for every S1-ranked species affected, and 2 offsite occurrences for every S2-rank species. This is entirely feasible, based on a GIS analysis of ownership and management opportunities. **BIO-20** also includes an option for mitigation through restoration of at-risk occurrences (occurrences threatened by, e.g., ORV, noxious weeds, etc.). The guidelines for establishing mitigation security in **BIO-20** were revised in the FSA; the estimated acquisition costs and amount of the security shall be calculated based on the estimated cost per acre for Desert Tortoise mitigation as a best available proxy.

13.202		Compensatory mitigation is not reflective of LORS.	See the comment above for simplifying the method for establishing mitigation security. The mitigation ratios are simple and straightforward (see discussion above under comment 13.201). The significance of the impacts are not based on LORS; CEQA requires a “mandatory finding of significance” for special-status species that meet CEQA’s definition of “rare” or “endangered,” regardless of their formal listing status under the NPPA, CESA or any other law:“When any of the following conditions occur the lead agency shall find that a project may have a significant effect on the environment which will require a Mandatory Finding of Significance. Such a finding shall require an EIR to be prepared (CEQA Guidelines Section 15065)...When a project has the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare or threatened species.” Staff’s conclusion that the significantly affected CRPR Rank 2 (CNPS List 2) species may meet the criteria for state listing is shared by CDFG . In the CDFG Special Plants List (CNDDB 2012b) “Taxa which meet the criteria for listing, even if not currently included on any list, as described in Section 15380 of the California Environmental Quality Act (CEQA) Guidelines; these taxa may indicate “None” under listing status, but note that all CNPS 1 and 2 and some List 3 and 4 (now known as California Rare Plant Ranks 1A, 1B, 2, 3, and 4) plants may fall under Section 15380 of CEQA.”
13.203		Securities held for the project should include both land acquisition and land management costs.	The guidelines for establishing mitigation security in BIO-20 were simplified in the FSA based on the discussion at the July 2, 2012 workshop. Tthe estimated acquisition costs and amount of the security shall be calculated based on the estimated cost per acre for Desert Tortoise mitigation as a best available proxy.
13.204		Plants ranked S1 should not be mitigated at 3:1.	**BIO-20** requires the offsite preservation of 3 occurrences for every S1-rank species affected. This mitigation ratio is justified given that S1-rank species are "critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province." It's also entirely feasible, based on a GIS analysis of ownership and management threats and opportunities. **BIO-20** also includes an option for mitigating through restoration of occurrences that are threatened by unauthorized off-road vehicles, noxious weeds, or other factors. A 1:1 ratio still results in a net loss of an occurrence, thus impacts to such rare species must be mitigated at higher ratios to truly offset the impact. A similar condition was adopted for three Energy Commission-licensed projects (Palen, Blythe, and Genesis). CDFG, in practice, requires 3:1 mitigation for permament impacts to washes, and 1:1 for temporary.

BIOLOGICAL RESOURCES - FIGURE 1

Hidden Hills Solar Electric Generating System (HHSEGS) - Groundwater-dependent Vegetation in the Project Vicinity

* Mesquite-dominant groundwater-dependent habitats within the cone of depression of the project pumping wells identified by the applicant. Photos of the mesquite and springs provided in Biological Resources Figure 2a.



BIOLOGICAL RESOURCES

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SOURCE:CH2M Hill, Data Response Set 1A

BIOLOGICAL RESOURCES - FIGURE 2a

Hidden Hills Solar Electric Generating System (HHSEGS) - Groundwater-dependent Resources in the Project Vicinity*

*The resources shown below occur within the cone of depression identified by staff for the project pumping wells (see the Water Supply section of the FSA)

#1 – Mesquite canyon approximately 1.75 miles east of the project boundary near the airport; characteristic of the larger "mesquite washes". No evidence of surface water within the last 10 years or longer; the vegetation appears to be dependent wholly on groundwater. The mesquite range from approximately 6 to 15 feet in height, and many with a trunk diameter of 8 inches or larger, sufficient for cavity-nesting special-status birds. Similar groundwater-dependent habitat on washes near the firearms training center and throughout the Stump Springs area; the ephemeral hydrology of the washes is insufficient to support the mesquite – an "obligate phreatophyte" (groundwater-dependent).

#2 – Representative photo of the mesquite coppice dunes just east of the project (between 600 and 2600 feet east of the project boundary). The mesquite on coppice dunes are typically shorter in stature than the mesquite in washes, and associated with four-wing saltbush (Atriplex canescens), a facultative "phreatophyte" (groundwater-dependent plant). The coppice dunes are arranged linearly along the state line fault, and are supported wholly by groundwater (no washes or other surface water present). Honey mesquite (Prosopis glandulosa) is considered an obligate phreatophyte in California and southern Nevada (Sawyer et al. 2009; Crampton et al. 2006).

SOURCE: CEC Staff and BLM (Boris Poff, Southern Nevada District) photos

BIOLOGICAL RESOURCES - FIGURE 2b

Hidden Hills Solar Electric Generating System (HHSEGS) - Two seasonal spring-supported pools at Stump Springs ACEC. BLM reports that the pools are present from approximately December to June or July.

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SOURCE: CEC Staff and BLM (Boris Poff, Southern Nevada District) photos

BIOLOGICAL RESOURCES - FIGURE 2c

Hidden Hills Solar Electric Generating System (HHSEGS) - Groundwater-dependent Resources in the Project Vicinity*

*The resources shown below occur within the cone of depression identified by staff for the project pumping wells (see the Water Supply section of the FSA)

Active seep-spring, and groundwater-supported riparian vegetation just south of the Front Sight Firearms Training Center, approximately 1.5 miles east of the project. Surface water present.

Another active spring and wetland located west of Cottonwood Spring. Not currently in the BLM spring database.

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SOURCE: CEC Staff and BLM (Boris Poff, Southern Nevada District) photos

BIOLOGICAL RESOURCES - FIGURE 2d

Hidden Hills Solar Electric Generating System (HHSEGS) - Groundwater-dependent Resources in the Project Vicinity*

*The resources shown below occur within the cone of depression identified by staff for the project pumping wells (see the Water Supply section of the FSA)

Both photos: Healthy mesquite stand with many age classes, located approximately 3.5 miles northeast of the project boundary.

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SOURCE: CEC Staff and BLM (Boris Poff, Southern Nevada District) photos

BIOLOGICAL RESOURCES - FIGURE 2e

Hidden Hills Solar Electric Generating System (HHSEGS) - Lush mesquite coppice dune vegetation at Stump Springs Area of Critical Environmental Concern (ACEC) south of Tecopa Highway. Photo from applicant's data response #1A, Figure 49-1.

Relatively lush mesquite coppice dune vegetation south of the Tecopa Highway.

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SOURCE: CEC Staff and BLM (Boris Poff, Southern Nevada District) photos

BIOLOGICAL RESOURCES - FIGURE 3a

Hidden Hills Solar Electric Generating System (HHSEGS) - Characteristic Stream Forms on the Project Site

One of the larger features, a jurisdictional state waters and waters of the U.S., photographed at the eastern project boundary. A few widely scattered mesquite. At the eastern boundary, where there is a greater slope gradient, the washes are generally more incised and the channel forms are more or less single thread, as in this photo. The single-thread forms generally lack a true floodplain, unlike the “braid plain”.

The terminus of the washes, i.e., where the washes are less defined, were noticeably wetter than the upper single-thread reaches following a 0.2 inch storm event, and the changes in species composition along the washes more distinct. Germination of annuals like rattlesnake weed (Chamaesyce albomarginata) – a native favored by desert tortoise – was abundant in the lower, wetter reaches following an August summer storm event.

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SOURCE: CEC Staff Photos

BIOLOGICAL RESOURCES - FIGURE 3b

Hidden Hills Solar Electric Generating System (HHSEGS) - Characteristic Stream Forms on the Project Site

One of the features delineated as a non-jurisdictional “pooled area” at the terminus of a wash, inundated for a day following a 0.2 in. storm event. The feature in the photo is one of multiple small channels across a larger “braid plain”, or floodplain of multiple small braided channels. It is the most common channel form on the project site, and characteristic of alluvial fan distributary networks.

An aerial photo of the watercourse described above, and a signature characteristic of alluvial fan distributary channel networks

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SOURCE: CEC Staff Photos and Google Earth Imagery

BIOLOGICAL RESOURCES - FIGURE 3c

Hidden Hills Solar Electric Generating System (HHSEGS) - Characteristic Stream Forms on the Project Site

Distributary channel characteristic of the smallest features; this feature one of several small channels across a larger braid plain. Unlike their temperate-region counterparts where streams typically decrease in number as they converge toward a single, larger channel, these distributary channels diverge from the single-thread source at the apex of the fan, and increase in number but decrease in size toward the toe of the fan, due to diversion of flow (avulsion) by channel blockages of sediment and debris deposited during previous flow events.

Another single thread channel form delineated near the eastern project boundary. Bunchgrasses like galleta grass (Pleuraphis rigida) and alkali sacaton (Sporobolus airoides) are often more abundant in the washes, as in this photo.

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: CEC Staff Photos

BIOLOGICAL RESOURCES - FIGURE 4a

Hidden Hills Solar Electric Generating System (HHSEGS) - Desert Tortoise Habitat Mapping Field Verification

Photo and data point locations depicted in Biological Resources Figure 5

#1 - Creosote bush scrub; taken at applicant's demarcation between the Mojave desert scrub (creosote scrub) and Shadscale scrub but no apparent shift in type on the ground; creosote bush scrub in all directions. Away from the road edge, disturbance and weeds light.

#2 - Start of shadscale scrub to west (left) of disturbed area. Beyond the graded area disturbance light to moderate, weeds light.

#2 (east of point) - Creosote bush scrub to east of the graded area. Beyond the grading, the habitat is lightly disturbed and recovering.

#3 - Creosote bush scrub; shadscale present but not dominant, patchy disturbance near road edge, weeds moderate to heavy (>5% cover)

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: CEC Staff Photos

BIOLOGICAL RESOURCES - FIGURE 4b

Hidden Hills Solar Electric Generating System (HHSEGS) - Desert Tortoise Habitat Mapping Field Verification

Photo and data point locations depicted in Biological Resources Figure 5

#4 - Creosote bush scrub; disturbance patchy, weeds associated largely with disturbed patches.

#5 - Creosote bush scrub to east and west; heavily disturbed, heavy weed component (10-15%)

#6 (no photo) #7 - Creosote bush scrub (beyond the road edge); diverse shrub layer, off road, disturbance is light, weeds moderate to heavy (7-10% cover) in patches in disturbed areas and concentrated in low-lying (moist) areas. Good to excellent habitat for all tortoise life-stages.

#8 - Creosote bush scrub (beyond the road edge); diverse shrub and herb layer, disturbance light with a moderate (7%) component of weeds (red brome), heavy weed cover (10-15%) of halogeton on the desert pavement.

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CEC Staff Photos

BIOLOGICAL RESOURCES - FIGURE 4c

Hidden Hills Solar Electric Generating System (HHSEGS) - Desert Tortoise Habitat Mapping Field Verification
Photo and data point locations depicted in Biological Resources Figure 5

#8 (west of point) - Creosote bush scrub; diverse shrub and herb layer, lightly disturbed with moderate weed componen of halogeton mostly on the desert pavement.

#9 (no photo)- #10 - Desert pavement and disturbed area with heavy component of halogeton (15-20%) and little natural vegetation (background of photo) interspersed with patches of intact and diverse shadscale scrub (shadscale-rabbit thorn with <2% creosote) in foreground.

#11 - Shadscale scrub; close-up of the shadscale-rabbit thorn ssociation described above (rabbit thorn dominant; not shadscale).

#12 - Creosote bush scrub (beyond the road edge); interspersed with pavement, lightly to moderately disturbed, moderately weedy but good diversity in shrub layer.

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SOURCE: CEC Staff Photos

BIOLOGICAL RESOURCES - FIGURE 4d

Hidden Hills Solar Electric Generating System (HHSEGS) - Desert Tortoise Habitat Mapping Field Verification

Photo and data point locations depicted in Biological Resources Figure 5

#13 - Shadscale scrub (to west, creosote bush scrub to east); diverse shrub and herb layer in both habitats, weed component light (3%).

#14 (no photo) - #15 - Shadscale scrub (all directions); heavy component of halogeton (10-15%) near roads but good shrub diversity and well-developed bio crust between shrubs beyond disturbed areas.

#16 - Shadscale scrub to west, cresosote bush scrub to east; disturbance and weeds light (<2%), good shrub diversity.

#17 (no photo; Creosote bush scrub of high quality with 10-15% cover of bio crust and only trace element of weeds) - #18 - Creosote bush scrub to east, shadscale scrub to west; light disturbance, moderately weedy (5%) with Russian thistle.

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CEC Staff Photos

BIOLOGICAL RESOURCES - FIGURE 4e

Hidden Hills Solar Electric Generating System (HHSEGS) - Desert Tortoise Habitat Mapping Field Verification

Photo and data point locations depicted in Biological Resources Figure 5

#19 - Creosote bush scrub to east (in photo), shadscale scrub to west; lightly disturbed but heavy component of Russian thistle (10-15%)

#20 (no photo; badger burrow) - #21 - Creosote bush scrub; nearly pristine, gravelly soils but low shrub species diversity relative to many other areas. Weeds nearly absent so may have a good component of native annuals in spring.

#22 - Highly disturbed; apparently disked historically with little native vegetation and heavy component of Russian thistle and halogeton

#23 - Shadscale scrub; undisturbed abd high quality, high shrub diversity, no (or trace) component of weeds.

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SOURCE: CEC Staff Photos

BIOLOGICAL RESOURCES - FIGURE 4f

Hidden Hills Solar Electric Generating System (HHSEGS) - Desert Tortoise Habitat Mapping Field Verification

Photo and data point locations depicted in Biological Resources Figure 5

#24 - Creosote bush scrub to west and east; lightly to moderately disturbed, moderately weedy.

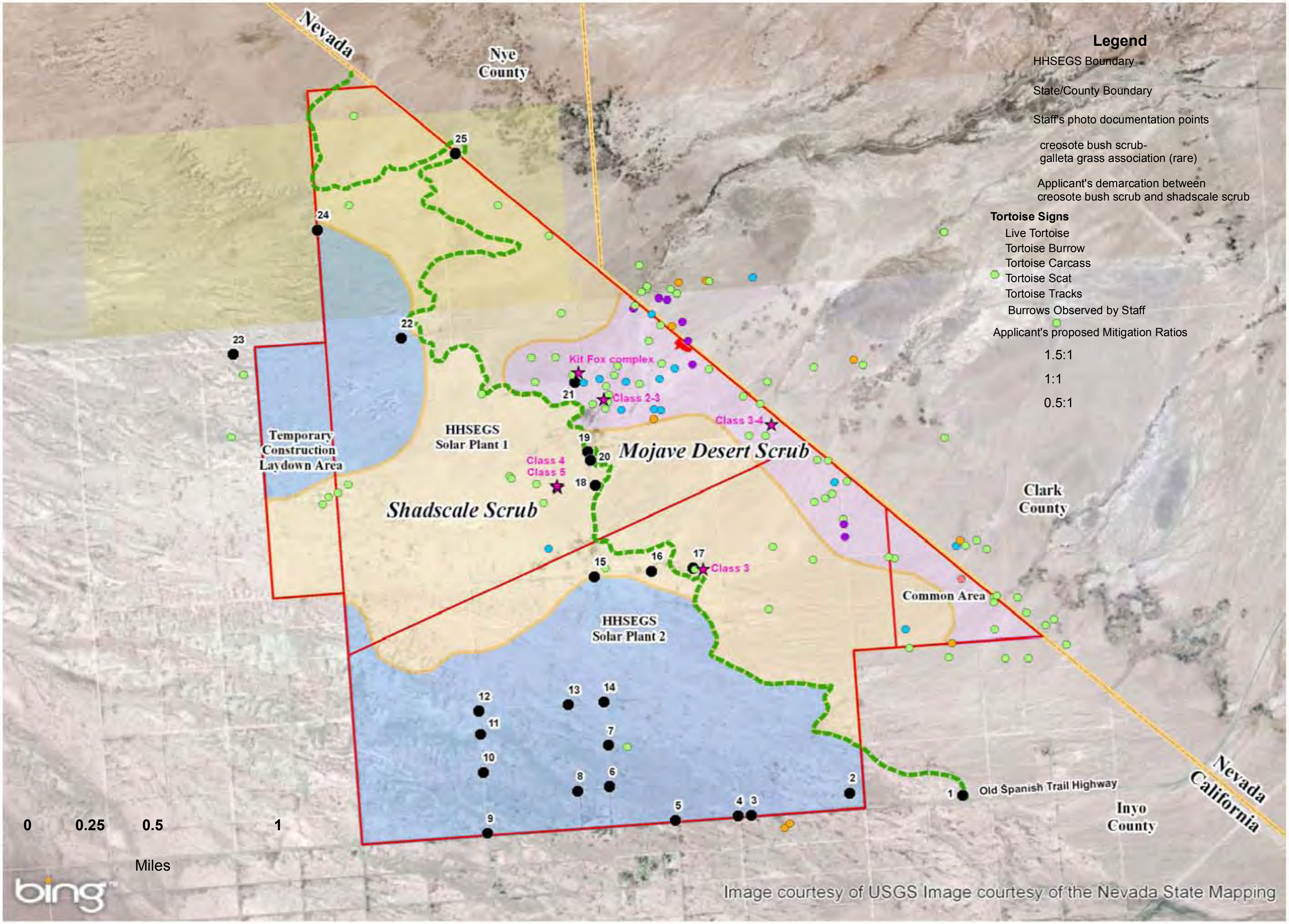
#25 - creosote bush scrub in all directions; lightly disturbed, light to moderate weed component (3%).

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CEC Staff Photos

BIOLOGICAL RESOURCES - FIGURE 5

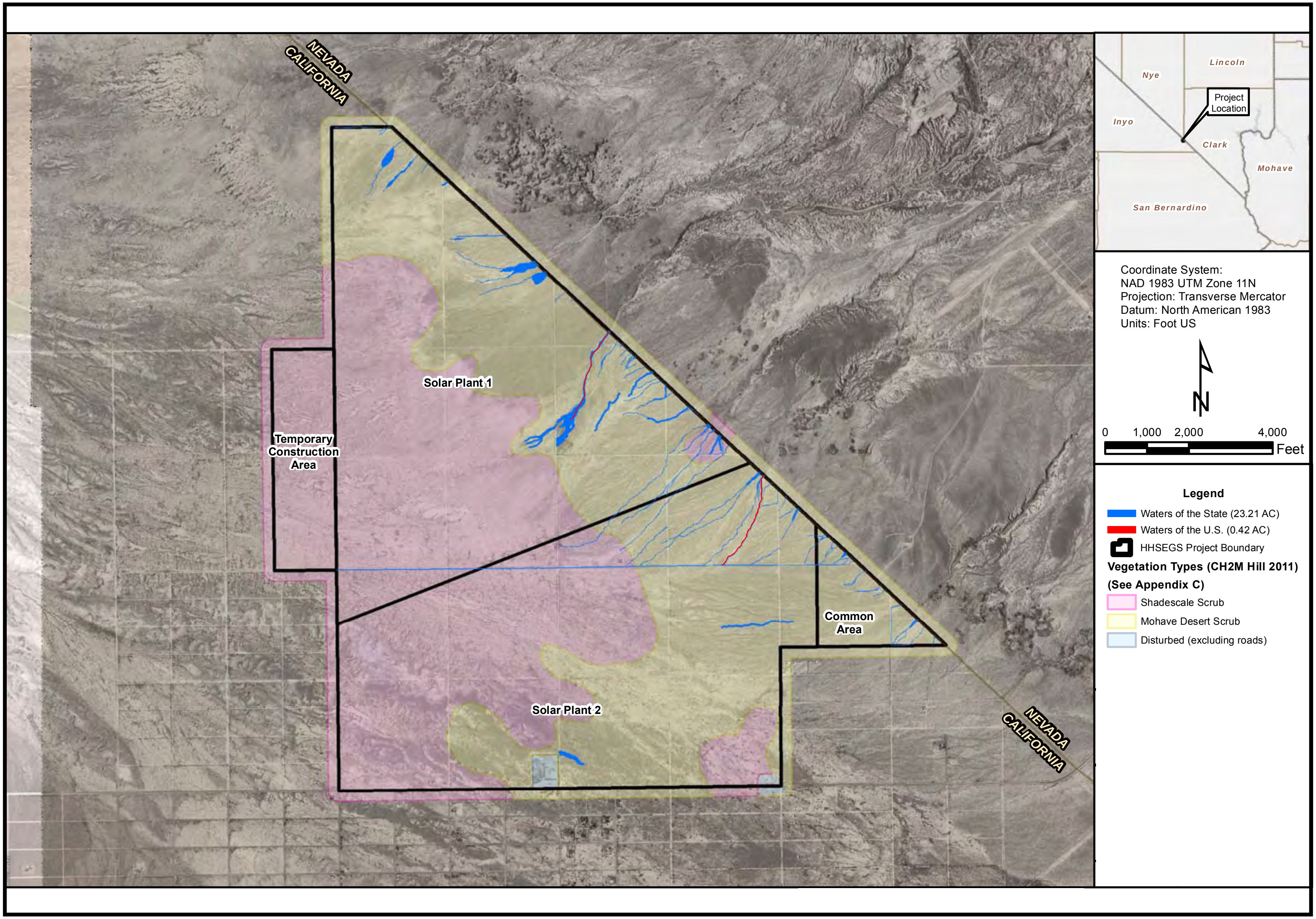
Hidden Hills Solar Electric Generating System (HHSEGS) - Desert Tortoise Habitat Mapping Verification



CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CH2M HILL, CEC Staff

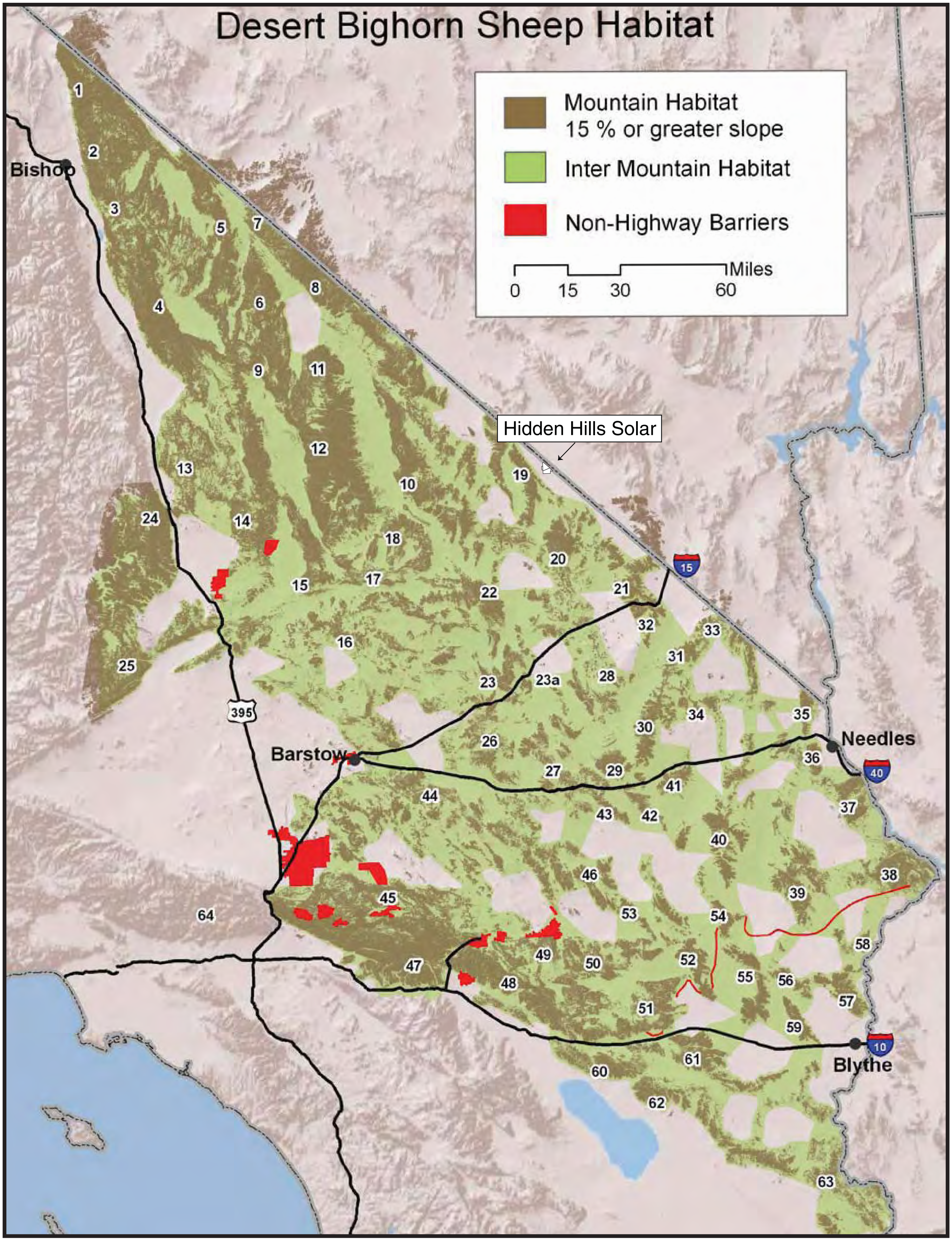
BIOLOGICAL RESOURCES - FIGURE 6
Hidden Hills Solar Electric Generating System (HHSEGS) - Revised Delineation of Waters of the State



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: M.J. Klinefelter GIS & Environmental Consulting

BIOLOGICAL RESOURCES - FIGURE 7

Hidden Hills Solar Electric Generating System (HHSEGS) - Desert Bighorn Sheep Habitat in California



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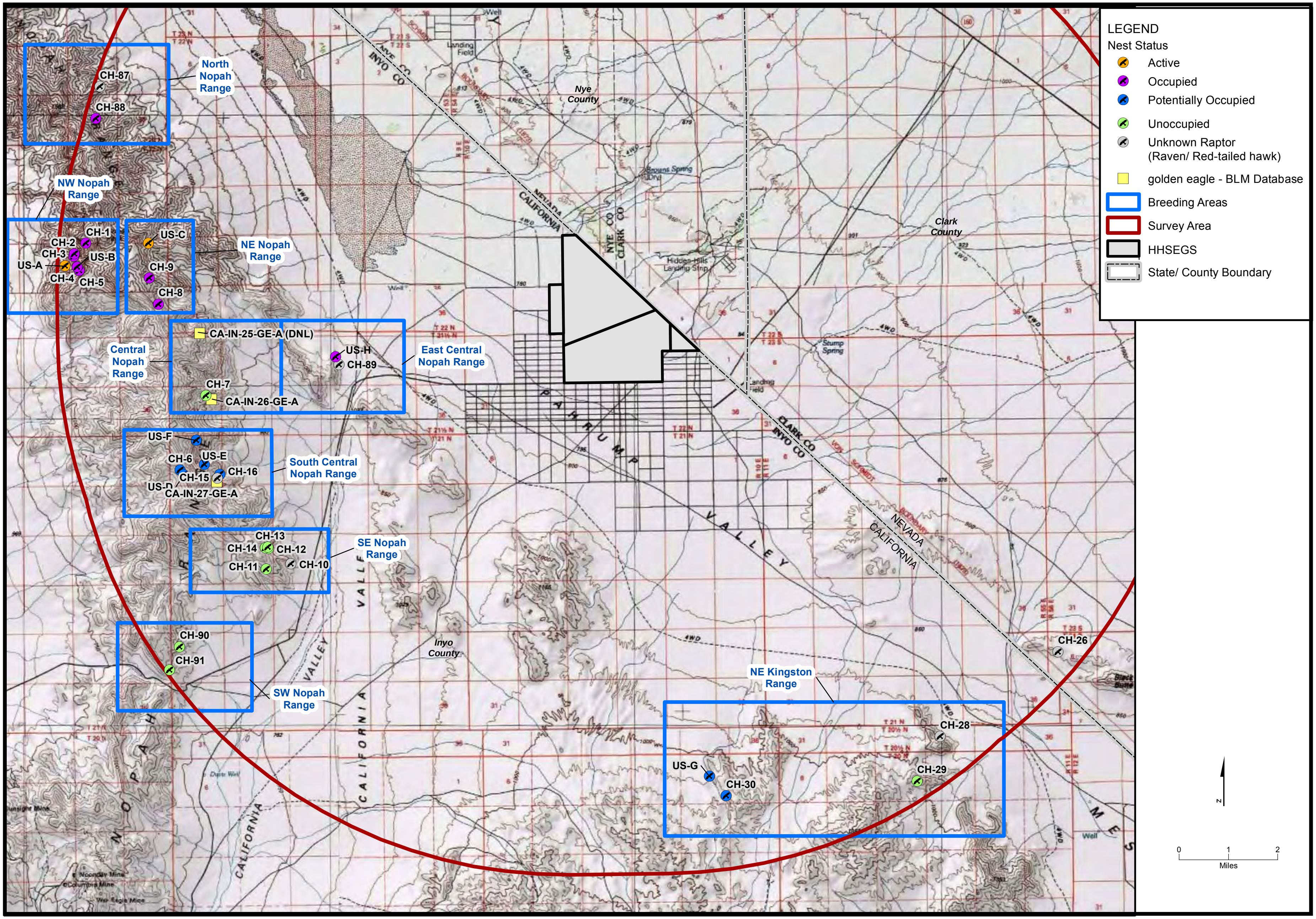
SOURCE: CA DFG

BIOLOGICAL RESOURCES - FIGURE 8

Hidden Hills Solar Electric Generating System (HHSEGS) - Golden Eagle Observations in the Project Vicinity



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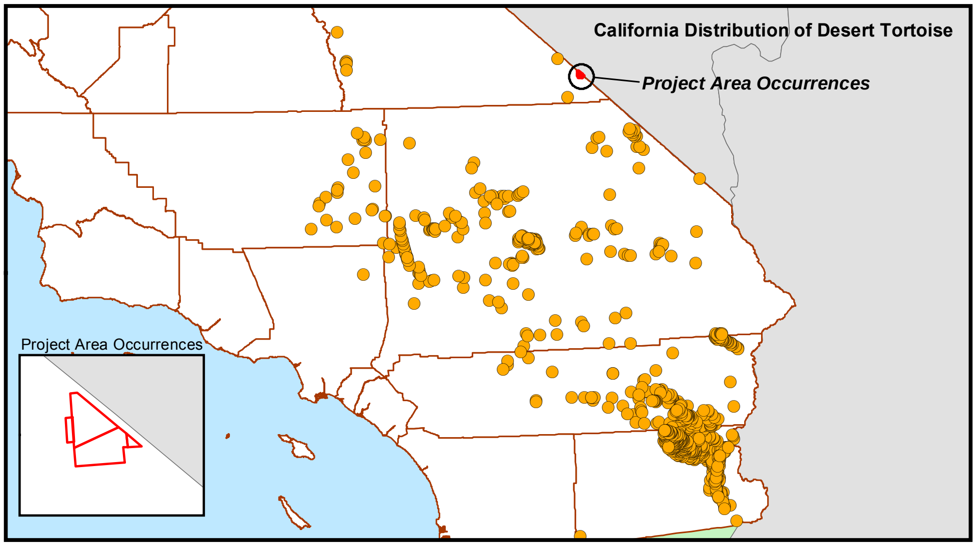
SOURCE: DR52.3-1

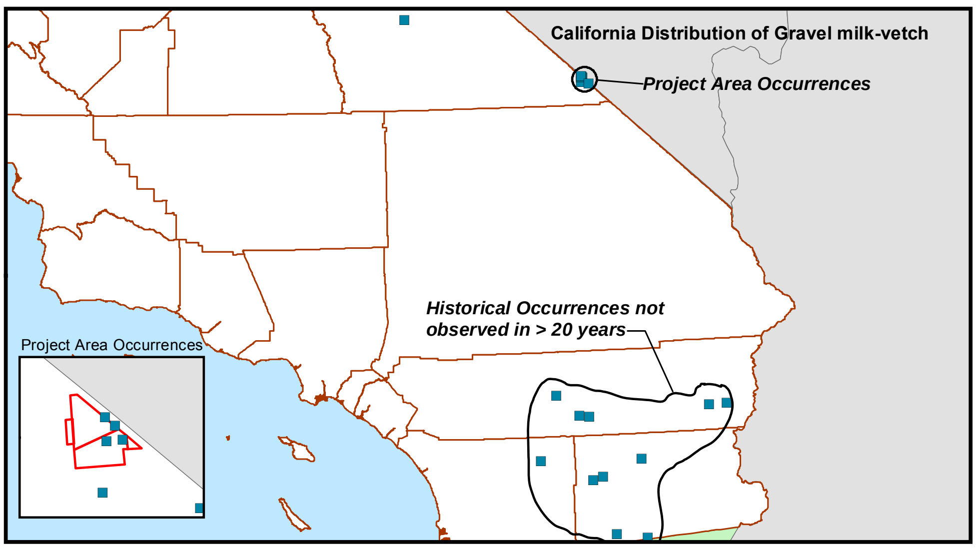
BIOLOGICAL RESOURCES FIGURE 9a

Hidden Hills Solar Generating System (HHSEGS) - California Range of Special-status Plants* Impacted by the Project

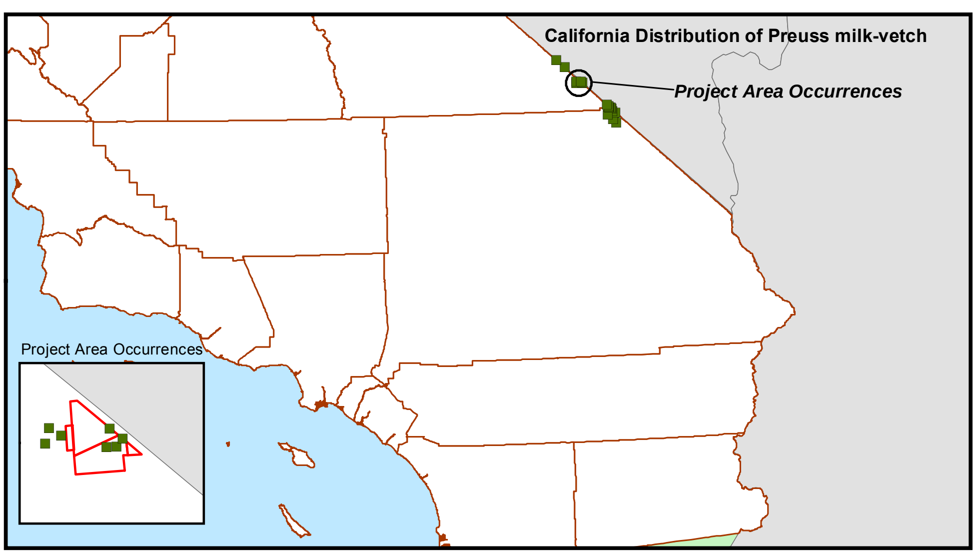
* State range maps are also provided for Desert Tortoise and Mohave Ground Squirrel to demonstrate the narrow range of the affected rare plant species relative to two listed wildlife species



Desert tortoise (*Gopherus agassazii*) – Federal Threatened, State Threatened



Gravel milk-vetch (*Astragalus sabulonum*) – CRPR 2; CNDDB S2



Preuss' milk-vetch (*Astragalus preussii var. preussii*) – CRPR 2; CNDDB S1

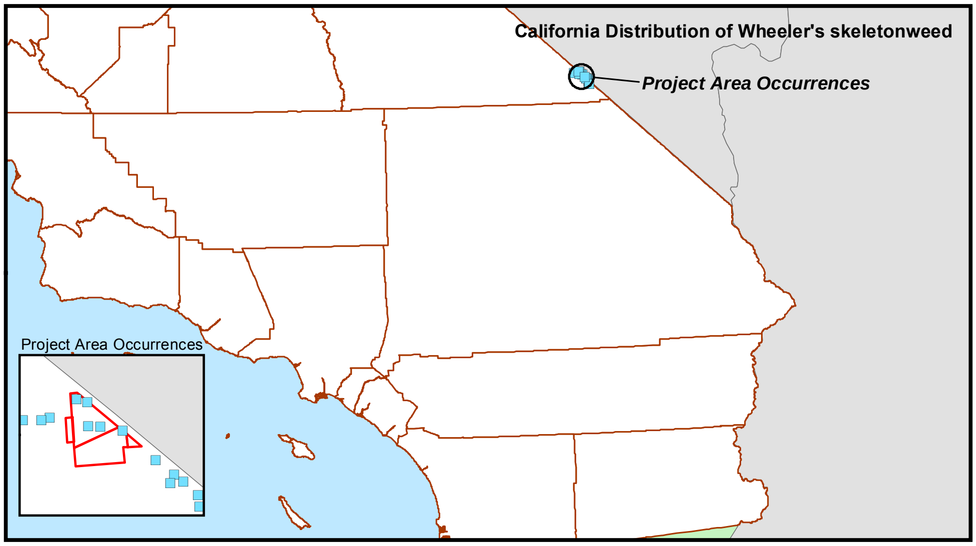
CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CNDDB, 9-4-2012 and CH2MHILL

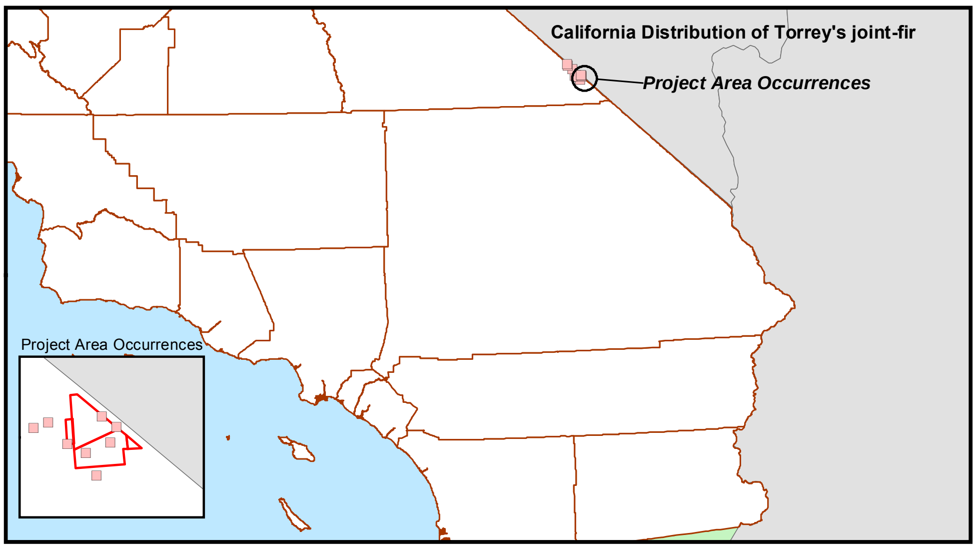
BIOLOGICAL RESOURCES FIGURE 9b

Hidden Hills Solar Generating System (HHSEGS) - California Range of Special-status Plants* Impacted by the Project

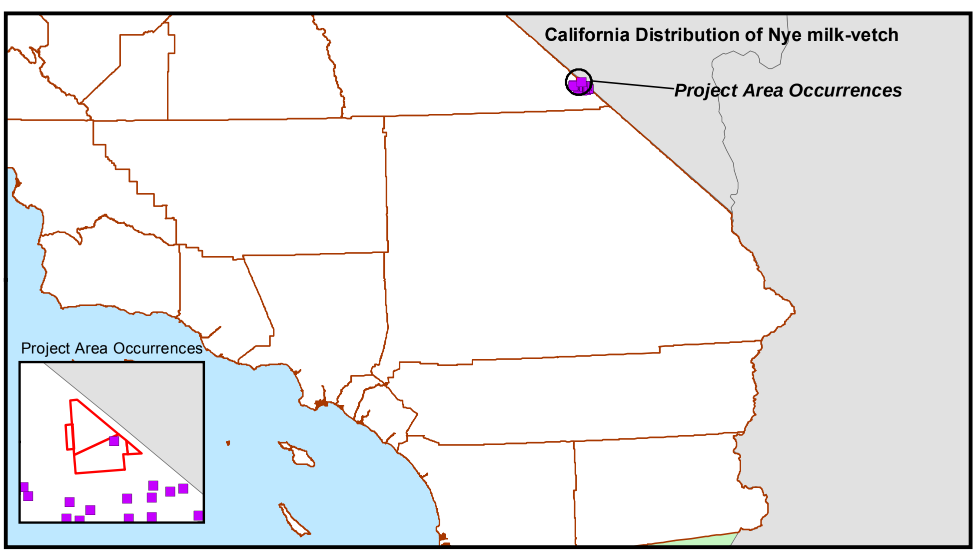
* State range maps are also provided for Desert Tortoise and Mohave Ground Squirrel to demonstrate the narrow range of the affected rare plant species relative to two listed wildlife species.



Wheeler's skeletonweed (*Chaetadelpha wheeleri*) – CRPR 2; CNDDB S1/S2



Torrey's joint-fir (*Ephedra torreyana*) – CRPR 2; CNDDB S1



Nye milk-vetch (*Astragalus nyensis*) – CRPR 1B; CNDDB S1

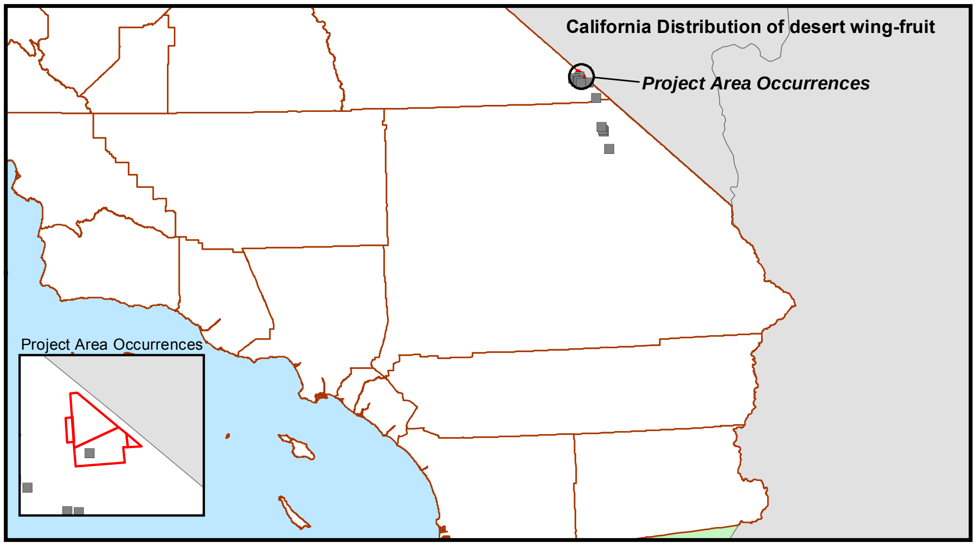
CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CNDDB, 9-4-2012 and CH2MHILL

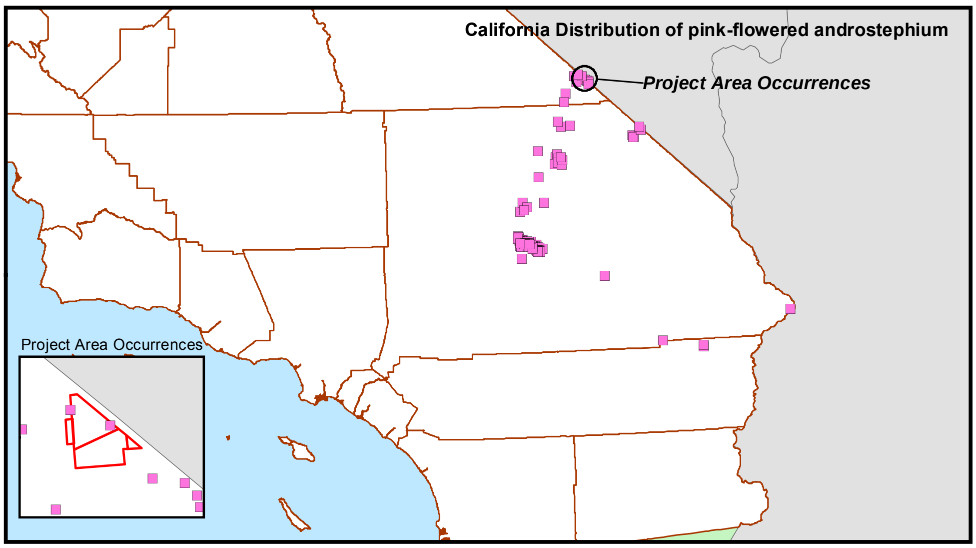
BIOLOGICAL RESOURCES FIGURE 9c

Hidden Hills Solar Generating System (HHSEGS) - California Range of Special-status Plants* Impacted by the Project

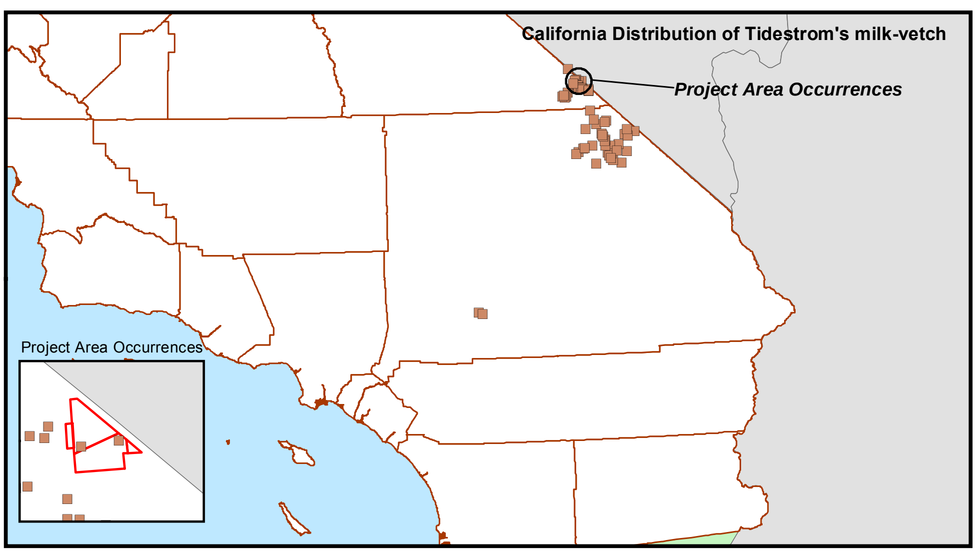
* State range maps are also provided for Desert Tortoise and Mohave Ground Squirrel to demonstrate the narrow range of the affected rare plant species relative to two listed wildlife species



desert wing-fruit (*Acleisanthes nevadadensis*) (syn=*Selinocarpus nevadensis*) – CRPR 2; CNDDB S1



pink-flowered androstephium (*Androstephium breviflorum*) – CRPR 2; CNDDB S3



Tidestrom's milk-vetch (*Astragalus tidestromii*) – CRPR 2; CNDDB S2

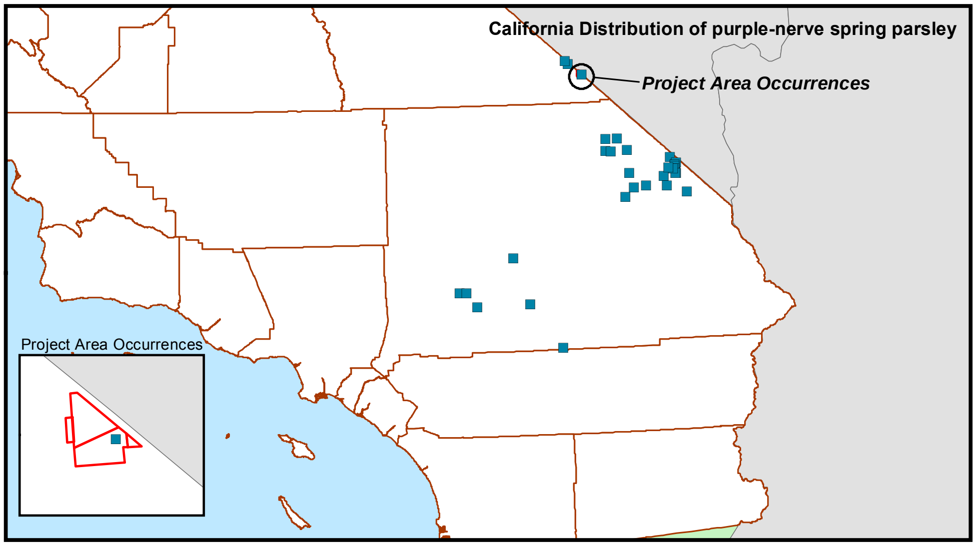
CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CNDDB, 9-4-2012 and CH2MHILL

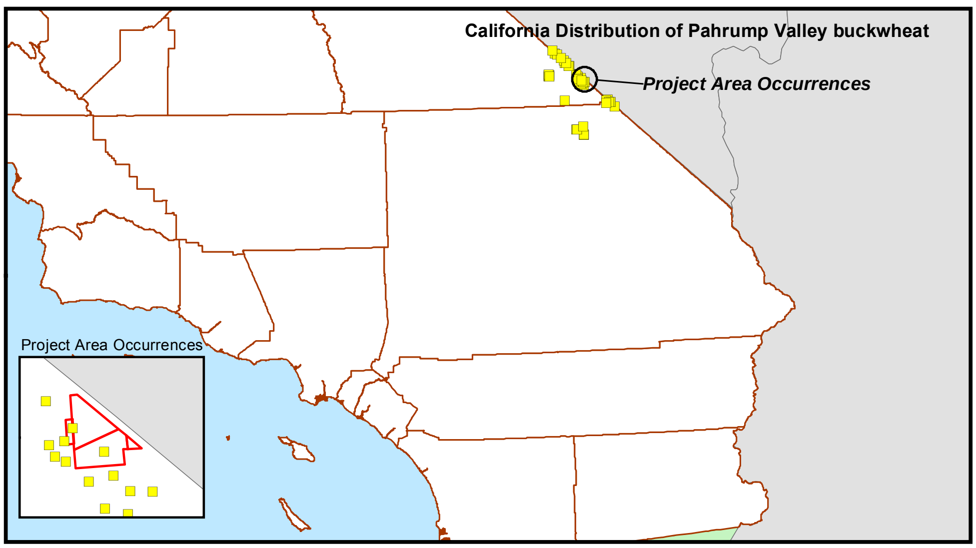
BIOLOGICAL RESOURCES FIGURE 9d

Hidden Hills Solar Generating System (HHSEGS) - California Range of Special-status Plants* Impacted by the Project

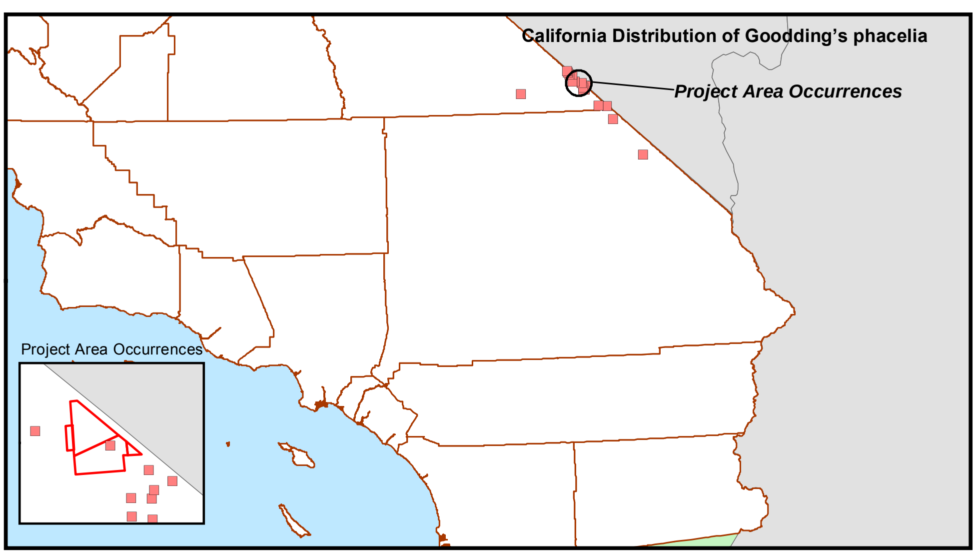
* State range maps are also provided for Desert Tortoise and Mohave Ground Squirrel to demonstrate the narrow range of the affected rare plant species relative to two listed wildlife species



purple-nerve spring parsley (*Cymopterus multinervatus*) – CRPR 2; CNDDB S2



Pahrump Valley buckwheat (*Eriogonum bifurcatum*) – CRPR 1B; CNDDB S3



Goodding's phacelia (*Phacelia pulchella var. gooddingii*) – CRPR 2; CNDDB S2

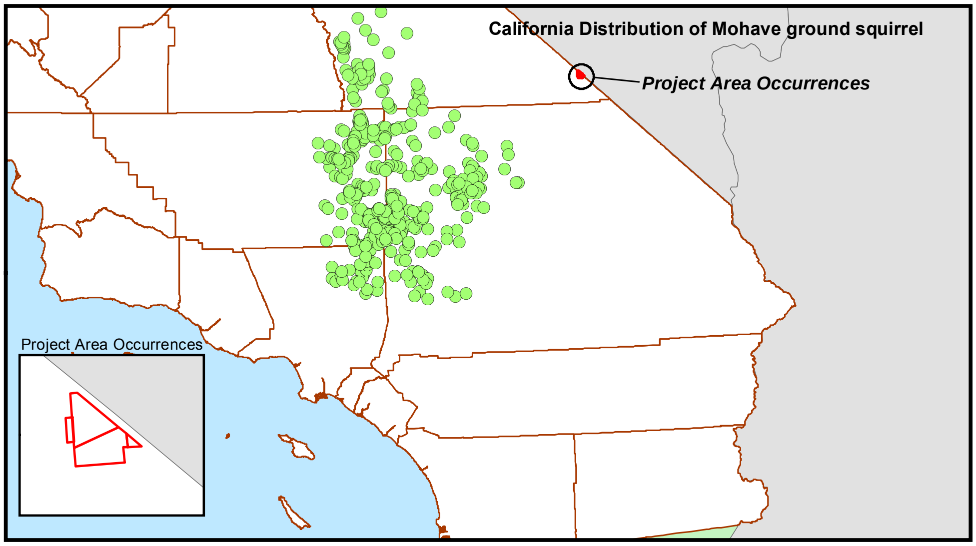
CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CNDDB, 9-4-2012 and CH2MHILL

BIOLOGICAL RESOURCES FIGURE 9e

Hidden Hills Solar Generating System (HHSEGS) - California Range of Special-status Plants* Impacted by the Project

* State range maps are also provided for Desert Tortoise and Mohave Ground Squirrel to demonstrate the narrow range of the affected rare plant species relative to two listed wildlife species



Mohave ground squirrel (*Xerospermophilus mohavensis*) - State Threatened

STATUS CODES

CNDDB Element Rank (NatureServe):

State rank (S-rank) is a reflection of the overall condition of an element throughout its state range (Master et al.2009). Multiple rankings indicate a range of values.

S1 = Critically Imperiled Critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state;

S2 = Imperiled Imperiled in the state because of rarity due to very restricted range, very few populations(often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state.

S3 = Vulnerable Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 = Apparently Secure Uncommon but not rare; some cause for long-term concern due to declines or other factors.

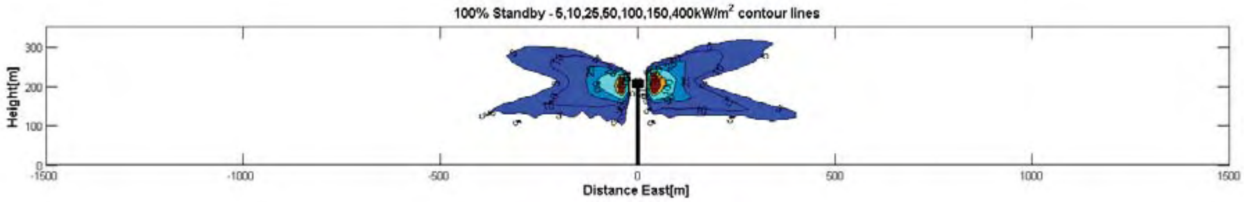
S5 = Secure Common, widespread, and abundant in the state.

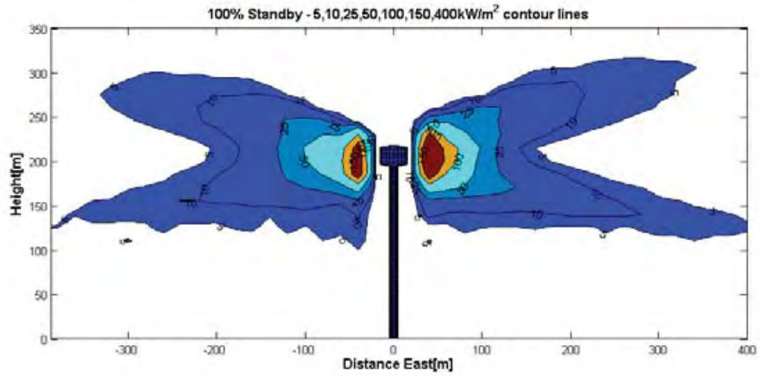
California Rare Plant Rank (former California Native Plant Society List):

CRPR 1B = Rare, threatened, or endangered in California and elsewhere
CPRP 2 = Rare, threatened, or endangered in California but more common elsewhere
CRPR 3 = Plants which need more information
CRPR 4 = Limited distribution - a watch list.

APPENDIX BIO2 - FIGURE 1

Hidden Hills Solar Electric Generating System (HHSEGS) - Full standby





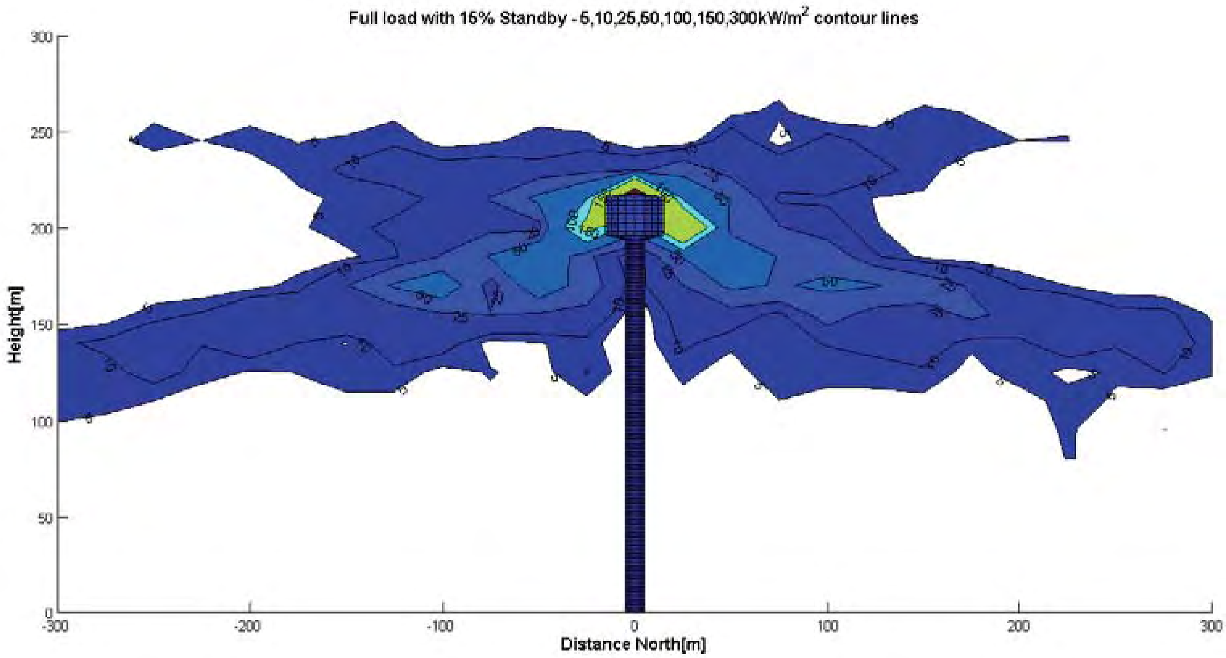
Side views of maximal flux quantifier vertical cross section plot at 20m resolution

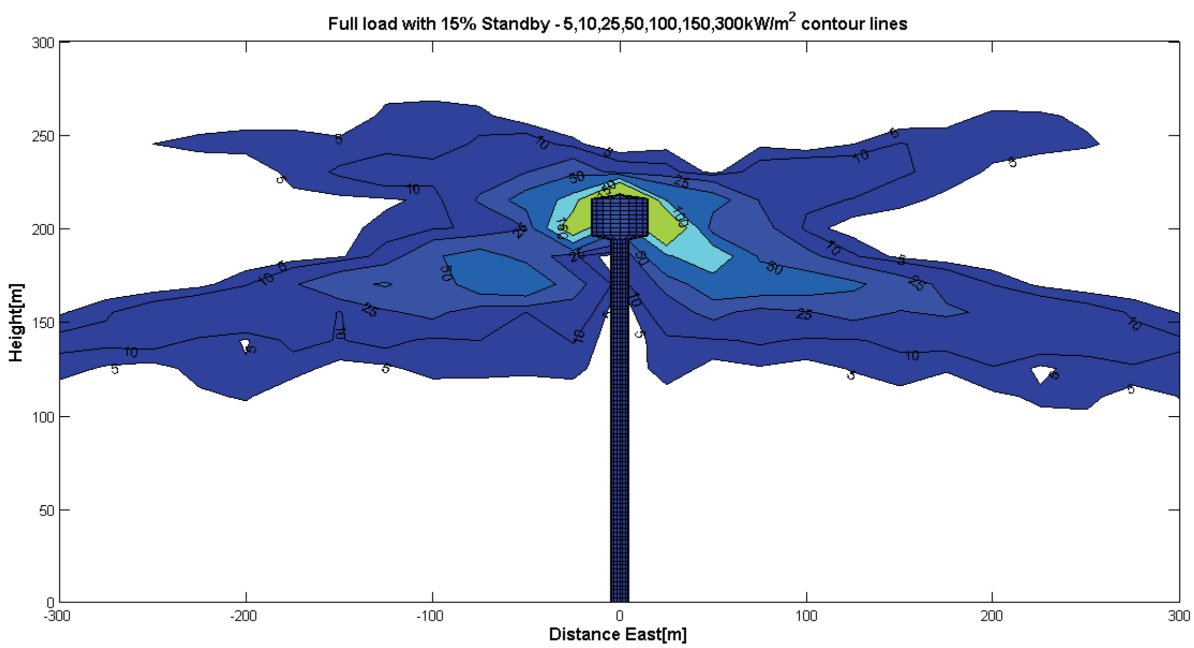
Top: view from east; bottom:zoom in of view from east.

Views from other direction are expected to be similar

APPENDIX BIO2 - FIGURE 2

Hidden Hills Solar Electric Generating System (HHSEGS) - Full load with 15% standby





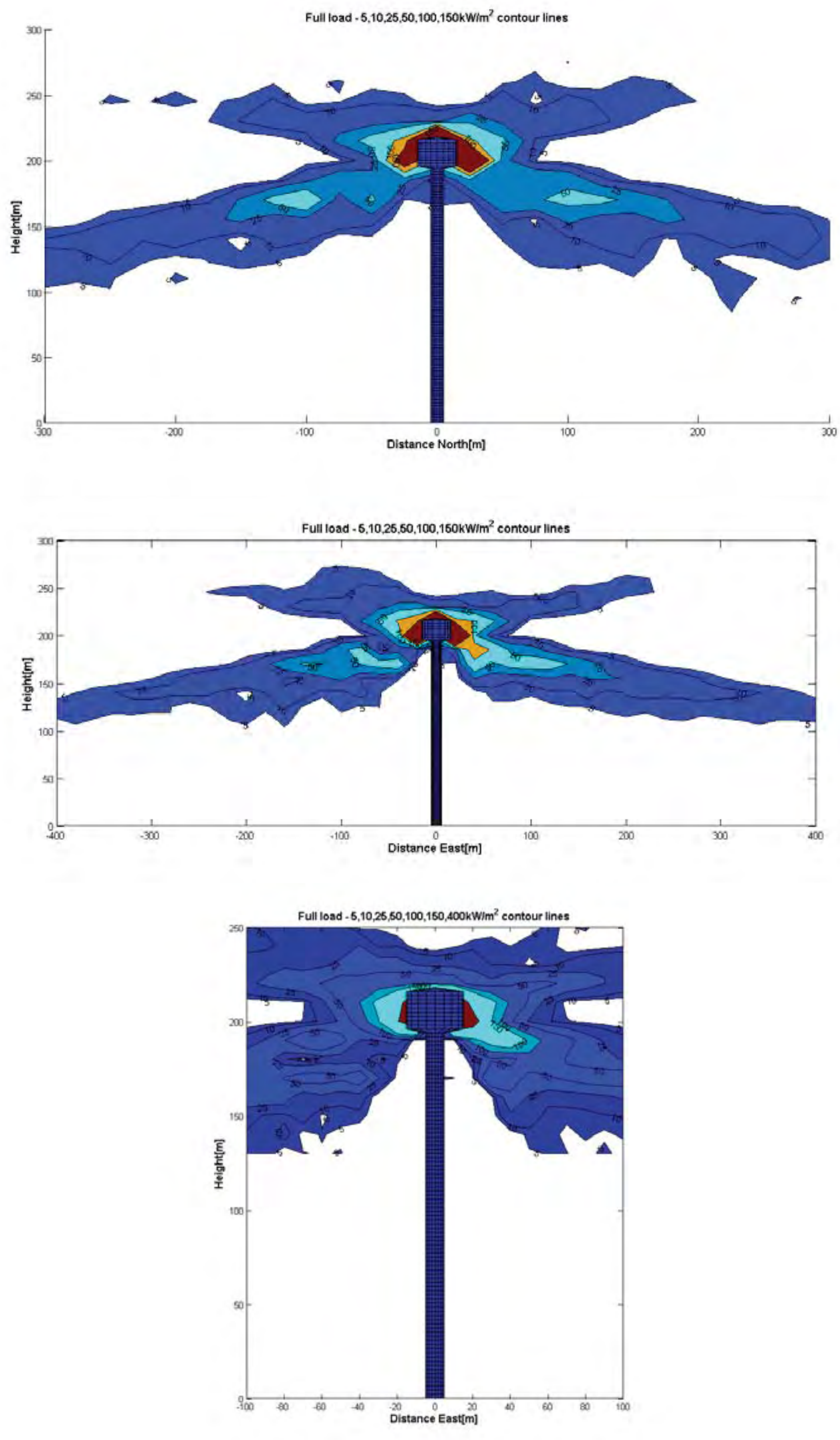
View of vertical cross section through the tower of maximal flux quantifier at full load with 15% of solar field at standby.

Top: view from east (25m resolution),

Bottom: view from south(25m resolution).

APPENDIX BIO2 - FIGURE 3

Hidden Hills Solar Electric Generating System (HHSEGS) - Full load with 0% standby



Profile views of Maximal Flux Quantifier at full load (with no standby)

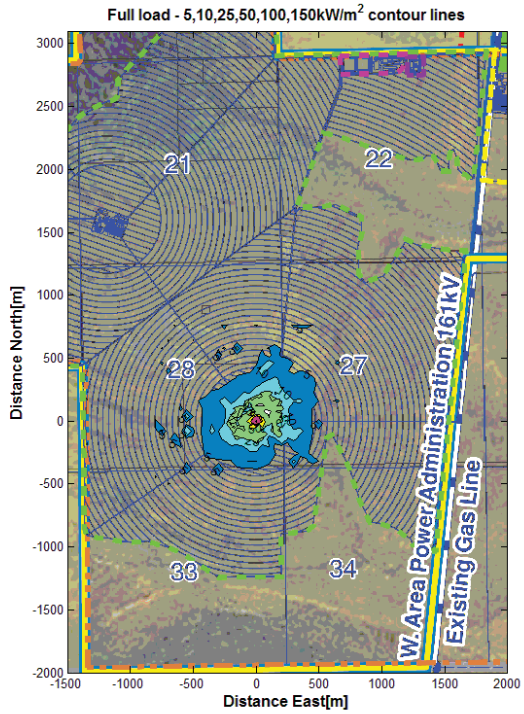
Top: View from East (25m resolution)

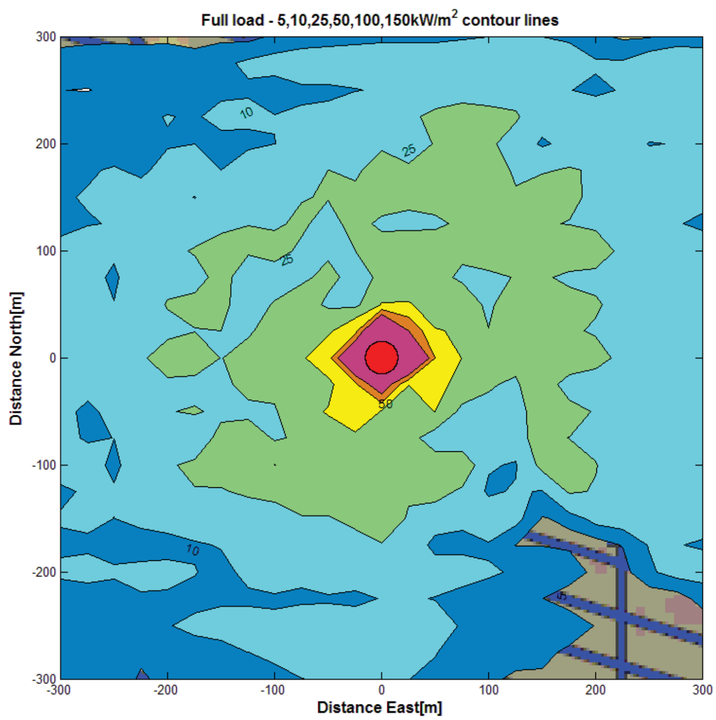
Middle: View from South (25m resolution)

Bottom: Enlarged view from South (10m resolution)

APPENDIX BIO2 - FIGURE 4

Hidden Hills Solar Electric Generating System (HHSEGS) - Plan View of Flux at Full load with 0% standby over RMS 1 Solar Field



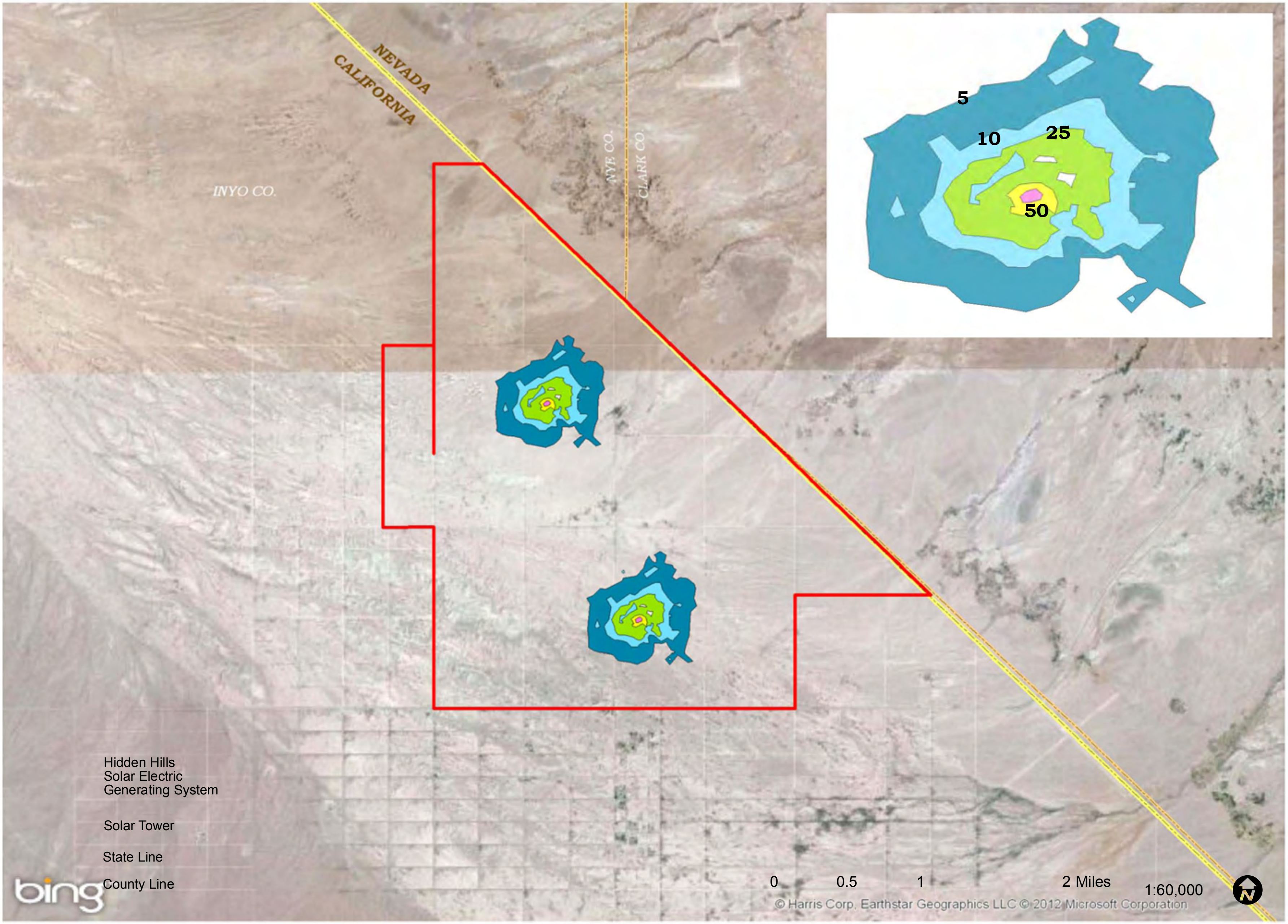


The above plan views show the maximal flux quantifier over the solar field at full load (no standby).

Top Image. Overview of the RMS site

Bottom Image: Enlargement of inner rectangle. Red circle represents the receiver location

APPENDIX BIO2 - FIGURE 5
Hidden Hills Solar Electric Generating System (HHSEGS) - Radiant Flux

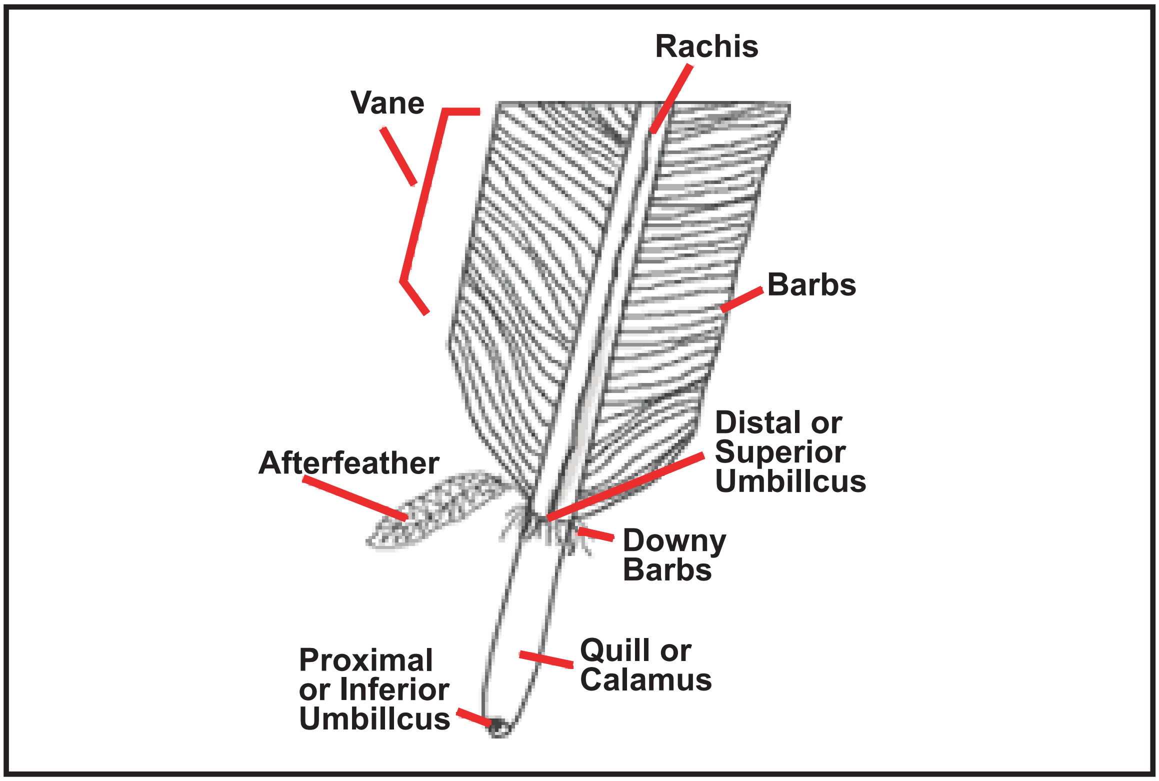


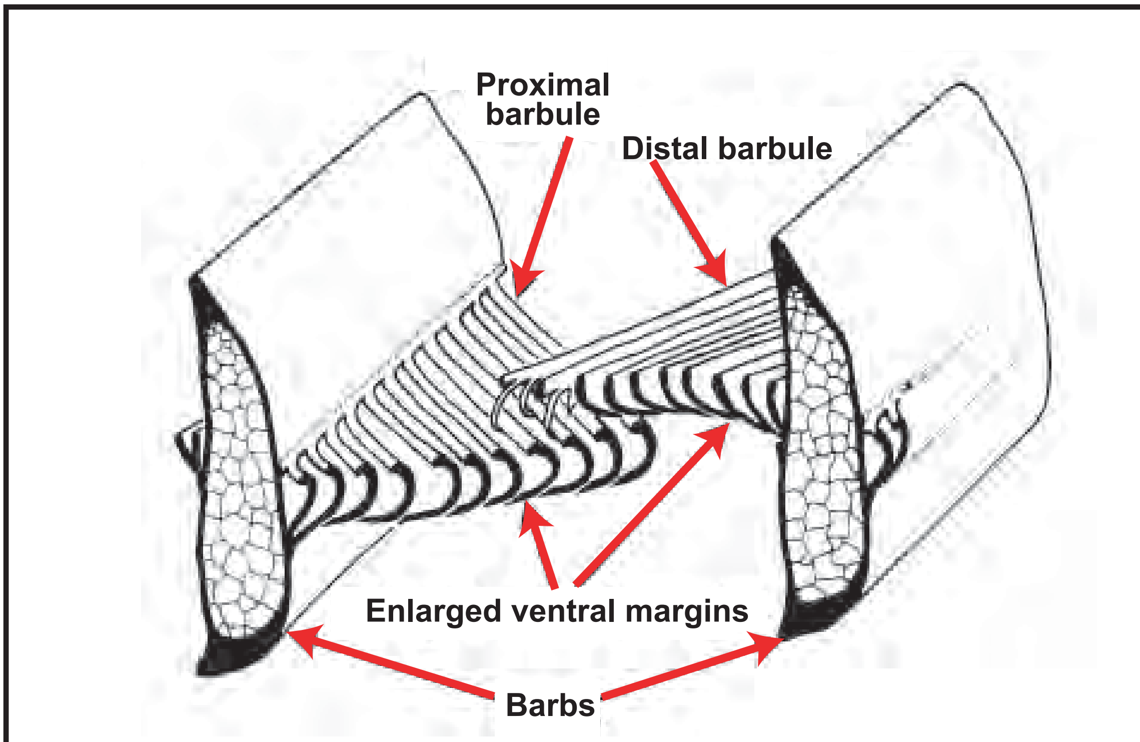
APPENDIX BIO2

CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: Applicant's Response to Data Requests, Set 2A, #159_Page 7, July 20, 2012, Bing Aerial

APPENDIX BIO2 - FIGURE 6

Hidden Hills Solar Electric Generating System (HHSEGS) - Bird Feather Types



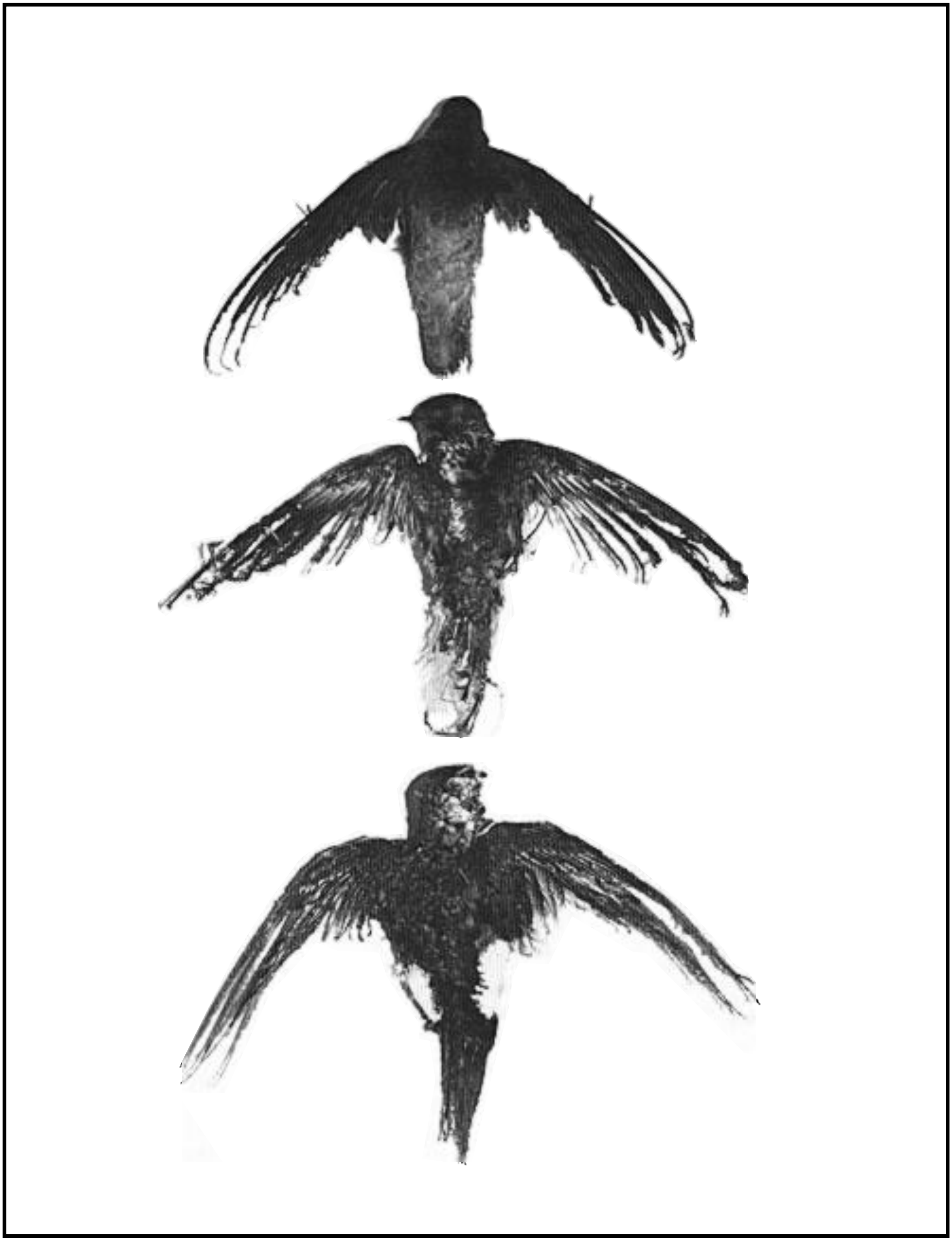


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: *Upper Figure:* Bird Feather Types, Anatomy, Growth, Color, and Molting by Doctors Foster and Smith at http://www.peteducation.com/article.cfm?c=15+1829&aid=2776

Lower Figure: Muller and Patone 1998 - Muller W. and G. Patone. 1998. Air Transmissivity of Feathers. The Journal of Experimental Biology 201, pages 2591-2599.

Hidden Hills Solar Electric Generating System (HHSEGS) - Burnt Birds



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: McCrary et al. 1986 – McCrary, M. D., R. L. McKernan, R. W. Schreiber, W. D. Wagner, and T. C. Sciarrotta, Avian Mortality at a Solar Energy Plant, In: Journal of Field Ornithology 57(2): 135-141

CULTURAL RESOURCES

Testimony of Thomas Gates, Ph.D[1]

SUMMARY OF CONCLUSIONS

Staff concludes that the proposed Hidden Hills Solar Electric Generating System project would have significant and unavoidable impacts to five historical resources: an archaeological landscape, three ethnographic landscapes, and a historic transportation corridor. Staff has proposed feasible mitigation in the recommended cultural resources Conditions of Certification **CUL-1** through **CUL-11**, with specific emphasis on **CUL-9** through **CUL-11**. However, the mitigation measures, individually or cumulatively, for impacts on the five historical resources (the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, the Salt Song Landscape, the Pahrump Paiute Home Ethnographic Landscape, the Ma-hav Ethnographic Landscape, and the Old Spanish Trail–Mormon Road Northern Corridor) would not reduce the impacts of the proposed project to a less than significant level.

ARCHAEOLOGY

The archaeological analysis for the Hidden Hills Solar Electric Generating System HHSEGS or Hidden Hills) project has identified the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, located just to the northeast of the facility site, as a historical resource assumed eligible for the California Register of Historical Resources (CRHR) with portions in both California and Nevada. This resource represents the aboriginal use of a locally significant ecological zone during still undetermined periods over probably at least the last 12,000 years. The visual impact of the proposed project on the landscape would severely degrade the ability of the resource to convey its association with aboriginal lifeways[2] of the Holocene epoch. Staff proposes Conditions of Certification **CUL-10**, in part, and **CUL-11** to reduce this impact, though not to a less than significant level. The subject landscape may also suffer indirect impacts if the proposed project draws down the local water table to a level that overly stresses or kills the mesquite woodland that is a central feature of the landscape. Staff places additional emphasis on the importance of the implementation of Conditions of Certification **BIO-23**, **BIO-24**, **WATER SUPPLY-6**, and **WATER SUPPLY-8** to avoid this further effect.

Staff has also concluded that the archaeological deposits found within the boundaries of the project site are not historically significant as individual resources and are not contributors to the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape.

[1] Thomas Gates' contribution to this cultural resources section only pertains to the ethnographic portions of this section, and therefore his testimony is limited to ethnographic resource subject matters.

[2] A "lifeway," as used herein, refers to any unique body of behavioral norms, customs, and traditions that structure the way a particular people carry out their daily lives (http://www.thefreedictionary.com/lifeway).

Staff has also proposed Conditions of Certification **CUL-1** through **CUL-8**, intended to ensure that all significant impacts to archaeological historical resources discovered during HHSEGS project construction (including the potential project use of borrow and disposal sites) and operation are mitigated below the level of significance.

ETHNOGRAPHY

The ethnographic analysis for the HHSEGS project has identified three ethnographic landscapes that are within the ethnographic project area of analysis (PAA) and assumed eligible for the CRHR:

1. Salt Song Landscape
2. Pahrump Paiute Home Landscape
3. Ma-hav Landscape

The impacts of the proposed project on these historical resources would be significant, and the mitigation recommended in **CUL-10** would not reduce impacts to a less than significant level for any of the landscapes. However, even with the adoption and implementation of the proposed mitigation, the project would still have significant and unmitigable effects on Native American spiritual practices dependent on the Salt Song landscape.

HISTORIC-PERIOD BUILT-ENVIRONMENT

One historic-period resource, the Old Spanish Trail-Mormon Road, has been identified in the HHSEGS built-environment PAA. Based on substantial evidence, including the National Register of Historic Places listing of the Nevada segments of the Old Spanish Trail, the National Historic Trail Feasibility Study and Environmental Assessment, and information provided by both the applicant and the Old Spanish Trail Association (OSTA) staff has determined that the Old Spanish Trail-Mormon Road is eligible for the CRHR. Staff has concluded that the impacts of the proposed HHSGS project to this Old Spanish Trail-Mormon Road Northern Corridor would be significant and, even with full implementation of **CUL-9, CUL-10**, and **VIS-6,** would not be mitigated to a less than significant level. The visual impacts on the setting and feeling to the segment of the OST-MR in the Pahrump Valley and NRHP-listed Nevada Segments[3] would remain significant and unavoidable. The impacts to the NRHP-eligible Emigrant Pass segment[4] would be less than significant as the project is not visible from Emigrant Pass (see Visual Resources Figure 17) as portions of the Nopah Mountain Range block these views.

[3] This specifically refers to the Stump Spring Segment, which is closest to the Nevada-California border.

[4] The Emigrant Pass segment NRHP nomination is currently in Draft-Internal Review format and is undergoing review by the Nevada BLM.

INTRODUCTION

This environmental assessment identifies the potential impacts of the HHSEGS project on cultural resources. The term “cultural resource” means any tangible or observable evidence of past human activity, regardless of significance, found in direct association with a geographic location, including tangible properties possessing intangible traditional cultural values. Historical resources are defined under California state law as including, but not necessarily limited to, any object, building, structure, site, area, place, record, or manuscript that is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the agency’s determination is supported by substantial evidence in light of the whole record” (Cal. Code Regs., tit. 14, § 15064.5(a)). Three kinds of cultural resources, classified by their origins, are considered in this assessment: prehistoric, ethnographic, and historic-period. Under federal and state historic preservation law, cultural resources must be at least 50 years old to have sufficient historical importance to merit consideration of eligibility for listing in the CRHR. A resource less than 50 years of age must be of exceptional historical importance to be considered for listing.

Prehistoric archaeological resources are associated with the human occupation and use of California prior to prolonged European contact. These resources may include sites and deposits, structures, artifacts, rock art, trails, and other traces of Native American human behavior. In California, the prehistoric period began over 12,000 years ago and extended through the eighteenth century until 1769, when the first Europeans settled in California.

Ethnographic resources represent the heritage of a particular ethnic or cultural group, such as Native Americans or African, European, Latino, or Asian immigrants. They may include traditional resource-collecting areas, ceremonial sites, value-imbued landscapes and related features, cemeteries, shrines, or ethnic neighborhoods and structures. Ethnographic resources are variations of natural resources and standard cultural resource types. They are subsistence and ceremonial locales and sites, structures, objects, and rural and urban landscapes assigned cultural significance by traditional users. The decision to call resources "ethnographic" depends on whether associated peoples perceive them as traditionally meaningful to their identity as a group and the survival of their lifeways.

Historic-period resources, both archaeological and architectural, are associated with Euro-American exploration and settlement of an area and the beginning of a written historical record. They may include archaeological deposits, sites, structures, traveled ways, artifacts, or other evidence of human activity. Groupings of historic-period resources are also recognized as historic districts and as historic vernacular landscapes.

For the HHSEGS project, staff provides an overview of the environmental setting and history of the project area from a cultural resources perspective, an inventory of the cultural resources identified in the project vicinity, and an analysis of the project’s potential impacts to significant cultural resources, using criteria from the California Environmental Quality Act (CEQA) and CEQA Guidelines.

If cultural resources are identified, staff identifies which are historically significant (defined as eligible for the CRHR or by other significance criteria) and whether the HHSEGS would have a substantial adverse impact on those that are determined or assumed to be historically significant. Staff's primary concern is to ensure that all potentially significant cultural resources are identified, all potential project-related impacts to those resources are identified and assessed, and conditions are recommended that ensure that all significant impacts that cannot be avoided are mitigated to a less than significant level or to the extent feasible.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Projects subject to the Energy Commission's licensing process are reviewed and conditions of certification are imposed, as needed, to ensure compliance with all laws, ordinances, regulations, and standards (LORS); plans; and policies that are applicable to the proposed project and related facilities, or would be applicable but for the Energy Commission's exclusive authority. For this project, there is no federal project land in California. The federal involvement occurs in Nevada, outside Energy Commission jurisdiction;[5] therefore, most of the LORS subject to Energy Commission review are California state laws and local regulations.

CULTURAL RESOURCES Table 1
Laws, Ordinances, Regulations, and Standards

Applicable Law	**Description**
State	
Public Resources Code (PRC), sections 5097.98(b) and (e)	Requires a landowner on whose property Native American human remains are found to limit further development activity in the vicinity until s/he confers with the Native American Heritage Commission-identified Most Likely Descendents (MLDs) to consider treatment options. In the absence of MLDs or of a treatment acceptable to all parties, the landowner is required to reinter the remains elsewhere on the property in a location not subject to further disturbance.

[5] Cultural resources in California are also protected under provisions of the federal Antiquities Act of 1906 (Title 16, United States Code, Section 431, et seq.) and subsequent related legislation, policies, and enacting responsibilities, e.g., federal agency regulations and guidelines for implementation of the Antiquities Act.

Applicable Law	Description
PRC, sections 5097.99, 5097.991, and 5097.993–994	5097.99 establishes as a felony the acquisition, possession, sale, or dissection with malice or wantonness of Native American remains or funerary artifacts. 5097.991 establishes a state policy requiring the repatriation of Native American remains and funerary artifacts. 5097.993–994 establishes that various forms of deliberate damage to historical resources on public or private land are subject to fines and imprisonment unless the damaging act occurred consistent with a number of defined exemptions.
Health and Safety Code, section 7050.5	This code makes it a misdemeanor to disturb or remove human remains found outside a cemetery. It also requires a project owner to halt construction if human remains are discovered and to contact the county coroner.
Government Code, section 62544.10 – California Public Records Act	Provides for non-disclosure of records that relate to archaeological site information and reports maintained by, or in the possession of, the Department of Parks and Recreation, the State Historical Resources Commission, the State Lands Commission, the Native American Heritage Commission, another state agency, or a local agency, including the records that the agency obtains through a consultation process between a California Native American tribe and a state or local agency.
Local	
County of Inyo General Plan, Conservation/ Open Space Element (Chapter 8.7), Cultural Resources Policy CUL-1.3	CUL-1.3 Protection of Cultural Resources – Preserve and protect key resources that have contributed to the social, political, and economic history and prehistory of the area, unless overriding circumstances are warranted.

SETTING

Information provided regarding the setting of the proposed project places it in its geographical and geological context and provides the context for the evaluation of the historical significance of any identified cultural resources within the several PAAs.

PROJECT SITE AND VICINITY

The proposed project area includes approximately 3,277 acres of privately owned land in the Pahrump Valley in Inyo County, California, approximately 8 miles south of Pahrump, Nevada and approximately 45 miles west of Las Vegas (see Cultural Resources Plates 1-3). The Pahrump Valley lies in the eastern Mojave Desert, part of the Basin and Range physiographic province (Fenneman 1931), a broad region of almost parallel, block-faulted mountain ranges that trend approximately north to south and are characteristically separated by internally draining, debris-filled structural basins. The erosion of the largely Cenozoic era ranges of the province (beginning 65 million years ago and continuing to the present) continues to contribute sediment to the poorly sorted gravel aprons or bajadas that predominate along the range flanks. The bajadas form most valley margins as they slope gradually down to the basin bottoms where seasonal lakes or playas often form. Low fault scarps and alluvial fans at the mouths of canyons periodically break the smooth, low-angle sweep of the bajadas (Eaton 1982; Thompson and Burke 1974). The elevation of the proposed project area varies from approximately 2,737 feet above mean sea level (amsl) along the eastern area boundary and 2,583 feet amsl along the western area boundary (HHSG 2011a, Appendix 2G: 1). Local elevations in this part of the Pahrump Valley range from a high of approximately 11,916 feet amsl (3,632 m) on Mount Charleston in the Spring Mountains, the dominant peak in the region, to approximately 2,516 feet amsl (767 m) on the floor of the valley bolson[6] in the center of Pahrump Dry Lake, approximately 4 miles to the west-northwest of the proposed facility site.

A bi-seasonal precipitation pattern in the eastern Mojave Desert delivers an average of six inches of annual rainfall from November through April and from July through September, with cool season precipitation being more significant (Hereford 2004). The Colorado River, flowing generally southwesterly from the Rocky Mountains, makes a significant bend within 75 miles of the project area that changes the course of the river towards the south and the Gulf of California. The largely alluvial parent material of the region's bajadas and valley bottoms, and the desert climate generally, support more weakly developed soil orders (Entisols and Aridisols) (NRCS 2007) where a Mojave Creosote Bush Scrub vegetation type predominates (BSE2007a:5.2-9).

The available archaeological evidence indicates a great deal of variability in the Native American use of different portions of the project vicinity through time. A relatively sparse veneer of toolstone acquisition debris on the present surface of the proposed facility site indicates a transitory Native American use of that area, while the presence and moderate frequency of fire pit ruins, stone tool production and maintenance debris, and fragmentary stone tools demonstrate a much more extensive use of the discontinuous mesquite woodland along the fault zone to the immediate northeast of the facility site, through which the transmission line and natural gas pipeline for the proposed project would be built.

The project vicinity also appears to have been subject to prospecting over the last approximately 160 years. Sporadic mineral prospecting near the project area continues today.

[6] A bolson is a semi-arid, flat-floored desert valley or depression, usually centered on a playa or salt pan. Bolson development may occur due to a number of different structural geologic scenarios.

ENVIRONMENTAL SETTING

Paleoclimate

The present climate in the proposed project area represents a moderately dry and harsh period in the climate of the region relative to the last 14,000 years, the minimum time frame for a human presence in the Mojave Desert. The climate of the Mojave Desert since late Pleistocene time (prior to 10,000 thousand years ago) can be split into three broad phases. The climate of the region during the Pleistocene was relatively much more moist or mesic than the present climate and led to the development of a number of large permanent lakes on the floors of the region's valleys. The lakes slowly evaporated during early Holocene time (10,000 years ago to present) as the climate progressively became more arid. The period from approximately 5,000 to 3,000 B.C. marks a time of extreme aridity, often referred to as the mid-Holocene Altithermal (Antevs 1948), one result of which was the final desiccation of the lakes in the region. The climate since approximately 3000 B.C. has typically been more mesic relative to conditions during the Altithermal, and there is evidence for particularly wet periods from approximately 1000 B.C. to A.D. 1, and again from approximately A.D. 500 to 1400 (Bamforth 1990:72).

Geology

The proposed project area is sited on the eastern margin of a bolson in Pahrump Valley in the Mojave Desert. Pahrump Valley is a closed, axial basin oriented roughly northwest to southeast. The geology of the valley reflects many of the closed basins in the region in that it has become filled with predominately fine-grained sediments with sporadic layers of stream-laid larger rocks. The valley is bounded by four principal mountain ranges, the Spring Mountains to the east, and the Kingston, Nopah, and Resting Springs Ranges, respectively, to the south-southwest, west, and, north-northwest. Valley elevations range from a high of approximately 11,916 feet (3,632 m) on Mount Charleston in the Spring Mountains, the dominant peak in the region, to approximately 2,516 feet (767 m) on the floor of the valley bolson in the center of Pahrump Dry Lake, approximately 4 miles to the west-northwest of the proposed facility site. The Spring Mountains form almost the entire eastern boundary of the valley. Primarily Paleozoic (ca. 542–251 million years ago (mya)) marine sedimentary rock predominates the geology of the range with intrusions of largely Tertiary (ca. 65.5–1.8 mya) volcanic rock found infrequently in the southern part of the range. The Kingston Range consists primarily of Mesozoic (ca. 251–65.5 mya) granitic intrusive with apparently uplifted suites of Cambrian (ca. 542–488.3 mya) and Precambrian (ca. 4,570–542 mya) rock that extend to the northeast. The Nopah and Resting Springs Ranges are Paleozoic marine sedimentary rock, predominately of Cambrian age. The Paleozoic rock includes numerous carbonate (limestone and dolomite) and siliciclastic (sandstone, mudstone, conglomerate) rock units (Jennings 1973).

Geomorphology

The proposed facility site is set on the broad, flat floor of a closed basin surrounded by a relatively diverse suite of landforms and subordinate deposits. The Pahrump-Stewart Valley fault system, the central segment of the State Line fault system, has three distinct subsegments in Pahrump Valley, the East Nopah, the Pahrump Valley, and the West

Spring Mountains fault zones, which, together, contribute to the structure of the valley (Workman et al. 2008). The Spring Mountains and Mount Charleston, the dominant peak of that range, bound the valley margin to the east of the proposed project area. A complex of coalescing alluvial fans forms a bajada that sweeps west down from the mountains toward the proposed project area. The bajada is subtly broken through its higher elevations by the West Spring Mountains fault zone which traverses the bajada in a roughly north-northeast direction (Workman et al. 2008).

The Pahrump Valley and East Nopah fault zones define the major landform that is the primary physical context for the proposed facility site, the basin floor. The Pahrump Valley fault zone visibly interrupts the toe of the Spring Mountains' western bajada roughly 1.8 miles to the northeast of the proposed facility site, the northeastern boundary of which is coterminous with the California-Nevada border. This fault zone is a relatively wide band of faults that traverses the approximate center of Pahrump Valley. The zone extends to the northwest, past the Town of Pahrump, into the Stewart Valley fault zone. The Pahrump Valley fault zone manifests as three visible scarps in the vicinity of the proposed project area. The scarps step up in elevation from west to east at intervals of 0.25, 1.6, and 1.8 miles to the northeast of the boundary of the proposed facility site and the California-Nevada border (HHSG 2011c:64). The most westerly of the scarps, the one 0.25 miles from the northeastern facility site boundary, forms the eastern edge of the graben[7], on the surface of which the proposed facility is sited. The scarps are thought to be a barrier for the aquifer that appears to underlie the Spring Mountains' western bajada (HHSG 2011a:5.15-9) and have, through time, provided multiple outlets for the aquifer, outlets that have been variably evident as seeps, springs, and desert marshes. Wind-blown or eolian deposits of sheet and dune sand flank this margin of the basin and drape up and over the scarps of the fault zone. Native stands of mesquite (*Prosopis glandulosa*, *Prosopis pubescens*) anchor lines of coppice dunes along those scarps. The East Nopah fault zone, across the basin floor to the west, is a relatively narrow band of faults that defines the western edge of the graben and creates the eastern front of the Nopah Range (Workman et al. 2008), which delimits the western margin of Pahrump Valley.

The basin floor that now forms the surface of the Pahrump Valley graben is the ongoing result of many thousands of years of the water- and wind-borne deposition of sediments, as the structural block that makes up the landform has dropped in elevation. Basin sediments nearest the present surface are a deflated, massively bedded deposit of silts and clays (CH2 2012a:8–9). Calcium carbonate ($CaCO_3$) nodules are common. The remnant deposit appears to be late Pleistocene in age and appears to evidence the former presence of phreatophyte flats[8], which, on the basis of paleoenvironmental reconstructions for the region, were probably in existence from the late Pleistocene through the early Holocene. The $CaCO_3$ nodules indicate phreatic or near-surface groundwater conditions during that time. The original deposit is thought to have been

[7] A graben is a portion of the earth's crust, bounded on at least two sides by faults, that has dropped downward in relation to adjacent portions.

[8] A phreatophyte flat is a relatively level area of ground where the predominant type of vegetation is phreatophytic plants, deep-rooted plants that obtains water from a permanent ground supply or from the water table.

subject to significant erosion during the mid-Holocene, which left the present deflated deposit of late Pleistocene-age sediments. Layers of stream gravels are also found bedded in and on the surface of these sediments. The Spring Mountains are most likely the primary source of more recent basin sediments beneath the proposed facility site, sediments which originated as alluvium washed down the mountains in rainfall runoff and snow melt. Larger rocks in the Spring Mountain alluvium are typically limestone with rare chert nodules (HHSG 2011c:64). There is also basalt and other volcanic rock exposed in the alluvium toward the eastern margin of the basin floor. There are a couple of potential sources for this rock. One source may be from a former stream that may have once flowed north approximately 20 miles from Sandy Valley, near where volcanic formations are found, north through Pahrump Valley to a confluence with the Amargosa River. Tectonic uplift, most likely during the middle Pleistocene (ca. 500 thousand years ago (kya)), eventually isolated both Sandy and Pahrump valleys (HHSG 2011c:64). Another source for the igneous rock may be the Kingston Range approximately four miles to the south of the proposed facility site (Spaulding 2012c). During parts of the Pliocene and Pleistocene epochs, alluvial fans from the Kingston Range may have reached out to the northeast, through the proposed facility site to what may at that time have been the primary focus of alluvial deposition in Pahrump Valley. That alluvium, derived in part from a late Tertiary (ca. 65.5–1.8 mya) suite of volcanic rock, would have subsequently been buried on the basin floor by other sediment sources as the depositional environment changed. East of the Pahrump Valley fault zone, the hypothetical Kingston Range alluvial fans would have become buried by ongoing deposition along the western Spring Mountains bajada. Ultimately, the Kingston Range alluvium was re-exposed along the scarps of the fault zone and subject to erosion. The Nopah Range contributes alluvial sediments to the basin along the western margin of the valley. Additional sedimentary deposits on the basin floor in the vicinity of the proposed facility site include the suite of lacustrine deposits associated with the playa, Pahrump Dry Lake, approximately four miles to the west-northwest of the proposed facility site.

The eastern portion of the basin floor is draped with a sequence (Qa) of relatively small alluvial fans that appear to emanate from the Pahrump Valley fault zone (Lawson et al. 2012, fig. 1). The sediment sources for the fans are small drainage basins through the zone where Paleozoic rocks and sediments erode from the toe of the western Spring Mountains bajada, late Tertiary volcanic rock erodes from older re-exposed fan deposits, and eolian sands and tufa erode from locales in the fault zone on and adjacent to surface seeps and springs, and near-surface water sources. This is the bulk of the inventory of the sediments that make up older dormant fans (Unit Qa2), and younger active ones (Unit Qa1). The particular proportions of the sediment types in each fan vary with the unique character of the portion of the fault zone from which each fan draws sediment.

CULTURAL RESOURCES INVENTORY

A project-specific cultural resources inventory is a necessary step in staff’s effort to determine whether the proposed project may cause significant impacts to historically significant cultural resources (i.e., historical resources) and would therefore, under

CEQA, have a significant adverse effect on the environment.

The development of a cultural resources inventory entails working through a sequence of investigatory phases. Generally, the research process proceeds from the known to the unknown. These phases typically involve doing background research to identify known cultural resources, conducting fieldwork to collect requisite primary data on not-yet-identified cultural resources in the vicinity of the proposed project, assessing the results of any geotechnical studies or environmental assessments completed for the proposed project site, and compiling recommendations or determinations of historical significance (see "Determining the Historical Significance of Cultural Resources," below) for any cultural resources that are identified.

This subsection describes the research methods used by the applicant and Energy Commission staff for each phase and provides the results of the research, including literature and records searches (California Historical Resources Information System (CHRIS) and local records), archival research, Native American consultation, and field investigations. Staff provides a description of each identified cultural resource, its historical significance, and the basis for its significance evaluation. Assessments of the project's impacts on historically significant cultural resources; potential impacts on previously unidentified, buried archaeological resources; and proposed mitigation measures for all significant impacts are presented in separate subsections below.

PROJECT AREA OF ANALYSIS (PAA)

The PAA is a concept that staff uses to bound the geographic area in which the proposed project has the potential to affect cultural resources. The effects that a project may have on cultural resources may be immediate, further removed in time, or cumulative. They may be physical, visual, auditory, or olfactory in character. The geographic area that would encompass consideration of all such effects may or may not be one uninterrupted expanse. It may include the project area, which would be the site of the proposed plant (project site), the routes of requisite transmission lines and water and natural gas pipelines, and other offsite ancillary facilities, in addition to one or several discontiguous areas where the project could be argued to potentially affect cultural resources.

The configuration of the PAAs for staff's consideration of the HHSEGS project reflects the limitations that CEQA places on dual-state projects. Due to the variety of resources considered by each of the cultural resources specialist, multiple PAAs have been established: the Archaeological PAA, the Ethnographic PAA, and the Built-Environmental PAA. Staff presently sees the core of all of the PAAs **(see Cultural Resources Figure 1)** as the project site, which includes the areas of Solar Plant 1 and Solar Plant 2, the Common Area, and the Temporary Construction Area (HHSG 2011a, Figure 2.1-2). The eastern boundary of the project site is coincident with the California-Nevada border. Elements of the project proposed for construction in Nevada, such as a transmission line and a natural gas pipeline, are not assessed by staff for environmental effects within Nevada. However, impacts, regardless of where they occur, resulting from project activities in California, are evaluated and mitigated to the extent feasible. Therefore, the PAAs for the present project extend over the California border and into Nevada.

Archaeological Resources PAA

Staff is presently aware of two areas in Nevada that qualify as discontiguous components of the HHSEGS cultural resources PAA. One of these areas encompasses the portion of the shallow step fault zone that defines the eastern edge of the project site. Portions of the step fault zone, which are part of the State Line fault system, appear to have been the focus of relatively intense Native American activity for thousands of years. This activity has been related to the periodic presence of surface springs and seeps and to mesquite woodlands that have become encased in an archipelago of sand dunes along the zone. The portions of the fault zone that are coincident with these woodlands and the surface springs and seeps, and the archaeological deposits that relate to the use of these natural resources, qualify as an archaeological landscape.[9]

A second area in Nevada that staff has identified as a discontiguous component of the PAA encompasses Mount Charleston and other prominent peaks of the Spring Mountains. On the basis of early consultation with local Native American communities, and relying also on the basic tenants of ethnogeography, it is reasonable to assume a relatively high probability that these peaks are important elements of the mythologies and religions of different Native American groups in the region.

There also appear to be areas to the west of the project site that are likely to be additional discontiguous components of the PAA. On the basis of Native American consultation to date, prominent peaks of the Nopah Range also appear to be places known and named in local Native American mythological and religious repertoires. Among the lower reaches of the range, there may also be places where the visual presence of the HHSEGS power tower would degrade the ability of key places and trails to convey their respective associative values.

Ethnographic Resources PAA

The Ethnographic PAA encompasses the western side of the Spring Mountains including Stirling Mountain and Potosi Mountain, Mesquite Valley, the Northern side of the Kingston Range, the Nopah Range, the Resting Spring Range, the Last Chance Range and the Ash Meadows Spring area. However, the Salt Song Trail landscape is a multi state resource with a segment in the project vicinity.

Built-Environment PAA

The Built-Environment PAA primarily includes the project site (Solar Plant 1 and Solar Plant 2, the Common Area, and the Temporary Construction Area) as well as the Old Spanish Trail-Mormon Road Corridor in the Pahrump Valley from the Spring Mountains to the east and to the Emigrant Pass to the west. Discontinuous areas of this PAA include the NRHP-listed Old Spanish Trail/Mormon Road Historic District in Nevada and the Old Spanish Trail National Historic Trail (OSTNHT). The OSTNHT is a multi-state resource with segments on the project site.

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[9] An archaeological landscape is a constellation of passively and/or actively managed natural features and material culture remains.

DATA COMPILATION FOR PROJECT AREA OF ANALYSIS

Record, File, and Database Searches

Identification of cultural resources in the PAA and analysis of the significance of those resources and the potential project-related impacts requires resource information specific to the project area and vicinity. Various repositories in California hold compilations of information on the locations and descriptions of cultural resources that have been identified and recorded in past cultural resources surveys. Consistent with the Energy Commission's Data Regulations, the applicant conducted background inventory research and provided the results as part of the HHSEGS Application for Certification (AFC) and in Data Responses to Energy Commission staff's Data Requests, Set 1D.

The applicant's literature and records search portions of the background research for archaeological resources attempted to gather and interpret archival evidence of the known archaeological resources in the applicant's project area of analysis, which was more narrowly defined and was universal across the sub-disciplines of cultural resources. The California source for the present effort was the Eastern Information Center (EIC) of the California Historical Resources Information System (CHRIS) in Riverside. The Nevada sources for the research were the Nevada Cultural Resource Information System (NVCRIS) of the Nevada State Historic Preservation Office (NSHPO) in Carson City, the Harry Reid Center for Environmental Studies (HRC) in Las Vegas, and the Southern Nevada District Office of the Bureau of Land Management (BLM), also in Las Vegas.

Energy Commission staff also conducted additional archival and literature research to supplement information provided by the applicant; partially due to the fact that staff's PAA was larger than the PAA presented in the AFC. This included reviewing documents obtained on the internet; subject-specific books from local venues, the Shoshone Museum, and the Nevada Historical Society Museum in Tonopah; books and manuscripts on file at the Pahrump Public Library, the California State Archives, Sacramento State University Library, and University of California-Berkeley Bancroft Library; historic photographs from the University of Nevada-Las Vegas; and photocopy and original documents provided by the Pahrump Paiute Tribe.

CHRIS Records Search

Methods

The applicant's background research on the archaeological resources in the applicant's PAA encompassed a number of separate efforts in both California and Nevada, the number and timing of which are not entirely clear. The cultural resources consultant to the applicant, CH2M HILL, conducted an in-person records search at the EIC on May 17, 2010 (CRTR 2011b: 48). The record search was limited to the area in California within a one-mile radius around the proposed facility site and the adjacent temporary construction laydown and parking area. CH2M HILL made a request to NSHPO on April 18, 2011, to provide the results of a database search of NVCRIS for the one-mile portion of the Applicant's PAA that extends into Nevada from the northeastern boundary of the proposed project, which is also the California-Nevada state border. CH2M HILL also conducted an in-person record search on this same area at the HRC on April 21, 2011, and sought archaeological resource information on the area from BLM staff, information which may not necessarily be found in the NVCRIS or the HRC. The applicant, in response to an advance draft of staff's second round data adequacy comments on the AFC, provided new information in Supplement B to the AFC (HHSG 2011c:25 and 26) on archaeological sites beyond the facility site in both California and Nevada. The source of much of the information is cited as largely having been the HRC. The searches provided information on the location and the character of known prehistoric and historical archaeological resources in the record search area and provided technical reports for previous cultural resources surveys that have taken place wholly or partly within 0.25 miles of the area subject to survey for the AFC and the technical reports for any previous archaeological excavations that have taken place anywhere in the record search area.

Results

The results of the applicant's record searches in California and Nevada indicate that six investigations were wholly or partially conducted in the Applicant's PAA between 1975 and 2005 (**Cultural Resources Table 2**). The combined results of these previous investigations in this area provided information on a total of approximately 548 acres, or 16.7 percent (CH2 2012a:19) of the approximately 3,276-acre area in California that encompasses the facility site and the adjacent temporary construction laydown and parking area.

CULTURAL RESOURCES Table 2
Previous Cultural Resources Investigations in the Records Search Area

Type of Investigation[10]	***Number of Investigations of Type***	***Date(s) of Investigation Reports***	***Document Identification Nos.***
Class II, Phase I motor and pedestrian surveys of Groundshakers Championship Desert Motorcycle Race course, CA and NV (N), and of Frontier 500 off-road vehicle race, NV (P)	2	September 1975, June 1982	5-84 (BLM), 5-1043 (BLM)

[10] N = negative survey results, P = positive survey, Resource ID No. = project area resource in CA, or n/a

Type of Investigation[10]	*Number of Investigations of Type*	*Date(s) of Investigation Reports*	*Document Identification Nos.*
Class II, Phase I pedestrian survey of Hidden Hills Ranch for proposed agricultural program, CA (CA-INY-2492)	1	October 1979	IN-0069 (EIC)
Class III, Phase I pedestrian survey of Old Spanish Trail-Mormon Road, National Historic Preservation Act Section 110 study, NV (NV-CK-3848)	1	July 1989	5-1950 (BLM)
Class III, Phase I pedestrian survey for electric transmission line pole replacement, CA (N)	1	June 2005	IN-0053 (EIC)
Class I, Phase I archival research for broader environmental resource assessment of parcels, CA and NV (n/a)	1	July 2005	IN-816 (EIC)

The record searches identified two archaeological resources in the Energy Commission regulatory record search area. Only one of these two resources is known to be on the facility site. That archaeological site, CA-INY-2496, is reported as a relatively small (10 x 20 m) scatter of chipped stone, a lithic scatter in the east-central portion of the proposed facility site (WESTEC 1979:12). The other resource identified in the subject record search area is the Old Spanish Trail-Mormon Road (NV-CK-3848). The resource is documented from the Las Vegas area, through Stump Spring roughly two and a half miles to the east of the proposed facility site, to a place on the California-Nevada border to the east-southeast of the site very near where the Old Spanish Trail Highway crosses the border.

Beyond the regulatory record search area but within the broader PAA, the applicant provided rather spare and disjointed bits of information on a number of other archaeological resources in Pahrump Valley (HHSG 2011c:25 and 26; CH2 2012a:14–16). Relatively complex prehistoric and historic archaeological deposits are noted in association with many of the major spring mounds[11] along the Pahrump Valley fault zone, such as Mound Spring and Bolling Mound, adjacent to former artesian-fed stream beds, such as the Bowman site, Manse Spring, and Stump Spring, and, like the Hidden Hills Ranch Spring site, on or partially embedded in the coppice dunes that shroud portions of the fault zone. The applicant notes other types of archaeological deposits in Pahrump Valley, such as rockshelters, cleared circles, roasting pits, rock art, and rock rings, but, despite staff's request for landscape contexts and complete archaeological descriptions of representative deposits (Data Request 109, CEC 2011h), the applicant declined to provide a substantive interpretative context for the archaeology of the broader PAA (CH2 2012a:14–16; ESH 2011a:8 and 9).The useable results of the record search efforts provide a site frequency for the proposed facility site and the adjacent temporary construction area of one site per 548 acres. The extrapolation of that number predicts a total of approximately six archaeological resources for the whole of that area. In consideration of the fact that the only type of archaeological resource that has been identified to date in the project area is a prehistoric lithic scatter (WESTEC 1979:9 and 12), the probability is rather high that those six resources would be predominantly of that type. Beyond the facility site, where the applicant's efforts to identify historical resources has been less intensive, it would be reasonable to anticipate relatively complex and potentially significant prehistoric and historical archaeological deposits along those portions of the Pahrump Valley fault zone where spring mounds, former artesian-fed stream beds, or coppice dunes are present.

Local Agency and Organization Consultation

California counties and cities may recognize particular cultural resources as locally historically important by ordinance, in general plans, or by maintaining specific lists. Consistent with the Energy Commission's Data Regulations, the applicant and Energy Commission Cultural Resources staff contacted local planning agencies and historical and archaeological societies to acquire information on locally recognized cultural resources specific to the vicinity of the project.

Local Historical Societies

The applicant's consultant, CH2MHill, contacted historical societies in the Pahrump, Nevada, and Sandy Valley, California areas, including the Pahrump Valley Historical Society, Goodsprings Historical Society, and the Nevada State Museum and Historical Society. They also sent letters and maps describing the project to these organizations, requesting information about historical features and structures near the project area and inviting comment on the project.

[11] A spring mound is a formation largely composed of $CaCO_3$ precipitates from spring water that combine in complex interactions with microbial, and plant and animal life to form a relatively durable mound that grows slowly over time.

Old Spanish Trail Association

CH2MHill also contacted the Old Spanish Trail Association (OSTA) as part of their organizational outreach. Staff also made contact with OSTA and met with Scott Smith and other representatives on December 1, 2011 at the project site. During the tour of the site, the group discussed both the visual and cultural impacts of the project to the Old Spanish Trail (OST). The OSTA members showed staff segments of a footpath they assert is part of the OST. OSTA prepared a report[12] on the history of the Old Spanish Trail and submitted it to the Energy Commission on April 30, 2012.

Native American Heritage Commission

The Governor's Executive Order B-10-11, executed on September 19, 2011, directs state agencies to engage in meaningful consultation with California Indian Tribes on matters that may affect tribal communities. The Energy Commission Siting Regulations require applicants to contact the Native American Heritage Commission (NAHC) for information on Native American sacred sites and a list of Native Americans interested in the project vicinity. The applicant is then required to notify the Native Americans on the NAHC's list about the project and include a copy of all correspondence with the NAHC and Native Americans and any written responses received, as well as a written summary of any oral responses in the AFC (CEC Regs 2007:App. B(g)(2)(D):87).

The NAHC is the primary California government agency responsible for identifying and cataloging Native American cultural resources, providing protection to Native American human burials and skeletal remains from vandalism and inadvertent destruction, and preventing irreparable damage to designated sacred sites and interference with the expression of Native American religion in California. It also provides a legal means by which Native American descendents can make known their concerns regarding the need for sensitive treatment and disposition of Native American burials, skeletal remains, and items associated with Native American burials.

The NAHC maintains two databases to assist cultural resources specialists in identifying cultural resources of concern to California Native Americans, referred to by staff as Native American ethnographic resources. The NAHC's Sacred Lands database has records for places and objects that Native Americans consider sacred or otherwise important, such as cemeteries and gathering places for traditional foods and materials. Their Contacts database has the names and contact information for individuals, representing a group or themselves, who have expressed an interest in being contacted about development projects in specified areas.

Both the applicant and staff requested information on the presence of sacred lands in the vicinity of the HHSEGS project area, as well as a list of Native Americans to whom inquiries should be sent to identify both additional cultural resources and any concerns the Native Americans may have about the proposed project.

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[12] http://www.energy.ca.gov/sitingcases/hiddenhills/documents/others/2012-04-27_Jack_Prichett_OSTA_Cultural_Rsources_Report.pdf

Staff contacted the NAHC on April 25, 2011, and requested a search of the Sacred Lands File and a Native American contacts list. The NAHC responded in May, 2011, with a list of Native Americans interested in consulting on development projects in the project area. Staff sent letters to all of the NAHC listed tribes on May 25, 2011, inviting them to participate in a field trip to the proposed project area and encouraging tribes to provide additional cultural resources information to staff (see **Cultural Resources Figure 2** for general map of tribal government office locations and territories).

On behalf of the applicant, CH2MHill also contacted the NAHC on May 27, 2011, and requested a search of the Sacred Lands File and a Native American contacts list. The NAHC responded on June 1, 2011, with a list of Native Americans interested in consulting on development projects in the HHSEGS project area. Letters to tribes and individuals listed on the NAHC contact list were mailed or faxed by CH2MHill on June 7, 2011. Copies of the contact letters were provided in Appendix 5.3A of the HHSEGS AFC. A detailed summary table of the results of consultations with the individual Native American organizations on the NAHC contact list was also included. CH2MHill received a response from the Timbisha Shoshone that indicated they would discuss the project at the next tribal meeting. A second response was received from Bill Helmer, Tribal Historic Preservation Officer for the Big Pine Band of Owens Valley Paiute stating that the tribe would like to discuss the project with staff. Staff followed up with all NAHC listed tribes, including the two tribes that formally responded, via subsequent phone conversations and face-to-face meetings.

The NAHC's record searches of the Sacred Lands file, conducted by both CH2MHill and staff, did not indicate the presence of Native American cultural resources on or within one mile of the HHSEGS site. However, the Sacred Lands file only contains those resources that tribes are willing to publically identify and cannot be considered a comprehensive list of places and objects that Native Americans consider sacred or otherwise important.

Field Investigations

In support of the broader research effort to identify historical resources in a PAA, the Energy Commission's Data Regulations require applicants to conduct field surveys to both relocate and identify cultural resources in or near proposed project areas, where prior surveys are more than five years old. These prescribed surveys include pedestrian archaeological surveys and built-environment windshield surveys. Additionally, staff may ask applicants to undertake geoarchaeological investigations or conduct additional fieldwork to support CRHR eligibility evaluations of the archaeological resources present in a PAA.

For the present siting case, the applicant provided field survey information as part of the AFC and in a confidential Cultural Resources Technical Report (CRTR), and additional survey and geoarchaeological information in response to staff's Data Requests. **Cultural Resources Table 3** lists the field investigations consulted or conducted by staff for the present analysis. The field methods and results of these investigations are detailed below. This information was augmented by staff's independent research and ethnographic resource study.

CULTURAL RESOURCES Table 3
Cultural Resource Investigations by Staff
Consulted for the Present Analysis

Investigation Type	***Results***	***Report Reference***
Geoarchaeological and Evaluation Phase Archaeological Investigations	Documentation of near-surface stratigraphy of the project site	CH2 DR128
Initial Intensive Pedestrian Cultural Resources Survey of the Facility Site	One previously recorded prehistoric archaeological site revisited, and ten new prehistoric[1], one new historical, and one new indeterminate-age archaeological site found	CRTR 2011a
Intensive Pedestrian Cultural Resources Surveys of the Transmission Line and Natural Gas Pipeline Alignments	Not available	Not available
Intensive Historic Trails and Roads Survey	One previously recorded historic trail, one previously recorded historic road, and 6 new roads/trails.	CH2 DR125
Ethnographic Resource Study	Three ethnographic landscapes: 1. Salt Song Landscape 2. Pahrump Paiute Home Landscape 3. Ma hav Landscape	HHSEGS Ethnographic Report prepare by Energy Commission staff.
The Old Spanish Trail National Historic Trail: A Report on Cultural and Visual Resource in the Near Vicinity of the Proposed Hidden Hills Solar Energy System Plant, Inyo County, California	Old Spanish Trail National Historic Trail	OSTA 2012

Investigation Type	Results	Report Reference
Draft National Historic Trail Feasibility Study and Environmental Assessment	Old Spanish Trail National Historic Trail	NPS 2000b

[1] The technical report for this survey documents a total of 13 new archaeological sites. Energy Commission staff, on the basis of a field examination, determined that one of the newly recorded prehistoric archaeological sites (Temporary No. S-2) was actually the result of recent historic activity.

Archaeological Field Investigations

Geoarchaeological Research

The original *Cultural Resources* section of the AFC does not include a subsection on the geoarchaeology of that portion of Pahrump Valley in which the proposed project is sited (HHSG 2011c). Supplement B to the AFC, in response to staff concerns during data adequacy about the interpretation and documentation of resource integrity, provides general information on the present and past climates of the project area, narrowly focused geologic and geomorphic contexts, and local surface and near-surface hydrology. This information is the result of background research, the applicant's geomorphic reconnaissance, and data from unrelated geotechnical and paleontological investigations for the proposed project. Staff requested that the applicant provide supplemental geologic and geomorphic information for different portions of the project area of analysis to, variably, finalize research on some issues and to assess whether other issues would require further research. The applicant, in the context of responses to staff data requests, ultimately provided adequate information on various aspects of the project site. A geoarchaeological field investigation, done in conjunction with an investigation to support historic significance evaluations of prehistoric archaeological deposits on the project site (Lawson et al. 2012), was one such source of information. Additional information that staff believes is necessary to our understanding of the character of a number of cultural resources in the broader PAA, beyond the project site, has not yet been provided and is presently unavailable to staff.

Geoarchaeological Field Investigation

Methods

The primary purpose of the geoarchaeological field investigation of the proposed facility site was to help assess the likelihood that archaeological deposits would be found buried there. The focus of the investigation was the excavation of three backhoe trenches in the small alluvial fan sequences (Units Qa1, Qa2) (see the *Geomorphology* subsection, above) that blanket the northeastern portion of the facility site (Lawson et al. 2012:12 and 13). The floor of the basin to the west was not subject to excavation, because those sediments are thought to be of late Pleistocene age (see *Geomorphology* subsection, above). The three trenches on the fan sequences were oriented to be perpendicular to the local former or active direction of surface flow for precipitation runoff. The trenches were approximately three feet in width and were 150 to 300 feet in length. Trench excavation was routinely to a depth of five feet and is reported to have been monitored by one archaeologist. The trench monitor made careful observation of trench walls in an effort to discern stratigraphic characteristics such as soil horizons, man-made sedimentary deposits, contacts between natural sedimentary layers, and variations in sediment composition. Three- to five-cubic-foot samples of trench fill were screened for every 50 feet of excavated trench. Profile drawings and photographic documentation of trench stratigraphy were also made every 50 feet.

Results

The information gathered as a result of the excavation of the three geoarchaeological trenches provides support of the interpretations of the geomorphology of the proposed facility site that have been made previously on the basis of surface observation (see *Geomorphology* subsection, above). Trenches 1 and 3 provide information on the relatively older, more stable alluvial fan surfaces of units Qa2 and Qa1, respectively. Trench 2 investigates the sedimentary profile of an active unit Qa1 ephemeral stream where it debouches onto the basin floor at the toe of that particular alluvial fan lobe.

Trench 1 was placed in the northeastern portion of the proposed Unit 2 heliostat field near the northernmost boundary of unit Qa2. The trench was excavated to a length of 150 feet. It was not excavated further because the monitor judged the excavated deposits to lack the potential for buried cultural remains. The initial 50–70 cm of the trench profile revealed a sandy, gravelly alluvium that displayed a great deal of variability along the trench in the depositional energy responsible for the observed sedimentary deposits. Individual depositional events were evident in sedimentary sequences that began with coarse gravels that rapidly changed to sands toward the top of each sequence, or fining-upward sequences. The profiles of multiple former stream channels are evident in the trench profile and cross-cut one another. No artifacts, anthropogenic features, fossils, or organic matter were found in the profile of this portion of a unit Qa2 alluvial fan lobe. The monitor notes the presence of a probable Pleistocene age deposit at 50–70 cm below the excavated surface. The description of that deeper deposit is unavailable.

Trench 2 was placed in the southeastern portion of the proposed Unit 1 heliostat field near the southwestern boundary of unit Qa1. The trench was excavated to a length of 300 feet in order to capture a more comprehensive sweep of stratigraphic information on a relatively broad unit Qa1 ephemeral stream channel and a low alluvial terrace associated with it. The trench revealed a profile that is characteristic of deposition in a stream environment, or fluvial deposition. Better sorted and more rounded gravels that are characteristic of stream channel deposits were observed in trench profiles, as were thicker fining-upward sequences where layers of fine sand and silt are more prominent and indicate stream channel and near-stream channel deposition. No artifacts, anthropogenic sedimentary deposits, fossils, paleosols, or organic matter were found in the profile of this portion of a unit Qa1 alluvial fan toe. What appear to be charcoal flecks were noted in the trench profile, and several of these were collected.

Trench 3 was placed in the northeastern portion of the proposed Unit 1 heliostat field in unit Qa1. The trench was excavated to a length of 150 feet. It was not excavated further because the monitor judged the excavated deposits to lack the potential for buried cultural remains. The upper approximately 1.4 m of the trench profile revealed a sandy, gravelly alluvium where multiple, moderately thick fining-upward sequences of gravel and sand, here thicker than analogous sequences in Trench 1, are thought to indicate wider stream channels on the surface of this particular alluvial fan lobe. No artifacts, anthropogenic features, fossils, paleosols or organic matter were found in the profile of this portion of a unit Qa1 alluvial fan lobe. The base of this fan lobe unit terminates abruptly approximately 1.4 m below the present surface on an undulating surface of the late Pleistocene-age sediments of the basin fill (Qbf). The undulating surface appears to be consistent with a mid-Holocene period of marked erosion.

The results of the geoarchaeological field research support the interpretations of the geomorphology of the proposed facility site that had been previously made (see *Geomorphology* subsection, above), but are unable to negate the potential presence of buried archaeological deposits in the alluvial fans along its eastern margin. The identification of the strongly eroded, mid-Holocene contact between the Pleistocene-age basin fill and the overlying alluvial fan deposits well supports the interpretation of the fans as Holocene, most likely late Holocene, landforms. The applicant interprets the absence of artifacts, archaeological features, anthropogenic sedimentary deposits, or paleosols to indicate the absence of potential subsurface archaeological sensitivity (Lawson et al. 2012:13). Staff interprets that data differently. In consideration of the fact that the archaeological deposits that have been found to date on the surface of the proposed facility site are all relatively sparse scatters of chipped stone, staff would anticipate any buried archaeological deposits to be similar, and, therefore, difficult to discern in a backhoe trench profile. The difficulty of identifying buried archaeological deposits in Trenches 1 through 3 was undoubtedly compounded by the fact that only one of the trenches, Trench 1, fell inside the known cluster of archaeological sites centered in the northeastern portion of the proposed Unit 2 heliostat field (see *Prehistoric Archaeological Resources on the Proposed Facility Site* subsection, below), an area probably more likely to have such buried deposits. Staff believes that the alluvial fan sequence along the eastern margin of the proposed project site is young enough in age, post mid-Holocene, and has sedimentary portions, or facies, that are of low enough depositional energy to bury material culture remains and to preserve the original spatial associations among them. Staff interprets the subject alluvial fan sequence, absent finer resolution data, to most likely contain buried, intact archaeological deposits. The extremely small subsurface data set for the proposed facility site precludes a meaningful assessment of the potential frequency of these deposits.

Intensive Pedestrian Cultural Resources Survey

Archaeologists for the applicant conducted an intensive pedestrian survey on the site of the proposed facility in an effort to construct a more complete inventory of the cultural resources on which the construction and operation of the facility would have potential effects (CRTR 2011b). The results of the survey provide information on the location and the character of the cultural resources on the present surface of the facility site, and contributes to the analysis of the proposed project’s potential direct physical effects on them.

Intensive pedestrian cultural resources surveys for the proposed project’s transmission line and natural gas pipeline alignments are presently underway in Nevada. The applicant has made preliminary and incomplete draft results of these surveys available to staff as personal communications from the applicant’s environmental consultants.

Methods

The methodology of the applicant's intensive pedestrian cultural resources survey reflected their attempt to comply with the Energy Commission's siting regulations (Cal. Code Regs., tit. 20, § 1701 et seq., app. B, subd. (g)). The requisite survey of built-environment resources, however, from the edge of the 200-foot buffer zone out to one half of a mile from the project site boundary was not an aspect of this survey and was conducted at a later date (CH2 2012a) (see *Built-Environment Field Activities* subsection, below). The survey of the HHSEGS facility site was conducted sporadically during March through June, 2011, over a total of approximately 19 field days (CRTR 2011b:1). The survey area was the entire proposed facility site, the construction laydown area adjacent to the western boundary of that site, and a 200-foot buffer area around both the facility site and the laydown area. The archaeologists for the applicant report that survey transect intervals varied from 10–15 m in width (CRTR 2011b:49-50) across the relatively flat expanse of alluvial sediments that characterize the vicinity of the proposed facility site. No explanation is available for transect interval variability. The visibility of the ground surface during the survey is reported to have been excellent. Visibility was approximately 90 percent or higher. Evidence of the subsurface structure of the local natural sedimentary deposits was limited to the odd rodent borrow and sporadic, shallowly incised ephemeral stream channels. Rodent borrow fill and exposed stream bank cuts were observed, when present. Survey crews navigated through the survey area with hand-held Trimble GeoXT submeter global positioning system (GPS) units. The units were loaded with survey area geographic information system overlays and overlays of previously recorded cultural resources. The actual survey transects were mapped in the field with the GPS units, as were the newly found and previously recorded sites. Notes were taken on and photographs were made of both newly found and previously recorded sites. Constituent site artifact and ecofact assemblages were also documented in this manner, but not collected. For the purposes of this survey, the definition of an archaeological site was any group of five or more artifacts or ecofacts on the same landform, where each specimen was no greater than 50 m apart. Archaeological features, whether isolated or associated with other features or with artifacts and ecofacts, were also documented as archaeological sites. Groups of five or more artifacts less than 50 m apart but spread across different landforms were split into separate archaeological sites by landform. Groups of four or fewer artifacts were documented as Isolated Occurrences (IOs).

Results

One previously recorded and 13 new archaeological sites and 49 IOs were found as a result of the intensive pedestrian cultural resources survey (**Cultural Resources Table 7**, see Inventory of Cultural Resources in the Project Areas of Analysis, below). The 14 archaeological sites were originally reported (CRTR 2011b:53 and 54) to include 12 prehistoric sites, one historical archaeological site, and one site of indeterminate age. Subsequently, staff determined, on the basis of field examination, that one of the newly recorded archaeological sites (site S-2) was primarily the result of recent historic activity and dropped it from further consideration. The archaeologists for the applicant also made the determination during the Phase II field investigation of a subset of the prehistoric sites (Lawson et al. 2012x) that archaeological sites S-10 and S-11 qualify as a single archaeological site under the definition in use for the present analysis. The adjusted archaeological site count leaves a total of 12 archaeological sites, 10 of which are prehistoric, one of which is historic-period, and one of which is of indeterminate age. No ethnographic resources were identified in conjunction with this survey, nor were any intact structures found in the survey area (CRTR 2011b:53). The trails and roads that relate to the project area of analysis are discussed below as built-environment resources (see Built-Environment Field Activities, below).

Archaeological Resource Inventory of the Proposed Facility Site

Prehistoric Archaeological Resource Inventory

Prehistoric archaeological resources make up the bulk of the cultural resources inventory on the proposed facility site. The prehistoric archaeological *sites* (as distinct from prehistoric IOs of four or fewer artifacts) cluster in an area that ranges from the far southeastern corner of the proposed heliostat field for Unit 1 across the majority of the northeastern heliostat field for Unit 2 and into the proposed Common Area (**Cultural Resources Figure 3**). These sites are all relatively sparse (1 artifact/0.7–344 m^2) surface scatters of chipped stone, or relatively sparse lithic scatters. Half of the sites are scatters of nothing other than stone flakes, or debitage, 20 percent include debitage and stone cores from which flakes have been detached, and 30 percent of the sites include debitage, cores, and one to three flake tools. The debitage on these sites is predominately large (~ 3–7 cm), primary and secondary flakes that most likely represent the testing and initial reduction of surface cobbles to produce toolstone-quality flakes. Tertiary, or interior flakes are a minor component of the assemblages, when present at all. Typical cores appear to indicate flake detachment in multiple directions (multidirectional core), and the rare flake tools appear to largely reflect the use of unmodified, expediently-produced flakes. The reported material types include rhyolite, chert, welded tuff, and indeterminate igneous stone. The archaeological sites for which chert is reported as the most common material type cluster along the eastern boundary of the Common Area. The sites further to the west, out where the Unit 1 and Unit 2 heliostat fields are proposed, contain little or no chert.

The distribution of prehistoric IOs (N=31) mirrors, in part, the distribution of the prehistoric archaeological sites (**Cultural Resources Figure 3**). The majority (N=23) of the prehistoric IOs were found in a zone that subsumes the cluster of prehistoric sites in the east-central portion of the proposed facility site. The IOs in this zone are predominantly (N=21) unmodified and non-utilized flakes plus one edge-modified flake and one utilized flake. The balance of the prehistoric IOs (N=8) are spread out in a very sparse, narrow zone across the extreme southern end of the facility site, south of the proposed location of the Unit 2 power tower. This artifact group is again predominately (N=6) flakes, but also includes a fragmentary bifacial tool, and a fragmentary and a whole metate which were found together, the latter being the only artifacts found on the proposed facility site that were not chipped stone.

The inventory of prehistoric archaeological resources on the proposed facility site indicates a marginal and transitory use of the floor of Pahrump Valley. Although alluvial fan and eolian sand deposition along the eastern side of the facility site have probably buried archaeological deposits during the Holocene epoch and thus reduced the material signature of past human behavior on the surface of that area, the small number and extremely sparse character of the known prehistoric archaeological sites, and the sparse distribution of the prehistoric IOs strongly suggest that the use of this area was quite infrequent and transitory. The prehistoric archaeological sites overwhelmingly appear to represent the fortuitous collection, assaying, and initial reduction of surface cobbles in search of toolstone-quality material, presumably for the production of expedient flake tools. The concentration of prehistoric sites and IOs toward the east-central portion of the proposed facility site most likely owes its location to the particular character of the outcrops of pre-Holocene alluvium immediately to the northeast of the facility site boundary. The outcrops are gravelly deposits that include Paleozoic era (ca. 542–251 mya) limestone gravels and cobbles, and rare chert nodules. These Paleozoic rocks presumably eroded out of and down the Spring Mountains, became incorporated into the alluvial fan deposits which were subsequently re-exposed along the Pahrump Valley fault zone, and eroded back out and over the facility site boundary. The distribution of the sparse smear of prehistoric IOs across the extreme southern end of the facility site may be related to the presence of desert pavements there in various states of development. The locations of the artifact group and the pavement area appear to roughly co-vary (**Cultural Resources Figure 4**). The alluvium in which the pavements have developed contains basalt and other volcanic rock from a former stream that may have once flowed north from Sandy Valley. The desert pavements, like the eroding outcrops of gravelly pre-Holocene alluvium to the east, appear to have served as convenient and incidental local toolstone sources. The collection and use of the chert nodules and the various igneous rocks found on the facility site appear to have most likely been incidental pursuits as people traversed the area on their way to other places, down from the Spring Mountains, through the mesquite woodland-shrouded sand dunes just up off of the basin floor to the east, to the former lake that is now Pahrump playa, and into the Nopah Range.

Historical Archaeological Resource Inventory

The historical archaeological component of the cultural resources inventory for the proposed facility site is quite limited. The historical archaeological resources include one archaeological site, an apparent 1960s refuse scatter, and 18 historical archaeological Isolated Occurrences. The one historical archaeological site was found in the near vicinity of the proposed Unit 2 power tower. It is a relatively small, sparse scatter of tin cans and bottle glass adjacent to a dirt road. The IOs are eleven pieces of historic refuse recorded as nine resources, and nine General Land Office (GLO) benchmarks dated 1933 and 1934. The historic refuse includes seven tin cans that range in date from approximately the 1880s to the 1960s, two hinged lid tobacco tins, a mule shoe, and an embossed bottle cap. These items are spread extremely sparsely across the eastern half of the proposed facility site and most likely represent incidental discards over the last approximately 130 years. The GLO benchmarks are all found along the dirt road that delimits the northeastern boundary of the facility site.

An Indeterminate Archaeological Resource

The archaeologists for the applicant found one archaeological resource the age of which is presently indeterminate. The resource is a relatively small cairn of 26 cobbles and boulders in the Common Area of the proposed facility site. No artifacts or other material evidence of human behavior was found in association with the cairn. There is no reliable evidence to establish a date or a function for the resource.

Intensive Pedestrian Cultural Resources Surveys of the Transmission Line and Natural Gas Pipeline Alignments

The results of intensive pedestrian cultural resources surveys for the proposed project's transmission and natural gas pipeline alignments are presently not available. The locations of these alignments, all of which are in Nevada, have been fluid since the August 2011 filing of the original AFC. Staff's consideration of any archaeological resources found along the alignments would, due to the limitations of the Energy Commission's jurisdiction, focus only on the effects that the construction and operation of the facility site in California would have on significant archaeological resources in Nevada. The effects that the construction and operation of the transmission and natural gas pipelines in Nevada would have on significant archaeological resources in Nevada would be beyond the Energy Commission's jurisdiction.

Summary of the Character of the Archaeological Resource Inventory for the California Portion of the Proposed Project Area

The archaeological resource inventory for the facility site and adjacent temporary construction area comports relatively well with the character of the inventory that one would anticipate on the basis of the results of prior investigations on the floor of Pahrump Valley. The extrapolation of the results of those previous efforts indicate a site frequency in the vicinity of the proposed project area of approximately one site per 548 acres with prehistoric lithic scatters as the only archaeological site type. The results of the intensive pedestrian cultural resources survey for HHSEGS documents a site frequency for the facility site and temporary construction area of one site per approximately 252 acres, or roughly twice the frequency that would reasonably have been anticipated, and prehistoric lithic scatters, at approximately 84 percent, as the predominate archaeological site type. Historical refuse deposits and indeterminate archaeological sites round out the actual cultural resources inventory at approximately eight percent each. At a relatively coarse level of resolution, the cultural resources inventory for the California portion of the proposed project area is relatively consistent with the reasonably anticipated character of that inventory. Staff believes, therefore, that the archaeological research efforts for this portion of the larger project area of analysis have produced results reliable enough to support an Energy Commission decision on the application for the project. Information on the cultural resources inventory in the broader PAA, outside of the proposed facility site and temporary construction area, has not yet been made available to staff.

Summary of the Character of the Archaeological Resource Inventory beyond the Proposed Facility Site in California and Nevada

The Archaeological Resources PAA extends well beyond the proposed facility site and temporary construction area in California and the different alternative routes of the transmission lines and the natural gas pipeline in Nevada that would serve the facility and distribute the energy that the facility would produce. The broad extent of the scope of the present analysis reflects the broad reach of the proposed project's potential visual effects. The applicant's reluctance during the present siting case to provide information on potential historical resources beyond the facility site precludes staff's ability to comment with a high degree of confidence whether and where the proposed project may significantly degrade the visual integrity of archaeological resources further from the facility site. There may be archaeological resources on the more prominent peaks of the Nopah Range to the west of the proposed project and among the lower eastern reaches of that range. There may also be such resources on Mount Charleston and other prominent peaks of the Spring Mountains and along the western shoulder of the range above the proposed facility site. Information on the cultural resources inventory in these areas of the PAA have not yet been made available to staff. On the basis of staff's informal field reconnaissance of the facility site and of east to west transects across the central portion of Pahrump Valley, staff has been able to identify and initiate the documentation of what staff refers to as the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape. The landscape is largely in Nevada adjacent and parallel to the northeastern boundary of the facility site in California. It has been identified by staff as an archaeological landscape and an historical resource under CEQA. The landscape appears to date from a presently undetermined point in prehistory through at least the early twentieth century and includes archaeological sites, springs, mesquite groves which aboriginal cultures have used and quite probably tended for millennia, and assemblages of flora and fauna unique to the variety of mesquite woodland association that is the focus of the landscape. The landscape, as presently bounded, encompasses the relatively complex prehistoric and historic Native American archaeological resources that are known along the Pahrump Valley fault zone, types of archaeological deposits found by staff during the reconnaissance of the landscape, and, in consideration of the spare documentation of the landscape to date, most likely other unknown types of archaeological deposits. Staff has been able to take this landscape into account and address its historic preservation under CEQA, and takes any archaeological resources in the Spring Mountains or the Nopah Range to be beyond the pragmatic scope of the present analysis.

Ethnographic Field Activities

Native American Consultation

Energy Commission Cultural and Visual Resources staff held a pre-filing Native American consultation and outreach meeting on August 2, 2011, in conjunction with the applicant and BLM staff. The meeting was attended by representatives of the Pahrump Band of Southern Paiute and the Las Vegas Paiute. The purpose of the meeting was to introduce the Energy Commission staff, present the project, explain the roles of the different agencies, talk about the visual resources and cultural resources analyses, and visit the project vicinity. Although a visit to the facility site did not occur, attendees could examine photos and photo simulations of key observation points (KOPs) in the vicinity of the project.

On December 2, 2011, Energy Commission staff met for a second time with representatives of the Pahrump Band, Las Vegas Paiute, and Timbisha Shoshone in Pahrump, Nevada. Also in attendance was Kathleen Sprowl of BLM's Southern Nevada District Office. The discussion was not limited to cultural and visual resources and a wide range of questions were asked about the project in general, including potential impacts to water. The group also visited the project site in the afternoon.

At the request of the tribes, a follow-up meeting with Energy Commission technical staff, including Cultural Resources, Visual Resources, Biological Resources, Water

Resources, Alternatives, and Soils specialists, occurred on January 19, 2012, in Shoshone, California, with representatives from the Pahrump Band, Las Vegas Paiute, Timbisha Shoshone, Lone Pine Paiute, and the Moapa, to discuss specific tribal concerns regarding several aspects of the project.

Several additional meetings were held to exchange general information with affiliated tribes and to gauge tribal interest in participating in further project-related ethnographic studies. Specific tribal government representatives and individual traditional Native American practitioners were invited, based on the May, 2011 listing of tribes interested in consulting on development projects in their ancestral territories, provided by the NAHC to Energy Commission staff.

General Meeting 1 was held on January 19, 2012, in Shoshone, California, and was attended by various Energy Commission staff technical experts in the areas of Water Resources, Biological Resources, Cultural Resources, and Planning, as well as representatives of management. Participating tribes included the Pahrump Paiute Tribe, Moapa Paiute Tribe, Las Vegas Paiute Tribe, Timbisha Shoshone Tribe, and the Lone Pine Tribe of Paiute and Shoshone. The tribal attendees were a combination of tribal cultural resources and environmental protection staff and several tribal elders. Staff provided the tribes with an overview of the proposed project and updates on how various natural and cultural resource studies were proceeding. Tribal attendees asked general and clarifying questions and made statements that expressed their concerns for how the project might impact their lifeways.

Specific concerns were expressed regarding the proposed project's water use; impacts to the water-related biomes, such as the local springs that support plants and animals in the nearby coppice dunes mesquite grove complexes; and mention was made that Paiute ceremonies, generally referred to as "Salt Song Trails," occurred or were centered in, around, and running through the project area. Additional concern was expressed regarding impacts to Indian trails, including the Old Spanish Trail, and possible impacts to on-site plants, animals, and cultural resources, including possible burial or cremation sites. Cultural Resources staff proposed that an ethnographic study be conducted. Tribes agreed that an ethnographic study would be one desired action to pursue. They also indicated that the Pahrump Paiute Tribe should be central to that study and that the other tribes could provide support to the Pahrump Paiute Tribe. However, participating tribes also requested exclusive follow-up meetings with Energy Commission Cultural Resources staff.

General Meeting 2 was held on February 11, 2012, at the Hidden Hills project site and in Pahrump, Nevada. Energy Commission staff ethnographer, Thomas Gates, met with various Pahrump tribal members as a group near the project site. The membership had assembled to get clarification and a better general understanding of the proposed project parameters. The ethnographic study and the confidentiality of information that the tribe might provide were two topics discussed. Several off-project cultural resource areas were visited, including a looted Pahrump Paiute cemetery.

General Meeting 3 was held on February 12, 2012, at the Hidden Hills project site and at Sandy Valley (an alternative project site). Mr.Gates, the Energy Commission ethnographer, met with the Moapa Tribe cultural resources staff and committee members. One Moapa tribal council person also attended, as did Pahrump tribal representatives. General HHSEGS project parameters were discussed. Some Moapa participants are descendants of Paiute families that originated from the Pahrump Valley vicinity. Cultural values attached to the Sandy Valley area were discussed. Moapa Tribe staff reiterated their previous statements that the Moapa Tribe would support the Pahrump Tribe and was interested in reviewing the ethnographic report prior to finalization. They also reiterated concerns voiced at the first general meeting about impacts to water, springs, plants, and animals, and the Salt Song ceremonies.

General Meeting 4 was held on February 14, 2012, with the Owens Valley Indian Water Commission. Representatives from the Uta Gwaitu Paiute Tribe, Bishop Paiute Tribe, Big Pine Paiute Tribe, Fort Independence Paiute Tribe, Lone Pine Paiute and Shoshone Tribe, and Timbisha Shoshone Tribe participated. The general HHSEGS project, as proposed, was discussed and the ethnographic study concept was presented. Participants agreed that the project area was within Southern Paiute Territory (as contrasted with Owens Valley Paiute territory) and that the Pahrump Tribe was the most affiliated tribe to work with, but that some Southern Paiute families had ended up as tribal members in Owens Valley Paiute Tribes. Individual families were identified.

General Meeting 5 was held on May 12, 2012, with the Pahrump Paiute Tribe. A draft of the ethnographic report was generally reviewed and the Energy Commission project review process was discussed. Sections of the ethnographic report included in this analysis were identified by staff and the Pahrump Tribe as non-confidential and form the basis of staff's conclusions and recommended mitigation measures.

Since May, 2012, staff has continued to consult with the Pahrump Tribe on possible ways to mitigate the project's impacts on tribal cultural and religious practices and the traditional use of ancestral lands. Staff will continue to consult with the Tribes during the licensing process.

Ethnographic Study

Ethnographic Methods

An ethnography, at its best, takes years to complete. Ethnographers can spend a lifetime studying another culture and still find that their cross-cultural knowledge of their "second" culture is incomplete. Minimally, it is advised to spend at least one year in studying another culture so that one can learn about the various seasonal variations and adaptations. Academic and self-funded anthropologists may have such luxury. However, the merits of ethnography, when employed to understand project impacts to ethnographic resources, often require less than optimal study durations. One method, called "Rapid Cultural Assessment" (RCA) was developed in the 1930s to assist sociologists' understanding of American rural agricultural community responses to socioeconomic impacts ensuing from evolving environmental conditions.

The National Park Service (NPS) has developed similar methods for understanding ethnographic resources within the shortened time frames related to project review. The NPS method, called Rapid Ethnographic Assessment Procedures (REAP), was generally followed for this project-related ethnographic study. REAP consists of a selection of ethnographic methods that relies on interview, observation, and research techniques to describe a way of life common to a group of people, including their knowledge, customs, beliefs, social habits, technology, arts, values, and institutions. REAP involves active participation of people in a cultural group to render representations of a way of life from a community's point of view. Unlike traditional ethnography, REAP focuses investigations and resultant descriptions on solving specific problems or issues that may arise as a result of proceeding with a development project (NPS 2007).

REAP's methods are:

1. Group meetings/interviews where the ethnographer explains the project to the group, answers general questions, and solicits immediate responses, fears, apprehensions, benefits, or other general perceptions from the participants concerning the project, the area where the project is being proposed, and the general connections of traditional people to the project area. Often issues of confidentiality are discussed. The ethnographer may be successful in scheduling follow-up activities with specific individuals to increase ethnographic understanding.

2. Areas worth further ethnographic inquiry are identified; a research design, including research/interview questions, is developed; and specific people are scheduled by the ethnographer and the group for follow-up interviews. Follow-up interviews should be conducted according to the protocols of documentation and confidentiality identified during the group meeting/interview. Interview notes, however recorded, should be vetted with the source individuals to verify accuracy and to gather additional nuanced information.

3. Follow-up interviews with the same or additional people often occur while both the ethnographer and the community begin to further think about the project, the project effects, and additional information that is necessary for fully identifying, evaluating, assessing effects, or otherwise considering impacts to ethnographic resources.

4. As Steps 1 through 3 are being conducted, a parallel archival "search, retrieve, and assess" process should be undertaken to provide supporting or conflicting information to what is being discovered through the interview process. In addition to archive, book store, and other informational repositories (e.g., the internet), the people themselves or other ethnographers with previous experiences with the same people, may provide source materials.

5. Field visits help the ethnographer triangulate between what people currently say, what people have written in the past, and what is actually or perceived to be in the project area as a potential ethnographic resource.

Research Design

Based upon these general meetings, an abbreviated research design was developed for the HHSEGS project ethnography that generated various research questions or directives. The following research design provided general guidance for preliminary archival research and allowed staff to prepare for interviews.

- Research specific Pahrump Valley Native American history and culture beyond what is generally provided in the CH2MHill Cultural Resources report prepared for the HHSEGS AFC.
- Determine what plants and animals that have Southern Paiute cultural significance are or may be located in the project area. Plants and animals determined to have attached Southern Paiute cultural values should be further studied to understand ethno-botanical and ethno-zoological details.
- Research the history of Southern Paiute water knowledge and use in the Pahrump Valley and surrounding mountains.
- Research and understand the importance of springs, mesquite groves, and the surrounding coppice dune environs in the project area for the continuance of Southern Paiute lifeways.
- Research and understand the Round dance, Harvest dance, and Cry ceremonies performed in the Pahrump Valley and specifically the ceremony held in 1933 at Hidden Springs Ranch. Determine to what extent these ceremonies are still practiced today and to what extent the proposed project would impact such ceremonies.
- Research and further understand the history, practices, and meaning of the Salt Song trail; deer and big horn sheep mourning songs; and Coyote and Wolf legends, with emphasis on ethno-geography and specific attention paid to the nature of the trail aspects of these songs and related ceremonies.
- Research the history of Southern Paiute horticulture in the project area from pre-contact to current times.
- Research and map, to the extent feasible, Native American trails located in and near the project area that are not necessarily “Salt Song Trails.”
- Understand to what extent the Old Spanish Trail is also a Native American trail.
- Particularly research the Native American slave traffic that occurred along the Old Spanish Trail.
- Inquire and document the importance of Charleston Peak, Spring Mountains, Kingston Mountains, Nopah Mountains, the Last Chance Mountains, and other surrounding landforms in general and as view- or auditory-sheds in relation to the project area and to other landforms.
- Research traditional and current Southern Paiute burial practices, including cremation.
- Inquire as to the interrelation of Paiute and Shoshone culture in general and specifically in project area.
- Research the history of tribal governments: Moapa, Las Vegas, Pahrump, Timbisha Shoshone, Lone Pine, Independence, Big Pine, Bishop, and Benton.

Interviews

Staff determined, based upon limited time, budget constraints, and the general attitude of most Native Americans who participated in the general meetings that an open-ended question/answer dialogue style of interviewing would be more effective than a formal interview style that would require protracted review of the research questions, the possible need to develop a formal questionnaire, and other methods of recordation. Instead, hand-written notes were taken by the ethnographer. These notes were then typed up within a few days and returned to the person interviewed for further review with instructions to make changes including deletions and additions. The ethnographer also asked interviewees to identify what information in the interviews should remain confidential.

Interviews were conducted with the following Southern Paiute and Shoshone individuals:

- Clarabelle Jim, Elder Pahrump Paiute Tribe
- Lorraine Jim, Elder Pahrump Paiute Tribe
- Cynthia Lynch, Elder Pahrump Paiute Tribe
- Richard Arnold, Traditional Religious Practitioner Pahrump Paiute Tribe
- George Ross, Elder Pahrump Tribal Member
- Vernon Lee, Moapa Tribal Member of Pahrump Paiute ancestry
- Juanita Kinlichine, Elder Moapa Tribal Member of Pahrump Paiute ancestry
- Lalovi Miller, Elder Moapa Tribal Member of Pahrump Paiute ancestry
- Philbert Swain, Elder Moapa Tribal Member
- Barbara Durham, Tribal Historic Preservation Officer for the Timbisha Shoshone Tribe and Timbisha Shoshone Tribal member

Follow-up interviews were conducted with Clarabelle Jim, Cynthia Lynch, and Richard Arnold.

An interview with Don Hendricks was conducted on May 8, 2012, in Pahrump. Mr. Hendricks is a retired nuclear physicist, formerly employed by the Atomic Energy Commission and the Environmental Protection Agency. Mr. Hendricks is also a respected local historian, archaeologist, and member of various local and state historic societies and associations. The purpose of this interview was to further verify conflicting written and oral history dates, people, and events.

Ethnographic Method Constraints

There were inherent constraints to the ethnographic methods described above. Five such constraints are identified and further described:

1. Confidentiality of sensitive Information;
2. Abbreviated time period in which to conduct thorough ethnography;

3. Language barriers in expressing and understanding information;

4. Seasonal prohibitions against divulging certain types of information; and

5. Some seminal archival information not obtainable (Isabel Kelley's 1934 field notes).

The confidentiality of Native American sensitive cultural information—key to obtaining critically important information necessary for the completion of a thorough cultural resources analysis—became problematic due to shifting comfort levels among contributing Native Americans in understanding how the information would be used. This fact initially inhibited staff's ability to collect pertinent information in a timely manner. Once information was presented in a completed study report, the Pahrump Paiute Tribe and Energy Commission staff came to an agreement on what could be shared publically. What was finally determined sensitive and not to be shared with the public is redacted in the publically available ethnographic report (Gates 2012).

The Southern Paiute culture, and particularly traditional cultural practices related to epistemology (belief systems), world view, and religion, are extremely complex to understand within the limits of a three-month study. One Pahrump Paiute stated:

> Admittedly and with all due respect, the abbreviated ethnographic approach being used in this project appears to be designed to collect only a limited amount of information. The open-ended interviews are good for collecting certain kinds of general data, but cause concern when trying to synthesize the data.

A Moapa Paiute stated a broader concern with language barriers to cross-cultural understanding:

> English language will never get to the bottom of such things like Salt Song Trails. When we speak our language to one another, we automatically know what the other is saying. Paiute language gets right to it. In English, we have to say it a bunch of different ways, and we still are not sure if the other person understands. With Paiute, it is either yes or no, do or not do. There is no ambiguity.

Well-documented in the literature and re-stated for this study by various interviewees is a general cultural prohibition against telling culturally significant and traditional stories outside of the winter period (Fowler 1971:21, Kelly 1964:120). The Pahrump Paiute winter time is generally defined as the months of November, December, and January. Interviews were conducted in February and March.

Finally, it was determined early in this study that Isabel Kelly conducted ethnographic research among the Southern Paiute in 1932. Her research was partially recorded in her personal field notes. However, only the eastern Southern Paiute (those Paiute residing in Utah and northern Arizona) were discussed in Kelly's seminal work *Southern Paiute Ethnography,* published in 1964. While staff was able to incorporate some comparative information from that ethnography into this report, Kelly's information for the western Southern Paiute was not obtainable, although several efforts were made by Energy Commission staff to obtain copies of her field notes.

Constraints were either *surmountable*, *partially surmountable,* or *not surmountable* as described below.

1. A confidentiality agreement was struck between Energy Commission staff ethnographer and the Pahrump Paiute Tribe representatives that guaranteed confidentiality of information provided. *Constraint Surmounted*.

2. Rapid Ethnographic Assessment Procedures (REAP) were adapted to this ethnographic study. While REAP cannot replace the quality of long-term ethnography, it does provide some ability to include consideration of ethnographic resources in the Energy Commission environmental project assessment of HHSEGS, for which Energy Commission staff had only a few months to conduct independent research. *Constraint Partially Surmounted*.

3. The cultural resources staff author of the publically available ethnographic report does not speak or understand Southern Paiute, and there are few other non-Southern Paiute that speak the language. Four of the Southern Paiute interviewees spoke English as a second language. However, their English language skills were proficient enough to convey partial understanding and some interviews were followed up with second interviews to verify previously recorded information. However, information conveyed in this report is provided in the English written language only. *Constraint Not Surmountable*.

4. A prohibition prevents traditional stories, many of the stories holding embedded information sought for this study, from being told in entirety during the months that this research was conducted. Interviewees could tell pieces of stories or otherwise provide specific information without breaking the prohibition. In addition, some literature discovered through archival research further substantiated the fragments that were provided through interview. However, an exhaustive review of significant oral history was not possible. *Constraint Partially Surmounted*.

5. While previously recorded seminal ethnographic information was not obtained from Kelly's field notes, similar information was gathered from other sources, including a Southern Paiute section included in the *Smithsonian Handbook of North American Indians,* Volume 11, and written by Kelly and Fowler (Kelly 1982: pp. 368-397) that did rely on the field notes in question. *Constraint Partially Surmounted*.

Results of Ethnography

Attributes, Elements, or Features of Southern Paiute Lifeways

While a research design guided staff's initial inquiries, after interviews were conducted the information acquired showed consistent themes that grouped into seven attributes. Therefore the ethnographic report analysis divides Pahrump life-ways, and how those life-ways are intertwined with a landscape, into seven attributes: water, plants, animals, horticulture, trails, landforms, and ceremonies. It should be noted that there is crossover between categories. For example, trails are waterways, trails are songs, trails are ceremony, trails are for hunting and gathering, and trails run through all of the landforms that allow Southern Paiute (and others) to travel among the mountains, valleys, gardens, plants and animals, and homes and camps. Likewise, any of the other attributes can be explained in terms of, or have overlaps with, the other attributes. The Pahrump Paiute world is one holistic phenomenon. This whole is segmented into attributes so that non-Paiute can understand something about the life-ways of a different people.

Paiute and Shoshone people from the various tribes consulted for this study continue to practice their traditional ways as best they can against the backdrop of a modern dominant society and the various developments that come with that modern society.

Ethnographic Landscapes

An ethnographic landscape is defined generally as a landscape containing a variety of natural and cultural resources that associated people define as heritage resources, as noted in this section's introduction. Ethnographic landscapes can have considerable overlap with what are called traditional cultural properties. Traditional cultural properties are synonymous with the term "place." Places and areas are types of cultural resources that can be synonymous with traditional cultural properties and ethnographic landscapes. The term ethnographic landscape will be used to generally refer to the types of resources that are considered in this report; however, staff, by using the term, ethnographic landscape, also intends that usage to mean an "area" or "place," per the CEQA definition of historical resource.

As a result of staff's ethnographic study, staff identified three overlapping ethnographic landscapes that the HHSEGS project could impact. They have as their contributing attributes, elements, or features the following: water, plants, animals, horticultural gardens, trails, landforms, and religious practices. All three landscapes include the entire project area within their boundaries and are within the ethnographic PAA. The three landscapes are:

1. Southern Paiute Salt Song Landscape

2. Pahrump Paiute Home Landscape

3. Ma-hav Landscape

Cultural Resources Tables 4, 5, and 6, below, provide a listing of contributing features, a description, and other relevant information for understanding the natural and cultural make-up of the three landscapes.

CULTURAL RESOURCES Table 4
Contributing Features of the *Salt Song Landscape* Related to the Hidden Hills Solar Energy Generating Systems Project Vicinity (Figure 4)

FEATURE	DESCRIPTION
Water	Puha, Spirits, Springs, Creeks, Flats, Washes, Creeks.
Plants	Puha, Spirits, Plants along the trail and in project vicinity. There are 364 plants related to the Salt Song Trail.
Animals	Puha, Spirits, Animals, Insects. There are 174 animals related to the Salt Song Trail.
Horticulture	Puha, Spirits, Springs Horticulture is a secondary aspect of the primary aspect of water, specifically springs and the activities that occur near springs.
Landforms	Potosi Mountain, Sandy Valley, Kingston Mountains, Nopah Range, Resting Springs Range, Lizard Mountain, Sterling Mountain, Pahrump Valley Floor including Playa.
Trails	Puha, Spirits, Humans, Animals. All Southern Paiute living and deceased participate in the Salt Song Trail. The trail is a path on the ground, a corridor on and above the ground, and an auditory sound scape.
Ceremony	Puha, various types of ceremonies related to funerals and memorials. Ceremonies require aesthetically compatible viewsheds, noise free space and foreign-odor free space.

CULTURAL RESOURCES Table 5[13]
Contributing Features of the *Pahrump Home Landscape* Related to the Hidden Hills Solar Energy Generating Systems Project Vicinity (Figure 1)

	DESCRIPTION
Water	**FEATURE**
Plants	(See Staff's Ethnographic Report for a full-list)
Animals	(See Staff's Ethnographic Report for a full-list)
Horticulture	Corn, squash, gourds, pumpkins, melons, sunflower, amaranth, winter wheat, various beans, and Devil's claw. Irrigation systems Garden plots
Trails	Lateral trails along the valley floor Lateral trails along the valley spring escarpments Lateral trails along the mountain side Vertical trails that connect the valley floor with the high elevations of the Spring Mountains Trails that connect various districts/tribes and the larger Southern Paiute Nations These trails include the Old Spanish Trail and the later and overlapping Mormon Road.
Ceremony	All of the ceremonies identified in this analysis and the Ceremony section of the Ethnographic Report for the Hidden Hills project. Some ceremonies are site specific and some ceremonies can be held based upon a consensus of the involved practitioners and affiliated families

[13] The contributing features that are characterized as landforms is omitted from this table because the landforms list for the Pahrump Paiute Home Landscape are numerous, and those landforms related to the project vicinity are best described in the Ma-hav landscape table below.

CULTURAL RESOURCES Table 6[14]
Contributing Features of the *Ma-hav Landscape* Related to the Hidden Hills Solar Energy Generating Systems Project Vicinity (Figure 5)

FEATURE	DESCRIPTION
Water	Stump Spring, Hidden Hills Ranch Spring, Browns Spring, Weeping Rock Seep, and other unnamed springs within the Ma hav Landscape boundaries as depicted on Figure 5. Edge of the Playa (Pahrump Dry Lake Bed, washes and creeks within the boundaries of the Ma-hav Landscape.
Plants	(See Staff's Ethnographic Report for a full-list)
Animals	(See Staff's Ethnographic Report for a full-list)
Horticulture	Horticulture gardens at Weeping Rock, Browns, Hidden Hills and Stumps Springs. The garden area at Hidden Hills can still be discerned today. The exact garden locations at the other springs would require further historic and archaeological investigation to determine exact locations
Trails	Trails that connected the springs, and connected the spring areas to other destination points such as the springs to the north (Mound, Manse, Pahrump), Sandy Valley to the south, the playa, Mule Springs to the east, the Trout Canyon, and Resting Springs to the west. Smaller paths in and around each of the spring areas. Tribal members assert that the project area is a traditional hunting and gathering area and that procurement activities do not necessarily follow pre-established routes

[14] The contributing features to the Ma-hav Landscape generally referred to as Landforms is omitted from this table, because landform features are cross referenced in the other contributing element types and particularly the water feature category.

FEATURE	DESCRIPTION
Ceremony	Hidden Hills Cry ceremony and Salt Song memorial; Burials and Pahrump Paiute Cemetery. It is highly probable that similar ceremonies occurred at the other Springs. Also John Stumper, being a renowned medicine man, conducted personal religious activities at or near Stump Spring.
Archaeology	Various resource procurement locations, seasonal occupation, village and homestead sites, including historic sites such as Tank Sharpe's still are located throughout the Ma-hav landscape. Archaeological information included in this staff assessment provides additional parameters for considering an archaeological district that encompasses the Ma-hav Landscape

Southern Paiute, Pahrump Paiute, and Ma-hav Ethnographic Landscapes Generally Described

The Salt Song Landscape, as described in **Cultural Resources Table 4**, encompasses portions of present-day southern California, southern Nevada, northeastern Arizona, and southwestern Utah (see **Cultural Resources Figure 4**). The boundaries encompass the Pahrump Valley and surrounding mountain ranges that collectively form the Pahrump Valley. The Salt Song Landscape is ubiquitous throughout the project area and exceeds it and the PAA in extent. Numerous bands of Southern Paiute participate in this landscape. Only such description of this song landscape as is relevant to assessing the effects of the HHSEGS project on the Salt Song Landscape is included here.

The Pahrump Paiute Home Landscape, as described in **Cultural Resources Table 5**, is a part of the Salt Song Landscape and ensues from and radiates out from and around the Spring Mountains. This landscape, extending from the western side of the Spring Range and including Pahrump Valley, Last Chance Range, Nopah Range, and the Kingston Mountains, and areas further to the north, west, and south, far exceeds the area of the project and the PAA. **Cultural Resources Figure 1** provides a general sense of some of the area mentioned. This landscape's largest extent is slightly larger than the area encircled by Chief Tecopa's 1873 homeland journey. It can be easily asserted that some portion of the eastern side of the Spring Mountains is more directly affiliated with the Las Vegas Southern Paiute, but it is not necessary for staff to specifically delineate the boundaries of the Pahrump Paiute Home Landscape because the project is on the west side of the Spring Mountains, and the west side is more directly affiliated with the Pahrump Paiute homeland. The Pahrump Paiute Home Landscape consists of numerous component landscape areas with multiple contributing attributes, but it is not necessary, for the purposes of this document, to further describe and delineate all of the component landscapes.

The proposed project is within the Ma-hav Landscape as described in **Cultural Resources Table 6**. **Cultural Resources Figure 5** provides a delineation of the Ma-hav Landscape. It is the ethnographic landscape that most closely fits the project area and the one on which the project's impacts are most direct. Based upon the preponderance of the ethnographic information collected for this landscape, there are four specific justifications for the boundary delineations:

1. Geology: The area represents a unique geological surface covering of clay that uplifted, eroded, and flowed towards and contributes to the Pahrump Valley Dry Lake bed. The playa itself is not included because it is formed from other eroded deposits that surround the playa on all sides. This unique clay surface has supported specific plant and animal communities that are hunted and gathered by Pahrump Paiute affiliated with the Ma-hav area.

2. Watershed: The area represents a specific lower portion of the watersheds of the Trout Canyon Creek and its main tributary, the Pahrump Valley Creek. These two creeks collectively drain the southwestern portion of Mount Charleston. These watersheds are separate and distinct from watersheds that drain the northwestern slopes of Mount Charleston and that flow towards the springs north of the Ma-hav Landscape such as Mound, Manse, and Pahrump Springs. These watersheds provided a corridor for travel from the valley floor to the heights of Mount Charleston.

3. People: The area represents the closely related Pahrump Paiute families of the Lees, Weeds, Haskins, Browns, Howells, Bruces, and Toms. While these families are inter-related to other Pahrump Paiute families, and other non-Pahrump Paiute people, they tended to reside, or frequent, in and around the Ma-hav, Hidden Hills, and Charleston View areas.

4. Unique Character: The Hidden Hills springs produced less water than others in the area and so attracted non-Indian development later. The larger Pahrump Valley ranches were first established to the north around Ash Meadows, Pahrump Spring, Manse Spring and Mound Spring. As a result the Hidden Hills area was known to have a more unique set of people that differentiated themselves from the larger valley population to the north and near the city of Pahrump. In addition, specific esoteric cultural and religious knowledge was formulated, instructed, and practiced within this delineated landscape and nowhere else in the Paiute landscape. Finally this landscape and the Pahrump Paiute people that occupied it during the Spanish Trail and Mormon road periods were subjected to some of the first contacts and related hostilities ensuing from trail-side encounters.

Given that the land is a contiguous whole, this delineation is conservative. The Ma-hav Landscape boundaries could be drawn up to the crest of Mount Charleston by including the Trout Canyon and Pahrump Valley creeks. However, the upper reaches of the aforementioned creeks are included in the Pahrump Paiute Home Landscape.

Built-Environment Field Activities
The applicant's consultant conducted a windshield survey of the Calvada Springs subdivision in Charleston View, south of the project site, on December 29, 2011, and concluded that a majority of the residences within a one-half mile radius of the project site are mobile homes. Two permanent residences are located on Carpenter Avenue. Other permanent structures include barns, sheds, and other outbuildings. Original construction dates were unavailable, but a review of maps and aerial photos indicated that none were built prior to 1968 (CH2 2012a: p. 23).

The applicant's consultant also identified six trails/roads within one mile of the HHSEGS project site, and Energy Commission staff identified one additional trail/road, all possibly of greater age than 50 years. These resources are listed in **Cultural Resources Table 7**, below.

On December 2, 2011, Energy Commission staff visited the project site after meeting with representatives of the Pahrump Band, Las Vegas Paiute, and Timbisha Shoshone in Pahrump, Nevada. A Built-Environment specialist was in attendance. Staff visited the project site again on April 25, 2012. On the same trip Staff surveyed the Sandy Valley Alternative site.

SUMMARY OF CULTURAL RESOURCES LOCATED IN THE HHSEGS PROJECT AREAS OF ANALYSIS, COMPILED FROM ALL SOURCES

Cultural Resources Table 7 lists the cultural resources, identified by staff from the applicant's and staff's investigations, and their CRHR eligibility of record or as recommended by investigators. In the Impact Analysis section, below, staff presents descriptions of these resources and its determinations of their eligibility.

CULTURAL RESOURCES Table 7
Inventory of Cultural Resources in the Project Areas of Analysis
Prehistoric Archaeological Resources

Cultural Resource Type (Year of Initial Recordation)	Description	Location	CRHR Eligibility	Source of Objective Data
CA-INY-2492 (1979/2011)	Lithic scatter of 5 yellow and brown chert flakes, and 4 light brown flakes of igneous stone	E-central portion of project area	Ineligible	CRTR 2011
Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape	Landscape thematically focused on collection and processing of mesquite and other plant resources unique to the mesquite woodland-coppice dune association during the entirety of woodland's existence. Landscape elements include the archaeological deposits, the mesquite population, ancillary floral and faunal populations, and, the structural features of the faults, dunes, and aquifer discharge locales	Largely just to the NE of the project area in Nevada. Several alternate transmission line and gas pipeline routes traverse this proposed landscape	Assumed eligible under Criterion 1 and 4 (see "Evaluations of Archaeological Resources" subsection, below)	Spaulding 2012b

Cultural Resource Type (Year of Initial Recordation)	Description	Location	CRHR Eligibility	Source of Objective Data
S-1	Lithic scatter (1 piece/9.4 m^2) with 1 utilized flake, 12 flakes, and 3 pieces of shatter in a 10 m x 15 m area amidst 3 apparent recent pot-hunters' holes.		Ineligible	CRTR 2011
S-3	Lithic scatter of 6 flakes, and 2 cores, mostly in a 1 x 1 m area. Flakes include 4 primary, 1 secondary, and 1 tertiary flakes of red rhyolite and a yellowish red "welded tuff." Site on flat, undisturbed floor of the project area bolson.	E-central portion of project area	Ineligible	CRTR 2011
S-4	Original technical report describes site as lithic scatter of 41 flakes. Majority of flakes reported as a "light brown igneous medium grained material."	SE portion of project area	Ineligible	CRTR 2011; CH2 DR128
S-5	Lithic scatter of 5, "red and black banded rhyolitic material" flakes in a 50 x 50 cm area. Overall site dimensions 10 x 10 m. Field archaeologists note the flakes' association with a 5 x 10 m shallow depression that they tentatively interpret as a former spring or seep.	E-central to central portion of project area	Ineligible	CRTR 2011

Cultural Resource Type (Year of Initial Recordation)	Description	Location	CRHR Eligibility	Source of Objective Data
S-6	A 25 x 30 m lithic scatter. Surface assemblage (1 piece/53.6 m^2) includes 3 multi-directional cores of green chert and a coarse mudstone, 1 poorly described utilized basalt flake, 9 flakes and a fragmentary flake of limestone or mudstone. No subsurface assemblage.	E-central to central portion of project area	Ineligible	CRTR 2011; CH2 DR128
S-10 and -11[15]	"Large, widely dispersed lithic procurement site or quarry." Surface assemblage (1 piece/2.5 m^2) includes 3 flake tools, 9 cores, and over 150 flakes, the majority of which is said to be "light brown chert." Subsurface assemblage (variably, 0 pieces/m^3, 100 pieces/m^3, and 310 pieces/m^3) appears to have maximum depth of 10 cm and includes chert flakes	E-central portion of project area	Ineligible	CRTR 2011; CH2 DR128
S-23	10 x 10 m scatter (1 piece/5.3 m^2) with 19 secondary and tertiary flakes of a "light yellow to brown igneous material, likely a welded tuff."	E-central to central portion of project area	Ineligible	CRTR 2011; CH2 DR128

[15] Archaeological sites temporary numbers S-10 and -11 were recorded in the original intensive pedestrian survey as separate resources (Helton, Lawson, and Fergusson 2011). Subsequent work on the sites to support evaluations of their respective historical significance (Lawson, Spaulding, and Helton 2012) determined, relative to the applicant's project definition of an archaeological site (see *Intensive Pedestrian Cultural Resources Survey* subsection, below), that the two resources were actually one.

Cultural Resource Type (Year of Initial Recordation)	Description	Location	CRHR Eligibility	Source of Objective Data
S-AF-1	Lithic scatter, approximately 13 x 13 m, of approximately 25 chert flakes ranging from beige to light brown in color	Buffer area on Nevada side of E-central portion of project area	N/A	CRTR 2011
S-AF-2	4 m-diameter, 19 flake scatter (1.5 pieces/1 m^2) of material described as “caramel colored chert,” surmised to have come from the same core.	SE portion of project area	Ineligible	CRTR 2011

Historical Archaeological Resources

Cultural Resource Type (Year of Initial Recordation)	Description	Location	CRHR Eligibility	Source
S-20	A 12-item scatter (150 m^2) of 1 “solder dot” can, 5 sanitary cans, 3 “soft top cans,” and 3”-dia. bottle bases.	S-central portion of the project area	Ineligible	CRTR 2011

Archaeological Resources of Indeterminate Age

Cultural Resource Type (Year of Initial Recordation)	Description	Location	CRHR Eligibility	Source
S-8	22 x 33 in. rock cairn of 26 "fist- to soccer-ball-sized" stones.		Ineligible	CRTR 2011; CH2 DR128

Ethnographic Resources

Cultural Resource Type (Year of Initial Recordation)	Description	Location	CRHR Eligibility	Source
Salt Song Landscape	Ethnographic Landscape	General Location: Southeastern Utah, Southern Nevada, Northwestern Arizona, Southern California Specific Location: Corridor between Spring Mountains, Mount Charleston, Pahrump Valley, including Ma hav area, Playa and Nopah Range (**Figure 2**).	Recommended eligible under Criterion 1 at the regional level Recommended eligible under Criterion 3 at the regional level	HHSEGS Ethnographic Report

Cultural Resource Type (Year of Initial Recordation)	Description	Location	CRHR Eligibility	Source
Pahrump Paiute Home Landscape	Ethnographic Landscape	General location: area encompassed by the Chief Tecopa Journey around the Spring, Nopah, Resting Spring, and Providence Mountain Ranges Specific Location: Western Slopes of Spring Mountains, Pahrump Valley (**Figure 1**).	Recom-mended eligible under Criterion 1 at the regional level Recom-mended eligible under Criterion 2 at the regional level	HHSEGS Ethno-graphic Report

Cultural Resource Type (Year of Initial Recordation)	Description	Location	CRHR Eligibility	Source
Ma-hav Landscape	Ethnographic landscape	Ma-hav is an area of approximately 35 square miles that takes in the southeastern margins of the Pahrump Dry Lake bed, the washes that extend from the alluvial toes of Mt. Charleston down to the Pahrump Dry Lake bed, the spring areas in between that include Browns Spring, Hidden Hills Ranch Spring, Stump Spring, several unnamed spring discharge areas (including Weeping Rock Seep), the various vegetations including the Mojave Scrub, Shadscale Scrub, and the coppice dune mesquite woodland areas. The proposed project site is within the Ma-hav Landscape (**Figure 3**).	Recom-mended eligible under Criterion 1 at the local level Recom-mended eligible under Criterion 4 at the local level	HHSEGS Ethno-graphic Report

Historic-Period Built-Environment Resources

Cultural Resource Type (Year of Initial Recordation)	**Description**	**Location**	**CRHR Eligibility**	**Source**
The Old Spanish Trail[16]	The entire approximately 2,700-mile long trail	Extends from Santa Fe, New Mexico, to Los Angeles, California. Tracks/traces run through and near the project site.	Listed National Historic Trail, CRHR eligible	NPS 2000b
Old Spanish Trail/Mormon Road Historic District	Three segments in Nevada totally approximately 10 miles	Extends from the California-Nevada border east to Halfway Wash	NRHP-listed	BLM 2001
S-24	Historic road segment	Traverses the southeast corner of the project site	Potentially CRHR eligible (OST-MR)	CH2 DR125
S-25	Historic road segment	Runs north-south, clips a portion of the eastern boundary of the project site	Potentially CRHR eligible (OST-MR)	CH2 DR125
S-26	Trail/footpath	Bisects the project site (northeast to southwest)	Potentially CRHR eligible (OST-MR)	CH2 DR125
Track 1	Historic road	Parallels the California-Nevada border in the project site	Potentially CRHR eligible (OST-MR)	CH2 DR125

[16] Referred to throughout this document as the Old Spanish Trail/Mormon Road because these two resources come together on the project site.

Cultural Resource Type (Year of Initial Recordation)	Description	Location	CRHR Eligibility	Source
Track 4	Historic road	South of Tecopa Road (outside of the project site)	Potentially CRHR eligible (OST-MR)	CH2 DR125
Track 5	Historic trail/road	North of the project site, originating at Brown's Spring	Potentially CRHR eligible (OST-MR)	CH2 DR125
NOTE: 'Track' refers to historic transportation marks generally made by vehicles of the historic period.				

ANALYSIS OF IMPACTS TO CULTURAL RESOURCES

DETERMINING THE HISTORICAL SIGNIFICANCE OF CULTURAL RESOURCES

Under CEQA, "a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment" (Pub. Resources Code, § 21084.1). Consequently, the Energy Commission, as a lead agency, must evaluate the historical significance of cultural resources by determining whether they meet several sets of specified criteria. Under CEQA, the definition of a historically significant cultural resource is that it is a "resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the CRHR", or "a resource listed in a local register of historical resources or identified as significant in a historical resource survey meeting the requirements of section 5024.1 (g) of the Public Resources Code," or "any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California, provided the agency's determination is supported by substantial evidence in light of the whole record" (Cal. Code Regs., tit. 14, § 15064.5(a)).

In general, to be considered historically significant under the CEQA Guidelines, a cultural resource must meet the criteria for listing in the CRHR. These criteria are essentially the same as the eligibility criteria for the NRHP. In addition to being at least 50 years old,[17] a resource must meet at least one of the following four criteria (Pub. Resources Code, § 5024.1):

[17] *The Office of Historic Preservation's Instructions for Recording Historical Resources (1995) endorses recording and evaluating resources over 45 years of age to accommodate a potential five-year lag in the planning process.*

- Criterion 1, is associated with events that have made a significant contribution to the broad patterns of our history;
- Criterion 2, is associated with the lives of persons significant in our past;
- Criterion 3, embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values; or
- Criterion 4, has yielded, or may be likely to yield, information important to history or prehistory.

Historical resources must also possess sufficient integrity of location, design, setting, materials, workmanship, feeling, and association to convey their historical significance (Cal. Code Regs., tit. 14, § 4852(c)).

Additionally, cultural resources listed in or formally determined eligible for the National Register of Historical Places (NRHP) and California Registered Historical Landmarks numbered No. 770 and up are automatically listed in the CRHR and are therefore also historical resources (Pub. Resources Code, § 5024.1(d)). However, even if a cultural resource is not listed or determined to be eligible for listing in the CRHR, CEQA allows a lead agency to make a determination as to whether it is a historical resource and, therefore, historically significant (Pub. Resources Code, § 21084.1).

The assessment of potentially significant adverse impacts to historical resources and the mitigation that may be required of a proposed project to reduce any such impacts depend on CRHR-eligibility evaluations.

California Register of Historical Resources Evaluations

Under CEQA, mitigation need only be developed for substantial project-related adverse impacts to historically significant cultural resources (historical resources). Consequently, staff seeks CRHR eligibility recommendations for those cultural resources subject to possible project impacts. The existing documentation for previously known cultural resources may include CRHR eligibility recommendations, and the applicant's cultural resources specialists often make CRHR eligibility recommendations for newly identified cultural resources they discover and record in their project-related surveys. Staff considers these prior CRHR eligibility evaluations and may accept them or conclude that additional information is needed before making its own recommendations.

When the available information on known or newly identified resources that could be impacted by the proposed project is not sufficient for staff to make a recommendation on CRHR eligibility, staff may ask an applicant to conduct additional research to gather the information needed to make such a recommendation, or staff may gather the additional information. For an archaeological resource, the additional research usually entails some degree of field excavation, called a "Phase II" investigation. For an ethnographic resource, the additional research may be an ethnographic study. For built-environment resources, the additional research would probably be archival. The object of this additional research is to obtain sufficient information to enable staff to validate or make a recommendation of CRHR eligibility for each cultural resource that the proposed project could impact.

METHODS AND THRESHOLDS FOR DETERMINING SIGNIFICANCE OF IMPACTS TO HISTORICAL RESOURCES

Under CEQA, “a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment” (Pub. Resources Code, § 21084.1). Staff analyzes whether a proposed project would cause a substantial adverse change in the significance of any historical resources identified in the Cultural Resources Inventory as CRHR- eligible, or as otherwise significant (Cal. Code Regs., tit. 14 § 15064.5(a)). The regulatory threshold for whether a proposed project would have a significant effect with respect to cultural resources is a finding that the project would materially impair the significance of one or more historical resources (Cal. Code Regs., tit. 14 § 15064.5(b)(1)). The CEQA Guidelines define material impairment, in part, as any project action that “demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA” (Cal. Code Regs., tit. 14 § 15064.5(b)(2)(C)). In order to assess whether a proposed project would materially impair the significance of a historical resource, one would therefore need to know and understand why that resource was eligible for inclusion in the CRHR. A resource’s CRHR eligibility status has two parts, a value for which the resource is significant and integrity sufficient to convey that significant value (Cal. Code Regs., tit. 14 § 4852(c)). (Note that “significance” as used in relation to the determination of a resource’s CRHR eligibility status is a much more narrowly focused technical use of the term than the broader sense of its use at, among other places, section 21084.1 of the Public Resources Code or section 15064.5(a) of the California Code of Regulations.) The significance component of a resource’s eligibility status is determined, as noted in the Determining the Historical Significance of Cultural Resources subsection above, with reference to its potential associative, design or construction, or information values as set out in the CRHR’s four significance criteria (Cal. Code Regs., tit. 14 § 4852(b)(1–4). A resource may be eligible under one or more of these values. The integrity component of a resource’s eligibility status is determined with reference to “location, design, setting, materials, workmanship, feeling, and association” (Cal. Code Regs., tit. 14 § 4852(c). Which of these aspects of integrity are relevant in a determination of a resource’s CRHR eligibility are dependent on the particular values for which that resource has been determined to be significant. The analysis of whether any of the potential impacts of a proposed project cross the threshold of a significant effect under CEQA, therefore, requires the consideration, primarily, of that project’s impacts on each applicable aspect of integrity for each historical resource subject to any such impacts. Dependent upon the particular values for which a resource has been determined to be significant, the aspects of integrity under consideration may be mostly related to the characteristics of the resource itself, or they may also be related to the characteristics of the physical and visual contexts that envelope the resource and whether those contexts would retain the ability to convey the values for which the resource has been found to be significant.

The general procedure of staff's determination of the significance of project impacts to cultural resources, then, is to:

1. Establish the inventory of historical resources, a subset of the Cultural Resources Inventory;

2. Identify and consider the nature of each resource's significance relative to the CRHR's criteria;

3. Consider how subject resources' historical significance are manifested physically and perceptually, and assess the baseline integrity of those characteristics and contexts;

4. Assess, more specifically, those aspects of each resource's integrity that are critical to that resource's ability to convey its historical significance; and

5. Analyze whether potential project impacts would alter any historical resources to the extent that any such resource would no longer be able to convey its historical significance.

Assessment of Impacts and Recommended Mitigation

To identify construction-related impacts to cultural resources that would need to be mitigated, staff first identifies all historical resources and evaluates the potential project impacts to the significant cultural resources to determine if these impacts are substantial and adverse (see above). Staff must then recommend avoidance or other mitigation for substantial and adverse impacts to these historical resources. Staff also must assess whether the proposed project has the potential to impact as-yet-unknown buried archaeological resources and recommend mitigation for impacts to previously unknown but historically significant resources discovered during construction, if impacts to such resources cannot be avoided.

CEQA advises a lead agency to make provisions for archaeological resources unexpectedly encountered during construction, and a project owner may be required to train workers to recognize cultural resources, fund mitigation, and delay construction in the area of the find (Pub. Resources Code, § 21083.2; Cal. Code Regs., tit. 14, §§ 15064.5(f) and 15126.4(b)). Consequently, staff recommends that procedures for identifying, evaluating, and possibly mitigating impacts to archaeological resources discovered during construction be put in place through conditions of certification to reduce those impacts to a less than significant level or to the extent feasible.

Direct and Indirect Impacts

In the abstract, direct impacts to cultural resources are those associated with project development, construction, and operation (co-existence). Construction usually entails surface and subsurface disturbance of the ground, and direct impacts to archaeological resources may result from the immediate disturbance of the deposits, whether from vegetation removal, vehicle travel over the surface, earth-moving activities, excavation, or demolition of overlying structures. Construction can have direct impacts on historic built-environment resources when, for example, those buildings or structures must be removed to make way for the proposed project or when the vibrations of construction impair the stability of historic buildings or structures nearby. New construction can have direct impacts on historic built-environment resources when it is stylistically incompatible with their neighbors and the setting, and when the proposed project produces something harmful to the materials or structural integrity of the historic buildings and structures, such as emissions or vibrations.

Generally speaking, indirect impacts to archaeological resources are those which may result from increased erosion due to site clearance and preparation, or from inadvertent damage or outright vandalism to exposed resource components due to improved accessibility. Similarly, historic buildings and structures can suffer indirect impacts when project construction causes obsolescence and demolition or creates improved accessibility, making vandalism or greater weather exposure possible.

Ground disturbance accompanying construction at a proposed plant site, along proposed linear facilities, and at a proposed laydown area has the potential to directly impact unknown archaeological resources. The potential direct, physical impacts of the proposed construction on unknown archaeological resources are commensurate with the extent of ground disturbance entailed in the particular mode of construction. This varies with each component of the proposed project. Placing the proposed project into this particular setting could have a direct impact on the integrity of association, setting, and feeling of nearby standing historic built-environment resources.

ANALYSIS OF IMPACTS TO ARCHAEOLOGICAL RESOURCES

Prehistoric Background

The prehistory of the eastern Mojave Desert is the narrative of how human populations have adapted to marked fluctuations in the local environment over the course of at least the last 12,000 years. The archaeological remains of the region's prehistory are relatively scarce. Sparse scatters of stone tools, chipped stone tool manufacturing debris, and isolated artifacts, resources that typically yield information of marginal value, account for 40–60 percent of the archaeological remains found in the Mojave and Colorado Deserts. A relative scarcity of intact buried archaeological deposits contributes further to the lack of information on the prehistory of the region (Lyneis and Macko 1986:52). The availability of water and the location of high-value resource patches in otherwise unproductive habitats appear to influence the distribution of human settlement and, consequently, of the archaeological sites that are on the desert landscape (Lyneis and Macko 1986:57; Sutton et al. 2007:230). The broad trajectory of cultural development in the Mojave Desert appears to be a steady decline in residential mobility as local populations come to occupy increasingly larger valley or basin-bottom base camps, in a few preferred locations, over longer periods of time, rather than working out of temporary camps in particularly productive environmental zones (Bamforth 1990:74).

Over the past seven decades, Mojave Desert archaeologists have developed and refined a broad sequence of approximately six artifact groups or assemblages, each with distinctive types of stone projectiles, that represent the material record of the peoples who once lived in the proposed project area (Bamforth 1990:72; Campbell 1936; Lyneis 1982; Rogers 1939; Sutton, et al. 2007; Warren 1984; Warren and

Crabtree 1986). Choosing what staff believes to be a cultural chronology applicable to the proposed project and acknowledging recent proposed refinements to the chosen chronology (Sutton, et al. 2007), the discussion here of the region's prehistory will rely primarily on Warren's 1984 chronology and Warren and Crabtree's 1986 chronology. Following Warren and Crabtree, the periods of the chronology below represent units of time during which particular artifact assemblages appear to prevail, rather than discrete, homogeneous past cultures.

Terminal Pleistocene Period (Prior to 10,000 B.C.)

The archaeological record of the Terminal Pleistocene Period in the Mojave Desert is particularly sparse. The most consistent evidence for human activity during this period are fragments of the characteristic fluted, concave-based, lanceolate spear or projectile point of the Clovis archaeological culture. The Clovis culture is a pan-Western Hemisphere archaeological phenomenon that manifests in diverse material patterns over North and South America. In the Mojave Desert, material culture assemblages that include Clovis projectile point fragments are typically sparse surface deposits (Lyneis and Macko 1986:41). The evidence from such deposits suggests only that human groups during this time were probably small in number, were highly mobile, and lived in small, temporary camps near what were then permanent water sources (Sutton, et al. 2007:234). It is unclear whether the Mojave Desert Clovis assemblages demonstrate a cultural continuity with the material remains of subsequent periods (Warren and Crabtree 1986:184).

Lake Mojave Period (10,000 to 5000 B.C.)

Lake Mojave Period artifact assemblages appear to represent a cultural phenomenon that is antecedent to subsequent cultural developments in the Mojave Desert (Warren and Crabtree 1986:184). Portions of archaeological sites or components that date to the Lake Mojave Period are typically sparse and vary little in assemblage composition (Bamforth 1990:73), although components that include extensive accumulations of residential debris have more recently been found (Sutton, et al. 2007:237). Lake Mojave components are most often found in the vicinity of high terraces above or on relict shorelines of what are now playas and along relict stream channels (Bamforth 1990:72; Lyneis and Macko 1986:41).

Lake Mojave Period assemblages include a relatively narrow range of stone tools and also represent a narrow range of site types. The index artifacts for the period are the local variants of the Great Basin stemmed series projectile point types—Lake Mojave and Silver Lake points. The balance of period assemblages may include bifaces, steep-edged unifaces, "small beaked gravers," "narrow concave scrapers," crescents, and occasional cobble-core tools and ground stone implements (Sutton, et al. 2007:234; Warren 1984:413). The assemblages primarily appear to represent temporary small camps and work stations. Infrequent accumulations of residential debris do indicate, however, that camps with longer use periods are also present.

The archaeological record of the Lake Mojave Period indicates that human populations during the Early Holocene were small, mobile groups practicing a hunting-and-foraging economy whereby groups shifted residency across the landscape among the most productive environmental zones as the resources in those zones became depleted over time (Bamforth 1990:73; Lyneis and Macko 1986:41).

Pinto Period (5000 to 2000 B.C.)

The evidence of human activity found in Pinto Period archaeological sites indicates a behavioral continuity with Lake Mojave Period developments (Warren 1984:414). The Pinto Period witnesses the final desiccation of the Pleistocene pluvial lakes in the Mojave Desert and the adaptive transformation of local populations to the extreme aridity of the mid-Holocene Altithermal (see Antevs 1948). It is unclear whether the Pinto Period directly follows the Lake Mojave Period, or may represent a resumption of the desert's use after a hiatus during the worst of the mid-Holocene droughts (Warren and Crabtree 1986:184). Pinto Period components are typically surface deposits that are small in area and do not include midden deposits, constituent residential debris of ash, charcoal, and food and other organic residues, although larger components with broader ranges of artifacts and substantial midden deposits have more recently been found (Sutton, et al. 2007:238, Warren 1984:413– 414). Pinto Period components are generally found on the landscape in the same places as deposits of the Lake Mojave Period (Bamforth 1990:72; Lyneis and Macko 1986:41). The suggestion has been made that the components may actually overlap in time (Bamforth 1990:73; Sutton, et al. 2007:238).

The most important distinction between the artifact assemblages of the Pinto Period and those of the preceding Lake Mojave Period appears to be the relative abundance of ground stone implements or milling tools. More recent research has found milling tools to occur in moderate abundance in most Pinto Period deposits and, occasionally, in great frequency (Sutton, et al. 2007:238). The characteristic Pinto Period assemblage includes large and small leaf-shaped projectile points and knives, domed and elongated keeled scrapers, several forms of well-made flake scrapers, flat millingstones, and manos. Drills, engraving tools, and *Olivella* spp. shell beads also occur (Sutton, et al. 2008:238; Warren 1984:412; Warren and Crabtree 1986:187). The index artifact for the period is the stemmed, indented-base Pinto series projectile point, the Mojave Desert variety of which is markedly crude in form and manufacture (Warren 1984:411). A broad continuity in the chipped stone technology evident in both the Lake Mojave and Pinto Periods has been noted. Populations during these periods appear to make extensive use of toolstones[18] other than cryptocrystalline silica or obsidian, and they also make regular use of unifacial and bifacial core tool forms (Sutton, et al. 2007:238).

More recent research indicates that Pinto Period assemblages may reflect the emergence of a two-tier settlement pattern. The small temporary or seasonal camps that appear to have been the primary focus of Lake Mojave Period activity may have become more task-specific camps that were subordinate to more permanent residential base camps. The increase during the Pinto Period in the relative frequency of milling

[18] Toolstone is a type of stone used to manufacture stone tools. Generally speaking, tools that require a sharp edge are made using cryptocrystalline materials that fracture in an easily-controlled conchoidal manner. Cryptocrystalline tool stones include flint, chert, rhyolite, and obsidian. These materials fracture in a predictable fashion, and are easily resharpened.

tools suggests a corresponding increase in the reliance of local populations on plant resources (Sutton 2007:238–239).

Gypsum Period (2000 B.C. to A.D. 500)

Gypsum Period artifact assemblages, though scarce relative to earlier and later periods, appear to evidence a shift in the economy of local populations toward a much greater dependence on plant resources (Bamforth 1990:73; Warren 1984:419). Period components are ephemeral in character, relatively more scarce in the southern and eastern portion of the Mojave Desert, smaller yet more numerous than components of the preceding periods, and found in more diverse locations on the landscape (Sutton, et al. 2007:241).

Gypsum Period assemblages encompass a relatively broad array of artifact types. The index artifacts for the period include any combination of Gypsum (Gypsum Cave), Humboldt (Humboldt Concave Base), or Elko (Elko Eared, Elko Corner-notched) series projectile points (Sutton, et al. 2007:241; Warren 1984:414; Warren and Crabtree 1986:187). The balance of period assemblages may include leaf-shaped projectile points; rectangular-based knives; flake scrapers; T-shaped drills; occasional large scraper-planes; choppers; hammerstones; manos and millingstones; mortars and pestles; shaft smoothers; incised slate and sandstone tablets and pendants; fragments of drilled slate tubes; *Haliotis* spp. Rings; central California Middle Horizon bead and ornament types; *Olivella* spp. shell beads; and bone awls (Warren 1984:418). The greater presence of quartz crystals, paint, split-twig figurines, and rock art also indicates the elaboration of ritual activity during this period (Warren and Crabtree 1986:188–189). The influence of the Anasazi archaeological culture of the Southwest is apparent in the eastern Mojave Desert toward the end of the Gypsum Period with the introduction of Anasazi ceramic types to period assemblages, and evidence of the replacement of the atlatl with the bow and arrow, as the larger Gypsum, Humboldt, and Elko series dart points give way to smaller Eastgate and Rose Spring arrow point types in the subsequent Saratoga Springs Period (Warren 1984:414–415).

The relative scarcity of Gypsum Period data complicates discussions of period settlement patterns in the Mojave Desert. Available data indicates that the focus of Gypsum Period components was lowland concentrations of plant resources along streams and in the lake basins (Bamforth 1990:73; Sutton, et al. 2007:241). One such resource may have been mesquite. The introduction of the mortar and pestle during this period and the use of these tools in the historic period to process mesquite pods have been taken to indicate that mesquite was first used in the Gypsum Period (Warren 1984:419). Populations appear to have spent a substantial part of each year in residential base camps while dispatching task groups out to hunt (Bamforth 1990:73). The presence of shell ornaments in the assemblages of the period also indicates the establishment of relatively routine trade with the southern California coast (Warren 1984:419).

Saratoga Springs Period (A.D. 500 to 1200)

The artifact assemblages of the Saratoga Springs Period in the eastern Mojave Desert reflect the mixture of cultures that appears to have influenced the region.

Saratoga Springs Period assemblages encompass a broad, diverse array of artifact types, many of which appear to come from outside the region or reflect outside influences. The index artifacts for the period include Eastgate and Rose Spring projectile points. The core of the period assemblage includes millingstones and manos, mortars and pestles, incised stones, and slate pendants (Warren 1984:420). Other characteristic artifact types of the period include small triangular knives, scrapers, drills, hammerstones, choppers, pendants of green schist, and Pacific Coast shell ornaments, including *Olivella* Saucer beads, *Olivella* Barrel beads, and limpet rings (Warren 1984:367). Anasazi grayware ceramics of the Basketmaker III through early Pueblo Periods (Pecos Classification, see Cordell 1984:55–58) are a notable element of the Saratoga Springs Period assemblage as well.

The archaeological data for the Saratoga Springs Period appear to indicate that local populations were developing broader spheres of interaction with outside groups, perhaps even allowing settlements of outsiders, in the context of a general continuity in local settlement patterns. The basic settlement pattern for the period appears not to change markedly from the Gypsum Period through to the Protohistoric Period (see below). The size of residential base camps and seasonal population dispersions to acquire more remote resources may both have been in slow decline however. The overexploitation of large mammals, due, in part, to the introduction of the bow and arrow during this period and to a deteriorating climate, may have led to a shift in hunting emphasis to small animals and reinforced the primary dependence of local populations on plant seed resources such as mesquite (Bamforth 1990:74).

The Anasazi influence, presumably of the Virgin Branch (see Fowler and Madsen 1986:175–181), was marked in the eastern Mojave Desert during this period from at least A.D. 700 through A.D. 1150 (Warren 1984:373–373, 426–427). The distribution of Anasazi grayware ceramics, the key archaeological index of Anasazi influence, reaches from the lower Virgin River in southern Nevada into California as far west as the Cronise Basin in San Bernardino County. The primary focus of Anasazi influence in the vicinity of the proposed project area appears to have been the turquoise deposits in the area around Halloran Springs, roughly 30 miles southwest of the proposed project area. The sequence of ceramic types found at the turquoise mines in the area indicate that the period of Anasazi influence there was from approximately A.D. 700 to 900, during the Basketmaker III and Pueblo I Periods (Warren 1984:371–372). It remains unclear whether Anasazi peoples were actually in residence in the area (Warren 1984:422) practicing the Virgin Branch horticultural lifeway, in residence living on stores of provisions, or not in residence and managing the extraction of turquoise through proxy labor. The Anasazi influence over the eastern Mojave Desert ultimately terminates around A.D. 1150 (Warren 1984:426–427).

Protohistoric Period (A.D. 1200 to present)
The speakers of Numic languages appear to displace the local populations of the eastern Mojave Desert at the outset of the Protohistoric Period, and to decisively eradicate Anasazi influence in the region (Warren 1984:430).

The Protohistoric assemblage has been said to relate directly to the historic Paiute (Warren 1984:427). The characteristic index artifacts for assemblages of the more northerly areas of the eastern Mojave Desert are Desert Side-notched projectile points and coarse, brownware ceramic types. The overall eastern Mojave assemblage strongly resembles assemblages across the northern Mojave Desert to Owens Valley and may derive from that region. Assemblages from the more southerly areas of the eastern Mojave Desert include Cottonwood Triangular projectile points, in addition to Desert Side-notched points, and the ceramic assemblage includes types representative of the Hakataya archaeological culture, a cultural unit of the Lower Colorado River and the Colorado Desert. Among the Hakataya ceramics in the Protohistoric Period assemblages of the eastern Mojave Desert are brownwares, buffwares, and red-on-buff wares (Warren 1984:427; Warren and Crabtree 1986:191).

Despite the apparent shifts in the local populations in the eastern Mojave Desert and the ebb and flow of outside influences during the Saratoga Springs and Protohistoric Periods, the basic economic milieu and the settlement patterns of the local populations continue, in the Protohistoric Period, to reflect the trends in desert adaptation that had been developing in the Mojave Desert for millennia. Among the final elaborations to the local economy of the populations in the Mojave Desert may have been the addition, during the late Saratoga Springs Period and into the Protohistoric Period, of small gardens in preferred areas, the produce from which may have supplemented local diets in a minor way (Lyneis and Macko 1986:41).

The influence of the Anasazi in the eastern Mojave Desert is supplanted by Hakataya influence from the Lower Colorado River and the Colorado Desert. Toward the end of the Saratoga Springs Period or the beginning of the Protohistoric Period around A.D. 1200, there is evidence of Hakataya influence or presence at the Halloran Springs turquoise mines lasting roughly a century. The Paiute have used the mines infrequently subsequent to the withdrawal of the Hakataya in about the fourteenth century (Warren 1984:372, 373).

Evaluations of Archaeological Resources

Evaluations of archaeological resources often require the execution of field research to gather the information necessary to adequately evidence whether and why particular resources possess historical significance. The most common purpose of evaluative archaeological field research, referred to as Phase II archaeological research in cultural resources management, is to record observations that establish the association of a resource with significant events, or that establish the resource as a potential source of significant historical information. This type of research focuses on the identification, documentation, and analysis of the information, the data sets that can be extracted from the material remains in archaeological deposits, and from the physical contexts of and the spatial associations among those remains.

Phase II archaeological research does not always require archaeological excavation. Archaeological deposits usually occur as either relatively thin, broad scatters of artifacts and ecofacts, or as layered, matrix-supported deposits of such materials. The evaluation of broad scatter-type deposits, solely on the basis of surface observation, is appropriate when it can be argued that they are almost entirely exposed at the surface, and that the landforms on the surface of which such deposits are found are older than the commonly accepted date of the initial human occupation of North America, or that the exposed material remains indicate a light and transitory use of the ground surface. For archaeological deposits where such arguments cannot be compellingly made, excavation is necessary to identify and assess the spatial integrity of the data sets that any buried components of those deposits may contain.

Staff evaluations, below, of the archaeological resources in the PAA divide the adjusted total inventory of 12 archaeological resources found as a result of the intensive pedestrian cultural resources survey (see Intensive Pedestrian Archaeological Resources Survey subsection, above) and an additional archaeological resource identified by staff into two groups: those resources for which surface observations provide sufficient information to make recommendations of historical significance and those resources for which Phase II archaeological research has been necessary to inform such recommendations.

Evaluations of Archaeological Resources on the Basis of Surface Observation

On the basis of the results of the intensive pedestrian cultural resources survey (CRTR 2011b), several reconnaissance-level field surveys by staff, and numerous discussions among staff, the applicant's cultural resources consultants, and BLM Southern Nevada District Office staff (BLM staff), staff concluded that surface observation was sufficient for the evaluations below of four prehistoric archaeological sites, one historical archaeological site, one archaeological site of indeterminate age, and a prehistoric archaeological landscape.

Prehistoric Archaeological Resources

Individual Prehistoric Archaeological Sites

Site S-1

Site S-1 is a small prehistoric lithic scatter in the east-central portion of the proposed Unit 2 heliostat field. The artifacts were found in a relatively small (10 x 15 m) area on the surface of distal, Holocene-age sediments of a dormant local alluvial fan (Unit Qa2). The ground surface that supports the scatter is relatively level with a moderately dense lag deposit of pebbles and cobbles. The surface vegetation on the site is documented as Mojave Desert scrub (HHSG 2011a:fig. 5.2-3). The applicant reports the presence of creosote (*Larrea tridentata*), *Lycium* spp., and unspecified native grasses. Surface visibility across the site is reported to be nearly 100 percent. The only noted information related to the historic land use of the site and surrounding area is their location on the Hidden Hills Ranch, which has been in operation as a cattle ranch since the 1920s.

The actual spatial distribution and the character of the group of artifacts, the artifact assemblage that makes up site S-1 are presently unclear. The DPR 523A and C forms for the resource and one part of the revised technical report of the original intensive pedestrian cultural resources survey (CRTR 2011b:54,) state that the site is 10 m from north to south and 15 m from east to west. The sketch map of the DPR 523K form, however, depicts the artifact distribution to cover an area approximately 12 m from north to south and 11 m from east to west. The different available descriptions of the site artifact assemblage also do not match well. The applicant reports artifact material types differently in the revised technical report (CRTR 2011b) and on the DPR523 A form than on the DPR 523C form for the resource. The revised technical report and the DPR 523A form state that the artifact assemblage of the site includes one utilized flake[19], twelve unmodified flakes, and three pieces of angular stone shatter[20]. Site artifacts are identified as being of “either a red and cream chert or a light brown igneous material.” The DPR 523C form identifies the utilized flake as being of red rhyolite and eleven of the unmodified flakes as being simply of rhyolite. A note is made there that rhyolite at the site is a “deep red to a light red and yellow” color. No material type is given for one flake and the three pieces of shatter. The DPR 523C reports the utilized flake as a large (15 x 45 x 88 mm) primary flake with “one heavily chipped and used edge.” The assemblage of moderately large (3–7 cm) flakes includes primary (N=6), secondary (N=3), and tertiary (N=3) flakes. Any patterns that may exist with regard to the differential distribution of artifact or material types are unreported.

The physical integrity of site S-1 appears to have been partially compromised. The applicant found evidence of what are described as “three small excavations” in unspecified locations on the site. The dimensions of one of the excavations was given on the DPR 523A and C forms as 60 x 77 cm at the surface and 10 cm in depth. The applicant notes that the unspecified number of flakes adjacent to this particular excavation appeared to have been arranged and no longer appeared to have been in situ. The balance of the site artifact assemblage did appear to the applicant to be in situ. The applicant states, apparently on the basis of the examination of the backfill from the three excavations and on the basis of a 10-cm-diameter and 10-cm-deep excavation by the applicant, that the subsurface sedimentary deposits at the site are devoid of artifacts.

On the basis of the available information, the artifact assemblage of site S-1 may represent one to several brief episodes during which people chose to stop and prepare one or several rocks for use as a source of flakes for tool production. The utilized red rhyolite flake in the site assemblage suggests that the production of expedient flake tools may have been the impetus for core preparation. The utilized flake may represent a discarded production failure, or its discard may have been incidental. . The light and transitory use of the site area that the material culture of the site indicates, and the facts that none of this material is of artistic value, nor provides information that would readily facilitate the placement of this activity in time or the association of it with significant events or persons, combine to indicate that the resource does not meet any of the CRHR criteria of historical significance. Staff therefore recommends that site S-1 is not eligible for listing in the CRHR.

Site S-3

Site S-3 is a small prehistoric lithic scatter in the east-central portion of the proposed Unit 2 heliostat field. The majority of the artifacts were found in an approximately one m square area on the surface of distal, Holocene-age sediments of a dormant local alluvial fan (Unit Qa2). The ground surface that supports the scatter is relatively level with a

[19] A utilized flake is a flake that has been detached from a core and used as a tool without further purposive modification to the flake.

[20] Shatter refers to small angular bits of stone that are produced as an incidental byproduct of chipping stone.

moderately dense lag deposit of pebbles and cobbles. The vegetation on the reportedly undisturbed surface is documented as Mojave Desert scrub (HHSG 2011a:fig. 5.2-3). The applicant reports the presence of creosote (*Larrea tridentata*), *Lycium* spp., and unspecified native grasses, although no creosote is clearly visible in the applicant's overview photograph of the site. Surface visibility across the site is reported to be nearly 100 percent. The only noted information related to the historic land use of the site and surrounding area is their location on the Hidden Hills Ranch, which has been in operation as a cattle ranch since the 1920s.

The actual spatial distribution and the composition of the group of artifacts, the artifact assemblage that makes up site S-3 are presently unclear. The DPR 523A form for the resource and one part of the revised technical report (CRTR 2011b:55,) report that the "majority of the artifacts were found in a one by one meter area." The DPR 523C form reports the dimensions of the flake scatter to be 15 m from north to south and 15 m from east to west. The revised technical report states that "all of the *flakes* [emphasis added] at this site were found in a very discrete concentration measuring less than" one meter square (CRTR 2011b:64). And, lastly, the sketch map of the DPR 523K form depicts the artifact distribution to cover an area approximately 5 m from north to south and 4 m from east to west. The artifact composition of the site is no clearer. The applicant reports the artifact composition of the resource differently in different parts of the revised technical report (CRTR 2011b:55, 63, 64) and, as well, on the DPR 523A and C forms for the resource. The site's artifact assemblage appears to include two stone cores and six to nine stone flakes. The cores are reported to be small (5 and 6 cm) artifacts of rhyolite that indicate multidirectional flake detachment. The number and character of the stone flakes is less certain. The revised cultural resources technical report and the DPR 523A form for the site report four primary flakes, one secondary flake, and one tertiary flake of red rhyolite and what appears to be a red and yellow welded tuff (CRTR 2011b: 55). The DPR 523C form for the site reports 7 primary flakes of rhyolite (N=3) and "igneous material" (N=4), and one secondary and one tertiary flake of "igneous material." The revised technical report does not provide descriptions of the flakes, but notes that the "available toolstone at this site consists of a few scattered cobbles of a yellow and red igneous material (CRTR 2011b:64).

Notwithstanding the variability in the applicant's description of the resource and outstanding concerns about the accuracy of artifact material type identifications, enough information exists to characterize, interpret, and evaluate site S-3. Site S-3 is a relatively small and discrete scatter of eight to eleven stone artifacts. The artifact assemblage includes what the applicant interprets to be two small, exhausted, multidirectional cores, and six to nine moderately large (4–9 cm) flakes, five to eight (83–89 percent) of which represent the initial removal of the weathered exterior cortex of two different, presently indeterminate types of cobbles. Any patterns that may exist with regard to the differential distribution of artifact or material types are unreported.

The artifact assemblage of site S-3 appears to represent one or two brief episodes during which people chose to stop and assess the value of two different types of rock for use as toolstone, and subsequently may have also sought to detach further flakes for use in tool production. The light and transitory use of the site area that the material culture indicates, and the facts that none of this material is of artistic value, nor provides information that would readily facilitate the placement of this activity in time or the association of it with significant events or persons, combine to indicate that the resource, despite its apparent physical integrity, does not meet any of the CRHR criteria of historical significance. Staff therefore recommends that site S-3 is not eligible for listing in the CRHR.

Site S-5

Site S-5 is a small prehistoric lithic scatter in the northeastern portion of the proposed Unit 2 heliostat field. All of the artifacts on the site are reported to have been found in an approximately 0.5-m square area, and are on the surface of distal, Holocene-age sediments of an active local alluvial fan (Unit Qa1). The ground surface that supports the scatter is, with one exception, relatively level with a moderately dense lag deposit of pebbles and cobbles. The exception is a small (5 x 10 m) depression directly adjacent to the site that the applicant suggests may have once been a small spring or seep. The vegetation in the vicinity of the site is documented as Mojave Desert scrub (HHSG 2011a:fig. 5.2-3). The applicant reports the presence of creosote (*Larrea tridentata*), *Lycium* spp., and unspecified native grasses, although no creosote is clearly visible in the applicant's overview photograph of the site. Surface visibility across the site is stated to be nearly 100 percent. The only noted information related to the historic land use of the site and surrounding area is their location on the Hidden Hills Ranch, which has been in operation as a cattle ranch since the 1920s.

The available information on the artifact assemblage for site S-5 and on the spatial distribution of the artifacts in the assemblage is unclear. The actual apparent artifact distribution and the applicant's boundary for site S-5 do not match. The revised cultural resources technical report (CRTR 2011b:55) and the DPR 523A and C forms unequivocally state that the five flakes that make up the entire artifact assemblage for the site were found in a 0.5 m square area, yet the dimensions of the site are reported on the DPR 523C form to be 10 m square and are depicted on the DPR 523K sketch map as a circle approximately 10 m in diameter. The composition of the site's artifact assemblage is much clearer. The assemblage includes five moderately large (4–8 cm) secondary flakes of what is alternately described as a "red and black banded rhyolitic material" and a "red and black banded igneous material." The flakes represent part of the process by which the weathered exterior cortex was removed from the original cobble core.

The artifact assemblage of site S-5 appears to represent one episode during which people chose to stop and prepare a rock for use as a source of flakes for tool production. The light and transitory use of the site area that the material culture indicates, and the facts that this material is not of artistic value, and does not provide information that would readily facilitate the placement of this activity in time or the association of it with significant events or persons, combine to indicate that the resource, despite its apparent physical integrity, does not meet any of the CRHR criteria of historical significance. Staff therefore recommends that site S-5 is not eligible for listing in the CRHR.

Site S-AF-2

Site S-AF-2 is a small prehistoric lithic scatter in Clark County, Nevada, outside of and adjacent to the easternmost portion of the Common Area. The artifacts on the site are reported to have been found in a “four meter area,” and are on the surface of mid- to distal, Holocene-age sediments of a dormant local alluvial fan (Unit Qa2). The identification of the landform context for the site is imprecise (CRTR 2011b:56, 69,70; IMACS 2011), but the site appears to be along the edge of and above an ephemeral stream channel that dissects the local fan surface. That surface appears to be relatively level with a lag deposit of pebbles and cobbles. The vegetation on and around the site is documented as Mojave Desert scrub (HHSG 2011a:fig. 5.2-3). The applicant reports the primary presence of creosote (*Larrea tridentata*). Low sagebrush (*Artemisia* spp.) and Indian ricegrass (*Achnatherum hymenoides*) are noted as present in the understory. Surface visibility across the site is unreported, though presumably high. The site is on land under the jurisdiction of the Bureau of Land Management’s (BLM) Southern Nevada Field Office.

The available information on the artifact assemblage for site S-AF-2 and on the spatial distribution of the artifacts in the assemblage is unclear. The actual apparent artifact distribution and the applicant’s boundary for site S-AF-2 do not match. The revised cultural resources technical report (CRTR 2011b:56) and Part A of the Intermountain Antiquities Computer System (IMACS) form state that the 19 flakes that make up the entire artifact assemblage for the site were found in a “four meter area,” yet the dimensions of the site are reported on Part B of the IMACS form to be 4 m square with a calculated area of 12.5 square m and are depicted on the IMACS sketch map as a circle-like shape approximately 10 m in diameter. The composition of the site’s artifact assemblage is much clearer. The assemblage includes 19 primary (N=16) and secondary (N=3) flakes of “caramel-colored” chert, all of which the applicant says appear to have been detached from the same core. The flakes would appear to represent the process by which the weathered exterior cortex was removed from the original chert core.

The artifact assemblage of site S-AF-2 appears to represent one episode during which people chose to stop and remove the weathered exterior cortex of a chert nodule, a process that would prepare the resultant core for later use elsewhere as a source of flakes for tool production. The light and transitory use of the site area that the material culture indicates, and the facts that none of this material is of artistic value, nor provides information that would readily facilitate the placement of this activity in time or the association of it with significant events or persons, combine to indicate that the resource, despite its apparent physical integrity, does not meet any of the CRHR criteria of historical significance. Staff therefore recommends that site S-AF-2 is not eligible for listing in the CRHR.

Multi-site Prehistoric Archaeological Resources: Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape (Pahrump Metapatch Landscape)

Technical Classification of the Landscape and Applicable Guidance

The Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, which is adjacent and parallel to the northeastern boundary of the project site, has been identified by staff as an archaeological landscape and historical resource under CEQA. The landscape appears to date from a presently undetermined point in prehistory through at least the early twentieth century and includes archaeological sites, springs, mesquite groves which aboriginal cultures have used and quite probably tended for millennia, and assemblages of flora and fauna unique to the variety of mesquite woodland association that is the focus of the landscape. Applying NPS guidance developed for the National Register Historic Places (NRHP) to the consideration of the landscape as a cultural resource under the parallel CRHR (NPS 1994, 1999, 2000), the combination of cultural and natural features that make up this composite resource would qualify the resource as a type of cultural landscape referred to as a "rural historic landscape" and would require technical evaluation of historical significance as a district (NPS 1999), more precisely, an archaeological district (NPS 2000).

Landscape Elements and Characteristics

Our knowledge of the character of the Pahrump Metapatch Landscape and the elements of which it is composed is severely constrained because no systematic survey of the landscape has been done to date. The records search for the present analysis revealed that no prior formal investigations have been undertaken across the portion of the Pahrump Metapatch Landscape within one mile of the proposed project site, and only two prior investigations have traversed the landscape in the vicinity of the proposed project: a 1982 reconnaissance survey for an off-road vehicle race and a 1989 intensive survey of the Old Spanish Trail (OST) from Las Vegas to the California border to facilitate the Nevada BLM's management of that resource. These two efforts led to updates of the records for the OST and a previously known archaeological site at Stump Spring (26CK301). No new sites were identified. The information that is presently available on the landscape is the result of Energy Commission staff's informal reconnaissance of the landscape in March and April of 2011 and draft information from the applicant on the results of intensive pedestrian surveys on two different transects through the landscape, received just prior to the publication of this analysis (Spaulding 2012d).

The Pahrump Metapatch Landscape is composed of both natural and cultural elements. The natural elements include what appears to be one of the relatively ancient populations of mesquite trees that falls within one mesquite woodland metapatch[21], the Pahrump metapatch, delineated in Clark County, Nevada (BLM 2006)(**Cultural Resources Figure 6**). The mesquite trees across broad swaths of this metapatch are the primary anchors of groups of coppice[22] dunes which, in turn, are a major structural element of the landscape. Local fault scarps and aquifer discharge points are other structural elements that shape the distribution of the mesquite trees across the landscape, and shape the inventory and the distribution of the balance of the floral and

[21] A "metapatch" is defined as a "collection of woodland patches separated by less than 2 km, and not separated by any major [geographic] barrier" (BLM 2006, p.41).

[22] "Coppice dunes" form as vegetation and air-transported sand interact to form sand mounds that vegetation anchors in place and out of which the anchoring vegetation continues to grow. The incremental growth of coppice dunes over time can lead to the formation of quite large sand dunes.

faunal associations that have been of import to Native American communities through time.

The frequency and the character of the archaeological deposits that make up the cultural elements of the landscape are unclear. Representative archaeological data for the landscape are presently unavailable. The applicant largely declined staff requests to consider the potential presence of theme-based, multi-property cultural resources or to provide primary contextual data to facilitate the evaluation of the historical significance of any such resources (CEC 2011h, Data Requests Nos. 105 and 121). What is presently known is that relatively robust archaeological deposits are usually associated with the points along the landscape from which springs emanate or did emanate in the past. These deposits appear to have higher artifact densities and a greater diversity of artifact types than deposits away from springs. Deposits of higher artifact density and greater artifact diversity most likely represent longer durations of land use around the springs, as well as a greater range of activity there.

Cursory staff observations of the landscape in the near vicinity of the proposed project site, an inter-spring area between Stump and Hidden Hills Ranch springs, document the presence of at least two additional types of archaeological deposits. One type is an interdunal lag[23], variably of fire-affected calcium carbonate ($CaCO_3$) tufa[24] and coarse-grained sandstone mixed with chipped flakes of chert and of fine-grained, toolstone-quality sandstone. Bifacial, edge-modified chert flakes were found to be an infrequent component of these deposits. The distribution of chert flakes was sparse and broad, subsuming multiple clusters of fire-affected rock. The chert appeared to have been worked using a hard-hammer technique. Another type of deposit is a relatively large (5–10 m-wide, 15–30 m-long) interdunal scatter made up almost entirely of small, what would appear to be pressure-flaked, late-stage, biface thinning flakes, all of chert and all of different colors of chert. No two flakes were typically found to be of the same material. The frequency of the flakes was roughly on the order of 12 pieces per square m. Presumably, the actual range of the archaeological deposits that represent the landscape is much broader. Clarification of this issue must necessarily await further research.

Staff does not believe that the prehistoric lithic scatters found on the proposed facility site bear a thematic association with the Pahrump Metapatch Landscape. The lithic scatters on the floor of the bolson and on the surface of the alluvial fans along the eastern margin of that floor appear to represent the incidental collection, assay, and initial reduction of toolstone-quality rock as people traversed the area on their way to other places. There is presently no demonstrable, necessary behavioral link between what appears to be the incidental acquisition of toolstone and the suite of resource use behaviors that most likely characterize human activity on this landscape. People may have acquired toolstone locally on the bolson floor or on the alluvial fans that they then

[23] An “interdunal lag” deposit is a deposit that is the result of the aerial erosion of a sand dune whereby the wind blows dune sand away leaving in its wake a heap or scatter of any materials larger than sand grains. Those materials “lag” behind the blown away dune sand.

[24] “Tufa” is a relatively porous deposit of $CaCO_3$ that slowly precipitates out of water in a number of surface and subsurface contexts.

later used to engage landscape resources, but there is presently no evident causal connection between the acquisition of those particular toolstones and the use of the landscape. Staff, consequently, does not consider the prehistoric lithic scatters on the proposed facility site to be contributing elements of the Pahrump Metapatch Landscape.

The Pahrump Metapatch Landscape is ultimately the result of a dynamic interaction among the natural elements of the landscape and the different Native American cultures that have evolved there. The tangible evidence of this interplay is the landscape characteristics that are part of its formal definition. Of the eleven landscape characteristics set out in National Register Bulletin 30 (NPS 1999:3–6), the landscape has the potential to possess six characteristics (land uses and activities, patterns of spatial organization, response to the natural environment, cultural traditions, vegetation related to land use, and archaeological sites). These characteristics would reflect and more precisely articulate the reciprocal manner in which the land has shaped local Native American cultures and, in turn, the manner in which successive and overlapping Native American cultures have shaped the land through time. There are a number of aspects of the landscape on which human action may have been more of a factor than is readily apparent. The shape of the individual mesquite patches within the landscape and their spatial distribution may, to some degree, be a function of cultural manipulation that reflects the ownership norms of the people who collected mesquite pods and may have tended the patches. The shapes of the individual trees may partially be the result of plant-tending techniques meant to maximize mesquite pod yield or facilitate easier harvesting. The information that would be necessary to develop meaningful discussions of these and other potential landscape characteristics is not presently available. Primary field research on the landscape would be necessary to acquire it. During the course of the consideration of the application for the proposed project, the applicant has repeatedly objected to engaging in this fieldwork.

Landscape Interpretation

The overarching behavioral theme that binds the Pahrump Metapatch Landscape into a discrete entity is the Native American use of the area to collect and process mesquite pods and other plant resources unique to this mesquite woodland-coppice dune association; to hunt the animal resources dependent on the association; and to access the scarce water resources that are coincident with it. The Native American use of this cultural landscape extends from the ancient point in time when the existence of the mesquite woodland and the presence of Native Americans first coincided, up through the early twentieth century. The landscape represents a local resource-rich zone in the midst of the relatively vast expanses of the resource-sparse Mojave Desert scrub and shadscale scrub associations that surround it. The landscape was undoubtedly of more than economic value to the native peoples who used it. As a desert floor area that yielded a disproportionately high amount of life-giving resources, the metapatch landscape can be surmised to have been deeply woven into the oral traditions, the mythology, the religion, and the ethno-geography of the peoples who once lived there.

The Pahrump Metapatch Landscape was one of a number of local, discontiguous resource zones that were, most likely, variable parts of the territorial configurations of different cultures here through time. The landscape was one resource island in a lateral and vertical resource archipelago scattered in a metaphorical sea of low resource-value vegetation associations. The Spring Mountains and Mount Charleston have offered and still offer, among other resources, pinyon nuts, agave, and water. The Pahrump Valley playa, perennially to seasonally, from the terminal Pleistocene through the Holocene epochs, has been a critical focus of a suite of lacustrine[25] resources. And the Nopah Range undoubtedly offers resources of value as well. The variable and most likely significant role that the metapatch landscape played in different prehistoric-through-early-historic aboriginal territories has not been well investigated to date.

CRHR Evaluation of the Landscape

There is presently not enough information on the Pahrump Metapatch Landscape to make a formal determination on the resource's eligibility for listing in the CRHR. However, there is enough information to provide a sound rationale for assuming the eligibility of the landscape as an archaeological district under CRHR Criteria 1 and 4 and for proceeding directly to the analysis of the potential project-related impacts to this historical resource under CEQA.

The Pahrump Metapatch Landscape is most likely worthy of listing in the CRHR under Criterion 1, for its association with events that have made a significant contribution to the broad patterns of the local aboriginal prehistory and history of Pahrump Valley, and under Criterion 4 for its potential to yield information important to our understanding of that prehistory and history. Although the visual quality of the landscape's setting, feeling, and association relative to Criterion 1 and the spatial quality of the landscape's location and design relative to Criterion 4 are not entirely pristine, the landscape, nonetheless, presently retains enough of its historic character and appearance (integrity) to be recognizable as a historical resource and to convey the reasons for and the sense of its significance.

The provisional boundary for the landscape is the boundary delineated for the Pahrump Metapatch in the *Conservation Management Strategy for Mesquite and Acacia Woodlands in Clark County, Nevada* (BLM 2006)(**Cultural Resources Figure 6**). This boundary is meaningful because it relates the resource to a discontiguous series of mesquite woodland populations that can be conceptually unified largely on the basis of their association with the near-surface water sources along the Pahrump-Stewart Valley fault system. This boundary is provisional and would require significant future refinement. The periods of significance for the bounded landscape would be those periods from the terminal Pleistocene through the Holocene epochs, when the landscape was a key component of local aboriginal culture. Whether there were distinguishable, discrete periods when this was not the case or the landscape has always functioned in this capacity has not yet been deciphered.

Historical Archaeological Resources

Site S-20

Site S-20 appears to be a sparse and relatively small historic refuse deposit to the west of the proposed Unit 2 power tower, adjacent to a dirt road. The deposit rests on the

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[25] Lacustrine**:** of, relating to, formed in, living in, or growing in lakes (Merriam-Webster On-Line Dictionary. 2012. http://www.merriam-webster.com/dictionary/lacustrine)

surface of non-Holocene, Quaternary-age sediments of Pahrump Valley basin fill (Qbf). The ground surface that supports the deposit is relatively level with a sparse lag deposit of pebbles overlying an apparent sheet of eolian sands. The boundary between the Mojave Desert scrub and the shadscale scrub vegetation associations on the facility site (HHSG 2011a:fig. 5.2-3) runs very close to site S-20. The applicant reports the presence of creosote (*Larrea tridentata*), *Lycium* spp., and unspecified native grasses. Surface visibility across the site is stated to be nearly 100 percent. The only noted information related to the historic land use of the site and surrounding area is their location on the Hidden Hills Ranch, which has been in operation as a cattle ranch since the 1920s.

The available information on the artifact assemblage for site S-20 and on the spatial distribution of the artifacts in the assemblage is spare. The only mention of the extent of the deposit or the distribution of the constituent artifacts within it is on the DPR 523C form for the site. The deposit apparently measures 10 m from north to south and 15 m from east to west. The description of the artifacts in the site assemblage are also somewhat vague. The deposit is reported to include one “solder dot can” or, presumably, matchstick filler can, five sanitary cans, three soft-top cans, and the embossed bases of three bottles which are undescribed. Without reference to artifact attribute data, the applicant states that the matchstick filler can dates to the 1950s and that the makers’ marks on the bottle bases date to the late 1960s.

On the basis of the available information, the artifact assemblage of site S-20 appears to represent one or several episodes of roadside refuse disposal. The facts that none of this material is of artistic value, nor provides information that would readily facilitate the association of it with significant events or persons, combine to indicate that the resource does not meet any of the CRHR criteria of historical significance. Staff therefore recommends that site S-20 is not eligible for listing in the CRHR.

Indeterminate Archaeological Resources

Site S-8

Site S-8 is a small rock cairn in the west-central portion of the Common Area. The archaeological feature is on the surface of distal, Holocene-age sediments of a dormant local alluvial fan (Unit Qa2). The vegetation on and around the site is documented as Mojave Desert scrub (HHSG 2011a:fig. 5.2-3). Surface visibility across the site is unreported, though presumably high.

The subject cairn is an isolated archaeological feature. It is small (56 x 84 cm) and made up of 26 cobbles and boulders set in what appears to be three courses. The rock types are unreported but appear, on the basis of the photograph on the DPR 523A form for the feature, to be largely of igneous origin. The rocks in the photograph exhibit different degrees of mechanical and physical weathering, and different degrees of $CaCO_3$ accretion on the weathered cortex of each rock. The applicant notes (CRTR 2011b:55; DPR 523A 2011) that the lowest course of the cairn is “set into,” or embedded in the surface of the ground. Archaeologists may cite the degree to which archaeological remains have become embedded in the surface on or in which they are found as a rough index of the antiquity of those remains. The implication here would be that the cairn may be of some antiquity and not a product of more recent historic activity. No cultural materials were found on, in, or adjacent to the cairn, the association with which might have indicated a more definitive age for the feature.

The rock cairn that is site S-8 appears to represent a single event where someone built this feature. On the basis of the available information, it is presently not feasible to determine when the feature was built or for what purpose. As the feature cannot be associated with significant events or persons, possesses no discernible artistic value, and has no information to offer that may be important to prehistory or history, despite its apparent physical integrity, it does not meet any of the CRHR criteria of historical significance. Staff therefore recommends that site S-8 is not eligible for listing in the CRHR.

Evaluations of Archaeological Resources on the Basis of Phase II Archaeological Research on the Facility Site

Of the six prehistoric archaeological sites where staff deemed surface observation alone to be an insufficient basis to develop formal recommendations of historical significance, the applicant, BLM staff, and staff ultimately agreed to conduct Phase II archaeological research on all or part of five of them (CA-INY-2492, S-4, S-6, S-10/11, and S-23). The excluded resource, site S-AF-1, an archaeological deposit in the 200 ft. buffer zone for the original intensive pedestrian cultural resources survey, is just north of the northernmost portion of the Common Area, on BLM land in Nevada. BLM staff was not in favor of conducting Phase II archaeological research on either it or the portion of another archaeological deposit, site S-10/11, which laps over the east-central boundary of the HHSEGS Common Area, and the California border, also onto BLM land in Nevada. BLM staff preferred to establish the historical significance of lithic scatters such as these through a more inductive evaluative process. Given that the deposits were on BLM land in Nevada, staff agreed to drop them from our request for Phase II archaeological research.

Phase II Facility Site Methods

The methodology of the applicant's Phase II archaeological research structures part of the applicant's effort to comply with the subdivision of the Energy Commission's siting regulations that relates to the assessment of the potential effects of the proposed project on historical resources and to the subsequent development of measures to mitigate any significant effects (Cal. Code Regs., tit. 20, § 1701 et seq., app. B, subd. (g)(2)(E)). To assess the potential effects of the proposed project on historical resources, one must implicitly determine which of the cultural resources found in the project area of analysis as a result of archival and field research meet the regulatory definition of a historical resource. When one cannot reasonably demonstrate that an archaeological deposit is almost entirely exposed on the present ground surface and also rests on a landform that is older than the commonly accepted date of the initial human occupation of North America (ca. 15,000 before the present), or when the material remains on the exposed surface of an archaeological deposit indicate more than a light and transitory use of that place in the past, archaeological excavation is necessary to identify and to assess the spatial integrity of the potentially significant data sets which any buried components of that deposit, if present, may possess.

The methodology of the applicant's Phase II archaeological research primarily involves the use of small excavation units and backhoe trenches to inventory the presence and density of any subsurface material culture on the five subject sites and to assess the integrity of the spatial associations among those remains (Lawson et al. 2012). The initial effort on each site for this phase of research involved an intensive re-survey of the site surface of each site within the boundary established during the original Class III, Phase I intensive pedestrian cultural resources survey. Surface artifacts were mapped with a Trimble GeoXH, 2005 Series GPS. Additional site documentation for the re-survey included photography and site-specific descriptions of geomorphic context. Each of the five sites, relatively sparse (1 artifact/2.5–344 m^2) surface scatters of chipped stone, or relatively sparse lithic scatters, was excavated with the use of small shovel test probes (STPs) approximately 35 cm in diameter. The STPs were excavated in 20 centimeter levels to a depth of one m, or until an impenetrable layer was encountered. Excavated STP sediments were screened through 1/8-inch hardware cloth. Artifacts found were analyzed in the field and cast back into their respective STPs along with the excavated sediments after the completion of each probe. STP locations were mapped and STP-specific forms document each excavation. STPs were placed on the largest of the five archaeological sites, S-10/11, relative to a 30 to 35 m grid that was set across the site. On the balance of the sites, STPs were more subjectively placed near apparent surface artifact concentrations.

The backhoe trenches that were ostensibly excavated as a part of the Phase II archaeological research are more appropriately given consideration as part of the research on the geoarchaeology of the facility site. Discussion of the trenches and the results of that field effort may be found in Geoarchaeological Field Investigation, above.

Phase II Facility Site Results

Phase II archaeological research on the portions of the five prehistoric archaeological sites agreed upon as a result of consultation among staff, BLM staff, and the applicant led to the excavation of a total of 23 STPs. Eight of the STPs for four sites were negative, and 10 of the 15 STPs for the fifth site, site S-10/11, were also negative. The five STPs on site S-10/11 in which artifacts were found yielded a total of nine whole or fragmentary stone flakes in the first 10 cm excavated below the ground surface. Notwithstanding the facts that the subsurface excavations on the California portion of site S-10/11 represent a maximum subsurface sample of 1.442-cubic m and those on the four other sites represent a maximum 0.192-cubic-m sample for each, the excavations do evidence one aspect of staff's efforts to establish a factual basis relative to which staff can develop reliable recommendations on the historical significance of the subject archaeological resources.

CA-INY-2492

Site CA-INY-2492 is a small, extremely sparse prehistoric lithic scatter in the northeastern portion of the proposed Unit 2 heliostat field. The site was originally recorded in 1979. It was relocated and the documentation for it updated during the intensive pedestrian cultural resources survey for the proposed project. The artifacts on the site are reported to have been found on the surface of distal, Holocene-age sediments of an active local alluvial fan (Unit Qa1). The ground surface that supports the scatter is level with a moderately dense lag deposit, primarily of pebbles with some cobbles present. The vegetation in the vicinity of the site is documented as Mojave Desert scrub (HHSG 2011a:fig. 5.2-3). The applicant reports the presence of creosote (*Larrea tridentata*), and *Lycium* spp. Rice grass (*Achnatherum hymenoides*) and Big Galleta grass (*Pleuraphis rigida*) are also noted on discontinuous sand sheets in nearby ephemeral stream channels. Surface visibility across the site is stated to be nearly 100 percent. The only noted information related to the historic land use of the site and surrounding area is their location on the Hidden Hills Ranch, which has been in operation as a cattle ranch since the 1920s.

The spatial distribution and the character of the surface artifact assemblage that appears to make up site CA-INY-2492 are presently unclear. The original USDA Forest Service Archaeological Site Survey Record for the site documents an approximately 10 x 20 m scatter of two chert or chalcedony cores and "numerous" flakes, none of which were thought to exhibit use-wear, that were interpreted to be the result of "cleaning and core reduction." The DPR 523C form for the site notes the dimensions of the deposit as being 55 m from north to south and 50 m from east to west. Any patterns that may exist with regard to the differential distribution of artifact or material types within the site area are unreported and poorly depicted. The sketch map on the DPR 523K form depicts the site, an assemblage of nine artifacts, as being approximately 45 m from north to south and 40 m from east to west with symbols that denote two flake concentrations, four individual flakes, and a trowel probe spread around that area. The uncertainty about the distribution of the artifacts across the site is not the only factor that complicates the interpretation of it. The descriptions of the character of the site artifact assemblage are inconsistent as well. The recent intensive pedestrian cultural resources survey found nine artifacts on the site, one core and eight flakes. The DPR 523A and C forms for the site state that the assemblage is made up of one brown chert core, one primary and one secondary yellow chert flake, two primary chert flakes of unreported color, and one primary and three secondary flakes of a "light brown igneous" material. The flakes range from approximately 3–5 cm in length. The interim Phase II report identifies one brown chert core that evidences flake detachment in multiple directions, a multidirectional core, two yellow chert flakes, and nine "rough grained reddish brown chert flakes" (Lawson et al. 2012:8).

Efforts were made during both the original intensive pedestrian cultural resources survey of CA-INY-2492 and the Phase II archaeological research on the site to identify and inventory any potential subsurface component that may be a part of that deposit. These efforts included the excavation of one trowel probe and two STPs. The small (10 cm in diameter, 10 cm in depth) trowel probe found no cultural material. The STPs were dug to depths of 74 and 85 cm, respectively, and the screening of probe sediments did not produce any artifacts. The probes were terminated at a tough layer of $CaCO_3$, or caliche. The texture of the sediments and the degree of sedimentary compaction were reported to be consistent throughout the profile of both probes, from the surface to the bottom. The sediment is reported to have been moderately compacted pinkish brown sandy silt with angular gravels.

Absent intrasite data on the spatial distribution of the surface artifacts that presently appear to make up site CA-INY-2492, the deposit can only be said to represent one to three episodes of the reduction of rock, ostensibly different kinds of chert, and the preparation of formal cores for the detachment of flakes for stone tool production, most likely expedient stone tools. The site assemblage appears to indicate an overall light and transitory use of the site area. The facts that the artifacts are not of artistic value and do not provide information that would readily facilitate the placement of the site activity in time or the association of it with significant events or persons, combine to indicate that the resource, despite its apparent physical integrity, does not meet any of the CRHR criteria of historical significance. Staff therefore recommends that site CA-INY-2492 is not eligible for listing in the CRHR.

Site S-4

Site S-4 is a small prehistoric lithic scatter in the east-central portion of the proposed Unit 2 heliostat field. The artifacts on the site are reported to have been found in relatively small (10 x 15 m) area on the surface of distal, Holocene-age sediments of a dormant local alluvial fan (Unit Qa2). The ground surface that supports the scatter is level with a spare lag deposit of pebbles and cobbles. The vegetation in the vicinity of the site is documented as Mojave Desert scrub (HHSG 2011a:fig. 5.2-3). The applicant reports the presence of creosote (*Larrea tridentata*), *Lycium* spp., unspecified native grasses, and unspecified invasive weeds. Surface visibility across the site is stated to be nearly 100 percent. The only noted information related to the historic land use of the site and surrounding area is their location on the Hidden Hills Ranch, which has been in operation as a cattle ranch since the 1920s.

The available information on the character of the surface artifact assemblage for site S-4 is partially contradictory. The assemblage is made up of 41 flakes, of which 35 are primary flakes, 2 are secondary flakes, 2 are tertiary flakes, and 2 which have unspecified attributes. The primary flakes range from approximately 4–8 cm in length, while the secondary and tertiary flakes are smaller and range from approximately 3–4 cm in length. There are gross contradictions as to the material types—the rocks of which the flakes are made. The DPR 523A form for the site refers to the flakes as being primarily of a “light brown igneous medium grained material” with one flake being of a “salmon colored chert material.” The igneous material was reported to be present as “large untouched cobbles” on the site as well. The DPR 523C form for the same site refers to the flakes as being primarily of a “very poor quality chert material.” One tertiary flake of jasper is also noted. The form states that the chert flakes have “a lot of cortex with inclusions” and that the chert has numerous vesicles. The applicant’s interim summary of the results of the Phase II archaeological research (interim Phase II report) reports that the flakes are “primarily a light brown to reddish brown rough grained silicified mudstone or siltstone” or a stone that resembles “freshwater limestone or siltstone” (Lawson et al. 2012:5–6). The flake of “salmon colored chert material” recurs.

The artifact distribution pattern across the site is at least fairly clear. The different sources agree that the site has one small (2 x 2 m), primary concentration of 33 flakes, which the interim Phase II report states as all being of a “yellow, silicified mudstone.” The eight other flakes from the site were found sparsely distributed across the balance of the site area.

The Phase II effort to identify and inventory any potential subsurface component of the site was the excavation of two STPs. The probes were dug to depths of 60 and 75 cm, respectively, and the screening of probe sediments did not produce any artifacts. Deeper excavation was precluded by the presence of what is reported to have been a tough layer of $CaC0_3$, or caliche. The initial 5 cm of the excavation is reported to have been unconsolidated, unspecified sediments with the balance of the subsurface sedimentary deposits being moderately compacted, pinkish brown sandy silt with angular gravels.

The surface artifact assemblage that presently appears to be site S-4 represents one primary and several other incidental episodes of the assay and initial reduction of rock available on the site, for use as toolstone. The one concentration of 33 flakes is the most unambiguous example of this. The contradictory information on lithic material types presently renders meritless any discussion of the implications that the artifacts may have for cultural behavior beyond this one site. The site assemblage indicates an overall light and transitory use of the site area. The facts that the artifacts are not of artistic value and do not provide information that would readily facilitate the placement of the site activity in time or the association of it with significant events or persons, combine to indicate that the resource, despite its apparent physical integrity, does not meet any of the CRHR criteria of historical significance. Staff therefore recommends that site S-4 is not eligible for listing in the CRHR.

Site S-6

Site S-6 is a moderately small, sparse prehistoric lithic scatter in the east-central portion of the proposed Unit 2 heliostat field. The artifacts on the site are reported to have been found on the surface of distal, Holocene-age sediments of a dormant local alluvial fan (Unit Qa2). The ground surface that supports the scatter is level with a lag deposit of pebbles and cobbles. The vegetation in the vicinity of the site is documented as Mojave Desert scrub (HHSG 2011a:fig. 5.2-3). The applicant reports the presence of creosote (*Larrea tridentata*), *Lycium* spp., and unspecified native grasses. Surface visibility across the site is stated to be nearly 100 percent. The only noted information related to the historic land use of the site and surrounding area is their location on the Hidden Hills Ranch, which has been in operation as a cattle ranch since the 1920s.

The spatial distribution and the character of the surface artifact assemblage that appears to make up site S-6 are presently unclear. The DPR 523C form for the site notes the dimensions of the deposit as being 25 m from north to south and 30 m from east to west. Any patterns that may exist with regard to the differential distribution of artifact or material types within the site area are unreported. The available descriptions of the composition and the character of the artifact assemblage are inconsistent. The DPR 523A form for the site at first details the assemblage as being eleven flakes, three cores, and a utilized flake. The form then proceeds to describe two cores, one of green chert and one of rhyolite, instead of three, and describes the utilized flake as being of basalt and having flaked edges, which would make the artifact an edge-modified flake, a formed tool, rather than simply a utilized flake. The form states that the flakes are of a poor quality, red rhyolite, a material which was observed to occur naturally on the site. The DPR 523C form for the site notes a light brown igneous core in addition to the others on the DPR 523A form, nine rhyolite flakes, and one orange and red chert flake fragment. The nine flakes are identified as three primary and five secondary flakes, and one tertiary flake. The interim Phase II report identifies nine flakes, one flake fragment, three cores, and a utilized flake (Lawson et al. 2012:6–7,). The cores are all interpreted to indicate the detachment of flakes from multiple directions. The two cores that are in addition to the green chert core are described in the interim report to be “rough grained, silicified mudstone.” The flakes are stated to be “mostly secondary flakes and all are a poor quality silicified freshwater limestone or mudstone,” cobbles of which occur naturally on the site and which makes up the bulk of the worked lithic material on the site. The interim report describes the utilized flake as being of “dark basalt” with slightly rounded and worn, perhaps sand-blasted, flake scar edges. The applicant interprets this piece to have been brought onto the site from elsewhere, because the material, the dark basalt, is one that the applicant had not “observed at other [archaeological] sites in the HHSEGS,” notwithstanding the fact that the interim report describes “exotic lithologies” as being common among the larger clasts or rocks of the Qa2 alluvial unit (Lawson et al. 2012: 5) on which S-6 rests. Those lithologies are reported to include a “variety of igneous rocks, from volcanic (basaltic andesite, vesicular basalt) to ignimbritic (tuffaceous breccias), to plutonic (granites).

The effort made during the original pedestrian survey on site S-6 to identify and during the Phase II field effort to identify and inventory any potential subsurface component of site S-6 included the excavation of one trowel probe and two STPs. The small (10 cm in diameter, 10 cm in depth) trowel probe was excavated in the northern portion of the site during the original pedestrian survey of the proposed facility site. No cultural material was found. The STPs were dug to depths of 20 and 60 cm, respectively, and the screening of probe sediments did not produce any artifacts. Deeper excavation was precluded by the presence of what is reported to have been a tough layer of $CaC0_3$, or caliche. The initial 5 cm of the excavation is reported to have been unconsolidated, unspecified sediments with the balance of the subsurface sedimentary deposits being a moderately compacted, pinkish brown sandy silt with angular gravels.

Absent intrasite data on the spatial distribution of the surface artifacts that presently appear to make up site S-6, the deposit can only be said to indicate the assay and initial reduction of marginal toolstone quality rock that appears to be found as cobbles as part of the natural sedimentary lag on the site. The purpose of reducing the rock appears to have been to fashion lithic cores from which flakes could be detached for stone tool production, most likely expedient stone tools. The green chert material from which the one core was fashioned and the orange and red chert of the flake fragment may or may not have come from the onsite lag deposit. The applicant was of the opinion that the dark basalt material of the apparent edge-modified flake was exotic to the site and, therefore, that people brought the artifact onto the site from elsewhere. The site assemblage does appear to indicate an overall light and transitory use of the site area. The facts that the artifacts are not of artistic value and do not provide information that would readily facilitate the placement of the site activity in time or the association of it with significant events or persons, combine to indicate that the resource, despite its apparent physical integrity, does not meet any of the CRHR criteria of historical significance. Staff therefore recommends that site S-6 is not eligible for listing in the CRHR.

Site S-10/11

Site S-10/11 is a relatively large, sparse prehistoric lithic scatter that straddles the northern part of the northeastern boundary of the Common Area and the California border. The site was documented as two distinct archaeological deposits during the original intensive pedestrian cultural resources survey (CRTR 2012b) and was subsequently lumped into a single site during Phase II archaeological research due, apparently, to the discovery of three buried artifacts between the formerly distinct sites (Lawson et al. 2012: 9). The artifacts on the site are reported to have been found on the distal and midslope surfaces of an alluvial fan of Holocene-age sediments. These sediments appear to be primarily a mixture of eroded deposits from the western Spring Mountains bajada, and from paleospring tufa and eolian sand deposits from the Pahrump Valley fault zone. This sediment mixture emanates from that zone as a coalescing sequence of relatively small and active alluvial fans (Unit Qa1). The surface of the particular alluvial fan that supports site S-10/11 slopes down toward the west and transitions from a less than five percent slope on the Nevada portion of the site to a slope of less than two percent on the California portion of it. Several small ephemeral stream channels that traverse the site incise the surface of this fan. Chert cobbles are a noted constituent of the streambed loads in these channels. The fan surface away from the ephemeral stream channels has a moderately dense lag deposit, primarily of pebbles and cobbles. A relatively thin sand sheet drapes the southern portion of the site. The vegetation in the vicinity of the site is documented as Mojave Desert scrub (HHSG 2011a:fig. 5.2-3). The applicant reports the presence of creosote (*Larrea tridentata*), *Lycium* spp., and unspecified native grasses. The sand sheet across the southern portion of the site supports Rice grass (*Achnatherum hymenoides*), and Big Galleta grass (*Pleuraphis rigida*). Surface visibility across the site is stated to be nearly 100 percent. The only noted information related to the historic land use of the site and surrounding area is their location on the Hidden Hills Ranch, which has been in operation as a cattle ranch since the 1920s.

The spatial distribution and the character of the surface artifact assemblage that appears to make up site S-10/11 are presently unclear. The DPR 523C form for site S-10, the larger of the two original sites, notes the dimensions of that deposit to be 80 m from north to south and 50 m from east to west. Any patterns that may exist with regard to the differential distribution of artifact or material types within the site area are unreported and coarsely depicted. The sketch map on the DPR 523K form depicts the same site as being approximately 210 m from northwest to southeast and 81 m from northeast to southwest. The DPR 523C form for site S-11, adjacent to the southwest-central portion of site S-10, similarly notes the dimensions of that deposit to be 10 m north to south and 15 m from east to west, and the DPR 523K sketch map for that site depicts it as approximately 28 m north to south and 44 m from east to west. Within whatever the actual dimensions of the site are, the site artifact assemblage appears to be distributed into three large artifact concentrations and seven smaller ones. The smallest of the three large concentrations is at the extreme northwestern end of the site surrounded to the southeast by four of the smaller concentrations. All five of these concentrations are within approximately 30 m of what the applicant identifies on the map as a source for toolstone, a chert source associated with one of the ephemeral stream channels that courses through the site. The balance of the large concentrations is found on the southeastern end of the site, and the balance of the smaller concentrations is found in the center of the site. The interim Phase II archaeological research report describes the large concentrations as having a variety of primary and secondary flakes and cores (Lawson et al. 2012:?). The smaller concentrations are reported to each have 10–20 flakes of various types, and 1–2 cores. The absence of intra-concentration descriptions of artifact assemblages and distributions constrains one’s ability to interpret the behavior that the concentrations and the broader site represent. The uncertainty about the distribution of the artifacts across the site is not the only factor that complicates one’s interpretation of it. The descriptions of the character of the site artifact assemblage are inconsistent as well. DPR 523 series forms document the observations of the original intensive pedestrian cultural resources survey on both site S-10 and S-11. The DPR 523A form for site S-10 notes the site to include 3 flake tools, 9 cores, and over 150 flakes, the majority of which are said to be of light brown chert. The DPR 523C form for that site states, alternately, that the assemblage is made up of 3 flake tools, 11 cores, 232 flakes, and 25 pieces of stone tool production shatter, all of which are noted to be of chert. The cores are relatively small and average approximately 7 cm in maximum dimension. The 232 flakes are reported to include 95 primary, 114 secondary, and 23 tertiary flakes. The primary and secondary flakes range in length from 2–7 cm, and the tertiary flakes range from 1–4 cm. The interim Phase II report describes the assemblage as including 3 flake tools, 1 core tool, 10 cores, and over 150 flakes, the majority of which are said to be of light brown chert. All of the cores are noted to indicate detachment of flakes in multiple directions, known as multidirectional cores. The observation was made that nodules of chert that appear to have eroded out of the Paleozoic carbonate rock of the Spring Mountains and become incorporated into the alluvial deposits of that range’s bajada have subsequently eroded out of those latter deposits and are now found as cobbles in the dry channels of the ephemeral streams that traverse the site.

The interim Phase II report also provides further detail on the stone tools that were found (Lawson et al. 2012:10). The three flake tools that were found all appear to be utilized flakes, expedient tools not subject to formal shaping subsequent to their detachment as simple flakes from a core. Although the descriptive detail that would more securely support the interpretation of the tools is not available, the applicant interprets two of the tools (L x W x T[26] of 37 x 35 x 10 and 74 x 65 x 18 mm, respectively) to have been subject to light use along one tool edge, presumably on the basis of sporadic unifacial chipping along that edge. The interim Phase II report describes the third flake tool (L x W x T of 38 x 30 x 10 mm) as having “heavy chipping damage along one edge.” This is presumably the same tool that the DPR 523C form for site S-10 describes as having “one good crushed edge.” The core tool, for which dimensions and a detailed description are unavailable, is stated in the interim Phase II report as being an exhausted, or completely used core with “heavy chipping damage along one edge.

Efforts were made during both the original intensive pedestrian cultural resources survey and the Phase II archaeological research on sites S-10 and S-11 to identify and inventory any potential subsurface components that may be a part of those deposits.

[26] L = length, W = width, and T = thickness

These efforts included the excavation of 3 trowel probes and 15 STPs. The small, shallow (10 cm in diameter, 10 cm in depth) trowel probes found no cultural material. The STPs were laid out 30–35 m apart across the California portion (~ 86 percent) of site S-10/11, relative to an arbitrary grid devised for that purpose. The probes were dug to depths of 24–100 cm. Probes were terminated prior to 100 cm of depth only when rock or dense $CaCO_3$ deposits, known as caliche, inhibited further excavation. The texture of the sediments and the degree of sedimentary compaction varied somewhat throughout the profiles of the probes. The majority of STPs were placed on portions of the site with a gravel lag where the surface was very dry and moderately compacted. The excavation of other STPs on portions of the site with loose surface sediments found the loose sediments to extend down only about 10 cm before more compacted sediments were encountered. The sediment is reported to have been moderately to well compacted pinkish brown silt with mostly small and angular gravel.

The screening of probe sediments produced artifacts in five of the probes. The applicant notes that all of the excavated artifacts came from the uppermost 10 cm of fill in probes that had been placed on surface deposits of loose silty sand. The interim Phase II report lists these artifacts as seven flakes and two flake fragments. No further description of the artifacts is available.

Absent higher resolution data on the intra-concentration spatial distribution and character of the surface artifacts that presently appear to make up site S-10/11, the deposit can be interpreted primarily as a lithic procurement site focused on a particularly productive local source of Paleozoic chert cobbles, ultimately derived from the Spring Mountains. The site artifacts indicate the presence of perhaps seven segregated reduction loci[27] (SRLs) and three larger areas that most likely represent recurrent reduction episodes that occurred over a relatively long period of time. The presence of a number of cores, the high percentages of the enumerated primary (41 percent) and secondary (49 percent) flakes relative to tertiary (10 percent) flakes that appear to indicate a behavioral emphasis on cobble assay and the preparation of flake cores, and the spare representation in the site artifact assemblage of other types or classes of artifacts all support the interpretation of a behavioral focus on the procurement of toolstone-quality chert and the preparation of cores for subsequent use in the production of stone tools. Given the extremely rare (< 2 percent) incidence of stone tools on the site relative to the enumerated artifacts, those that were found, the core tool and the three flake tools, may represent pursuits on the site secondary to lithic procurement, but more probably represent cases of incidental or accidental discard of these specimens. The site assemblage, as a whole, appears to indicate an overall light and transitory use of the site area. More precise documentation of the constituent artifacts of the larger and smaller lithic concentrations and the patterns of artifact distribution within those, and lithic refit analyses of the discrete SRLs and of any SRLs identified within the larger lithic concentrations have the potential to yield more useful information to reconstruct the behavioral patterns that the composite artifact assemblage of the site represents, but staff does not believe that that information would

[27] A segregated reduction locus is a concentration of stone artifacts that “contains wastes from individual knapping events, produced wherever one or a couple [of] suitable cobbles were decorticated and/or reduced into rough cores or tool preforms” (Giambastiani 2005).

ultimately prove to be significant. The facts that the artifacts are not of artistic value and do not provide information that would readily facilitate the placement of the site activity in time or the association of it with significant events or persons, combine to indicate that the resource, despite its apparent physical integrity, does not meet any of the CRHR criteria of historical significance. Staff therefore recommends that site S-10/11 is not eligible for listing in the CRHR.

Site S-23

Site S-23 is a small prehistoric lithic scatter in the southeastern portion of the proposed Unit 1 heliostat field. The artifacts on the site are reported to have been found on the surface of distal, Holocene-age sediments of an active local alluvial fan (Unit Qa1). The ground surface that supports the scatter is level with a relatively sparse lag deposit, primarily of pebbles with some cobbles present. The vegetation in the vicinity of the site is documented as Mojave Desert scrub (HHSG 2011a:fig. 5.2-3). The applicant reports the presence of creosote (*Larrea tridentata*), *Lycium* spp., and unspecified native grasses. Surface visibility across the site is stated to be nearly 100 percent. The only noted information related to the historic land use of the site and surrounding area is their location on the Hidden Hills Ranch, which has been in operation as a cattle ranch since the 1920s.

The spatial distribution and the character of the surface artifact assemblage that appears to make up site S-23 are presently unclear. The DPR 523C form for the site notes the dimensions of the deposit as being 10 m from north to south and 10 m from east to west. Any patterns that may exist with regard to the differential distribution of artifact or material types within the site area are unreported and poorly depicted. The sketch map on the DPR 523K form depicts the site as being 15 m from north to south and 10 m from east to west with symbols that denote a flake concentration, a flake, and a trowel probe clustered in the center of that area. The available descriptions of the character of the artifact assemblage are inconsistent. The DPR 523A and C forms for the site states that the four secondary and fifteen tertiary flakes that make up the entire artifact assemblage are, respectively of a “light brown medium grained igneous material” and a “light yellow to brown igneous material, likely a welded tuff.” The interim Phase II report identifies the flakes as being of a “light brown coarse grained silicified mudstone,” cobbles of which occur naturally on and near the site (Lawson et al. 2012:11). The material is described there as extremely poor quality toolstone.

The effort made during the original pedestrian survey on site S-23 to identify and during the Phase II field effort to identify and inventory any potential subsurface component of site S-23 included the excavation of one trowel probe and two STPs. The small (10 cm in diameter, 10 cm in depth) trowel probe found no cultural material. The STPs were placed in areas of the site where a gravel lag was apparent. The probes were dug to depths of 66 and 90 cm, respectively, and the screening of probe sediments did not produce any artifacts. Deeper excavation was precluded by the presence of what is reported to have been a layer of cobbles. The texture of the sediments and the degree of sedimentary compaction were consistent throughout the profile of each probe, from the surface to the bottom. The sediment is reported to have been moderately to well compacted light brown silt with a moderate density of small, angular gravel.

Absent intrasite data on the spatial distribution of the surface artifacts that presently appear to make up site S-23, the deposit can only be said to indicate the reduction of marginal toolstone quality rock that appears to be found as cobbles as part of the natural sedimentary lag on the site. The purpose of reducing the rock appears to have been to detach flakes for stone tool production, most likely expedient stone tools. The site assemblage appears to indicate an overall light and transitory use of the site area. The facts that the artifacts are not of artistic value and do not provide information that would readily facilitate the placement of the site activity in time or the association of it with significant events or persons, combine to indicate that the resource, despite its apparent physical integrity, does not meet any of the CRHR criteria of historical significance. Staff therefore recommends that site S-23 is not eligible for listing in the CRHR.

ASSESSMENT OF PROJECT IMPACTS TO CRHR-ELIGIBLE ARCHAEOLOGICAL RESOURCES AND RECOMMENDED MITIGATION

The construction of the proposed project would cause a substantial adverse change in the significance of the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape. The Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape (Pahrump Metapatch Landscape) is a constellation of what have been and, to a lesser degree, may still be passively and actively managed natural features and of material culture remains that staff, for the purpose of the present analysis, has assumed to be significant for the landscape's associative and information values. The landscape is most likely significant for its association with particular events and sequences of events that have made an important contribution to the broad patterns of the Native American prehistory and history of this portion of the eastern Mojave Desert (CRHR Criterion 1), and for the potential importance for the information that the landscape may be able to provide about the prehistory and history of Native American life in the region (CRHR Criterion 4). The construction and operation of the proposed facility site has the potential to indirectly cause physical damage to the landscape, which would degrade its value under Criterion 4, and would unquestionably degrade the landscape's value under Criterion 1 due to the stark visual intrusion the facility would have on it. The landscape must retain enough integrity of setting, feeling, and association to be able to convey its associative values if the proposed project is not to have a significant effect on it.

The *indirect* physical effect that the proposed project has the potential to cause on the Pahrump Metapatch Landscape is related to the magnitude of the project's potential drawdown on the local system of aquifers that underlie the proposed facility site in California and the adjacent landscape in Nevada. If the project's use of the local aquifer system were to result in an appreciable drop in the level of the water table, then previously documented local environmental stress would intensify on the mesquite woodland which is a fundamental component of the Pahrump Metapatch Landscape. The ultimate death of the woodland mesquite, which would be an indirect project effect, would compromise the integrity of the subject landscape under both CRHR Criteria 1 and 4. With respect to Criterion 1, the loss of the mesquite would compromise the landscape's setting, feeling, and association, aspects of the landscape's integrity that enable the resource to convey the associative values for which staff has, in part, recommended that it be assumed significant. The loss of the mesquite would also ultimately lead to the physical destabilization of the coppice dunes which the mesquite anchor. There are most likely archaeological deposits embedded in those dunes. The loss of the mesquite and the consequent deterioration of the mesquite roots which presently act to stabilize the dunes would make the dune sand available for eolian transport or pluvial erosion, and could therefore reasonably be anticipated to lead to the damage and destruction of some of the landscape's archaeological deposits. Any such damage or destruction would compromise the landscape's location, design , and association, aspects of the landscape's integrity that enable the resource to convey the information values under Criterion 4 for which staff has, in part, also recommended that the landscape be assumed significant. Staff believes that the implementation of **BIO-23**, **BIO-24**, **WATER SUPPLY-6**, and **WATER SUPPLY-8** would reduce the potential indirect physical effect of the proposed project to a less than significant level. Any remedy for noncompliance with any of the above recommended conditions of certification would need to additionally take into account and mitigate for the damage done to the Pahrump Metapatch Landscape as a whole and for the damage done to any of the landscape's contributing elements, which would include, among other contributors, the mesquite population itself and any archaeological components of the landscape.

The presence of the proposed facility's two heliostat fields and the two, approximately 750 foot-tall solar power towers would be a stark visual intrusion that would profoundly and irreparably degrade the ability of the landscape to convey its historical significance under CRHR Criterion 1. The mass of the looming towers in particular, in combination with the operational glare from the solar receiver steam generators atop each tower, would compromise the setting, feeling, and association aspects of the resource's integrity, aspects critical to the resource's ability to convey its associative values under Criterion 1. Subsequent to the construction of the facility, one would no longer be able to experience the sense of the landscape as it was during its period of significance. The baseline presence of the roads and residences of the Charleston View community along the southwestern side of the landscape and of Nevada State Route 160 through the northeastern side of it has contributed somewhat to the visual degradation of the landscape, in those limited areas. There are broad expanses from within the landscape, however, where that degradation is not readily apparent, where dunes, fault scarps, and stream banks shield the viewer from both the sight and the sound of Charleston View and the highway. The presence of the solar power towers would significantly intrude on those remaining broad landscape expanses. The towers would loom over the very landscape features that presently shield the viewer from the modern world. Staff therefore concludes that the construction of the proposed project, its indefinite period of operation, and the indefinite period of the presence of the facility's infrastructure on the land would result in a significant impact on the Pahrump Metapatch Landscape, a historical resource; and would require mitigation under CEQA.

The significant effect of the proposed project on the Pahrump Metapatch Landscape may not be wholly mitigable if the project is constructed as designed in the proposed location. Given the indefinite period of both the proposed project's operation, a minimum of at least 30 years, and the long-term physical presence of the proposed power towers on the land, the effect of the towers' presence on the landscape can, in essence, be considered permanent. Once the towers are present, the visual integrity of the landscape would be lost. Staff is unaware of any mitigation measures that would materially mitigate the loss of an entire landscape or a substantial portion of one. Staff believes that any suite of mitigation measures that could reasonably be argued to reduce the almost permanent loss of the entire landscape or a substantial portion of it to a less than significant level would have to provide compensation the benefits of which would provide returns to the public on a time scale that would be commensurate with the duration of the project's visual effects, and of a magnitude that would be commensurate with the magnitude of those effects. To substantively reduce the visual effects of the proposed project on the Pahrump Metapatch Landscape to a less than significant level, the applicant would need to provide for compensatory mitigation that attenuates the magnitude of the project's visual effects on the subject landscape over the entire span of time that the power towers are present there. As the applicant has been unable to date to acknowledge any effects of the proposed project beyond the boundary of the facility site or, consequently, to consider potential historical resources outside of that boundary, the applicant has provided no information or analysis on the subject landscape and has recommended no mitigation to reduce the proposed project's effects on it. Staff nonetheless concludes that the project's projected effects on the Pahrump Metapatch Landscape would be significant, and that, were mitigation measures to meet specific criteria, mitigation of these effects to a less than significant level would, in theory, be feasible. Mitigation that would meet such criteria has proven infeasible in this case (see Multi-resource Mitigation for the Degradation of Multiple Landscapes, below). Staff nonetheless does propose mitigation through two conditions of certification (**CUL-10**, and **CUL-11**) that while not reducing the project's effects to a less than significant level would ameliorate the loss of the Pahrump Metapatch Landscape's ability to convey its associative values.

Staff proposes mitigation measures through two conditions of certification (**CUL-10**, and **CUL-11**) that would, in part, compensate for the loss of the Pahrump Metapatch Landscape's ability to convey its associative values. Condition of Certification **CUL-10** provides for partial compensatory mitigation for the proposed project's visual effects to the Pahrump Metapatch Landscape by facilitating the delivery of a number of different programs through extant regional interpretive centers. These programs would encompass objectives to facilitate primary landscape research and the public interpretation of the landscape, and to preserve landscape archaeological assemblages, natural history collections, and the documentation related to primary research efforts. **CUL-10** would also function at a broader level as mitigation for the proposed project's direct visual effects to the Pahrump Paiute Home Landscape and the Ma' hav Landscape (see *Analysis of Impacts to Ethnographic Resources* subsection, below), and for both direct physical and visual effects to trail and road segments in the Old Spanish Trail-Mormon Road Northern Corridor (see *Analysis of Impacts to Historic-Period Built-Environment Resources* subsection, below) (see also the *Multi-Resource Mitigation for the Degradation of Four Historical Resources* subsection, below, for the complete discussion of the broader concept, the history of its development, and its proposed implementation.). **CUL-10** would emplace valuable programs dedicated to the interpretation and preservation of the significant aboriginal landscape that the proposed project, as well as other reasonably foreseeable renewable energy projects in Pahrump Valley, respectively, would and will permanently and irreparably cause to be lost as a result of profound direct visual degradation. From a broader perspective, the degradation of the subject landscape would represent the loss of a significant piece of the anthropological mosaic of human life on our planet. Though only partial and incomplete compensatory mitigation for this loss, staff believes that the implementation of **CUL-10**, in combination with **CUL-11**, while not reducing the project's effects to a less than significant level, would ameliorate the loss of the Pahrump Metapatch Landscape's ability to convey its associative values, because it would foster the generation and interpretation of, and preserve knowledge about the landscape, and provide archaeological materials related to human life on the landscape to a public who may largely have never been aware of its existence, or its significance, prior to the irreversible loss of the relatively pristine whole.

Staff's proposed Condition of Certification **CUL-11** would seek to develop a comprehensive picture of the Pahrump Metapatch Landscape's associative values and attempt to re-create or to engender at least some sense of the experience of the landscape through description and interpretation. This type of mitigation would parallel the treatments routinely given to significant built-environment resources, such as buildings and bridges (Historic American Building Survey and Historic American Engineering Record documentation, respectively) prior to demolition, and increasingly given to significant landscapes (Historic American Landscape Survey documentation), under federal historic preservation programs, where such resources are subject to profound visual degradation or physical destruction. This form of mitigation does not serve to directly avoid or minimize the significant direct visual effects that the proposed project would have on the Pahrump Metapatch Landscape, and, as a sole mitigation measure, would not reduce those effects to a less than significant level. It would however serve to partially compensate local Native American communities and the public for their respective losses, and, in combination with **CUL-10**, would further reduce those effects.

Staff finds the proposed mitigation appropriate here, because staff knows of no direct way to effectively counteract the visual degradation that the proposed project would inflict on the landscape. **CUL-11** seeks to compensate, in part, for the permanent loss of the public's ability to experience a significant aboriginal landscape through the reasonably thorough documentation of the landscape's diachronic[28] composition and character, and the subsequent dissemination of this information among the public, to the people who would suffer the loss. **CUL-11** proposes to gather this information through the design and execution of a thoughtful program of primary field research.

The proposed field research would develop two primary avenues of inquiry. One direction of inquiry would encompass research on the geomorphology and the paleoenvironment of the ancient mesquite woodland-coppice dune association, and on the springs and seeps across the proposed landscape. This information is critical to the establishment of the chronology of the use of this area and of the age of related archaeological sites, and to the determination of the relative importance that the landscape may have played in the broader ecological milieu of Pahrump Valley over the last several millennia. The applicant's May 13, 2012 response to Data Request 105

[28] "Diachronic" means of or concerned with phenomena as they change through time.

(Spaulding 2012b), a technical memorandum that provides an initial scope for a study of the physiographic and biological contexts of a portion of the subject vegetation association adjacent to the proposed facility site, would serve as a useful point of departure for the development of a more formal research design for such an inquiry.

A second line of inquiry would entail the investigation of the archaeology of the landscape and would seek to establish the range of variability, the density, and the patterns of distribution of the archaeological deposits that typify the landscape. The overarching purpose for gathering and interpreting information on the associative values of the Pahrump Metapatch Landscape is not to provide further support to staff's assumption of historical significance of the subject landscape. Once assumed significant by the lead agency, the resource is considered significant under CEQA and treated accordingly. The purpose would rather be to attempt to provide the public with a sense, however diminished, of the experience that they would have had if the HHSEGS project did not exist.

Staff believes that the implementation of **CUL-10**, and **CUL-11**, while not reducing the proposed project's effects to the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape to a less than significant level, would provide reasonable and feasible means to substantively reduce those effects. Staff therefore concludes that the project's effects to the subject landscape would stand as unmitigable were the application for the proposed project approved, and despite the implementation of **CUL-10**, and **CUL-11**.

Construction of the proposed facility has the potential to cause a substantial adverse change in the significance of buried archaeological resources across the eastern portion of the facility site on or in Holocene-age alluvial landforms Qa1 and Qa2 (see CH2 2012a, Figure DR101-1). Any construction excavation into these landforms has the potential to truncate or destroy archaeological resources buried beneath, but not evident from, the surface. The implementation of both **CUL-6**, a monitoring protocol for the landforms, and **CUL-7**, a discovery protocol, would reduce any potential significant effects that the inadvertent discovery of buried archaeological resources would cause to a less than significant level. The monitoring protocol of **CUL-6** provides for full-time archaeological monitoring of all construction-related ground disturbance on or in the Qa1 and Qa2 alluvial fans. Both a professional archaeologist and a member of a local Native American community would together conduct this monitoring. Upon the discovery of any buried archaeological resources, **CUL-7** sets out a discovery protocol that would provide for measured assessments of the age, integrity, and significance of cultural resource construction finds. The combination of both conditions of certification tailors the applicant's monitoring burden, on the basis of geoarchaeological research done in conjunction with the review of the AFC, down to only the portion of the proposed facility site that has a demonstrable potential to harbor buried archaeological resources, and provides a protocol for the treatment of any such resources upon their discovery.

The construction of the proposed project and the fulfillment of staff's recommended conditions of certification may cause effects to cultural resources which cannot be adequately analyzed prior to the approval of the application, because it may not be feasible to acquire information of sufficient detail. The reasons for the lack of access to key information vary. The proposed project would not be far enough along in design to be able to identify, with any degree of certainty, either whether project construction would require the use of offsite construction fill, or the one or several sources from which that fill would come. Construction also may require the use of an offsite disposal site for fill generated on the facility site. Whether and where the use of such a site may be necessary are presently unknown as well. Each of these types of project effects, both direct and indirect, have the potential to damage the physical and visual integrity of archaeological resources. Staff proposes **CUL-8** to take these types of effects into account.

In the event that the construction or operation of the California components of the project require the acquisition or disposal of sediments, soil, or gravel (construction fill) from any non-commercial borrow or disposal site, in California or elsewhere, **CUL-8** would require the applicant to develop an inventory of the cultural resources for the portions of any such site where physical damage or visual intrusion to such resources may occur, and to engage in consultation with staff on the resolution of any significant effects to historical resources. The construction fill would have to come from or be disposed of at non-commercial borrow sites where it would be feasible to mitigate any significant effects to historical resources to a less than significant level through the use of relatively routine mitigation measures. For example, archaeological resources found to be significant on the basis of their information value would need to be wholly mitigable through data recovery. Built environment resources found to be significant on the basis of their associative, or design and construction values would need to be similarly mitigable through a formal heritage documentation protocol equal or analogous to the Federal Historic American Buildings Survey (HABS), Historic American Engineering Record (HAER), or Historic American Landscapes Survey (HALS) programs. If historical resources on a proposed non-commercial borrow site were found not to be mitigable to a less than significant level, the use of that site would be precluded, for that purpose, because stakeholders would never have had an opportunity under CEQA to provide comment on the character of the proposed project's effects on such a resource, whether any significant effects to such a resource were mitigable, and, if so, what the range of appropriate mitigation measures might be. The implementation of **CUL-8**, by virtue of its design, would ensure that the applicant's use of a non-commercial borrow or disposal site would not result in an unmitigable impact to a historical resource.

ANALYSIS OF IMPACTS TO ETHNOGRAPHIC RESOURCES

Ethnographic Background

Ethnography fulfills a supporting role for other anthropological disciplines, while providing contributions on its own merits. It supports archaeology by providing a cultural and historic context for understanding the people who are associated with the material remains of the past. By understanding the cultural milieu in which archaeological sites and artifacts were manufactured, utilized, or cherished, this additional information can provide greater understanding for identification efforts, significance determinations per the National Historic Preservation Act (NHPA) or CEQA; eligibility determinations for the NRHR or CRHR; and for assessing if and how artifacts are subject to other cultural resources laws, such as the Native American Graves Protection and Repatriation Act.

In addition, ethnography's own merits include providing information on ethnographic resources that tend to encompass physical places, areas, or elements or attributes of a place or area. Ethnographic resources have overlap with and affinity to historic property types referred to as cultural landscapes, traditional cultural properties, sacred sites, and heritage resources.

General ethnographic backgrounds for the Western Shoshone and Southern Paiute were provided by the applicant in the AFC (HHSEGS 2011a, Section 5.3: 14-15). With this information as a starting point, staff conducted an ethnographic study to identify Native American concerns and as a basis for determining the significance of related resources and potential mitigation for impacts to those resources.

Nine distinct tribal governments were consulted regarding an ethnographic study for this project. Tribes were invited to participate based upon a list of affiliated tribes provided by the Native American Heritage Commission (NAHC). The nine invited tribal governments represent three different cultural affiliations. From west to east, these affiliations are: Owens Valley Paiute, Timbisha Shoshone, and Southern Paiute (consisting of the Pahrump Paiute, Las Vegas Paiute, and the Moapa Paiute. Of the nine tribal governments, the Pahrump Southern Paiute participated fully, the Moapa Southern Paiute and Timbisha Shoshone participated in supporting roles, and the remaining six tribes provided limited input due to their greater distances and relationships to the project area. **Cultural Resources Figure 1** is a map of the general locations and territories of the participating tribes. The map also includes a historic journey taken by a Pahrump Paiute leader, Chief Tecopa, and his son that, in part, helps to define Pahrump Paiute ancestral territory.

Southern Paiute

The "Southern Paiute" represents a population of people that traditionally reside in a large swath of land that has, as its general boundaries, the Black Mountains to the east, the eastern Mojave Desert to the west, the Colorado River and the Grand Canyon to the south, and the southeastern plateaus of the Rocky Mountains to the east. The northern boundary takes in the southern third of present day Utah and the lower quarter of present day Nevada. The Pahrump and Moapa Tribes are the Southern Paiute residing in the western extent of Southern Paiute territory. The Chemehuevi people to the immediate south of Pahrump and living along the lower Colorado River are also Southern Paiute and share many cultural traits with those Southern Paiute to the north and east. Chemehuevi did not participate in this ethnographic study because they were not listed by the NAHC and therefore were not invited to participate. In addition, the more eastern Southern Paiute Tribes, located in Utah and Northern Arizona, were not invited to participate although they recognize the Spring Mountains as their common place of origin and participate in some of the ceremonial practices in common with the Moapa and Pahrump Southern Paiute.

A written record of Paiute tribes in 1873 was the result of a federal commission. In the fall of 1873, Major John Wesley Powell and G. W. Ingalls were commissioned by the U.S. Department of the Interior to determine the extent of Paiute Indians (Numic) dwelling throughout the Great Basin who had not yet been moved to reservations (Fowler 1971:97–120). In all, the two commissioners documented 83 separate tribes.

Powell made one trip as far as Las Vegas, where he collected information on the Paiutes of that area. Powell documented a “Chief of Alliance”, named To-ko’-pur (Chief Tecopa), who represented one tribe, as well as the alliance of seven additional tribes (**Cultural Resources Table 8)**. Each of the additional tribes had “Chiefs.” The following table provides Powell’s grouping of seven tribes into one alliance. Powell suggested that all Southern Paiute of southeastern California, southern Nevada, northwestern Arizona and southern Utah be relocated to the Moapa Reservation (Fowler 1971:116).

CULTURAL RESOURCES Table 8
Seven Tribes Allied Under Chief Tecopa

TRIBE	LOCALITY	CHIEF
No-gwats	Vicinity of Potosi	To-ko’-pur
Pa-room’-pats	Pa-room Springs	Ho-wi’-a-gunt
Mo-quats	Kingston Mountains	Hu-nu’-na-wa
Ho-kwaits	Vicinity of Ivanspaw	Ko-tsi’-an
Tim-pa-shau’-wa-go-tsis	Providence Mountains	Wa-gu’-up
Kau-yai’-chits	Ash Meadows	Nu-a’-rung
Ya’-gats	Armagoza	Ni-a-pa’-ga-rats

Powell’s 1873 Las Vegas journey report counted a total of 240 individual Southern Paiute within the alliance lead by Chief Tecopa (Fowler 1971:104–105). Powell provides further clarification by stating that a number of Indians who acknowledge a common authority and encamp together is a “Tribe”. Powell also adds that any collection of “tribes” that acknowledge allegiance to a head chief would be designated as a “nation” (Fowler 1971:50). Hence, all of the seven tribes with allegiance to Chief Tecopa were considered a nation.

Today, the terminology has changed, with the alliance or nation, now called a “tribe” and each of the contributing localities referred to as “districts.” The entire alliance is now referred to as the Pahrump Tribe. The nomenclature was partly confused when anthropologist Isabel Kelly chose to combine the above Tecopa alliance with four other localities, (Las Vegas, Colville, Indian Spring, and Cottonwood Island) and then chose to call the entire group the “Las Vegas Tribe.” Some ethnographers have then come to falsely associate the currently recognized Las Vegas Tribe with this larger conglomerate or to consider Pahrump Paiute as Las Vegas Paiute.

That the Pahrump and Las Vegas Southern Paiute are two distinct groups is further confirmed by a document produced by the Inter-Tribal Council of Nevada:

> Centered around Las Vegas, Red Rock, and Mt. Charleston were the Pegesits who lived as far east as present-day Hoover Dam. On the western edge of Nevada were the Pahrumpits. They lived in Pahrump Valley and on the western slopes of the Spring Mountains (Inter-tribal 1976:11).

Pahrump Paiute Tribe

The Pahrump Paiute Tribe, located in Pahrump, Nevada, is not a federally recognized tribe, but is recognized as an established tribal entity by the State of California and is informally recognized by federal land management agencies that operate within the Tribe's traditional territory. Over the years, Pahrump Paiute individuals have been intermittently recognized by the federal government. The Tribe currently consists of approximately 100 tribal members. The membership generally resides in the nearby Las Vegas, Pahrump, Charleston View, and Tecopa/Shoshone areas, although some tribal members live a considerable distance beyond the tribal territory. The tribe is led by a chairperson and is based in Pahrump, Nevada. While the Pahrump Paiute Tribe has no reservation, they do assert an ancestral territory. They are the primary tribe affiliated with the area in which the project is proposed. The tribe's primary foci are maintaining their unique cultural identity, protecting important cultural resources that are in harm's way of various federal, state and local projects, and attaining federal recognition. The tribe's cultural expertise resides within its membership.

Moapa Paiute Tribe

The Moapa Band of Paiute Indians, located in Moapa, Nevada, is a federally recognized tribe. It currently consists of approximately 300 members. Some tribal members are closely related to Pahrump tribal members or are from the Pahrump Valley and continue to bury some of the Moapa members that are related to the Pahrump Valley in the Chief Tecopa Cemetery (formerly known as the Pahrump Indian Cemetery). The tribe occupies a 71,954-acre reservation near Moapa, Nevada. A reservation of 2 million acres was originally established in 1874; however, two years later, the reservation was reduced to 1,000 acres. In the 1980s, the reservation was expanded by an additional 70,000 acres. The reservation is located along the lower flood plains of the Muddy River. The tribe governs per a constitution that was adopted in 1942. An elected tribal council presides over several tribal businesses (travel center, fireworks store, and a tribal farm) and various tribal departments and committees, including a cultural committee. The tribe has been impacted by surrounding development, such as the nearby coal-fired Reid Gardner Power Station. Tribal elders and cultural staff also assert that decades of bomb testing at Nellis Air Force Range immediately to the west and northwest of the reservation have contaminated their reservation and ancestral lands (Kinlichine 2012; http://www.moapapaiutes.com/about_us.htm).

Las Vegas Paiute Tribe

The Las Vegas Tribe of Paiute Indians of the Las Vegas Indian Colony is a federally recognized tribe. It consists of approximately 71 members who occupy a 3,800-acre reservation generally referred to as "Snow Mountain" and located several miles north of Las Vegas. Pahrump Paiute and Las Vegas Paiute are closely related to one another and to some of the Moapa Tribe membership. Isabel Kelly identified both Pahrump and Las Vegas under the Las Vegas Paiute Tribe; however, both tribes have continuously maintained their distinct identities and function independently. The Las Vegas Tribe's original reservation was a 10-acre plot of land located in downtown Las Vegas and deeded to the tribe in 1911 by a private ranch owner. The 10-acre plot is still part of the reservation. The tribe has a constitution adopted in 1970 and is governed by a tribal council. The tribe has several businesses, including an extensive golf resort, gas station, and two smoke shops. Recent issues that involve the tribe's concern are on-going desecration of tribal cultural sites, including graffiti of sacred sites in the Red Rock area, a popular tourist destination for visitors to Las Vegas. The Tribal staff cultural resources expertise resides within the Tribal Environmental Protection Office ((http://lvpaiutetribe.com; http://en.wikipedia.org/wiki/Las_Vegas_Tribe_of_Paiute_Indians_of_the_Las_Vegas_Indian_Colony).

Shoshone

The Shoshone people reside in a swath of land immediately north of, the Southern Paiute territory. Their western-most boundaries are in the Coso Mountains and on the eastern slope of the Inyo Mountains in California. The eastern end of their territories is in the areas of northwestern Utah and southern Idaho. The Shoshone in the western side of this swath of land are referred to as Western Shoshone.

Timbisha Shoshone Tribe

The Timbisha Shoshone Tribe, California, is a federally recognized tribe. It currently has approximately 306 tribal members and occupies a 7,914-acre reservation, comprised of several parcels in and around Death Valley National Park, including a 314-acre parcel near Furnace Creek, California. Some reservation parcels are located in Nevada, near Lida, Scotty's Junction, and Death Valley Junction. The Tribe also has several areas that are co-managed with the NPS or the BLM. The Tribe's main office is in Bishop, California. The Tribe was originally represented in the 1863 treaty of Ruby Valley. However, that treaty did not result in any specific representation for the Timbisha Shoshone, who fought for and eventually achieved federal recognition in 1983. However, the Tribe did not receive a land base until 2000 with the passage of the Timbisha Homeland Act. The Tribe holds general elections; it is led by a chairperson and holds monthly meetings. The Tribe's cultural resources programs are managed by a Tribal Historic Preservation Office (THPO). The Timbisha's ancestral territory abuts the Pahrump Paiute Tribe's ancestral territory in the vicinity of Ash Meadows, Eagle Mountain, and the Black Mountains. (Field Directory, 2004:156; http://www.timbisha.org/index.htm; Durham 2012).

Owens Valley Paiute

The Owens Valley Paiute are a distinct group of Paiute that reside in the Owens Valley and have the Owens Valley as an ancestral territory, including the valley's defining flanks, the eastern flanks of the Sierra Nevada, and the western flanks of the Inyo and White Mountains. The Mono Lake area provides the northern boundary of their territory. The Owens Valley Paiute are represented by five separate tribes. All of the tribes are members of the Owens Valley Indian Water Commission. Of the five tribes, two (Lone Pine and Big Pine) have some tribal members with cultural affiliation to the Timbisha Shoshone and Pahrump Paiute people that historically co-existed in the Ash Meadows area.

Lone Pine Paiute Shoshone Tribe

The Lone Pine Paiute Tribe of Lone Pine, California, is a federally recognized tribe. It currently has approximately 425 tribal members and occupies a 237-acre reservation near Lone Pine, California. The Tribe is governed by a general council and holds monthly meetings. Some Lone Pine Paiute Tribal members are of Timbisha Shoshone descent. Cultural resources affairs are provided by the tribal Environmental Protection Program. (Field Directory 2004:111; http://lppsr.org/).

Fort Independence Paiute Tribe

The Fort Independence Paiute Tribe is a federally recognized tribe. It consists of approximately 136 tribal members and occupies a 580-acre reservation near Independence, California. The Tribe has recently attained National Historic Preservation Act, Section 101(d)2 tribal historic preservation status. (Field Directory 2004: 94, http://www.fortindependence.com/native.aspx)

Big Pine Paiute Tribe

The Big Pine Paiute Tribe of the Owens Valley is a federally recognized tribe. It consists of approximately 403 tribal members and occupies a 279-acre reservation near Big Pine, California. The Tribe has a constitution and is governed by a Tribal Council and a General Council. The Tribal Council holds monthly meetings; the General Council meets quarterly. At least one Big Pine Paiute Tribe family shares a tribal affiliation with the Pahrump Paiute. The Big Pine Tribe's cultural resources program is maintained through a THPO (Field Directory, 2004:66; http://www.bigpinepaiute.org; Jim 2012).

Bishop Paiute Tribe

The Paiute-Shoshone Indians of the Bishop Community is a federally recognized tribe. It consists of approximately 1,040 tribal members and occupies an 875-acre reservation near Bishop, California. The tribe meets bi-monthly and is governed by the Bishop Indian Tribal Council. The Paiute-Shoshone Indians of the Bishop Community share a tribal affiliation with the Paiute-Shoshone. The Bishop Tribe's cultural resources program is maintained through a THPO. (Field Directory, 2004:69; http://www.bishoppaiutetribe.com/).

Utu Utu Gwaitu Paiute Tribe

The Utu Utu Gwaitu Paiute Tribe (formerly the Benton Paiute Tribe) is a federally recognized tribe. It consists of approximately 138 tribal members and occupies a 162-acre reservation near Benton, California. The tribe has a constitution and is governed by the Utu Utu Tribal council. The Tribal Council holds monthly meetings; the General Council meets annually. The Utu Utu Gwaitu Paiute shares a tribal affiliation with the Paiute. (Field Directory, 2004:63).

Evaluation of Ethnographic Resources: Three Ethnographic Landscapes

The National Park Service Brief 36 (NPS 2000a) provides the following definition of a cultural landscape and lists four types. A cultural landscape is:

> …a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein), associated with a historic event, activity, or person exhibiting other cultural or aesthetic values. There are four general types of cultural landscapes, not mutually exclusive: historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes.
>
> An ethnographic landscape is defined as "a landscape containing a variety of natural and cultural resources that associated people define as heritage resources. Examples are contemporary settlements, religious sacred sites, and massive geological structures. Small plant communities, animals, subsistence and ceremonial grounds are often components." Examples include a section of a river where a Native American culture lives, travels, and fishes; or an upland mountain area where tribal people hunt, gather, camp and travel extensively during part of the year.

Ethnographic landscapes are understood and documented by conducting ethnographic research that identifies the contributing elements or attributes of the landscape. Contributing elements can include both cultural and biological resources, climate and landforms, subsistence, religion, economy, and the built environment. Surrounding the HHSEGS project site, staff has identified three ethnographic landscapes, discussed below.

Southern Paiute Salt Song Landscape
This landscape is eligible for the CRHR under Criterion 1 at the regional level for its broad contributions to the unique historic events that shape Southern Paiute understanding of the landscape, its mapping through song and movement, and the conveyance of the deep oral tradition through the generations for the unborn, living, and deceased.

This landscape is also eligible for the CRHR under Criterion 3 at the regional level for its contributions to the production and retention of the salt songs, whose high artistic value would have been degraded without the landscape—songs sung during a ceremony that moves a group of living people and the deceased through a landscape are most aesthetic and culturally appropriate sung <u>in</u> the landscape, in contrast to being sung for a studio recording or transcribed into musical notation and then heard, read, or duplicated by others.

Pahrump Paiute Home Landscape
This landscape is eligible for the CRHR under Criterion 1 at the regional level for the broad contributions to the unique historic events that shape Pahrump understanding of their homeland and their ongoing traditions and history that have allowed them to survive, and, during particular periods of their existence, flourish in a place that many non-Pahrump would consider harsh, inhospitable, or vastly in need of improvements.

This landscape is also eligible for the CRHR under Criterion 2 at the regional level for its association with the life and times of Chief Tecopa, the first Pahrump Paiute chief who sustained, advocated for, and guided his people through the pressures of a rapidly changing world brought on by the intrusions of other cultures. The transformational role and exemplary association of this leader with his homeland and his people endures into modern times, passing from generation to generation into the present.

Ma-hav Landscape

This landscape is eligible for the CRHR under Criterion 1 at the local level for its broad contributions to the unique historic events of the Pahrump Paiute Home Landscape. in that it provides a unique marginal, or fringe, cultural milieu that spanned the interaction of the first contacts between Pahrump Paiute and non-Pahrump Paiute foreigners, such as the Mexican traders; American explorers, trappers, and traders; the American and Mormon miners and homesteaders; and later American ranchers and businessmen who came to call the Pahrump Valley either a wayside curiosity or their new home (see **Cultural Resources Table 9**, below).

This landscape is also eligible for the CRHR under Criterion 4 at the local level of significance for its potential to yield ethnographic information important to the prehistory and history of the Ma-hav area and also for its potential to specifically yield prehistoric archaeological information from archaeological remains known to exist or potentially exist in the Ma-hav Landscape.

The Ma-hav Landscape contains burials and at least one known cemetery. Normally, cemeteries are not eligible for the NRHP. However, the burials and cemetery are considered as contributing features of the Ma-hav landscape and lend a sense of longevity to the landscape. Rather than render the landscape ineligible, this actually increases the qualifications for eligibility.

The Pahrump Paiute feel that their lifeways have been trodden upon, stolen, lost, forgotten, rejected, belittled, infringed upon, and otherwise dismissed. In the face of this treatment, Pahrump Paiute continue to practice as much of their traditional ways as is possible within the dominant society. They feel like it is still within their reach to maintain their cultural identities and ensuing obligations as traditional Pahrump Paiute while participating in the dominant society. The Pahrump Paiute see federal recognition and a tribal land base, including at a minimum, greater tribal involvement in land management planning processes, as critical steps to ensure their tribal longevity.

Integrity

Southern Paiute Salt Song Landscape

The Southern Paiute Salt Song Landscape has been visually and physically compromised by significant modern developments, such as the presence of numerous large cities, towns, military installations, energy generating facilities, mining infrastructure, and other infrastructure, such as transportation and transmission corridors. In addition, auditory and olfactory characteristics and nightscapes have been compromised. The Spring Mountains are surrounded on several sides with incompatible intrusions to traditional religious and cultural practices. To the east/southeast lies the sprawling Las Vegas metropolis. To the north lies Nellis Air Force Base and Nevada Test Site. And to the east/northeast lies the town of Pahrump. Across and through this terrain are several major highway corridors and transmission lines. However, in one major area, lying to the south/southeast where the proposed project and its alternative site are proposed, the landscape is remarkably and relatively unmarred.

In addition, Southern Paiute traditional singers have an obligation to continue the singing tradition lest they void their obligations to the deceased and ultimately to themselves, their descendents yet to be born, and their very identity and continuance as a people. No amount of landscape alteration can prevent them from continuing this tradition. However, increased infrastructural intrusions increase the burden and challenges to traditional practitioners to continue traditions vital to their community and related heritage. They consider their landscape to remain aesthetically pleasing despite intrusions due to the beauty, balance, and sustenance by which they are provided a unique identity, handed down through generations and originally provided to them in a pact with their creator.

The Southern Paiute Salt Song Landscape maintains integrity of association, feeling, setting (from the perspective of the traditional practitioners), and location.

Pahrump Paiute Home Landscape

The Pahrump Paiute Home landscape has been compromised by the same modern developments, such as the sprawling town of Pahrump. Water used for agriculture has significantly lowered the water table, resulting in declines of associated plant communities and related animal habitat and population viability. Private property rights have restricted access to important hunting and gathering grounds. The tribe does not have a land base that would preserve intact their cultural traditions, except for which they would otherwise be able to take their cultural destiny into their own hands. However, sufficient land is in federal ownership, such as the U.S. Forest Service lands in the Spring Mountains, the U.S. Fish and Wildlife Ash Meadows Wildlife Area, and designated BLM wilderness areas in the Nopah and Kingston Mountain Ranges, as well as BLM front-country lands that encircle the Pahrump Valley, that allow the Pahrump Paiute some continued access to traditional hunting and gathering grounds. Because this landscape is intricately tied to Pahrump Paiute identity as a distinct people, no amount of environmental alteration of their lands would deter them from protecting and maintaining their landscape the best that they can. Indeed, one main reason for Pahrump Paiute application for federal recognition is to attain greater leverage in protecting what is their perceived birthright to exist in their homelands, including standing in issues related to the Native American Graves Protection and Repatriation Act.

The Pahrump Paiute Home Landscape maintains integrity of association, feeling, setting (from the perspective of the Pahrump Paiute), and location.

Ma-hav Landscape

The Ma-hav landscape has been primarily compromised by the establishment and workings of the Hidden Hills Ranch and perhaps, marginally, by the operations of the Front Site Gun Range located in the northeast portion of the landscape. However, these historic and recent alterations are minimal compared to other component landscapes that contribute to the Pahrump Paiute Home Landscape. Areas of the Ma-hav landscape are in BLM ownership and subject to federal management. One specific area

(Stump Springs) is protected as an Area of Critical Environmental Concern (ACEC) for its association with Pahrump Paiute cultural values. The Pahrump Paiute People affiliated with the Ma-hav landscape live as close to the landscape as is possible, given that the land is in private ownership by non-Pahrump Paiute people. The Ma-hav Landscape maintains integrity of association, feeling, setting (from the perspective of the Pahrump Paiute), and location.

Periods of Significance

Southern Paiute Salt Song Landscape
The period of significance for the Southern Paiute Salt Song Landscape spans from the time of primordial instruction, just after the great flood and Coyote's creation of the Southern Paiute, up to the present.

Pahrump Paiute Home Landscape
The period of significance for the Pahrump Paiute Home Landscape spans from the time of Coyote's creation of Southern Paiute up to the present. From an archaeological perspective, the earliest dates would liberally be sometime between 10,000 years B.C. and the ethnographic present. A conservative archaeological perspective would be from 600 years ago to the ethnographic present. A historically documented time period of significance would be from the time of Chief Tecopa's leadership (circa 1840s) to the present. It can be assumed that Chief Tecopa inherited his leadership from one of his male relatives, but the historical record does not provide sufficient information regarding Chief Tecopa's preceding lineage to support an earlier documentable date for this landscape. Upon Chief Tecopa's death, his leadership was passed on to his son, Tecopa Johnny.

Ma-hav Landscape
The period of significance for the Ma-hav Landscape is provided in the following timetable.

Cultural Resources Table 9
Ma-hav Landscape Chronology

Time	Specific Places, People, and Events
Beginning of Time	The area is flooded. Primordial animals abide on Mount Charleston to wait out the residing waters. Coyote releases first humans from a basket.
Time of Animal Instruction to First Humans	Coyote provides instruction to his adopted daughter concerning menses, childbirth, and becoming a woman at Ma-hav.
Period of Pahrump Paiute occupation	Pahrump Paiute occupy the Springs area as a part of a permanent or seasonal encampment and horticultural place.

Time	Specific Places, People, and Events
1776–1830	Pahrump Paiute hear of Spanish, Mexican, and early American traders (Escalante, Garcés, Armijo, Jedidiah Smith, Peg-Leg Smith) who travel, trade, and raid along some of the Paiute trade routes closer to the Colorado River.
1815	Chief Tecopa born at Manse Spring. He will become a leader of various tribes or “districts” that today collectively identify as the Pahrump Paiute.
1829–1848	Mexican traders move goods between New Mexico and California and engage in the Indian slave trade. Some travel the old Spanish Trail between Resting Springs and Mountain Springs.
1840s–1890?	John “Stomper” Pete, a Southern Paiute Medicine Man, occupies Stump Springs. There is also anecdotal information of a Southern Paiute family with the last name of Stump that occupied the Stump Springs in subsequent years.
1844	John C. Fremont travels between Resting Springs and Mountain Springs and overnights at or near Stump Springs. Fremont retaliates upon possible Pahrump Paiute for the killing of most of the Hernandez Party.
1849 –1875	Many emigrants, including gold miners, Mormons, and military personnel, travel through Stump and other nearby springs, en route to Utah or California. Early homesteaders begin to settle the various valleys by establishing homesteads on or near springs, including springs in Pahrump Valley.
1849–1930s	Several diseases are introduced to the Pahrump Paiutes as well as other Native American populations. Many young and old die. Alcohol is introduced to the Pahrump Paiute causing social disarray. There is a time of famine. This happens throughout the Pahrump Valley, including Ma-hav.
1860s	Miners pass through the area to begin harvesting timber in the Spring Mountains, to be used for the development of mining infrastructure. The first reported mill is established in the Spring Mountains in 1875 by the Brown brothers.

Time	Specific Places, People, and Events
1860–72	Charlie, a Pahrump Paiute man and the Tribal War Chief, establishes one of the first Indian Ranches in Pahrump Valley, the Ma-hanse (now named Manse Ranch). He is sometimes referred to as “Mormon Charlie” or “Ash Meadows Charlie.” Chief Tecopa also establishes a ranch at Bolling Mound Spring. John B. Yount is born in Oregon. Charlie is involved in the 1865 assault and robbery of gold prospector Charles Breyfogle at Stump Springs.
1872	Wagon roads connect Stump Springs, Mountain Springs, Charlie’s Ranch, and other Pahrump Valley Springs. One road runs through the Hidden Hills area. Other ranches become established by Indians and whites at some of the larger springs such as Ash Meadows, Pahrump, and Manse.
1873	Chief Tecopa is encouraged by the U.S. government to make his circular journey to convince his and neighboring tribes to move to the newly established Moapa Reservation. The Paiute and Shoshone from the Armagosa River refuse to go. Many Pahrump Paiute are enticed or force-marched to Moapa reservation. Some hid and remained; others escape and return.
1874–1915	Lee brothers move to area, and Phi Lee buys the Resting Spring Ranch. Phi marries Sally “Mopats,” a Paiute woman and has several children, including Dora, Robert, Robert “Bob,” Dick, Clara, Gus, Bert, and Cub. Phi and Sally have a seasonal camp at Ma-hav. “Bob” Lee resides at an area of Hidden Hills near Weeping Rock Springs and raises his son Robert (1910?). Cub Lee homesteads in Mesquite (Sandy) Valley. Bob Lee is at Hidden Hills as a small boy and sees two Indian-constructed fireplaces at Hidden Hills.
1877	Joseph Yount purchases Manse Ranch from the Jordan brothers.
1880	Queho is born.
1900?	Albert Howell, Pahrump Paiute and later informant to anthropologist Julian Steward, lives with his Pahrump Paiute wife Mary at Ma-hav where they maintain a small farm. The Howells have a daughter-in-law named Anna Tecopa. John Howell, the first black to live in the area, is a freed slave from North Carolina. John works in the mines and marries a Southern Paiute from Las Vegas. They have a son, Albert.

Time	Specific Places, People, and Events
1904	Chief Tecopa dies; the Chief's son, Tecopa Johnny, inherits his father's leadership role.
1905	Chief Tecopa's Cry ceremony held at either the Pahrump cemetery or Ma-hav or at both places.
1910s?	Dora Lee marries Gallant Brown, and they live at Ma-hav near Dora's brother, Bob Lee's place. Dora and Gallant have several children, Steve, Earnest, William, and Gallant Jr., who are raised in the Ma-hav area.
1900–1920	Many more ranchers and farmers move into the Pahrump Valley and begin to develop large crop lands, which require greater amounts of water. Many Pahrump Paiute provide the labor required for the flourishing ranches of the Valley, including Chief Tecopa's son Charlie, who is killed in 1911 by another ranch hand, Joe Lake, while both are working for the Manse Ranch. Pahrump Paiutes claim that Charlie Tecopa (Paiute) was shot by John Yount east of Manse Ranch, and John Smith (Paiute) was shot by John Yount and was buried where he was shot.
1911	Las Vegas Reservation established through a 10-acre land donation made by Helen Stewart.
1915	John Yount, son of Joseph Yount, sells his Trout Creek Property to Phi Lee, and he and his Pahrump Paiute wife Sally "Mopats," move to Ma-hav and rename the place Charleston View (not the Charleston View of today). John makes improvements.
1916	It is reported that the Yount Ranch (at Ma-hav) was irrigated by means of windmills that pumped from three shallow wells. Water was within 6 to 15 feet below surface.
1921	George Rose receives patent on 179 acres to the east of the Bob Lee homestead and north of the Yount Ranch.
1922	John Yount files fee patent and becomes owner of Yount Ranch at Ma-hav.

Time	Specific Places, People, and Events
1920–31	“Tank” Sharp (Libby Scott’s son), whose family is from Mound Spring and Manse Ranch area is one-quarter Pahrump Paiute and a friend of John Yount. Tank operates a still and bootlegs alcohol from the hills around Yount Ranch. Joe Hudson, a non-Indian, killed Tank, and Oscar Bruce, a Pahrump Paiute from Mound Spring perhaps living near Bob Lee’s place, retaliates by killing Joe Hudson. Other bootleggers operate out of the Ma-hav area.
1926	William Wilson receives patent for 160 acres immediately south of the Yount Ranch.
1920s	John Yount purchases Wilson and Rose’s properties.
1932–33	Susie Yount, John Yount’s first wife, dies and a Cry Ceremony is held at Yount Ranch. John Yount allows the ceremony. Hundreds of Indians attend ceremony and camp out at the Yount Ranch near the orchard.
1930s?	Bob Bruce and Susie Howell die and are buried at the Ma-hav cemetery.
1930s–Present	Archaeologists accumulate evidence of southern Great basin/Mojave desert occupations that reach back to 12,000 years B.P. When inland seas covered some of the area. There are numerous archaeological sites throughout the Mesquite dunes including at Hidden Hills Ranch.
1935–1940	John Yount has a second common-law wife named Sally Belle, who is white. John dies. Belle attempts to sell property to Roland Wiley and becomes embroiled in inheritance problems with Younts. Eventually Wiley buys out heirs. Before Wiley arrives at property, Sally Belle illegally sells property to Louise Kellog. Wiley and Kellogg have a legal battle and Wiley wins. Wiley evicts Kellog.

Time	Specific Places, People, and Events
1940–1990	Wiley buys additional property. Wiley evicts numerous Pahrump Paiute families from his properties. Including Dora Brown. Dora establishes Dora's Place at Browns Spring In 1941. Wiley holdings become the largest private property holdings in Pahrump Valley. Wiley establishes the Hidden Hills Ranch (dude ranch), has guests living in teepees and digging for Indian artifacts, constructs an airplane runway, attempts to grow crops, taps springs and messes up water flow, builds Cathedral Canyon tourist attraction. Wiley hires Al Carpenter as the Hidden Hills caretaker.
1940s–Present	Pahrump Paiute families, Lees, Browns, Weeds, Howells, Bruces, and Toms and their descendents continue to live near Hidden Hills after being forced out. These are some of the families that are tribal members of the federally unrecognized Pahrump Paiute Tribe. The Ma-hav Pahrump Paiute Cemetery continues to be used and maintained by Pahrump Paiute.
1951	The mushroom cloud from the detonation of an atomic bomb can be seen from the Hidden Hills ranch.
1975	Queho is buried at Hidden Hills Ranch.
1987–Present	Pahrump Tribe files for federal recognition with the U.S. Department of Interior. The filing was posted in the Federal Register on Dec 10, 1987. The petition for federal recognition remains pending.
1989	Roland Wiley dies, and Wiley estate is established
2006	Hidden Hills Caretaker, Al Carpenter dies. Hidden Hills Ranch is vandalized and looted.
2006	Stump Spring Area of Critical Environmental Concern is established by the BLM for protection of the cultural resources located at and near the spring.
2011	Bright Source proposes Hidden Hills Solar Energy Generating Systems on Wiley Property and has lease option with Wiley Estate.

A historic time period that can be documented in the literature, including oral histories collected for staff's ethnographic study, starts with John "Stomper" Pete's occupation of Stump Springs, circa 1840–1890, up to the present.

All CRHR-Eligible Ethnographic Resources Subject To Potential Project Impacts

Staff has identified three ethnographic landscapes that the HHSEGS project would impact, the Southern Paiute Salt Song Landscape, the Pahrump Paiute Home Landscape, and the Ma-hav Landscape. The contributing features, integrity, and periods of significance for these resources are discussed above.

Quotes from Recent Tribal Interviews Concerning Perceived HHSEGS Impacts

> The project impact is huge. That does not mean that a traditional ceremony can be held and then the land and spirits will understand once and for all. Confusion will increase and multiply over time and that will accumulate in the burden that singers and other people will take on year after year.
>
> Bomb testing in the area has contaminated a lot of the desert around Moapa. We are at risk if we go gather plants. There is also the local coal plant that causes environmental problems. So we go to Pahrump Valley (and other areas where Southern Paiute are from) to gather because we think that it is a cleaner environment.
>
> Area is also important for Fox Trail songs. Which is a song that follows the fox, who travels from spring to spring. Putting a high tech facility in the midst of the ceremonial song trail is an invasion of Indian religion. The project area is a religious area. There is not only what the project mirrors and towers will do to the salt song prayers and people but also there will be long term impacts from more people and activity over the course of the project. What actual impacts would be to the Salt Song Trail and if those impacts can be mitigated are something that only certain practitioners can answer. Those answers can only be provided by medicine men or song practitioners. It is suggested that the ethnographer talk with Larry Eddy (Chemehuevi Elder) or Richard Arnold (Pahrump Paiute Singer).
>
> There is a real concern about environmental justice and how Southern Paiute people are being disproportionately and adversely impacted by the proposed project. When our cultural landscape is impacted significantly, such as will happen with the proposed solar project, lifeways are changed forever and [that] does not allow our people to complete their journey to the afterlife as described in our Salt Songs.
>
> An impact to the song trails would impact all Southern Paiute that need or rely on the Salt Songs trails and related ceremonies.

ASSESSMENT OF PROJECT IMPACTS TO CRHR-ELIGIBLE ETHNOGRAPHIC RESOURCES AND RECOMMENDED MITIGATION

Staff has assessed the impacts of the proposed HHSEGS project on the three ethnographic landscapes as significant, but it is anticipated that none of the recommended mitigation measures would reduce impacts to a less than significant level. However, the project's impacts to the Ma-hav landscape and the Pahrump Paiute Home landscape would be somewhat reduced with the project's implementation of **CUL-10**. However, because the Salt Song Landscape corridor, where traditional singers visualize the landscape as they sing their deceased ancestors to the other side, will be physically blocked should the project be constructed, and because this corridor blockage would create spiritual, emotional, and physical imbalance among the living in not being assured that their deceased relatives have been transported to the afterlife, and would raise doubts for the living as to their own spiritual passage upon death, Staff's recommendation that the Salt Song Landscape is CRHR-eligible is based on the evidence of continuous ancestral use, the continued investment of tribal lives in the use of this landscape, and its integrity. Energy Commission staff cannot recommend any mitigation that would ameliorate project impacts to the Salt Song Landscape.

The construction of the proposed project would cause a substantial adverse change in the significance of the three ethnographic landscapes. The presence of the heliostat fields and the 750 foot tall solar power towers would be a stark visual intrusion that would profoundly and irreparably degrade the ability of the landscapes to convey historical significance under CRHR Criterion 1. In particular, the mass of the looming towers, in combination with the operational glare from the solar receiver steam generators atop each one, would compromise the setting, feeling, and association aspects of the resources' integrity, aspects critical to the resource's ability to convey its associative values under Criterion 1. Subsequent to the construction of the facility, one would no longer be able to experience the sense of the landscape as it was during its period of significance.

Salt Song Landscape

Direct Impacts

The Salt Song Landscape and associated practices require a specific landscape, and that landscape, a linear corridor, totally encompasses the proposed project area. The cultural practices associated with this landscape have endured for at least a millennium and are ancient enough that most Southern Paiute do not know of its specific historical origins except to say that the practices, and places where the practices are conducted, were provided to Southern Paiute at the time of creation. The project is proposed to be placed in the midst of this corridor. Siting the project in its proposed location would result in a physical impact to the Salt Song Landscape trail and its contributing features, in that the project footprint and infrastructure would blemish, mar, and otherwise damage, destroy, and alter the trail corridor. In the course of project construction some natural waterways would be removed, damaged, or altered. New water flow patterns, with newly introduced water sources, would be created. The project would also damage, remove, and otherwise destroy plants and animals that are contributing features to the landscape in the vicinity of the trail corridor. Unprecedented and continuous human activity would occur in a place otherwise considered to be comparatively tranquil.

Many of the impacts during construction would endure for the operational life of the project. The washing of heliostat mirrors and establishment of project roads would cause further alteration to the natural course of ground and surface water flow. Dew would accumulate in differential amounts depending on project extent of infrastructure.

Alteration to water accumulation and flow would change surviving plant characteristics. Contributing feature plants and animals would be removed and or fenced out from the project footprint, subject to harm up to and including death. The heliostat mirrors would not only cause alteration of the water flow and plant and animal life, but traditional cultural and religious practitioners believe that the heliostats would also diminish the power of the songs and add confusion to the songs and souls on their journey to the afterlife, given the large number of heliostats, approximately 170,000, that would be utilized in Solar Plant 1 and Solar Plant 2.

Indirect Impacts

Construction would also have indirect impacts to the deceased that travel the trail, to the traditional singers that guide the deceased along the trail, and to the surviving relatives. Funeral ceremonies have occurred adjacent to the proposed project site in the past and are likely to occur in the future. A year after burial, Salt Song Singers in conjunction with grieving relatives, undertake the Salt Song Ceremony, which occurs in various places within the project boundaries and in adjacent areas. The project would become a physical barrier to those who travel the Salt Song Trail. In addition, the construction of the project would irreparably damage and alter, through physical, visual, and auditory impacts, the ability of the Salt Song Singers to fulfill their spiritual obligations to the deceased to move them from their places of death through the landscape and on to the afterlife.

As the uncertainty of Salt Song Singers to fulfill their obligations is increased, so also is there a correlating increased impact to grieving families of the deceased. Grieving families would be uncertain if their deceased have been properly ushered to the place of afterlife. Additionally, although the Salt Song Trail is a Southern Paiute institution, the segment that runs through, across, and within the Pahrump Valley is within Pahrump Paiute ancestral territory and, therefore, is under their watch. Should this segment of the trail be impacted, it would further adversely affect the Pahrump Paiute in that they would be perceived by other Southern Paiute to have had a role in allowing the impact to occur. There are indirect cause and effect links between impacts to ethnographic landscapes and impacts to people whose lifeways and related sense of cultural well-being rely upon and ensue from such landscapes.

Mitigation

The direct, indirect, and cumulative adverse impacts of the proposed project on the Salt Song Landscape are significant and unavoidable if the project is constructed as designed and in the proposed location. Given the extended period of both the proposed project's operation (a minimum of at least 30 years) and the physical presence of the proposed facilities, including the heliostats and power towers, the effect of the project's presence on the landscape must be considered permanent. Staff is unaware of any suite of mitigation measures that would reduce the loss of a substantial portion of the Salt Song Landscape's integrity and spiritual context, particularly one that provides the means by which the Southern Paiute deceased travel from their places of birth and death to an afterlife. The applicant has provided no information or analysis on this or any of the other ethnographic landscapes, and has recommended no mitigation to date to reduce the project's impacts on these significant resources.

Although it is not possible to avoid or substantially reduce the direct adverse impacts this project, as proposed, would cause to this resource, there may be alternatives that would allow the project to proceed in some fashion, while still offering some protection to the resource and its associative values. This could include selecting a much reduced footprint, changing the proposed infrastructure to a technology that does not rely on solar power towers, or mitigating for the loss of plants and animals that are otherwise not considered or protected, because they are not among those recognized as endangered, in the conditions of certification recommended in the **BIOLOGICAL RESOURCES** section of the HHSEGS **FSA**, but that are significant to the Pahrump Paiute and integral to their traditional and spiritual practices and beliefs. It is likely, however, that construction of the proposed project in any configuration, at the proposed location, would result in the complete disruption of the existing ecosystem and habitat within the facility footprint, conditions that would have to be maintained for the life of the project. Appropriate rehabilitation of the site would need to be revisited at the time of closure; however, return to the drainages; plants, animals, supportive ecosystem, and topography that existed prior to construction is not reasonably feasible.

Staff has consulted with the Southern Paiute to explore the possibility of mitigation measures that would at least partially mitigate the loss of this landscape's ability to convey its associative values and to compensate for the impacts to those who pass away, those responsible for facilitating the passage of death, and those who grieve during a time of transition. There is not another resource that can replace the Salt Song Landscape. By Southern Paiute reckoning, the creator provided a specific set of instructions in relation to a particular landscape and the transference of knowledge from the creator to the Southern Paiute concerning matters of life and death is non-negotiable. There are no rules by which tribal religious leaders can modify, delete, or add to the religious prescriptions provided them in a solemn pact with the creator. To do otherwise is to invite chaos, particularly as the rules and practices at hand are those pertaining to relations between the living and the deceased. No conditions of certification to address impacts to this resource are recommended at this time.

Pahrump Paiute Home Landscape

Direct and Indirect Impacts
The project site is wholly within the boundaries of the Pahrump Paiute Home Landscape. The Pahrump Paiute Home Landscape overlaps with and is a contributor to the Salt Song Landscape.

In addition, a number of the indirect impacts identified for the Salt Song Landscape and all of the indirect impacts identified for the Ma-hav Landscape also apply to the Pahrump Paiute Home Landscape. However, because of relative scale, the HHSEGS project would have a smaller visual impact on the Pahrump Paiute Home Landscape.

Mitigation
Although impacts to the Pahrump Paiute Home Landscape might be mitigable if it were a stand-alone resource, the direct, indirect, and cumulative impacts of the proposed project on the Pahrump Paiute Home Landscape are only mitigable to less than significant by mitigating for the Ma-hav Landscape to a level of less than significant.

CUL-10 would function at a broader level as mitigation for the proposed project's direct visual effects to the Pahrump Paiute Home Landscape.

Ma-hav Landscape

Direct Impacts
The project site is wholly within the boundaries of the Ma-hav Landscape. The Ma- hav landscape overlaps with and is a contributor to the Pahrump Paiute Home Landscape and the Salt Song Landscape. Therefore, some of the direct impacts identified for the other two landscapes would also apply to the Ma-hav landscape.

Indirect Impacts
Water usage would increase during the period of construction. It is possible that increased water drawdown from the local aquifer would potentially impact the adjacent spring areas of the Ma-hav landscape. Reduced water in the spring areas could degrade plant and animal habitats. Many of the impacted plant and animal habitats and populations are contributors to the Ma-hav Landscape. Animals that no longer can frequent the project site and that have a capability to self-relocate would move into adjacent areas of the Ma-hav Landscape, further increasing competition for habitat and other life-sustaining resources that also may be in decline due to overall water decreases.

Some of the Pahrump Paiute horticultural areas in the Ma-hav Landscape can still be identified. However, as spring areas are potentially reduced and vegetation types are also potentially reduced, it is possible that soils would erode quicker and it is even more possible that horticultural areas would erode away or be covered over with soil types not conducive to horticultural fertility. The spring areas of the Ma-hav Landscape, adjacent to the project site, have been and continue to be locales for tribal ceremony, including burial in and near the Tribal cemetery. It is likely that burial ceremonies would occur in the future, despite the fact that the burial area and related access is on or near private land and that the cemetery has been vandalized in the past. A large solar field with large solar power towers, adjacent and within view of the ceremonial area of the Ma-hav Landscape would visually and auditorily intrude on the areas where Pahrump Paiute are accustomed to conducting very solemn ceremonies.

Mitigation
There may be alternatives that could allow the project to proceed in some fashion, while still offering some protection to the resource and its associative values. This could include selecting a much reduced footprint, changing the proposed infrastructure to a technology that does not rely on solar power towers, or mitigating for the loss of plants and animals that are otherwise not considered or protected in the conditions of certification recommended in the Biological Resources section of the HHSEGS Final Staff Assessment (**FSA**), but that are significant to Pahrump Paiute and integral to their traditional and spiritual practices and beliefs. Conditions of certification that would monitor possible water level decreases and related impacts to spring reliant vegetation are recommended in the both the Biological Resources Condition of Certification **BIO-24** and Water Supply Conditions of Certification **WS-2** and **WS-6** of the FSA.

Visual Resources Condition of Certification **VIS-6** would require an Interpretive Area be placed somewhere in the Pahrump Valley in Inyo County to compensate for the visual intrusion that the project would impose on scenic values by highlighting the natural and cultural visual resources in the project vicinity, including the Wilderness Areas, National Recreation Areas, named peaks and the Old Spanish Trail-Mormon Road. This way-side Interpretive Area would also direct visitors to places where more in depth interpretive resources about the Ma-hav landscape could be experienced. Cultural Resources Condition of Certification **CUL-10** has been added to expand the interpretive scope to include information on the traditional Pahrump Paiute land management, usage, and history of the Ma-hav Landscape. One (or several) selected extant Interpretive Facility (different from the "Interpretive Area" envisioned in **VIS-6**) would be provided with a traditional Pahrump Paiute horticultural garden, that to the extent feasible would be watered by a natural spring and that would include a sampling of traditional plants to demonstrate, to the general public, the ethno-botanical uses and knowledge base of the traditional tribal peoples who were adapted to the desert environment over at least a millennia. Development of the ethnographic elements of a (or several) interpretive facility would be implemented in direct consultation with the Pahrump Paiute Tribe, including all stages of planning, construction, and management, to the extent that the Pahrump Paiute Tribe is comfortable in participating.

ANALYSIS OF IMPACTS TO HISTORIC-PERIOD BUILT ENVIRONMENT RESOURCES

Historic-Period Background

The border region of southeastern California and southern Nevada has long been a travel corridor in the American West, with a climate and terrain that has made travel and settlement in the area challenging. The history of this travel can still be seen across the Pahrump Valley (see **CULTURAL RESOURCES Figures 7 and 8**).

Old Spanish Trail-Mormon Road
The Old Spanish Trail (OST) has gone by many names, including the Camino de California, Camino de Santa Fe, and Camino de Nuevo Mexico, depending on one's destination (NPS 2000b:5). Various groups of people used the OST in historic times, including explorers, trappers, prospectors, and immigrants; however, the primary use appears to have been for trade. The OST was primarily a horse and burro trail, but in places it follows trails used by the Native Americans, which would have originally been footpaths. Later the Mormons traveled parts of the OST primarily by wagon; therefore, traces in the western half of the OST that joined up with the Mormon Road were transformed into a wagon road beginning in 1847 (NPS 2000b: 5).

Various portions of the OST were explored by different groups. The exploration of the OST in historic times began in the Spanish Period as their interest in the exploration and settlement of the present-day American southwest intensified.

Spanish Period
By the middle of the sixteenth century, Spain had emerged as the premier naval and military power in Western Europe with colonies in North and South America and a trading network throughout the Pacific. The Spanish colonization of California was

achieved through a program of military-civilian-religious conquests. Soldiers secured areas for settlement by suppressing Indian and foreign resistance and establishing fortified structures called presidios. Civilians established pueblos (e.g., towns) and Spanish priests led the religious conquest effort by establishing missions and converting the Indians.

Don Francisco Vazquez de Coronado led the first excursion by European peoples through the southwest in 1540 (Steiner 1999:1). As part of this expedition Gárcía López de Cárdenas, a lieutenant of Coronado, first ventured up the Colorado River, but only came as far as the south side of the Grand Canyon (CRTR 2011b:24; Steiner 1999:4–5). While Coronado failed to find the riches he originally set out for, his expedition spurred Spanish settlement in the American Southwest.

In the late 1770s, Antonio Maria de Bucareli, the Viceroy of New Spain, "legitimized Spain's claim to Alta California by making it the new *Provincia de California* with a provisional capitol at the Presidio at Monterey." (Steiner 1999:6). Bucareli's plan was to use the missions to colonize the new province. Despite the abundance of rich farmland, the missions that had been established were not geared towards sustaining large populations. As such, supplies were imported from the Provinces of New Mexico and Sonora to the east. Small supply ships and the lack of reliable overland supply routes initially hampered growth in California. Bucareli realized that it was necessary to establish a direct supply route between New Mexico and California in order for California to flourish (Steiner 1999:8). The OST would eventually be that route.

Spanish priests, or padres, played a key role in the establishment of the OST. They began the colonization of the American southwest in the late sixteenth century, long before Bucareli's decree, motivated by their mission to convert the native peoples to Christianity and extend the influence of the Catholic Church. The first church in New Mexico was built in 1598, and the padres were followed by settlers, who colonized land suitable for agricultural activities. The provincial capital of Santa Fe was founded in 1610, and by the eighteenth century, this area was considered politically stable and productive. The Spanish were less successful at colonizing what is now northern Arizona and were only able to extend their sphere of influence to the areas south of the Gila River and along the Santa Cruz River south of present-day Tucson. The Spanish explored the coast of present-day California in the mid-sixteenth century, but it was not until the incursion of Russian and British explorers into what are now Alaska, British Colombia, Washington, and Oregon in the 1750s that serious attempts were made by the Spanish to colonize Alta California (Steiner 1999:4–6).

The Spanish continued to explore the Southwest region through the seventeenth century. Father Eusebio Francisco Kino followed Coronado's route, travelling north to southern Arizona. He explored the courses of the San Pedro and Santa Cruz rivers north to the Gila River and was the first European to the see the ruins of Casa Grande in 1694. He also explored what is now the United States-Mexico border from south of Nogales to Yuma, Arizona (Steiner 1999:9–10).

Father Francisco Garcés picked up where Father Kino left off when the Jesuits were expelled from New Spain in 1767. Father Garcés was the resident missionary at the

Mission San Xavier del Bac, near present day Tucson, Arizona. Father Garcés made five important entradas, or explorations, during his tenure there. His first two entradas, in 1768 and 1770, brought him as far north as the Gila River. His third entrada, in 1771, brought him again to the Gila River where he retraced Father Kino's route to Yuma then south along the Colorado River to the Sea of Cortez. On each of these explorations, Father Garcés ministered to the local peoples and established friendly relations. He also accompanied Captain Juan Bautista de Anza on his expedition from the Presidio at Tubac, Arizona to the Presidio of Monterey in 1774, and went as far as the Mission San Gabriel. This expedition proved that an overland route was possible between Sonora, Mexico, and Monterey, California. While waiting for de Anza to return at the Yuma Crossing, Father Garcés continued to explore along the banks of the Colorado River and into the Mojave Desert, which provided more valuable information on the region (Steiner 1999:10–12).

Father Garcés's most important entrada was in 1776, when he and two Native American guides set out north towards the Colorado River. They had reached the Mojave villages by February 28, where they were shown items by the natives that had come from the coast. Father Garcés convinced several of the Mojave natives to guide his party across the desert. They set off on March 4 and crossed the Mojave Desert via Indian trade routes, surviving only because their guides knew where to find water. Presumably they stopped at Paiute Spring, Rock Spring, Marl Spring, and Soda Spring, which would later become critical stops along the extreme southern alternative route of the OST. Once they reached the sink of the Mojave River they followed it to Cajon Canyon and descended into the Los Angeles basin, reaching Mission San Gabriel and Los Angeles on March 26, 1776 (Steiner 1999:12–14).

Initially Father Garcés intended to continue on to San Luis Obispo; however, he was denied troops and supplies and was unable to continue his journey. Instead he explored other parts of California up to Tulare Lake in the San Joaquin Valley, crossed over the Tehachapi Pass, and retraced his route to the Mojave Villages and Colorado River in May. Recognizing the significance of the Native American desert trails and the impact they would have on the Spanish goal of establishing an overland route from Santa Fe to the coast, Father Garcés continued his journey east to try to reach Santa Fe. He and his guides began near present-day Needles and travelled to Kingman, Arizona, Peach Springs, detoured to the Grand Canyon, and to the Hopi pueblo of Old Oraibi, part of the present-day Hopi Reservation. Spanish priests had not previously been welcomed there, and Father Garcés's experience was no different. He did, however, meet a member of the Zuñi tribe there who confirmed that the New Mexican missionaries had made it as far west as Old Oraibi. This confirmed for Father Garcés that an overland route from Santa Fe to the coast was possible. However, he did not continue to Zuñi Mission, and others received credit for discovering this route (Steiner 1999:14–16).

Father Garcés returned to the Mission La Purisima Conception at the Yuma Crossing on the Colorado River and continued working among the Quechan people. In July 1781, the Quechan revolted against the Spanish and killed all of the men, including Father Garcés (Steiner 1999:16). Some of the routes that Father Garcés traveled would later become part of the western portion of the OST (NPS 2000b:6).

In the 1760s and ‘70s, there were three official Spanish-sanctioned expeditions into Ute country (southwestern Colorado and southeastern Utah); the first two were led by Juan Maria Antonio Rivera and the third by Francisco Atanasio Dominguez and Father Sivestre Velez de Escalante (NPS 2000b:6).

In 1822, Mexico achieved independence from Spain, and California became an outpost of the Mexican Republic.

Mexican Period

The first Europeans known to have entered present-day Nevada were fur trappers: As early as the 1820s, British and American mountain men, fur traders, and entrepreneurs were venturing into California. In 1825-26 Antoine Robidoux built Fort Uncompahgre (a.k.a. Fort Robidoux), near present-day Delta, Colorado, which acted as a centralized trading area. Trappers and traders traveling to and from the Fort used routes that would later become part of the OST. Peter Skene Ogden of the Hudson’s Bay Company and Jedidiah Strong Smith of the Rocky Mountain Fur Company. In 1826, both men crossed into Mexican Territory looking for the San Buenaventura River and beavers. Smith and his party explored an impressive amount of Nevada and were the first non-Indians to cross the Great Basin. Trade connections between Santa Fe and Los Angeles developed quickly along what came to be called the Old Spanish Trail. Jedediah Smith first traversed the route in 1826, traveling down the Virgin River to the Colorado River and then on to California. Although west of the lower Colorado River, Smith’s party traveled a similar route as Garcés, which would later be named the Mojave trail or road.

Antoine Robidoux, Peter Skene Ogden, Jedediah Strong Smith, Antonio Armijo, William Wolfskill, and George C. Yount explored and documented the OST route throughout the Mexican Period in the Mohave Desert Region. Early mountain men such as Jedediah Smith, in addition to trapping and trading, also dabbled in contract map-making for the United States. Wolfskill and Yount first established the Northern Route of the OST in 1831 (NPS 2000b:7).

In 1829–1830, Mexican trader Antonio Armijo successfully established a route from New Mexico to Los Angeles. He traded New Mexican goods for horses and mules. His accounts reportedly took him south of present day Las Vegas on his way to the Amargosa River. It is likely that he passed somewhat south of the project area, but perhaps through the project alternative area near present day Sandy Valley. Armijo came down the Virgin River to the Colorado River below the Grand Canyon and then journeyed across the desert reaches to the Mojave River. He followed the Mojave River to the Cajon Pass and then on to Los Angeles. Armijo crossed the Colorado River at the Crossing of the Fathers, which was discovered by Fathers Dominguez and Escalante in 1776 (NPS 2000b:7). After Armijo paved the way, annual trading expeditions between New Mexico and Los Angeles became routine. During this time a number of routes were developed. Many travelers avoided the Colorado River below the Grand Canyon. After descending out of the Utah Mountains by way of the Virgin River, travelers cut across the desert, establishing a direct route to the Mojave River.

The primary use of these routes was for commerce and immigration. A less well-documented activity during this period was slaving. Beginning in the Spanish Period, Paiutes were often captured by Ute and Navajo raiders and sold as slaves in New Mexico or California.

American Period

By the 1840s, there was a steady migration of American settlers into California. Unable to stop the incursion, the Mexican government granted citizenship to all who would pledge to follow Mexican law. Many of these foreigners received land grants on which they established grazing and commercial operations. One example of this is the New Helvetia Rancho granted to John Sutter in 1839 in what is now the City of Sacramento.

War broke out between the United States and Mexico in May 1846, with some decisive battles occurring in California. The American victory over Mexico was formalized in February 1848 with the signing of the Treaty of Guadalupe Hidalgo, and Mexico ceded all its land holdings above the Gila and Rio Grande rivers to the United States. California was admitted as the thirty-first state in the Union on September 9, 1850

In 1848, Brigham Young, leader of the Church of Latter Day Saints, or Mormons, in Utah, had established a church policy of settlement, which included a series of settlements for several hundred miles both north and south of Salt Lake City and a port on the Pacific coast. This policy would aid immigration and ensure control over the Great Basin (Reeder 1966:216). By 1849, Young had established plans for the State of Deseret, encompassing the Great Basin, the Colorado River drainage, and most of present-day southern California, but, when California became a state in 1850, the land east of California was divided into the two territories of New Mexico and Utah, which would ultimately thwart Young's plans for a Mormon port in southern California. Young continued to seek a route to a port and plan for the settlement of a colony in present day southern California, and so the Mormon Road was established. In early 1851, Mormon settlers left Salt Lake City bound for California. They arrived in southern California in June of that year, where they purchased the San Bernardino Rancho (Reeder 1966:205). "The main route to this burgeoning Mormon Center became known as the "Mormon Corridor," or the "Mormon Road" (BLM 2001:5). A one-mile-square town site was laid out, which essentially marked the California end of the Mormon Road. San Bernardino County was established in 1853. The population of this new settlement grew steadily in the early 1850s and in 1856, it was said that it had grown to 3,000 people (Reeder 1966). Brigham Young and other Mormon leaders built what later became known as the "Mormon Fort" (a.k.a., Las Vegas Mission) in 1855, located in present-day Las Vegas, Nevada. The Fort was strategically located half-way between the settlements in southern Utah and the San Bernardino Mission in southern California along the Mormon Road. This part of the Mormon Road overlapped with the OST between New Mexico and California. The Mormon settlements were officially abandoned in February 1857, under the direction of Brigham Young, although a few settlers remained to tend the fields and continue to operate way stations.

Agriculture

The Pahrump Valley has a number of artesian wells conducive to farming. Some of the earliest homesteads were established by Pahrump Paiute, with the assistance of some Mormon families that stayed on in the Ash Meadows, Pahrump, and Las Vegas areas. Southern Paiute were horticulturalists prior to European contact. As non-Indian populations increased, cattle ranching quickly became a mainstay after Europeans settled in the valley in the mid-1860s. In addition to cattle, several crops were grown, including alfalfa, cotton, sugar beets, and wine grapes.

In the 1860s-70s Charlie, a Pahrump Paiute man and the Tribal War Chief, establishes one of the first Indian Ranches in Pahrump Valley, the Ma-hanse (now named Manse Ranch). In 1877 Joseph Yount purchased Manse Ranch. In 1902, one of Joseph Yount's sons, John B. Yount, acquired the land that would eventually become the Hidden Hills Ranch, another of the early ranches, which was located approximately 10 miles south of the Manse Ranch. In the late 1930s Roland Wiley buys the Yount Ranch from Sally Belle, John Yount's common-law wife. Wiley's holdings grow over subsequent decades as he buys surrounding property. In 1940 the Hidden Hills Ranch comprised 2,474 acres (see HHSEGS 2011a: table 5.3-3 for location). Wiley establishes the Hidden Hills Ranch as a dude ranch where guest live in teepees and dig for artifacts. Agricultural activities include a small orchard that was established near the complex of buildings that included the family home.

During the first two decades of the 20th Century large farming and ranching enterprises, such as the Yount Ranch, were established and flourishing throughout the northern portion of Pahrump Valley. Many of these ranches relied on the valley's abundant (but dwindling) water sources and Paiute laborers.

Evaluation of CRHR Eligibility of Individual Historic-Period/Built-Environment Resources

Old Spanish Trail-Mormon Road
The Old Spanish Trail Recognition Act of 2002 (Act) designated the Old Spanish Trail (OST) as a National Historic Trail. The Act defines the Old Spanish National Historic Trail as "an approximately 2,700 mile long trail extending from Santa Fe, New Mexico, to Los Angeles, California, that served as a major trade route between 1829 and 1848…, including the Armijo Route, Northern Route, North Branch, and Mojave Road" (16 USC 1241) and refers to maps in the National Park Service's "Old Spanish Trail National Historic Trail Feasibility Study," (Feasibility Study) dated July, 2001 (NPS 2000b). The OST, as documented by the Act, is located to the south and just outside of the HHSEGS project site, but within the HHSEGS built-environment PAA. While the OST and Mormon Road diverge in Nevada, with the Mormon Road turning north and the OST continuing east, in California they are recorded as occupying the same general area. The Mormon Road linked the settlements in southern Utah to the San Bernardino Mission in southern California. The Mormons used the OST in the project area as an alternate to the northern Emigrant Trail (BLM 2001:5).

In 2001, the Nevada Office of Historic Preservation listed segments of the OST in Nevada on the NRHP calling it the Old Spanish Trail-Mormon Road Historic District (OST-MR District). The OST-MR District was found significant under NRHP Criteria A and D in the areas of transportation, exploration/settlement, and archaeology/historical, with a period of significance of 1844-1857. The OST-MR District includes approximately 10 miles of the OST-MR, just a small portion of the 2,700-mile-long trail. The study that resulted in the nomination was restricted to the historic route in Nevada, as it was mapped by John C. Fremont. The OST-MR District is defined by the extant wagon traces (6–7-foot-wide) plus a 20-foot-wide corridor on either side, described as the "pitch zone" where travelers discarded trash and goods along the way. Archaeological finds have been made in the OST-MR District (NPS 2001:11). The OST-MR District includes three segments, all in Nevada, with a total of five contributing sites and four non-contributing sites. The Stump Spring segment, the nearest to the California-Nevada border, is described as beginning on the two-track road near Stump Spring and travels generally southeast towards the border.

In 2010-2011 the Old Spanish Trail association (OSTA), their consultant(s), volunteers and stakeholders performed field and historic research in six states (CA, UT, NV, AZ, NM and CO) in order to prepare a Multiple Properties Documentation Form (MPDF) and nominations to the National Register of Historic Places (NRHP) for six segments of the Old Spanish National Historical Trail. The MPDF and NRHP nominations were prepared by the OSTA, their consultant(s), volunteers and stakeholders under contract to the New Mexico State Historic Preservation Office. The project is being funded by the Bureau of Land Management (BLM), National Park Service (NPS) and NM Historic Preservation Division (HPD). The MPDF and the NRHP nominations were submitted as Drafts for review by the NM HPD, BLM, and the NPS in August 2011. After these documents are finalized each of the six nominations will be sent to their respective SHPOs for review. At this time there is no schedule for the completion of these documents; however, it is known that the draft NRHP nomination for the Emigrant Pass segment recommends this segment as eligible at the State Level for listing on the NRHP under Criteria A and D.

The OST is a large and complicated resource that has not been fully documented through survey. "It [the OST] was never a single, clearly defined route, but was a composite of traces that separated and converged according to the dictates of terrain and potable water (Steiner 1999: ix)." It is logical that there would be a single, narrow trail or road through those areas of difficult terrain, such as mountain passes; however, in open, flat lands such as the project area, it is unlikely that travelers would travel the same perfectly straight path between springs. Rather, circumstances such as availability of water, forage (e.g., food for the animals), terrain and climate, the presence of friendly tribes and the absence of hostile tribes, could take them on a more southerly or northerly route. "Over time, travelers sought easier, shorter routes, and numerous variant trails developed along the Old Spanish Trail Northern Route corridor (NPS 2001:13)."

While many have endeavored to trace a single route for the OST, or even a main route with some alternates, it seems more appropriate to call the resource a corridor, as it is referred to by the Feasibility Study. The Northern Route of the OST, as documented in the Feasibility Study, is located in the HHSEGS built-environment PAA (16 USC 1241:15):

> [The] combined North Route [of the OST-MRNC] followed Virgin River and Dry Lake Valleys southwest to Las Vegas (Big Springs) and Blue Diamond (Cottonwood) Spring, crossing the Spring Mountains at Mountain Springs. The trail entered California by way of the Pahrump Valley.

Because the resource is best described as a corridor and because the Northern Route is located in the HHSEGS built-environment PAA, the OST and the Mormon Road are discussed together here and are referred to as the Old Spanish Trail-Mormon Road Northern Corridor (OST-MRNC).

The project site lies within the OST-MRNC. Documented and previously determined NRHP-eligible portions of the OST-MR are located within close proximity to the project site, and traces on the project site have not been adequately studied to determine whether or not they are contributors to the OST-MRNC. Known elements and features within the OST-MRNC to date include the Northern Route[29] of the Old Spanish Trail National Historic Trail (as designated by the Old Spanish Trail Recognition Act of 2002), Track 4 (CH2MHill DR125), Steiner's Apx Trace (OSTA 2012), S-24 (CH2MHill DR125), S-26 (CH2MHill DR125), Track 5 (CH2MHill DR125), Central trace (OSTA 2012), and Northern trace (OSTA 2012). While not all of the traces on the project site have been ground-truthed, it is clear that the project site lies squarely among all of these tracks and traces and, therefore, within the OST-MRNC, a regionally and nationally significant travel and trade corridor that aided the exploration and shaped the development of the southwestern United States.

Staff has concluded that there is a high probability that these tracks and traces, although not formally included in the Act, would be CRHR eligible under Criterion 1 as part of the Old Spanish Trail National Historic Trail.

The OSTA has documented approximately seven miles of the mule trace defining the OST from Emigrant Pass east to the community of Charleston View. Based on the locations of the springs just over the border in Nevada, OSTA has hypothesized that branches of the route are located on the HHSEGS project site. Other traces or segments of the OST-MR have been proposed, based on travel accounts, from just south of present-day Pahrump, to the north of the project site, and to the south of the project site within the built-environment PAA (see **CULTURAL RESOURCES Figure 8**). Many individuals and organizations have studied, searched for, and documented portions of the trail in California near and on the project site. As such, many possible traces have been proposed as "The" Old Spanish Trail. Based on the various studies, traces in the vicinity of the project area could cross the California-Nevada border as far north as Pahrump, Nevada; as far south as Charleston View, California (a.k.a. Calvada Springs), south of the project site; and at locations in between, which could traverse the project site.

The applicant's consultant identified two traces of the OST-MR in the HHSEGS built-environment PAA, which were given temporary site numbers, Track 4 and S-24. It is also possible, although not identified by the applicant, that S-25, S-26, Track 1, and/or Track 5 are associated with the OST-MR. In particular S-25 and Track 4 appear to line up with the study done by the OSTA. These resources are discussed below.

[29] Note: This overlaps with Track 4 (CH2MHill DR125) and Steiner's Apx Trace (OSTA 2012).

S-24 (Historic Road Segment)
Temporary Site S-24 was recorded and evaluated by the applicant's consultant. This resource consists of a historic road segment connecting the old Nevada State Route 16 to the Tecopa Pass Road. Historically it connected either Hidden Hills Ranch Spring and/or Browns Spring to the OST-MR just 0.5 mile south of the project site. It was measured at approximately 8,250 feet in length and is approximately 20 feet wide. The segment of this road located within the built-environment PAA was noted as being graded in the modern era. Some historic and modern debris was observed along this segment, including one flat-top, steel Coors can; a green glass Coke bottle; and an Owens-Illinois maker's mark dating to 1944. One segment of the road, which is located within Charleston View in an area of desert pavement, was described as ungraded and in fair condition. It is bounded by two modern roads. This segment is 10 feet wide and appears to have two tracks that are approximately 2 inches deeper than the surrounding desert pavement. The segment is short, measuring less than 20 feet and is bound by two modern roads. This road bed has no remaining desert pavement. A large pit approximately six feet in diameter is located next to this small segment and appears modern.

S-24 is depicted on the 1910 USGS 30-minute Ivanpah map and the 1956 USGS 15-minute Horse Thief Springs quadrangle map. This road also appears to be the road discussed in archival sources that led into and out of the Hidden Hills Ranch in the 1930s. Its construction consists of a shallow grade in the natural landform. The 1910 Ivanpah map shows that S-24 crosses another road, which runs through Stump Springs. S-24 then turns southwest, approximately 0.5 mile south of the HHSEGS project area.

The applicant's consultant states that the segment of S-24 within the HHSEGS built-environment PAA no longer retains sufficient integrity to be eligible as a contributing element to the overall OST-MR. Staff agrees that S-24 would not be eligible under NRHP Criterion A (equivalent to CRHR Criterion 1) due to the alterations that have occurred during maintenance, which included being graded with modern equipment. However, staff disagrees with the applicant's conclusion with regards to NRHP Criterion D (equivalent to CRHR Criterion 4). The history of the OST-MR is incomplete; therefore, any traces and tracks that are discovered are potentially eligible under Criterion D (and CRHR Criterion 4) for data potential. Despite the fact that some segments have been maintained or upgraded, they still retain integrity of location, feeling, and association which can add to the historical knowledge of the route(s) of the OST-MR. The applicant's consultants confirmed this: "The current graded road appears to be situated on the remnants of an historical wagon road…. (Lawson and Spaulding, 2012, S-24 Historic Road Segment DPR 523L)." Also, based on the width of the modern, graded part of S-24 (approximately 20 feet) versus the width of the ungraded part of S-24 (approximately 10 feet), subsurface artifacts associated with the road may be present on either side of the ungraded segment, in the "pitch zone." Staff recommends that S-24 is potentially eligible as a feature or element of the OST.

S-25
Temporary Site S-25 is a road that connects the Hidden Hills Ranch to Sandy Valley. The segment recorded within the project site measures 4,025 feet in length and is 20

feet wide. Its construction consists of a shallow grade in the natural landform. The applicant notes that the road does not appear on the 1910, 1912, and 1942 USGS Ivanpah 30-minute quadrangle maps, but does appear on the 1956 15-minute Horse Thief Springs USGS quadrangle map. As such the applicant has suggested that a construction date range of 1942 to 1956 is appropriate.

The road, in its modern form, was primarily used by Roland Wiley to access his Hidden Hills Ranch from the Arrowhead Highway between Las Vegas and Los Angeles. It connects the ranch to Sandy Valley. It is said that Wiley regularly graded the road to maintain his access. It was an alternate route to the pass at Mountain Springs prior to the construction of Nevada Highway 160. The applicant's consultant states that the road could have been considered eligible for the NRHP and CRHR as part of the Hidden Hills Ranch because of its association with Wiley. However, as the Hidden Hills Ranch is no longer extant, there is no longer that association for the road, so the road has therefore lost integrity as an element or feature of the Hidden Hills Ranch. Staff also agrees that on its own the road is not individually eligible for either the NRHP or the CRHR. However, evidence suggests that portions of this road are associated with the OST. As is the case with S-24, the fact that some portions have been maintained or upgraded does not change the fact that it still retains integrity of location, feeling, and association which can add to the historical knowledge of the route(s) of the OST-MR. As such it is a potential historical resource under CEQA.

S-26
This recorded site is a single, ephemeral trail or footpath that measures approximately 35 to 40 cm wide. The width and location of the trail led the applicant's consultant to the conclusion that it is a prehistoric trail possibly connecting nearby Hidden Hills Ranch Spring and/or Browns Spring to the northeast with a village site to the southwest. Additional evidence suggests that this is also a possible segment of the OST-MR. Staff has recommended that S-24 would be eligible under NRHP Criterion A (equivalent to CRHR Criterion 1) and under Criterion D (and CRHR Criterion 4) for data potential. The history of the OST-MR is incomplete; therefore, any traces and tracks that are discovered are potentially eligible with those traces showing a high degree of integrity even more valuable. This trace appears to have retained integrity of location, feeling, and association which can add to the historical knowledge of the route(s) of the OST-MR. Because it has not been significantly altered there is a higher potential for the discovery of subsurface artifacts associated with the road may be present in the "pitch zone."

Track 1
This is a narrow road paralleling the California-Nevada border within the HHSEGS built-environment PAA. It is approximately 2 miles long with a southern terminus at S-24. There is evidence that it may be associated with the OST and later early surveys of the California-Nevada border. Staff agrees that Track 1 would not be eligible under NRHP Criterion A (equivalent to CRHR Criterion 1) due to the alterations that have occurred during maintenance, which included being graded with modern equipment. However, the history of the OST-MR is incomplete; therefore, any traces and tracks that are discovered are potentially eligible under Criterion D (and CRHR Criterion 4) for data potential. Despite the fact that some segments have been maintained or upgraded, they

still retain integrity of location, feeling, and association which can add to the historical knowledge of the route(s) of the OST-MR. Staff recommends that Track 1 is potentially eligible as a feature or element of the OST.

Track 4

Track 4 has been identified as a segment of the OST-MR as documented by the NPS in 2001. The applicant's consultant initially discerned it as a single route during remote imagery analysis; however, two track portions were observed along portions of the route. It is an approximately 5.5 miles long, and 6 foot wide portion of the OST-MR starting at Stump Spring and trending southwest. It passes south of the project site, but within the HHSEGS built-environment PAA. It merges with S-24 and then can be followed west out of the valley. Artifacts found by the applicant's consultant along this segment include a hand-soldered can with a crimp seam top, a mule shoe, a crushed soldered can, a soldered-seamed sanitary can, and a large metal ring, likely from a bridle or harness. The applicant's consultant dated the can prior to 1883. A small scatter of aqua glass was also found and one basal fragment bore a pontil scar, dating the glass to pre-1860. Some modern trash was also observed including a wire hanger, a modern aluminum beer can, and a crushed sanitary can.

The history of the OST-MR is incomplete; therefore, any traces and tracks that are discovered are potentially eligible with those traces showing a high degree of integrity even more valuable. This trace appears to have retained integrity of location, feeling, and association which can add to the historical knowledge of the route(s) of the OST-MR. Because it has not been significantly altered there is a higher potential for the discovery of subsurface artifacts associated with the road may be present in the "pitch zone." Staff recommends that Track 4 is potentially eligible as a feature or element of the OST.

Track 5

Track 5 is a trail of unknown age that runs from Browns Springs in the east and near the western margin of the Pahrump Valley bolson on the west. It is outside of the project site, but within the HHSEGS built-environment PAA. There is evidence that it could be a trace of the OST. The history of the OST-MR is incomplete; therefore, any traces and tracks that are discovered are potentially eligible with those traces showing a high degree of integrity even more valuable. This trace appears to have retained integrity of location, feeling, and association which can add to the historical knowledge of the route(s) of the OST-MR. Because it has not been significantly altered there is a higher potential for the discovery of subsurface artifacts associated with the road may be present in the "pitch zone." Staff recommends that Track 4 is potentially eligible as a feature or element of the OST.

Assessment of Project Impacts to Historic-Period/Built-Environment CRHR-Eligible Resources and Recommended Mitigation

The project site lies within the OST-MR Northern Corridor. Documented and previously determined eligible portions of the OST are located within close proximity to the project site and traces on the project site and in the larger Pahrump Valley have not been adequately studied. Known elements/features within the OST-MR Northern Corridor to date include the Northern Route of the Old Spanish Trail National Historic Trail as designated by the Old Spanish Trail Recognition Act of 2002, Track 4 (CH2MHill, 2012), Steiners Apx Trace (OSTA 2012), S-24 (CH2MHill, 2012), S-26 (CH2MHill, 2012), Track 5 (CH2MHill, 2012), Central trace (OSTA 2012), and Northern trace (OSTA 2012). While not all of the traces on the project site have been ground truthed, it is clear that the project site lies squarely among all of these tracks/traces and, therefore, within the OST-MR Northern Corridor, a regionally and nationally significant travel/trade corridor that aided the exploration and shaped the development of the southwestern United States.

The information from the above sources and the complex character of trail segments recorded by both the applicant's consultant and the OSTA, has led staff to conclude that, within the built-environment PAA and the wider Pahrump Valley, this resource is not represented by a single route, but as a corridor of converging and intermingled tracks and traces. The applicant's cultural resources consultant, CH2MHill, acknowledged the scale and complexity of the resource in their research design for the Historic Trails and Roads Technical Study. "For the sake of historical realism, it is assumed that there is no "one" road on the surface, and that the OST-MR is a braided or anastomosing network of tracks… (CH2MHill, DR125)." The project site is located within this corridor, with traces running throughout the project site.

Although not formally included in the Act, staff has concluded that there is a high probability that these tracks/traces would be eligible as part of the Old Spanish Trail National Historic Trail and eligible for the NRHP and CRHR. As such, the Corridor is a potential historical resource for the purposes of CEQA and potential impacts resulting from the proposed project must be evaluated. The construction of the proposed project would cause a substantial adverse change in the significance of the OST-MR Northern Corridor by erasing traces/trails on site and visually impacting traces/tracks off site, which could jeopardize the integrity of the OST-MR segment of the Old Spanish Trail National Historic Trail in the Pahrump Valley.

Additionally, the proposed project is within the viewshed of the NRHP-listed Old Spanish Trail/Mormon Road Historic District (District). The District was found eligible for the NRHP under Criteria A and D. KOP 2 in the **VISUAL RESOURCES** section of the **FSA** clearly shows that the power towers would be visible from the Stump Springs area. At a minimum the Stump Spring Segment, as described in the NRHP nomination form for the District, would be impacted based on the visual simulation at KOP 2. The proposed project would degrade three of the aspects of integrity that contribute to the District's significance; setting, feeling, and association.

While modern development in the Charleston View area may have disturbed some OST-MRNC tracks and traces in the HHSEGS built-environment PAA and has caused some visual intrusion with the construction of low-rise buildings, the overall setting of the Pahrump Valley has been well preserved with long stretches of uninterrupted natural landscape. The area is relatively flat and consists of scrub vegetation. This vast, relatively flat landscape is a major character-defining feature of the setting of the OST. When travelers came over the Spring Mountains and viewed the Pahrump Valley they knew they had come to one of the most difficult parts of their journey; between the various springs in the Spring Mountains and Resting Spring west of Emigrant Pass there was no water, no respite from the hot, dry desert. Modern development has been sparse and the visibility of that development is minimal from the project site, as discussed in the **VISUAL RESOURCES** section of the FSA. Conversely, the HHSEGS proposed project would be visible for miles, creating the most significant visual intrusion into the valley to date. Based on the visual simulations and analysis of the visual impacts from the Key Observation Points (KOPs), the proposed project would be visible for at least 30 miles away as can be seen in **Figure 26** of the **VISUAL RESOURCES** section of the **FSA**. (Figure DR37-1 in the AFC demonstrates locations and areas that would have a view of the project.)

The integrity of the setting, feeling, and association of the tracks and traces outside of the HHSEGS project site would thus be significantly impacted by the project, which is within the viewshed of the NRHP-listed OST-MR District in Nevada, discussed above. KOP 2 in the **VISUAL RESOURCES** section of the **FSA** clearly shows that the power towers would be visible from the Stump Springs area. At a minimum the Stump Springs segment of the OST-MR District, as described in the NRHP nomination form, would be impacted, based on the visual simulation at KOP 2. The HHSEGS project would significantly degrade three of the aspects of integrity that contribute to the OST-MR District's significance—setting, feeling, and association.

As discussed above, staff considers the OST-MRNC a historical resource for the purposes of CEQA, and therefore potential impacts resulting from the HHSEGS project must be evaluated. The project would significantly impact the OST-MRNC by erasing potential tracks and traces on-site. Any OST-MRNC tracks and traces on the HHSEGS project site would be destroyed—directly, physically impacted by the project's construction. Destruction of the tracks and traces, and the resulting loss of integrity, is irreversible. Staff has concluded that this impact on the informational values of the OST-MRNC is significant and must be mitigated.

Staff has also concluded that the installation of the proposed power towers and heliostats would result in a significant and unavoidable direct, perceptual impact to the OST-MRNC. The installation of this large number of heliostats and 750plus-foot towers would substantially alter the vast, open landscape that is a character-defining feature of this historical resource. The visual quality of this section of the OST-MR would be permanently damaged by the project's presence, resulting in a substantial adverse change in the significance of a historical resource and a significant and unmitigable impact. This impact cannot be avoided or reduced if the project is constructed as designed and in the proposed location. Given the extended period of both the HHSEGS proposed project's operation (a minimum of at least 30 years) and the physical presence of the proposed project facilities, the impact of the project on the resource must be considered permanent. Staff is unaware of any suite of mitigation measures that would fully mitigate the impacts of the proposed project and reduce the impacts to a less than significant level. The historical significance of the OST-MR in the Pahrump Valley is largely tied to its view of the vast, unobstructed, flat expanse of desert landscape, which would be impeded by any type of screening that might be proposed to attempt to block views of the project, especially the power towers. Eliminating project elements along the project site boundary would not lessen the visual impact, as the existing views are unobstructed for several miles.

The applicant has proposed no mitigation measures to reduce significant impacts to built-environment resources as they do not believe that significant impacts would occur. As noted above, staff is unaware of any action, short of project relocation or denial that would directly fully mitigate the significant direct impacts that the proposed project would have on the OST-MRNC. As an alternative, staff finds mitigation, identified in Conditions of Certification **CUL-9**, **CUL-10,** and **VIS-6**, to be a means of compensating, in large part, for the permanent loss of the resource's visual and informational values. **CUL-9** addresses both of the HHSEGS project's significant direct impacts: the physical impact on the potential OST-MRNC tracks and traces that may be located on the project site; and the visual impact on the setting of the OST-MRNC. **CUL-10** also addresses the project's significant direct impacts as well as the visual impact on the setting of the OST-MRNC by disseminating the information gathered in **CUL-9** to other cultural resource professionals and the public, so that the history of this significant resource is not lost. First, **CUL-9** would require the HHSEGS project owner, before the start of construction, to fund research by the OSTA to confirm potential OST-MRNC tracks and traces that are located on the project site and to fully record them. Second, **CUL-9** would require the HHSEGS project owner, during construction, to fund research by a qualified historian to gather information and verify existing data specific to the location, history, condition, and significance of the OST-MRNC, as an individually CRHR-eligible resource and an element of the Old Spanish Trail National Historic Trail and/or a possible contributor to the NRHP-listed Old Spanish Trail Historic District. The information resulting from **CUL-9** would be necessary to completing the Interpretive Program recommended in **CUL-10**.

However, even with full implementation of Conditions of Certification **CUL-9, CUL-10, and VIS-6**, the project's impact to the OST-MRNC would remain significant and unmitigable.

MULTI-RESOURCE MITIGATION FOR THE DEGRADATION OF FOUR HISTORICAL RESOURCES

The construction and operation of the proposed project would result in direct physical and visual degradation and cumulative degradation to four historical resources including archaeological, ethnographic, and built-environment landscapes in Pahrump Valley, and may result in indirect physical degradation to them as well. For the analytic details of each of these effects on each respective resource type, please see the *Assessment of Project Impacts to CRHR-Eligible Archaeological Resources and Recommended Mitigation, Analysis of Impacts to Ethnographic Resources,* and *Assessment of Project Impacts to Historic-Period/Built-Environment CRHR-Eligible Resources and Recommended Mitigation* subsections of the present section of this FSA. "CEQA established a duty for public agencies to avoid or minimize environmental damage where feasible." (Cal. Code Regs., tit. 14, § 15021(a))

Staff has modified the original interpretive center concept, the development of which was begun in **CUL-10** of the SSA and conceptually completed subsequent to the publication of the SSA, and offers a related concept that would appear to be consistent with the regulatory intent of mitigation under CEQA, while still meeting the basic objectives for the mitigation of the proposed project's effects on the multiple subject historical resources in Pahrump Valley. CEQA requires mitigation proposed for projects under consideration to be feasible measures which have the potential to minimize any significant adverse effects (Cal. Code Regs., tit. 14, § 15126.4), where "feasible" is defined as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors" (Cal. Code Regs., tit. 14, § 15364). In addition to being feasible, mitigation measures must also be "roughly proportional" to the significant effects that a proposed project may have on the environment (Cal. Code Regs., tit. 14, § 15364, subd. (a)(4)(B)).

The mitigation that staff recommends for the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, the Pahrump Paiute Home Landscape, the Ma-hav Landscape, and the Old Spanish Trail-Mormon Road Northern Corridor focuses on the public interpretation of the resources, largely through extant interpretive facilities in and near Pahrump Valley. While the interpretation of the subject resources would be more effective closer to the remnants of the landscapes that the proposed project would damage, the use of extant interpretive facilities further afield would not entirely compromise the delivery of the interpretive mitigation objectives identified for those resources, and the use of the basic infrastructure and the staff of the extant facilities would somewhat reduce mitigation costs. **CUL-10** would parse out the different interpretive mitigation objectives to one or more extant interpretive facilities in the vicinity and thus accomplish the interpretive goals of resource mitigation. Under this multiple facility approach, **CUL-10** would require the applicant to fund the delivery of each of the parsed interpretive mitigation objectives in each interpretive facility that would agree to deliver particular interpretive mitigation objectives. The delivery mode groups and the delivery mode venues cited below serve as an example scenario for the implementation of **CUL-10**. Staff consultation with the venues is ongoing and to date has been informal and preliminary. **CUL-10** has been drafted with the flexibility in mind to accommodate the outcomes of more formal venue consultations.

Example CUL-10 Implementation Scenario

1. The construction and maintenance of an interpretive kiosk within one hundred yards of the facility site that presents broad overviews of the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, the Pahrump Paiute Home Landscape, the Ma-hav Landscape, and the Old Spanish Trail-Mormon Road Northern Corridor along with information on the nearby interpretive facilities where the public would be able to access more in-depth interpretive programs for each resource. The presentation of the overviews and the delivery of information on nearby interpretive facilities could occur in conjunction with the implementation of **VIS-6**, as long as the implementation of that condition occurred within the specified distance from the facility site.

2. The delivery of passive museum displays and multi-media presentations, *and* hands-on, interactive exhibits the purpose of which is to facilitate the interpretation of the cultural landscapes and corridor. The specific interpretive

modes would include the development and delivery of separate displays, presentations, *and* exhibits, of museum quality, about

- the genesis, paleoecology, and archaeology of the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape,
- the seasonal subsistence cycle of the Pahrump Paiute Tribe, and
- the Old Spanish Trail-Mormon Road Northern Corridor.

The Shoshone Museum in Shoshone, California could facilitate the delivery of the above interpretive modes. The Shoshone Museum, an extant venue approximately 37 miles west of the proposed facility site, is a gateway community into Death Valley National Park and one of the National Park Service's suggested routes into the park. The traffic through the community, primarily from Las Vegas, to Death Valley provides the museum with a relatively high local volume of visitors. The implementation of this subgroup of delivery modes would most likely require the construction of an expansion onto the museum to house museum displays and interactive exhibits, and to deliver multi-media presentations, in addition to the construction of the actual displays and exhibits, and the production of the multi-media presentations.

3. The delivery of ethnographic reconstructions the purpose of which is to facilitate the interpretation of the Native American use of the local landscape in the prehistoric and ethnographic periods. The specific interpretive modes would include the

   - Native American installation and maintenance of an aboriginal horticultural garden for public interpretation, and
   - the conjunctive Native American installation and maintenance of an exploratory reconstructed village consisting of a few replica dwellings that allow public access to walk in, about, and through the village and garden area. Providing direct visitor access to a real garden featuring native garden varietals, such as pumpkins, beans, and corn, set near the interpretive materials provided per item 2, above, will greatly enhance the visitor education experience beyond what passive interpretive materials would solely provide.

Staff believes that were the alternate level of mitigation set out here (**CUL-10**) and **CUL-11** to be emplaced for the proposed project, one would not be able to argue that the direct physical and visual, the indirect, and the cumulative effects of the proposed project would be reduced to a less than significant level for the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, the Ma-hav Landscape, and the Pahrump Paiute Home Landscape. Staff believes that the direct physical effects of the proposed project on the Old Spanish Trail-Mormon Road Northern Corridor would also not be reduced to a less than significant level with the implementation of **CUL-9**, and the multiple facility approach. The implementation of **CUL-9** and the multiple facility approach would still not reduce the direct visual and cumulative effects of the proposed project on the Old Spanish Trail-Mormon Road Northern Corridor to a less than significant level. Staff would retain the belief that these particular effects would be unmitigable.

ALL CRHR-ELIGIBLE RESOURCES SUBJECT TO POTENTIAL PROJECT IMPACTS

Cultural Resources Table 11 lists, by resource type, the CRHR-eligible cultural resources potentially impacted by the project and the recommended conditions of certification that would mitigate, to the extent possible, the HHSEGS project's significant impacts.

CULTURAL RESOURCES Table 11
CRHR-Eligible Cultural Resources Potentially Subject to Impacts from the Proposed Project and Recommended Mitigation

Resource Type, Designation	Resource Description [type, size, age,]	CRHR-Eligibility	Recommended Conditions to Mitigate Impacts
<u>Prehistoric Archaeological Resources</u>			
Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape	Terminal Pleistocene to Holocene proposed landscape thematically focused on collection and processing of mesquite and other plant resources unique to the mesquite woodland-coppice dune association. Landscape elements include the archaeological deposits, the mesquite population, ancillary floral and faunal populations, and, the structural features of the faults, dunes, and aquifer discharge locales	Assumed eligible for listing in the CRHR	1. To re-create for the public a sense of the experience of this landscape, under **CUL-10**, through interpretive and preservation programs delivered at extant regional interpretive facilities, as partial compensation for the HHSEGS project's damage to this resource. 2. To obtain, under **CUL-11**, a comprehensive picture of a significant aboriginal landscape through the documentation of the landscape's composition and character over time; and
Buried archaeological resources that may be discovered during construction monitoring or identified during survey of potential soil borrow and disposal sites	Unknown	To be determined by CPM	**CUL-1** through **CUL-8**
<u>Historical Archaeological Resources</u>	None		

Resource Type, Designation	Resource Description [type, size, age,]	CRHR-Eligibility	Recommended Conditions to Mitigate Impacts
<u>Ethnographic Resources</u>	Three ethnographic landscapes: 1. Salt Song Landscape 2. Pahrump Paiute Home Landscape 3. Ma-hav Landscape	Recommended eligible for listing in the CRHR	**CUL-10** objectives for the recommended interpretive and preservation programs, as partial compensation to the public and to Native Americans for the HHSEGS project's damage to these resources, are: 1. To interpret the historic and cultural uses of the Ma-hav Landscape, its surroundings and relation to the Pahrump Paiute Home landscape, and those landscapes' linked cultural resources such as identified in the above mentioned archaeological landscape and portions of the Old Spanish Trail-Mormon Road Northern Corridor; 2. To interpret the nature and ecology of the mesquite springs area and surrounding habitats; and 3. To educate the public and otherwise promote wise and conservative water and energy use in desert environs.

Resource Type, Designation	Resource Description [type, size, age,]	CRHR-Eligibility	Recommended Conditions to Mitigate Impacts
<u>Built-Environment Resources</u>			
The Old Spanish Trail-Mormon Road Northern Corridor (see **Cultural Resources Figure 7**)	Historic trail and road.	Portions of the OST are designated as a National Historic Trail. NRHP and CRHR-eligible.[30]	**CUL-9** objectives are: 1. To complete research by the OSTA to confirm potential OST-MRNC tracks and traces that are located on the project site and to fully record them; 2. To complete research by a qualified historian to document the location, history, condition, and significance of the OST-MRNC, as an individually CRHR-eligible resource and an element of the Old Spanish Trail National Historic Trail and/or as a possible contributor to the NRHP-listed Old Spanish Trail Historic District; 3. To nominate the OST-MRNC to the CRHR and the NRHP; and 3. To provide newly compiled information on the OST-MRNC to the public as recommended in **CUL-10**, as partial compensation to the public for the HHSEGS project's damage to this resource.

[30] An NRHP nomination is currently being reviewed by the Nevada BLM.

CUMULATIVE IMPACTS AND MITIGATION

GEOGRAPHIC SCOPE OF ANALYSIS

Table 1, Hidden Hills Master List of Cumulative Projects, and the **Cumulative Projects Figure 1**, included in the Cumulative Impacts Assessment **EXECUTIVE SUMMARY** of the HHSEGS FSA, identify the development projects that may contribute to cumulative impacts on cultural resources in combination with the proposed HHSEGS project. These include St. Therese Mission, Pahrump Airport, Element Solar, Amargosa Farm, PSI Amargosa PV Solar Project, Silver State South Solar Project, Stateline Solar Farm, Sandy Valley, Searchlight Wind Energy, Southern Owens Valley Solar Ranch, Lathrop Wells Solar, Table Mountain, and South Solar Ridge. These projects are located within a geographic area that has been identified by staff as covering an area large enough to provide a reasonable basis for evaluating cumulative impacts for all resource elements or environmental parameters. Most of these projects would be required to undergo their own independent environmental review under CEQA.

Cumulative impacts could occur if impacts resulting from the implementation of the proposed HHSEGS project combine with the impacts of other local or regional projects on the same or similar resources. Cumulative impacts would occur locally if the HHSEGS impacts combined with the impacts of projects located within the area identified in **Cumulative Projects Figure 2**. Cumulative impacts could also occur as a result of the development of some of the many proposed and licensed solar and wind development projects that have been, or are anticipated to be, constructed in the foreseeable future. This geographic scope is appropriate because it is likely that cultural resources similar to those in the HHSEGS PAA are present throughout the Pahrump Valley and eastern Mojave Desert.

PROJECT CUMULATIVE IMPACTS AND MITIGATION

Archaeological Resources

Staff projects the cumulative effects of the proposed project, and of past and reasonably foreseeable probable future projects on the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape (Pahrump Metapatch Landscape) to be significant, and staff concludes that the proposed project's contribution to those effects are cumulatively considerable. The baseline cumulative effects of the development of the Charleston View community, the construction and use of the Front Sight Firearms Training Institute , and improvements to both the Tecopa Road and Nevada State Route 160 have been to degrade the setting, feeling, and association aspects of integrity related to the landscape's ability to convey its significance under Criterion 1, and the location and design aspects of integrity with respect to its analogous ability under Criterion 4. Staff believes, however, that the degree of degradation to date, relative to either criterion, has not been significant. Broad, important portions of the landscape remain intact. The construction and operation of the proposed project would represent the first significant, direct visual intrusion on the Pahrump Metapatch Landscape and has the potential to foster other indirect effects. The presence of the proposed project and the modifications made to the ancillary regional infrastructure to accommodate it would likely enhance development opportunities for other solar generation projects in the future, which would, in turn, dependent on the particular technology suites, compound the significant effects of the proposed project on the subject landscape. The effects of the proposed project on the Pahrump Metapatch Landscape are cumulatively considerable, because they would be the first significant effects that would be inflicted on the landscape, the significance of which is amplified by the project's location adjacent to it, the effects would be extremely difficult to mitigate to a less than significant level, and they would likely degrade the visual integrity of the landscape to a point that would make the effects that subsequent projects would have seem less significant than they otherwise would.

The mitigation of what staff concludes here are the cumulatively considerable effects of the proposed project to a less than significant level is problematic. In theory, one may be able to devise a suite of mitigation measures that could be reasonably argued to accomplish this goal, but any such suite would face difficult tests of feasibility. As discussed above (see Multi-resource Mitigation for the Degradation of Multiple Landscapes), such a suite of mitigation measures would have to include the delivery of interpretive programs amidst or adjacent to this or the other cultural landscapes that this project would damage. As any such mitigation suite has been found to be infeasible for the present application, the project's cumulatively considerable effects to the Pahrump Metapatch Landscape are found by staff to be unmitigable. The implementation of **CUL-10**, and **CUL-11**, though not reducing the project's effects to less than significant, would nonetheless provide for their substantive reduction.

Ethnographic Resources

Were the project to be implemented as proposed three ethnographic landscapes would be cumulatively impacted in similar ways as described in the Archaeological Resources section above. The project site and vicinity are a known area for important Native American religious and traditional resource uses.

The Pahrump Paiute Home Landscape is much larger than the project footprint. The project would be visible from less than one tenth of the total Pahrump Paiute Home Landscape. However, all of the projects identified in the "Cumulative Impacts" subsection of this analysis are within the Pahrump Paiute Home Landscape. In addition, because of its size, there are many more reasonably foreseeable projects than those listed that would adversely impact the Pahrump Paiute Home Landscape.

Two other solar projects, Element Solar and Sandy Valley, are proposed either near or immediately adjacent to the Ma-hav Landscape. Element Solar would be of a similar scale to the Hidden Hills project, but would not incorporate solar power tower infrastructure into its designs. The proposed Sandy Valley project would occupy a much larger site footprint and would probably use solar power tower technology and infrastructure. Therefore, cumulative impacts would be greater from the Sandy Valley project. The Element Project would provide a slightly lesser set of impacts, but the combined set of projects would jointly provide even greater impacts than any one of the projects would singularly introduce.

As mentioned in the Integrity discussion for the three ethnographic landscapes, the Southern Paiute Salt Song Landscape has already been visually and physically compromised to some extent by modern developments, such as the presence of numerous large cities, towns, military installations, energy generating facilities, mining infrastructure, and other infrastructure, such as transportation and transmission corridors. In addition, auditory, olfactory, and nightscapes have been compromised. The Spring Mountains are surrounded on several sides with incompatible intrusions to traditional religious and cultural practices. To the east/southeast lies the sprawling Las Vegas metropolis. To the north lie Nellis Air Force Base and the Nevada Test Site. And to the east/northeast lies the City of Pahrump. Across and through this terrain are several major highway corridors and transmission lines. Although not in the immediate vicinity of the proposed project, the expanse of these ethnographic landscapes exposes them to cumulative impacts resulting from projects well outside the area identified in **Cumulative Projects Figure 1**.

The impacts to the entire Salt Song Landscape are beyond the scope of this analysis. However, the segment of the Landscape that runs through the Pahrump Valley is already compromised, in particular, by the presence of the City of Pahrump.

Erosion of the spiritual context and critical elements of religious practice of the Salt Song Landscape in the Pahrump Valley is occurring primarily in response to the continued development in and around the Pahrump area. The focus of development, both current and future, is being driven by the need for housing and businesses to serve the influx of temporary construction and permanent operational personnel needed to build and staff the solar development projects in the area. These projects, some currently proposed by the same parent company in the immediate vicinity of the Hidden Hills project (Sandy Valley project), would have similar impacts as the Hidden Hills project and, therefore, would contribute cumulatively to the significant adverse impacts on the Landscape. Staff is not proposing any mitigation for impacts to the Salt Song Trail landscape. **CUL-10** provides compensatory mitigation for cumulative impacts to the Ma-hav landscape and Pahrump Paiute Landscape, but not to a level of less than significant.

Built-Environment Resources

St. Therese Mission, Pahrump Airport, Element Solar, and Sandy Valley Solar projects are considered most likely to contribute to the cumulative impacts on historic/built-environment resources, specifically the OST-MR Northern Corridor. The Sandy Valley project would have direct, physical impacts to the OST-MR as it appears to have the potential to adversely affect springs and tracks and traces in Nevada just east of the project site. The other projects could potentially increase the adverse impacts to the setting, or visual quality, of the Pahrump Valley, adversely affecting a contributing element of the OST-MR. The construction of the Hidden Hills project would result in permanent adverse impacts related to the destruction of the tracks and traces of the OST-MR on the project site, as well as create a substantial visual intrusion on the landscape. This would result in significant and unmitigable adverse impacts to built-environment resources, specifically the OST-MR. Therefore, any additional adverse impacts to the OST-MR Northern Corridor from other projects would simply add a cumulative element to the existing significant and unmitigable impacts.

PROJECT CUMULATIVE IMPACTS CONCLUSION

The construction of other projects in the same vicinity could affect unknown cultural resources of the same types as those affected by the proposed project. Proponents for other projects in the area may be able to reduce the impact(s) to CRHR-eligible cultural resources through deliberate project planning, or reduce impacts to presently unknown cultural resources to a less than significant level by implementing construction monitoring, evaluation of resources discovered during monitoring, and avoidance or data recovery for historical resources. However, significant and unmitigable cumulative impacts to the Pahrump Metapatch (archaeological) Landscape; Salt Song,; and the OST-MR Northern Corridor by the proposed project virtually guarantee that impacts from any other projects on these resources would result in an overall significant and unmitigable cumulative impact.

RESPONSE TO PUBLIC COMMENTS

Staff's responses to applicant and public comments are included in **Appendix 1**, PSA Response to Comments, Cultural Resources.

CONCLUSIONS, RECOMMENDATIONS, AND RECOMMENDED FINDINGS OF FACT

- Staff has evaluated the individual archaeological deposits found within the boundaries of the HHSEGS facility site and recommends that they are not historical resources under CEQA, and they are not contributors to the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape.

- Staff recommends that no mitigation is required for HHSEGS project impacts to the individual archaeological deposits found within the boundaries of the HHSEGS facility site.

- Staff recommends the adoption and implementation of Conditions of Certification **CUL-1** through **CUL-8** to ensure that all significant impacts to archaeological historical resources discovered during HHSEGS project construction, including the potential project use of borrow and disposal sites, and operation are mitigated below the level of significance.

- Staff has identified the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, located just to the northeast of the HHSEGS facility site, as a historical resource under CEQA and recommends that it be assumed eligible for the California Register of Historical Resources (CRHR), under CRHR Criteria 1 and 4, for the purpose of the present siting case. The resource represents the aboriginal use of a locally significant ecological zone during still undetermined periods over probably at least the last 12,000 years.

- Staff concludes that the visual impact of the proposed HHSEGS project on the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape would severely degrade the ability of the resource to convey its association with aboriginal lifeways of the Holocene epoch, potentially compromising its CRHR eligibility.

- Staff has not identified, and the applicant has not recommended, any mitigation measures that would reduce the HHSEGS project impacts to the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape to a less than significant level. Staff recommends the compensatory mitigation identified in Condition of Certification **CUL-11**; however, even with the adoption and implementation of **CUL-11**, the project would still have a significant and unmitigable impact on the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape and related impacts to affected Native American cultural practices.

- Staff has identified and evaluated three ethnographic landscapes within which the HHSEGS project is located (Salt Song, Pahrump Paiute Home, and Ma-hav Landscapes) and recommends that they be assumed to be historical resources under CEQA, for the purpose of the present siting case, and potentially eligible for listing in the CRHR, under, variously, Criteria 1, 2, 3, and/or 4.

- Staff concludes that the presence and visual impact of the HHSEGS proposed project on these three ethnographic landscapes would significantly impact the setting, feeling, and association aspects of the resources' integrity, aspects critical to the resources' ability to convey their associative, artistic, and information values, potentially compromising their CRHR eligibility.

- Staff concludes, in consultation with Native American Tribes and Salt Song Practitioners, that no level of mitigation is appropriate for mitigating impacts to the Salt Song Trail landscape due to the Salt Song Trail Landscape's importance for Southern Paiute that are responsible for ushering their deceased to the afterlife and in providing relief to grieving families.

- Staff recommends the adoption and implementation of mitigation in Condition of Certification **CUL-10** for the HHSEGS project's impacts on the Pahrump Paiute Home landscape and the Ma-hav landscape. However, even with the adoption and implementation of **CUL-10**, the project would still have significant and unmitigable impacts on the ethnographic landscapes and Native American spiritual practices dependent on these resources.

- Staff has identified a historic trail corridor, within which the HHSEGS project site is located, containing various converging and intermingled tracks and traces that comprise a portion of the Old Spanish Trail-Mormon Road. Staff recommends that this trail corridor be assumed to be a historical resource under CEQA, for the purpose of the present siting case, eligible for the CRHR under Criteria 1 and 4.

- Staff concludes that the HHSEGS project impacts on the Old Spanish Trail-Mormon Road Northern Corridor would be significant and that, even with adoption and full implementation of Conditions of Certification **CUL-9** and **CUL-10**, project impacts to this resource could not be mitigated to a less than significant level.

- Staff recommends that construction and operation of the HHSEGS project, in conjunction with past, present, and reasonably foreseeable projects in the archaeological, ethnographic, and built-environment Project Areas of Analysis, would result in significant and unmitigable cumulative impacts to one archaeological landscape, one ethnographic landscape (Salt Song Trail landscape), and one built-environment historical resource, as identified in this section. Although full implementation of all recommended conditions of certification would reduce the significance of the project-related impacts to some degree, thereby reducing the project's contribution to cumulative impacts to these resources, they would not reduce the cumulative HHSEGS project contribution to the total resource inventory for this project or that of the past, present, and foreseeable future projects in the vicinity to these resources to below the level of significance.
- Staff recommends that full implementation of all Cultural Resources conditions of certification would ensure compliance with all applicable laws, ordinances, regulations, and standards identified in **Cultural Resources Table 1**.

RECOMMENDED CONDITIONS OF CERTIFICATION

CUL-1 Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; and/or surface grading or subsurface soil work during pre-construction activities or site mobilization, and/or mowing activities and heavy equipment use in loose or sandy soils, at the site and for access roads and linear facilities, the project owner shall obtain the services of a Cultural Resources Specialist (CRS) and one or more Alternate CRS(s). The project owner shall submit the resumes and qualifications for the CRS, CRS alternates, and all technical specialists to the CPM for review and approval.

The CRS shall manage all cultural resources monitoring, mitigation, curation, and reporting activities, and any pre-construction cultural resources activities (e.g., geoarchaeology or data recovery), unless management of these is otherwise provided for in accordance with the cultural resources conditions of certification (Conditions). The CRS may elect to obtain the services of Cultural Resources Monitors (CRMs), Native American Monitors (NAMs), and other technical specialists, if needed, to assist in monitoring, mitigation, and curation activities. The project owner shall ensure that the CRS makes recommendations regarding the eligibility for listing in the California Register of Historical Resources (CRHR) of any cultural resources that are newly discovered or that may be affected in an unanticipated manner.

No construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; and/or surface grading or subsurface soil work during pre-construction activities or site mobilization, and/or mowing activities and heavy equipment use in loose or sandy soils, at the site, access roads, and linear facilities, shall occur prior to Energy

Commission Compliance Project Manager (CPM) approval of the CRS and alternates, unless such activities are specifically approved by the CPM.

If, during operation of the power plant, circumstances develop that would require ground disturbance in soils or sediments previously undisturbed during project construction, no surface grading or subsurface soil work shall occur prior to submission of a Petition to Modify and CPM review and approval of a project-specific protocol for addressing unanticipated discoveries, consistent with the approved Cultural Resources Mitigation and Monitoring Plan (CRMMP).

CULTURAL RESOURCES SPECIALIST

The resumes for the CRS and alternate(s) shall include information demonstrating to the satisfaction of the CPM that their training and backgrounds conform to the U.S. Secretary of the Interior's Professional Qualifications Standards, as published in Title 36, Code of Federal Regulations, part 61 (36 C.F.R., part 61). In addition, the CRS and alternate(s) shall have the following qualifications:

1. Listing in the Register of Professional Archaeologists;

2. Qualifications appropriate to the needs of the project, including a background in anthropology, archaeology, history, architectural history, or a related field;

3. At least three years of archaeological or historical, as appropriate (per nature of predominant cultural resources on the project site), resources mitigation and field experience in California; and

4. At least one year of experience in a decision-making capacity on cultural resources projects in California and the appropriate training and experience to knowledgably make recommendations regarding the significance of cultural resources. The resumes of the CRS and alternate CRS shall include the names and telephone numbers of contacts familiar with the work of the CRS/alternate CRS on referenced projects and demonstrate to the satisfaction of the CPM that the CRS/alternate CRS has the appropriate training and experience to implement effectively the Conditions.

CULTURAL RESOURCES MONITORS

CRMs shall have the following qualifications:

1. B.S. or B.A. degree in anthropology, archaeology, historical archaeology, or a related field, and one year experience monitoring in California; or

2. A.S. or A.A. degree in anthropology, archaeology, historical archaeology, or a related field, and four years experience monitoring in California; or

3. Enrollment in upper division classes pursuing a degree in the fields of anthropology, archaeology, historical archaeology, or a related field, and two years of monitoring experience in California.

CULTURAL RESOURCES TECHNICAL SPECIALISTS

The resume(s) of any additional technical specialist(s), e.g., historical archaeologist, historian, architectural historian, and/or physical anthropologist, shall be submitted to the CPM for approval.

The historian(s) must meet the U.S. Secretary of Interior's Professional Qualifications Standards, as published in Title 36, Code of Federal Regulations, part 61 (36 CFR, part 61). Resume(s) of the selected historian(s) shall be submitted for review and approval by the CPM and shall include the names and telephone numbers of contacts familiar with their work on referenced projects and demonstrate, to the satisfaction of the CPM, that the historian has the appropriate training and experience to effectively implement all study requirements.

Verification: At least 45 days prior to the start of ground disturbance, the project owner shall submit the resumes for the CRS and alternate(s) to the CPM for review and approval.

At least 10 days prior to a termination or release of the CRS, or within 10 days after the resignation of a CRS, the project owner shall submit the resume of the proposed new CRS, if different from the alternate CRS, to the CPM for review and approval. At the same time, the project owner shall also provide to the proposed new CRS the Application for Certification and all cultural resources documents, field notes, photographs, and other cultural resources materials generated by the project. If no alternate CRS is available to assume the duties of the CRS, the project owner shall designate a CRM to serve in place of a CRS for a maximum of 3 days. If cultural resources are discovered, ground disturbance shall remain halted until there is a CRS or alternate CRS to make a recommendation regarding significance.

At least 20 days prior to ground disturbance, the CRS shall provide a letter naming CRMs and attesting that the identified CRMs meet the minimum qualifications for cultural resources monitoring required by this condition.

At least 5 days prior to additional CRMs beginning on-site duties during the project, the CRS shall provide letters to the CPM identifying the new CRMs and attesting to their qualifications.

At least 15 days prior to any technical specialists, other than CRMs, beginning tasks, the resume(s) of the specialists shall be provided to the CPM for review and approval.

At least 10 days prior to the start of ground disturbance, the project owner shall confirm in writing to the CPM that the approved CRS will be available for onsite work and is prepared to implement the cultural resources Conditions.

CUL-2 Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; and/or surface grading or subsurface soil work during pre-construction activities or site mobilization, and/or mowing activities and heavy equipment use in loose or sandy soils, at the project site, access roads, and linear facilities, if the CRS has not previously worked on the project, the project owner shall provide the CRS with copies of the Application For Certification (AFC), data responses, confidential cultural resources reports, all supplements, the Energy Commission cultural resources Final Staff Assessment (FSA), and the cultural resources conditions of certification from the Final Decision for the project. The project owner shall also provide the CRS and the CPM with maps and drawings showing the footprints of the power plant, all linear facility routes, all access roads, and all laydown areas. Maps shall include the appropriate USGS quadrangles and a map at an appropriate scale (e.g., 1:24,000 or 1" = 200') for plotting cultural features or materials. If the CRS requests enlargements or strip maps for linear facility routes, the project owner shall provide copies to the CRS and CPM. The CPM shall review map submittals and, in consultation with the CRS, approve those that are appropriate for use in cultural resources planning activities. No ground disturbance shall occur prior to CPM approval of maps and drawings, unless such activities are specifically approved by the CPM.

If construction of the project would proceed in phases, maps and drawings not previously provided shall be provided to the CRS and CPM prior to the start of each phase. Written notice identifying the proposed schedule of each project phase shall be provided to the CRS and CPM.

Weekly, until ground disturbance is completed, the project construction manager shall provide to the CRS and CPM a schedule of project activities for the following week, including the identification of area(s) where ground disturbance will occur during that week.

The project owner shall notify the CRS and CPM of any changes to the scheduling of the construction phases.

Verification: At least 40 days prior to the start of ground disturbance, the project owner shall provide the AFC, data responses, confidential cultural resources documents, all supplements, cultural resources conditions of certification, and the FSA to the CRS, if needed, and the subject maps and drawings to the CRS and CPM. The CPM will review submittals in consultation with the CRS and approve maps and drawings suitable for cultural resources planning activities.

At least 15 days prior to the start of ground disturbance, if there are changes to any project-related footprint, the project owner shall provide revised maps and drawings for the changes to the CRS and CPM.

At least 15 days prior to the start of each phase of a phased project, the project owner shall submit the appropriate maps and drawings, if not previously provided, to the CRS and CPM.

Monthly, during ground disturbance, the project owner shall email an electronic copy of the MCR to Native Americans and other parties who have expressed or express an interest in that document.

Within 5 days of changing the scheduling of phases of a phased project, the project owner shall provide written notice of the changes to the CRS and CPM.

CUL-3 Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; and/or surface grading or subsurface soil work during pre-construction activities or site mobilization, and/or mowing activities and heavy equipment use in loose or sandy soils, at the project site and at laydown areas, roads, and other ancillary areas in California, the project owner shall submit the Cultural Resources Monitoring and Mitigation Plan (CRMMP), as prepared by, or under the direction of, the CRS, to the CPM for review and approval. The CRMMP shall follow the content and organization of the draft model CRMMP, provided by the CPM, and the authors' name(s) shall appear on the title page of the CRMMP. The CRMMP shall identify measures to minimize potential impacts to sensitive cultural resources. Implementation of the CRMMP shall be the responsibility of the CRS and the project owner. Copies of the CRMMP shall reside with the CRS, alternate CRS, each CRM, and the project owner's on-site construction manager. No ground disturbance shall occur prior to CPM approval of the CRMMP, unless such activities are specifically approved by the CPM.

The CRMMP shall include, but not be limited to, the following elements and measures:

1. The following statement included in the Introduction: "Any discussion, summary, or paraphrasing of the conditions of certification in this CRMMP is intended as general guidance and as an aid to the user in understanding the conditions and their implementation. The conditions, as

written in the Commission Decision, shall supersede any summarization, description, or interpretation of the conditions in the CRMMP. The Cultural Resources conditions of certification from the Commission Decision are contained in Appendix A."

2. A proposed general research design that includes a discussion of archaeological research questions and testable hypotheses specifically applicable to the project area, and a discussion of artifact collection, retention/disposal, and curation policies as related to the research questions formulated in the research design. The research design will specify that the preferred treatment strategy for any buried archaeological deposits is avoidance. A specific mitigation plan shall be prepared for any unavoidable impacts to any CRHR-eligible (as determined by the CPM) resources. A prescriptive treatment plan may be included in the CRMMP for limited data types.

3. Specification of the implementation sequence and the estimated time frames needed to accomplish all project-related tasks during the ground disturbance and post-ground–disturbance analysis phases of the project.

4. Identification of the person(s) expected to perform each of the tasks, their responsibilities, and the reporting relationships between project construction management and the mitigation and monitoring team.

5. A description of the manner in which Native American observers or monitors will be included, the procedures to be used to select them, and their role and responsibilities.

6. A description of all impact-avoidance measures (such as flagging or fencing) to prohibit or otherwise restrict access to sensitive resource areas that are to be avoided during ground disturbance, construction, and/or operation, and identification of areas where these measures are to be implemented. The description shall address how these measures would be implemented prior to the start of ground disturbance and how long they would be needed to protect the resources from project-related effects.

7. A statement that all encountered cultural resources 50 years old or older shall be recorded on the appropriate Department of Parks and Recreation (DPR) 523 form(s) and mapped and photographed. In addition, all archaeological materials retained as a result of the archaeological investigations (e.g., survey, testing, data recovery) shall be curated in accordance with the California State Historical Resources Commission's Guidelines for the Curation of Archaeological Collections, into a retrievable storage collection in a public repository or museum.

8. Among the categories of cultural resources subject to prescriptive treatment as a result of discovery during the construction and operation of the project, an explicit category for isolate, unexceptional prehistoric or historic artifacts, or groups of such artifacts, up to five in number in an

area of 25 square meters or less, of which the CPM shall be notified and which shall be reported completely in the MCR, but for which the CRS, having fulfilled all requisite documentation requirements, does not need the approval of the CPM to resume construction. This prescriptive treatment category shall specify that the CPM shall have the discretion to nullify this same category upon the CPM's determination that the CRS has inadvertently, or otherwise, misapplied explicit criteria set out in the category for what shall constitute unexceptional prehistoric and historic artifacts.

9. A statement that the project owner will pay all curation fees for artifacts recovered and for related documentation produced during cultural resources investigations conducted for the project. The project owner shall identify three possible curation facilities that could accept cultural resources materials resulting from project activities.

10. A statement demonstrating when and how the project owner will comply with Health and Human Safety Code 7050.5(b) and Public Resources Code 5097.98(b) and (e), including the statement that the project owner will notify the CPM and the Native American Heritage Commission (NAHC) of the discovery of human remains.

11. A statement that the CRS has access to equipment and supplies necessary for site mapping, photography, and recovery of any cultural resource materials that are encountered during ground disturbance and cannot be treated prescriptively.

12. A description of the contents, format, and review and approval process of the final Cultural Resource Report (CRR), which shall be prepared according to ARMR guidelines.

Verification: After approval of the CRS proposed by the project owner, the CPM will provide to the project owner an electronic copy of the draft model CRMMP for the CRS.

At least 30 days prior to the start of ground disturbance, the project owner shall submit the CRMMP to the CPM for review and approval.

At least 30 days prior to the start of ground disturbance, in a letter to the CPM, the project owner shall agree to pay curation fees for any materials generated or collected as a result of the archaeological investigations (survey, testing, data recovery) and as a result of the historical documentation of the Old Spanish Trail-Mormon Road Northern Corridor.

Within 90 days after completion of ground disturbance (including landscaping), if cultural materials requiring curation were generated or collected, the project owner shall provide to the CPM a copy of an agreement with, or other written commitment from, a curation facility that meets the standards stated in the California State Historical Resources Commission's Guidelines for the Curation of Archaeological Collections, to accept the cultural materials from this project. Any agreements concerning curation will be retained and available for audit for the life of the project.

CUL-4 The project owner shall submit the final Cultural Resources Report (CRR) to the CPM for approval. The final CRR shall be written by or under the direction of the CRS and shall be provided in the ARMR format. The final CRR shall report on all field activities including dates, times and locations, results, samplings, and analyses. All survey reports, DPR 523 forms, data recovery reports, and any additional research reports not previously submitted to the California Historical Resource Information System (CHRIS) and the State Historic Preservation Officer (SHPO) shall be included as appendices to the final CRR.

If the project owner requests a suspension of ground disturbance and/or construction activities, then a draft CRR that covers all cultural resources activities associated with the project shall be prepared by the CRS and submitted to the CPM for review and approval. The draft CRR shall be retained at the project site in a secure facility until ground disturbance and/or construction resumes or the project is withdrawn. If the project is withdrawn, then a final CRR shall be submitted to the CPM for review and approval at the same time as the withdrawal request.

Verification: Within 30 days after requesting a suspension of construction activities, the project owner shall submit a draft CRR to the CPM for review and approval.

Within 90 days after completion of ground disturbance (including landscaping), the project owner shall submit the final CRR to the CPM for review and approval. If any reports have previously been sent to the CHRIS, then receipt letters from the CHRIS or other verification of receipt shall be included in an appendix.

Within 10 days after CPM approval of the CRR, the project owner shall provide documentation to the CPM confirming that copies of the final CRR have been provided to the SHPO, the CHRIS, the curating institution, if archaeological materials were collected, and to the tribal chairpersons of any Native American groups requesting copies of project-related reports.

CUL-5 Prior to, and for the duration of, construction-related ground disturbance, or grading, boring, and trenching, as defined in the General Conditions for this project; and/or surface grading or subsurface soil work during pre-construction activities or site mobilization, and/or mowing activities and heavy equipment use in loose or sandy soils, the project owner shall provide Worker Environmental Awareness Program (WEAP) training to all new workers within their first week of employment at the project site and at laydown areas, roads, and other ancillary areas in California. The cultural resources part of this training shall be prepared by the CRS and may be presented in the form of a video. The CRS is encouraged to include a Native American as a presenter in the training to contribute the Native American perspective on archaeological and ethnographic resources. During the training and during construction, the CRS shall be available (by telephone or in person) to answer questions posed by employees. The training may be discontinued when ground disturbance is completed or suspended, but must be resumed when ground disturbance, as described in detail in **CUL-1**, resumes.

The training shall include:

1. A discussion of applicable laws and penalties under law;
2. Samples or visuals of artifacts that might be found in the project vicinity;
3. A discussion of what such artifacts may look like when partially buried, or wholly buried and then freshly exposed;
4. A discussion of what prehistoric and historical archaeological deposits look like at the surface and when exposed during construction, and the range of variation in the appearance of such deposits;
5. Instruction that the CRS, alternate CRS, and CRMs have the authority to halt ground disturbance in the area of a discovery to an extent sufficient to ensure that the resource is protected from further impacts, as determined by the CRS;
6. Instruction that employees, if the CRS, alternate CRS, or CRMs are not present, are to halt work on their own in the vicinity of a potential cultural resources discovery, and shall contact their supervisor and the CRS or CRM, and that redirection of work would be determined by the construction supervisor and the CRS;
7. An informational brochure that identifies reporting procedures in the event of a discovery;
8. An acknowledgement form signed by each worker indicating that they have received the training; and
9. A sticker that shall be placed on hard hats indicating that environmental training has been completed. No ground disturbance shall occur prior to implementation of the WEAP program, unless such activities are specifically approved by the CPM.

No ground disturbance shall occur prior to implementation of the WEAP program, unless such activities are specifically approved by the CPM.

Verification: At least 30 days prior to the beginning of ground disturbance, the CRS shall provide the cultural resources WEAP training program draft text, including Native American participation, graphics, and the informational brochure to the CPM for review and approval.

At least 15 days prior to the beginning of ground disturbance, the CPM will provide to the project owner a WEAP Training Acknowledgement form for each WEAP-trained worker to sign.

Monthly, until ground disturbance is completed, the project owner shall provide in the Monthly Compliance Report (MCR) the WEAP Training Acknowledgement forms of workers who have completed the training in the prior month and a running total of all persons who have completed training to date.

CUL-6 Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; and/or surface grading or subsurface soil work during pre-construction activities or site mobilization, and/or mowing activities and heavy equipment use in loose or sandy soils, at the project site and at laydown areas, roads, and other ancillary areas in California, the project owner shall notify the CPM of the date on which ground disturbance will ensue. The project owner shall ensure that the CRS, alternate CRS, or CRMs monitor, full time, all ground disturbance at the project site, along the linear facilities routes in California, and at laydown areas, roads, and other ancillary areas wherever such ground disturbance occurs on and in Holocene-age alluvial landforms Qa1 and Qa2 (see CH2 2012a, Figure DR101-1), which compose much of the eastern portion of the project site. The purpose of monitoring the physical disturbance of these landforms is to minimize any impacts to previously unknown archaeological resources that are found during the course of project construction and operation, and to ensure that known cultural resources are not impacted in an unanticipated manner.

Full-time archaeological monitoring for this project shall be the archaeological monitoring of ground-disturbing activities in the areas specified in the previous paragraph, for as long as the activities are ongoing. Where excavation equipment is actively removing dirt and hauling the excavated material farther than fifty feet from the location of active excavation, full-time archaeological monitoring shall require at least two monitors per excavation area. In this circumstance, one monitor shall observe the location of active excavation and a second monitor shall inspect the excavated spoils. The inspection of excavated spoils shall include periodic and systematic screening of five-gallon samples of such spoils through one-quarter-inch hardware cloth. For excavation areas where the excavated material is dumped no farther than fifty feet from the location of active excavation, one monitor shall both observe the location of active excavation and inspect the dumped material.

A Native American monitor (NAM) shall be obtained to monitor ground disturbance full time in project areas where the CRS, alternate CRS, or CRMS are monitoring full time. Contact lists of interested Native Americans shall be obtained from the Native American Heritage Commission (NAHC), and the project owner shall, to the extent feasible, adhere to the NAHC's *Guidelines for Monitors/Consultants Native American Cultural, Religious, Burial Sites* (http://www.nahc.ca.gov/guidelines4mon.html). Preference in selecting a monitor shall be given to the Pahrump Paiute Tribe, a Native American community with traditional ties to the project area. Should no member or too few members of that community be able to serve as monitors for whatever reason, or should the CPM assess that no member or too few members of that community are qualified under the above guidelines to serve as monitors, then the project owner shall seek and, to the extent feasible, accommodate the preferences of the Pahrump Paiute Tribe as to the Native American community affiliation of any other Native American monitors that are to monitor the construction of the project. If efforts to obtain the services of a qualified Native American monitor are ultimately unsuccessful, the project owner shall immediately inform the CPM. The CPM will either identify potential monitors or will allow ground disturbance to proceed without a Native American monitor.

The research design in the CRMMP shall govern the collection, treatment, retention/disposal, and curation of any archaeological materials encountered.

On forms provided by the CPM, CRMs shall keep a daily log of any monitoring and other cultural resources activities and any instances of non-compliance with the conditions and/or applicable LORS. Copies of the daily monitoring logs shall be provided by the CRS to the CPM, if requested by the CPM. From these logs, the CRS shall compile a monthly monitoring summary report to be included in the MCR. If there are no monitoring activities, the summary report shall specify why monitoring has been suspended.

The CRS or alternate CRS shall report daily to the CPM on the status of the project's cultural resources-related activities, unless reducing or ending daily reporting is requested by the CRS and approved by the CPM.

In the event that the CRS believes that the current level of monitoring is not appropriate in certain locations, a letter or e-mail detailing the justification for changing the level of monitoring shall be provided to the CPM for review and approval prior to any change in the level of monitoring.

The CRS, at his or her discretion, or at the request of the CPM, may informally discuss cultural resources monitoring and mitigation activities with Energy Commission technical staff.

Cultural resources monitoring activities are the responsibility of the CRS. Any interference with monitoring activities, removal of a monitor from duties assigned by the CRS, or direction to a monitor to relocate monitoring activities by anyone other than the CRS shall be considered non-compliance with these conditions.

Upon becoming aware of any incidents of non-compliance with the conditions and/or applicable LORS, the CRS and/or the project owner shall notify the CPM by telephone or e-mail within 24 hours. The CRS shall also recommend corrective action to resolve the problem or achieve compliance with the conditions. When the issue is resolved, the CRS shall write a report describing the issue, the resolution of the issue, and the effectiveness of the resolution measures. This report shall be provided in the next MCR for the review of the CPM.

Verification: At least 30 days prior to the start of ground disturbance, the CPM will notify all Native Americans with whom the Energy Commission communicated during the project review of the date on which the project's ground disturbance will begin. At least 30 days prior to the start of ground disturbance, the CPM will provide to the CRS an electronic copy of a form to be used as a daily monitoring log.

Monthly, while monitoring is on-going, the project owner shall include in each MCR a copy of the monthly summary report of cultural resources-related monitoring prepared by the CRS and shall attach any new DPR 523A forms completed for finds treated prescriptively, as specified in the CRMMP.

At least 24 hours prior to implementing a proposed change in monitoring level, the project owner shall submit to the CPM, for review and approval, a letter or e-mail (or some other form of communication acceptable to the CPM) detailing the CRS's justification for changing the monitoring level.

Daily, as long as no cultural resources are found, the CRS shall provide a statement that "no cultural resources over 50 years of age were discovered" to the CPM as an e-mail or in some other form of communication acceptable to the CPM.

At least 24 hours prior to reducing or ending daily reporting, the project owner shall submit to the CPM, for review and approval, a letter or e-mail (or some other form of communication acceptable to the CPM) detailing the CRS's justification for reducing or ending daily reporting.

CUL-7 The project owner shall grant authority to halt ground disturbance to the CRS, alternate CRS, and the CRMs in the event of a cultural resources discovery. Redirection of ground disturbance shall be accomplished under the direction of the construction supervisor in accordance with the opinion of the CRS.

In the event that a cultural resource over 50 years of age is found (or if younger, determined exceptionally significant by the CPM), or impacts to such a resource can be anticipated, ground disturbance shall be halted or redirected in the immediate vicinity of the discovery sufficient to ensure that the resource is protected from further impacts. If the discovery includes human remains, the project owner shall comply with the requirements of Health and Human Safety Code § 7050.5(b) and shall additionally notify the CPM and the NAHC of the discovery of human remains. No action with respect to the disposition of human remains of Native American origin shall be initiated without direction from the CPM. Monitoring, including Native American monitoring, and daily reporting, as provided in other conditions, shall continue during the project's ground-disturbing activities elsewhere, while the halting or redirection of ground disturbance in the vicinity of the discovery shall remain in effect until the CRS has visited the discovery, and all of the following have occurred:

1. The CRS has notified the project owner, and the CPM has been notified within 24 hours of the discovery, or by Monday morning if the cultural resources discovery occurs between 8:00 AM on Friday and 8:00 AM on

Sunday morning. Notification shall include a description of the discovery (or changes in character or attributes), the action taken (i.e., work stoppage or redirection), reasoned recommendations of CRHR eligibility, and recommendations for appropriate regulatory treatment, whether or not, in any given case, a determination of CRHR eligibility has been made.

2. If the discovery would be of interest to Native Americans, the CRS has notified all Native American groups that have requested to be notified in the event of such a discovery within 24 hours of the discovery.

3. The CRS has completed field notes, measurements, and photography for a DPR 523 "Primary" form. Unless the find can be treated prescriptively, as specified in the CRMMP, the "Description" entry of the DPR 523 "Primary" form shall include a recommendation on the CRHR eligibility of the discovery. The project owner shall submit completed forms to the CPM.

4. The CRS, the project owner, and the CPM have conferred, and the CPM has concurred with any recommendations of eligibility made in relation to the discovery and approved the CRS's proposed treatment, if any, including the curation of the artifacts, or other appropriate treatment; and any necessary treatment has been completed. Ground disturbance may resume only with the approval of the CPM.

In the event that heavy rain should coincide with an incomplete or compromised project drainage system during construction, and flooding occurs that impacts cultural resources beyond the project site boundaries, the project owner shall treat such impacted cultural resources as discoveries under this condition of certification, and all provisions of this condition shall apply, with the exception of the requirement to halt construction in the vicinity of the discoveries.

Verification: At least 30 days prior to the start of ground disturbance, the project owner shall provide the CPM and CRS with a letter confirming that the CRS, alternate CRS, and CRMs have the authority to halt ground disturbance in the vicinity of a cultural resources discovery, and that the project owner shall ensure that the CRS notifies the CPM within 24 hours of a discovery, or by Monday morning if the cultural resources discovery occurs between 8:00 AM on Friday and 8:00 AM on Sunday morning.

Unless the discovery can be treated prescriptively, as specified in the CRMMP, completed DPR 523 forms for resources newly discovered during ground disturbance shall be submitted to the CPM for review and approval no later than 24 hours following the notification of the CPM, or 48 hours following the completion of data recordation/recovery, whichever the CRS decides is more appropriate for the subject cultural resource.

Within 48 hours of the discovery of a resource of interest to Native Americans, the project owner shall ensure that the CRS notifies all Native American groups that expressed a desire to be notified in the event of such a discovery, and the CRS must inform the CPM when the notifications are complete.

No later than 30 days following the discovery of any Native American cultural materials, the project owner shall submit to the CPM copies of the information transmittal letters sent to the chairpersons of the Native American tribes or groups who requested the information. Additionally, the project owner shall submit to the CPM copies of letters of transmittal for all subsequent responses to Native American requests for notification, consultation, and reports and records.

Within 15 days of receiving them, the project owner shall submit to the CPM copies of any comments or information provided by Native Americans in response to the project owner's transmittals of information.

CUL-8 If fill soils necessary to the construction or operation of the California components of the project must be acquired from any non-commercial borrow site or disposed of at any non-commercial disposal site, in California or elsewhere, the project owner shall have the CRS survey any such borrow or disposal site for cultural resources, including ethnographic and built-environment resources, and record on DPR 523 series forms any resources found, unless the project owner is able to submit reports of the results of surveys completed less than five years prior to the anticipated use of any subject borrow or disposal site, that document 100 percent coverage of the subject site. The adequacy of the documentation of any prior survey is subject to the approval of the CPM.

Upon the completion of any new requisite survey, the project owner shall convey the results and the CRS's recommendations for further action to the CPM. The CPM, in consultation with the project owner, shall determine what, if any, further action may be required. If the CPM determines that significant archaeological resources that the project cannot avoid are present at the borrow or disposal site, other conditions, which may include the elimination of a proposed non-commercial borrow or disposal site from consideration, shall apply. The project owner shall have the CRS report on the methods and results of these surveys in the final CRR.

Verification: As soon as the project owner knows that a non-commercial borrow site or disposal site will be used, the owner shall notify the CRS and CPM, and provide documentation, for the approval of the CPM, of any relevant previous archaeological surveys completed less than five years prior to the anticipated use of any subject borrow or disposal site.

In the absence of documentation for any cultural resource surveys completed less than five years prior to the anticipated use of any subject borrow or disposal site, the CRS shall survey any such borrow or disposal site for archaeological resources. Said survey shall occur at least 30 days prior to the disturbance of the ground on any such site. The project owner shall report the results of any cultural resources survey to the CPM, with recommendations for further action. The CPM, in consultation with the project owner, shall determine what subsequent action is warranted.

CUL-9 Prior to the start of construction-related ground disturbance or grading, boring, and trenching, as defined in the General Conditions for this project; and/or surface grading or subsurface soil work during pre-construction activities or site mobilization, and/or mowing activities and heavy equipment use in loose or sandy soils, at the project site and at laydown areas, roads, and other ancillary areas in California, the project owner shall fund a study of the Old Spanish Trail-Mormon Road Northern Corridor (OST-MRNC) by the Old Spanish Trail Association (OSTA).The project owner shall submit the OSTA study research design to the CPM for review and approval prior to the start of the investigation. The study shall not begin prior to CPM approval. No ground disturbance shall occur prior to completion of the OSTA study, unless such activities are specifically approved by the CPM. The OSTA study shall, at a minimum:

a. Ground-truth all potential OST-MRNC tracks and traces within the identified OST-MRNC in the Pahrump Valley; and

b. Produce a report identifying the confirmed OST-MRNC tracks and traces in the Pahrump Valley and justifying the confirmation or rejection of each, with a map showing the confirmed tracks and traces; and

c. Complete a DPR-523l form for each confirmed track and trace located on the HHSEGS project site and submit these forms with the report required in Part b.

At the same time as or after the completion of the OSTA study, the project owner shall fund a follow-up study of the OST-MRNC, to be conducted by a qualified historian. The project owner shall submit the follow-up study research design to the CPM for review and approval prior to the start of the investigation. The study shall not begin prior to CPM approval. This OST-MRNC documentation and evaluation study shall, at a minimum:

a. Produce a local historical context of the OST-MRNC in the Pahrump Valley, incorporating the information from the OSTA report and the Old Spanish Trail Documentation Project, and evaluating the role of the Mound, Browns, Weeping Rock, Hidden Hills Ranch, and Stump springs as key natural water sources for those traveling along this portion of the OST-MRNC;

b. Evaluate the identified OST-MRNC tracks and traces for NRHP and CRHR eligibility in the local context of the Pahrump Valley;

c. Evaluate the identified OST-MRNC for inclusion in the National Register of Historic Places (NRHP)-listed Old Spanish Trail-Mormon Road Historic District (Nevada), and the Old Spanish Trail National Historic Trail.;

d. Produce a report of investigations, including full documentation of the OST-MRNC and a recommendation, with full justification, on nominating the OST-MRNC for inclusion in the CRHR and/or the NRHP-listed Old Spanish Trail-Mormon Road Historic District (Nevada); documentation shall adhere to the Secretary of the Interior's Guidelines for Architectural and Engineering Documentation and the National Park Service guidelines for Historic American Landscape Surveys.

The project owner shall ensure that all reports and resource documentation are submitted to the CPM and to the appropriate California Historical Resources Information System (CHRIS) Information Center. The project owner shall also provide all OST-MRNC reports and resource documentation to the interpretive facilities identified in **CUL-10** for use in the planning and completion of OST-MRNC interpretation and exhibits. The project owner shall ensure that all reports, resource documentation, and nominations are submitted to the appropriate federal and/or state agencies for nomination to the NRHR, CRHR, and the Old Spanish Trail National Historic Trail.

<u>Verification:</u> At least 90 days prior to the start of ground disturbance, the project owner shall submit an agreement or contract with the OSTA for required research on the tracks and traces of the OST-MRNC to the CPM for review and approval.
At least 60 days prior to the start of the OSTA study, the project owner shall submit the research design for the study and a recommended due date for the submission of the draft report and DPR 523L forms to the CPM for review and approval.

At least 30 days prior to the start of ground disturbance, the project owner shall submit the final OSTA study report and DPR 523L forms to the CPM. Construction-related ground disturbance may start after the CPM approves the final report and forms.

No later than 45 days after CPM approval of the OSTA study report, the project owner shall submit an agreement or contract with a qualified historian for the required documentation of the OST-MRNC to the CPM for review and approval.

At least 60 days prior to the start of the OST-MRNC documentation study, the project owner shall submit the research design for the study and a recommended due date for the submission of the draft report to the CPM for review and approval.

No later than 120 days after CPM approval of the OST-MRNC documentation study research design and due date, the project owner shall submit the draft study report to the CPM for review and approval.

Within 30 days of receiving CPM approval of the draft OST-MRNC documentation study report, the project owner shall submit the final OST-MRNC documentation study report to the CPM.

Within 10 working days of receipt, the project owner shall provide a copy of all study-related correspondence with OSTA and other agencies and organizations to the CPM.

Within 90 days after CPM approval of all OST-MRNC study reports and documentation, the project owner shall submit the final OSTA and OST-MRNC documentation study reports and DPR 523L forms to the California Historical Resources Information System (CHRIS) and to the Interpretive Center (**CUL-10**) Stakeholders Group for use in the planning and completion of OST-MRNC interpretation and exhibits.

Within 30 days after submitting all OST-MRNC documentation to the CHRIS and the Interpretive Center Stakeholders Group, the project owner shall provide documentation to the CPM confirming receipt of the materials.

CUL-10 The project owner shall negotiate, design, plan, cause to be built, staff, and maintain the infrastructure, and architectural and interior improvements necessary to implement interpretive and preservation objectives that will reduce the project's significant and feasibly unmitigable effects to the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, the Pahrump Paiute Home Landscape, the Ma-hav Landscape, and the Old Spanish Trail-Mormon Road Northern Corridor in Pahrump Valley. The interpretive and preservation objectives that the project owner shall implement include, at a minimum:

1. The construction and maintenance of an interpretive kiosk within one hundred yards of the facility site that presents broad overviews of the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, the Pahrump Paiute Home Landscape, the Ma-hav Landscape, and the Old Spanish Trail-Mormon Road Northern Corridor along with information on the nearby interpretive facilities where the public shall be able to access more in-depth interpretive programs for each resource. The presentation of the overviews and the delivery of information on nearby interpretive facilities could occur in conjunction with the implementation of **VIS-6**, as long as the implementation of that condition occurred within the specified distance from the facility site.

2. The delivery of passive museum displays and multi-media presentations, *and* hands-on, interactive exhibits, at extant interpretive facilities in Pahrump or adjacent valleys, the primary purposes of which shall be to facilitate the interpretation of the cultural landscapes and corridor, and visual resources. The specific interpretive modes shall include, at a minimum, the development and delivery of accessible[31], separate displays, presentations, *and* exhibits, of museum quality[32], for the following topics:
   - the genesis, paleoecology, and archaeology of the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape,
   - the seasonal subsistence cycle of the Pahrump Paiute Tribe, and
   - the Old Spanish Trail-Mormon Road Northern Corridor.

[31] "accessible" shall be herein defined as comporting with the *Smithsonian Guidelines for Accessible Exhibition Design* (http://accessible.si.edu/pdf/Smithsonian%20Guidelines%20for%20accessible%20design.pdf)

[32] "museum quality" shall be herein defined as comporting with the *Standards for Museum Exhibitions and Indicators of Excellence* as developed by the Standing Professional Committees Council of the American Association of Museums (http://name-aam.org/about/past-winners/standards-for-museum-exhibitions)

The interpretation of each of the above topic and subtopic areas shall facilitate separate consideration of the chronologic phases and sociocultural themes relevant to each such area. The planning, development, maintenance, and periodic renewal of these modes shall be done in consultation with stakeholders that actively participated in the consultation process conducted in conjunction with the review of the project owner's application for certification for this project.

3. The delivery of ethnographic reconstructions,[33] at an extant interpretive facility in Pahrump or adjacent valleys, the purpose of which shall be to facilitate the interpretation of the Native American use of the local landscape in the prehistoric and ethnographic periods. The specific interpretive modes shall include, at a minimum:

   - Native American installation and maintenance of an aboriginal horticultural garden reliant on natural spring water to the extent feasible, for public interpretation, and
   - the conjunctive Native American installation and maintenance, of an exploratory reconstructed village consisting of a few replica dwellings that allow public access to walk in, about, and through the village and garden area. Providing direct visitor access to a real garden, featuring native garden varietals, such as pumpkins, beans, and corn, set near the interpretive materials provided per item 2, above, will greatly enhance the visitor education experience beyond what passive interpretive materials would solely provide.

The planning, development, maintenance, and periodic renewal of these modes shall be done in consultation with representatives of the Native American communities that actively participated in the consultation process conducted in conjunction with the review of the project owner's application for certification for this project.

The project owner shall conduct each phase of the implementation of this condition in consultation with stakeholders who formally respond to the project owner's formal invitation to participate in such consultation, and shall also be able to provide evidence, to the satisfaction of the CPM, of all resultant consultation. At a minimum, the stakeholders should include, in addition to representatives of the hosting interpretive facilities, the Pahrump Paiute Tribe, the Old Spanish Trail Association, the Armagosa Conservancy, a representative of each municipality or county government in whose jurisdiction a hosting interpretive facility falls.

[33] "museum quality" shall be herein defined as comporting with the *Standards for Museum Exhibitions and Indicators of Excellence* as developed by the Standing Professional Committees Council of the American Association of Museums (http://name-aam.org/about/past-winners/standards-for-museum-exhibitions)

The CPM, in consultation with the California and Nevada Bureau of Land Management, will provide active and discretionary oversight to ensure that the negotiated venues for the delivery of the mitigation objectives, the design of the delivery modes, the environmental planning for those modes, and actual mode delivery, maintenance, and efforts of periodic renewal are consistent with the intent of this condition.

Verification: No later than 12 months after the CPM's issuance of the notice to proceed for the project, the project owner shall conclude negotiations with the facilities that will host the delivery of the mitigation objectives for **CUL-10**. The project owner shall submit, for CPM for review and approval, a report of these negotiations and their respective outcomes, and shall further include, as appendices, formal correspondence from each host facility that specifies precisely what mitigation objectives that the facility has agreed to host, the period of time for which the facility has agreed to host them, and any conditions that the host facility has placed on their agreement with the project owner.

No later than 6 months after the CPM's issuance of the notice to proceed for the project, the project owner shall submit, for CPM for review and approval, a draft consultation protocol that sets out the precise manner in which the project owner intends to interact with the stakeholders whose input the project owner shall seek as the project owner negotiates, designs, plans, constructs, and maintains the delivery modes for the mitigation objectives of this condition. The minimum stakeholder group shall include, to the extent feasible, representatives of the hosting interpretive facilities, the Pahrump Paiute Tribe, the Old Spanish Trail Association, the Armagosa Conservancy, a representative of each municipality or county government in whose jurisdiction a hosting interpretive facility falls. The draft protocol shall include, as appendices, proofs of contact for each of the above members of the minimum stakeholders group and any additional potential stakeholders with whom the project owner has made contact, and an initial stakeholder list.

No later than 18 months after the CPM's issuance of the notice to proceed for the project, the project owner shall submit, for CPM for review and approval, a draft, host facility-approved, initial design proposal for each delivery venue for each mitigation objective in this condition.

No later than 24 months after the CPM's issuance of the notice to proceed for the project, the project owner shall submit, for CPM for review and approval, the host facility-approved, final design for each delivery venue for each mitigation objective in this condition.

No later than 30 months after the CPM's issuance of the notice to proceed for the project, the project owner shall initiate construction or installation of each delivery venue for each mitigation objective in the approved final designs.

No later than 36 months after the CPM's issuance of the notice to proceed for the project, the project owner shall ensure, and provide the CPM evidence, that each delivery venue for each mitigation objective in the approved final designs is in full operation.

For the operational life of the project, through project decommissioning, the project owner shall provide evidence in the annual compliance report for the project that each delivery venue for each mitigation objective in the approved final designs continues to be maintained.

CUL-11 The project owner shall design and implement a multidisciplinary program of primary research on the geology, geomorphology, hydrology, ecology, and archaeology of the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape, which is delineated and described in the cultural resources section of the Final Staff Assessment for the HHSEGS project. The scale of the research shall be sufficient to provide reliable interpretative synopses, from both processual and historical perspectives, of each of these disciplines. The measure of research sufficiency, should any dispute arise, shall be the expert opinion of research institution faculty members who actively pursue research and publish in peer-reviewed journals in each discipline. The CPM shall select the faculty members whose opinion would be sought to resolve any dispute.

The project owner shall develop, under the direct and active supervision of a qualified professional geoarchaeologist, a draft formal research design that includes a proposed budget for the research and submit the design plan simultaneously to the CPM for review and approval, and to Native American tribes who have expressed an interest in commenting or participating in the research program for review and comment.

Upon the CPM's approval of the research design, the project owner shall implement the program as designed. The project owner shall ensure that the research team shall provide regular quarterly progress reports to the CPM for review and comment.

Following completion of the research program, the project owner shall submit the research program's draft final report simultaneously to the CPM for review and approval, and to the Native American tribes who have been actively involved in the research process for review and comment.

The project owner shall also ensure that the research program's approved final report, completed DPR 523 series forms, and other associated documentation are submitted to the appropriate California Historical Resources Information System (CHRIS) Information Center(s) and other repositories, both in California and Nevada.

The project owner shall provide a copy of all final documents and study-related correspondence with other agencies and organizations to the CPM in a timely manner.

The project owner shall ensure the curation of all research documentation related to the execution of this research program and the material culture recovered as a result in a curation facility that meets federal curation standards. The project owner shall also be responsible for any curation fees associated with the program.

The project owner shall develop and execute professional and public outreach initiatives that would clearly benefit the public.

<u>Verification:</u> No later than 90 days from the start of construction, the project owner shall submit a draft formal research design to the CPM for review and approval.

No later than 90 days subsequent to the CPM's approval of the formal research design, the project owner shall, unless otherwise stipulated by the CPM, initiate the implementation of the research design and complete the fieldwork portion of it without interruption.

No later than 90 days subsequent to the CPM's approval of the formal research design and every 90 days thereafter until the submission to the CPM of the draft final report of the research program, the project owner shall submit a brief report on the progress of the different phases of research and on the preliminary research results to that date.

No later than 270 days subsequent to the completion of the fieldwork portion of the formal research design, the project owner shall, unless otherwise stipulated by the CPM, provide the CPM with written proof of the submission of the approved final report and complete DPR 523 series forms to the appropriate CHRIS Information Center(s) and to other appropriate regional repositories in California and Nevada. The CPM shall make the final determination which other repositories, in addition to CHRIS Information Centers, are appropriate.

No later than 270 days subsequent to the completion of the fieldwork portion of the formal research design, the project owner shall, unless otherwise stipulated by the CPM, provide draft proposals for the professional and public outreach initiatives that are to be one result of this research to the CPM for review and approval.

No later than 390 days subsequent to the completion of the fieldwork portion of the formal research design, the project owner shall, unless otherwise stipulated by the CPM, provide the CPM with written proof of the completion of the CPM-approved professional and public outreach initiatives.

CULTURAL RESOURCES ACRONYM GLOSSARY

HIDDEN HILLS SOLAR ELECTRIC GENERATING PROJECT

A.D.	After the Birth of Christ
AFC	Application for Certification
ARMR	Archaeological Resource Management Report
B.C.	Before the Birth of Christ
CEQA	California Environmental Quality Act
CHRIS	California Historical Resources Information System
Conditions	Conditions of Certification
CRHR	California Register of Historical Resources
CRM	Cultural Resources Monitor
CRMMP	Cultural Resources Monitoring and Mitigation Plan
CRR	Cultural Resource Report
CRS	Cultural Resources Specialist
DPR 523	Department of Parks and Recreation cultural resource inventory form
EIC	Eastern Information Center, University of California, Riverside
FSA	Final Staff Assessment
HHSEGS	Hidden Hills Solar Electric Generating System
KOP	Key Observation Point (see also VISUAL RESOURCES section of FSA
LORS	laws, ordinances, regulations, and standards
MCR	Monthly Compliance Report
MLD	Most Likely Descendent
NAHC	Native American Heritage Commission
NAM	Native American Monitor
NRHP	National Register of Historic Places

OHP	Office of Historic Preservation
OSTA	Old Spanish Trail Association
OST-MR	Old Spanish Trail-Mormon Road
OST-MRNC	Old Spanish Trail-Mormon Road Northern Corridor
PAA	Project Area of Analysis. The project site (see below) plus what additional areas staff defines for each project that are necessary for the analysis of the cultural resources that the project may impact.
Project Site	The bounded area(s) identified by the applicant as the area(s) within which they propose to build the project.
PSA	Preliminary Staff Assessment
SHPO	State Historic Preservation Officer
Staff	Energy Commission cultural resources technical staff
WEAP	Worker Environmental Awareness Program

REFERENCES

The “(tn: 00000)” in a reference below indicates the transaction number under which the item is catalogued in the Energy Commission’s Docket Unit. The transaction number allows for quicker location and retrieval of individual files.

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CULTURAL RESOURCES

List of Comment Letters

		Cultural Resources Comments?
1	Inyo County	
2	Bureau of Land Management	
3	National Park Service	X
4	The Nature Conservancy	
5	Amargosa Conservancy	X
6	Basin & Range Watch	X
7	Pahrump Paiute Tribe	X
8	Richard Arnold, Pahrump Paiute Tribe	X
9	Big Pine Tribe of Owens Valley	X
10	Intervener Cindy MacDonald	X
11	Intervener Center for Biological Diversity	
12	Intervener, Old Spanish Trail Association	X
13	Applicant, BrightSource Energy, Inc.	X

Comment #	DATE	COMMENT TOPIC	RESPONSE
3	**July 23, 2012**	**National Park Service**	
3.1		Documentation and evaluation of the Old Spanish Trail (OST).	CEC staff agrees that the documentation and evaluation provided by the applicant is inadequate. That is why Staff has recommended additional work per **CUL-9**.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
5	**July 21, 2012**	**The Amargosa Conservancy**	
5.8		Viewshed of the OST	Impacts to the setting of the OST are evaluated in the **Visual Resources** and **Cultural Resouces** sections of the **FSA**.

Comment #	DATE	COMMENT TOPIC	RESPONSE
6	**July 23, 2012**	**Basin and Range Watch**	
6.19		Adequacy of Mitigation (specifically CUL-9)	The PSA did not state -- and the FSA does not state -- that the mitigation measure would reduce the impact to the OST to less than significant. The CEQA Guidelines states "An EIR shall describe feasible measures which could minimize significant adverse impacts..."(CCR Title 14, Chapter 3, Article 9, 15126.4(a)(1)).
6.20		Mitigation, Interpretive Center does not mitigate for impacts to OST	See response to comment 6.19 above. See **CUL-10** in the FSA for a discussion of the mitigation.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
7	**July 23, 2012**	**Pahrump Piahute Tribe**	
7.2		The proposed project will impact visual, cultural, wildlife and water resources	Comment noted, and addressed throughout respective section of the **FSA**
7.3		Insufficent mitigation measures	The mitigation measures in the SSA were preliminary. The **FSA** provides the final verion of these mitigation measures.
7.4		Request for legal representation to handle mitigations for life of project	Comment noted.
7.5		Request for compensatory lands equal to the project size be “placed in the Pahrump Paiute Tribes hands.”	Please see **CUL-1** through **CUL-11** for a complete description of the mitigation measures.

7.6		Objects to **VIS-6** mitigations that only require wayside panels in Inyo County and that are verified as complete by Inyo County. Also requests that Interpretive center "building" include an archaeological curation facility meeting federal standards and is operated by a person meeting federal qualifications. Also requests that it should not be a foregone conclusion that Interpretive Center be placed in Inyo County.	Please see **CUL-1** through **CUL-11** for a complete description of the mitigation measures.
7.8		Alternatives analysis -- scope regarding Cultural Resources	Please see the **Alternatives** Section of the **FSA.**
7.9		Request to be involved in Management plans or mitigations regarding plants, wildlife and water.	Please see **CUL-1** through **CUL-11** for a complete description of the mitigation measures.
7.10		Pahrump Paiute Tribe requests to be consulted with regard to selection of Native American monitors.	**CUL-6** revised to give Pahrump Paiute Tribe first preference for selection as Native American monitors, and, in event members of that community are unable to serve as monitors, applicant must try to accommodate the Pahrump Paiute Tribe's preference as to the Native American community affiliation of any other monitors.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
8	**July 23, 2012**	**Richard Arnold, Pahrump Piahute Tribe**	
8.1		Environmental Justice - Native Americans	Please see the **Executive Summary** and **Socioeconomics** sections of the FSA for more information regarding EJ.
8.2		Ethnographic Study information - Confidentiality	A redacted version of the ethnographic study was filed on August 17, 2012, and is consistent with the Tribe's specific requests, and can be viewed here: http://www.energy.ca.gov/sitingcases/hiddenhills/documents/2012-08-16_Hidden_Hills_Ethnography_Report_TN-66701.pdf

8.3		The Pahrump Paiute Holy lands are unfairly impacted – environmental justice	Please see the **Executive Summary** and **Socioeconomics** sections of the FSA for more information regarding EJ.
8.4		SSA does not adequately address Pahrump Paiute cultural practices – suggest releasing a redacted version of the ethnographic study	A redacted version of the ethnographic study was filed on August 17, 2012, and is consistent with the Tribe's specific requests, and can be viewed here: http://www.energy.ca.gov/sitingcases/hiddenhills/documents/2012-08-16_Hidden_Hills_Ethnography_Report_TN-66701.pdf
8.5		Project will alter the cultural landscape in ways that render the potential cultural usage of the land to unusable and this will impact cultural transmission opportunities.	Please see **CUL-1** through **CUL-11** for a complete description of the mitigation measures.
8.6		Project will reduce water levels that will in turn impact water dependent and culturally important wildlife and plant life.	Please see **CUL-1** through **CUL-11** for a complete description of the mitigation measures.
8.7		Request to include cultural easements for areas that are intended to protect threatened and endangered plants and animals	Please see **CUL-1** through **CUL-11** for a complete description of the mitigation measures.
8.9		Pahrump Paiute Tribe does not want to participate in mitigations with the St. Therese Mission.	Please see **CUL-1** through **CUL-11** for a complete description of the mitigation measures.

Comment #	DATE	COMMENT TOPIC	RESPONSE
9	**July 21, 2012**	**Big Pine Tribe of Owens Valley**	
9.1		Project impacts to the Old Spanish Trail (OST)	Staff has evaluated the impacts of the proposed project to the OST and concluded that the impacts would be significant and unavoidable.
9.2		Water Resources	Please see the **Water Supply** section of the **FSA**.
9.3		Biological resources	Please see the **Biological Resources** Section of the **FSA**.
9.4		Alternatives	Please see the **Alternatives** Section of the FSA for a discussion of the Alternatives with regards to Cultural Resource impacts.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
10	**July 21, 2012**	**Intervenor Cindy MacDonald -- p. 5-1**	
10.1a		NAGPRA - LORS Relevancy	Only those LORS that are applicable to the applicant/owner are listed in SSA and FSA. NAGPRA is only applicable to federal land managers and institutions holding NAGPRA defined items that are recipients of federal funding – Not applicable
10.1b/c		Executive Order 13007 / 12898 LORS relevancy	Only those LORS that are applicable to the applicant/owner are listed in SSA and FSA. EO 13007 is only applicable to federal land managers that consider actions that may prevent Native American access to sacred sites on federal lands – Not applicable

10.1d		Executive Order 13175 LORS relevancy	Only those LORS that are applicable to the applicant/owner are listed in SSA and FSA. EO 13175 requires federal agencies to conduct consultation with tribes when placing unfunded mandates on tribes or in the course of developing policies that may burden federally recognized tribes – Not applicable
10.1e		PRC 5097.99 LORS relevancy	This Public Resources Code prohibits anyone from taking or possessing Native American human remains taken from a burial unless otherwise provided by law. CEC has no knowledge that the applicant has taken or possesses Native American human remains. No known Native American human remains have been identified within the project area boundaries. Should Native American human remains be discovered during project related ground disturbing activities, then **CUL-3** addresses the potential discovery by requiring the applicant to develop a Cultural Resources Monitoring and Mitigation Plan that has as a required section (9), that the applicant follow procedures provided by law at Health and Human Safety Code 7050.5. **CUL-5** requires that a Worker Environmental Awareness Program is instituted to inform project workers of applicable environmental laws including those laws pertaining to Native American human remains.
10.1f		PRC 5097.993 -994 LORS relevancy	This Public Resources Code states that various forms of deliberate damage to historical resources on public or private land is subject to fines and imprisonment unless the act is exempt per a number of exceptions. **CUL 5** requires that a Worker Environmental Awareness Program is instituted to inform project workers of applicable environmental laws including those laws pertaining to Native American human remains.

10.1g		Penal Code 622 ½ LORS relevancy	Similar to 5097.993-994 (**Response 10.1f,** above), except the penalty / fine for violators is less.
10.1h		Ca H & S Code 8010- 8011 LORS relevancy	This code addresses repatriation of Native American remains and cultural items from federal institutions in California and California State Agencies and museums. This code does not apply to the applicant.
10.2		Younts Ranch	The complex of buildings and structures that once comprised the Younts Ranch, later known as Hidden Hills Ranch, is located approximately 2 miles to the east of the project site and outside of the PAA. However, Staff did visit the area during a site visit and noted that the integrity of the buildings and structures on the Younts Ranch has been severely compromised. The majority of the buildings and structures are no longer standing, which can been seen in the photos attached to Comment Letter #10 (to view, see **Appendix RTC)** many of them have either fallen down and/or been burned down.
10.3		Vandalism of historic and cultural resources	Staff is unsure as to how the commentor is using the phrase "zone of impact." Prior to assessing a project's potential impact Staff determins the Project Area of Analysis (PAA). The PAA includes the project site and a buffer around the project site in an effort to identify both direct and indirect impacts. The PAA is established based on the characteristics of the project components as well as the types of cultural resources in the area. After the PAA is established Staff documents the current condidtions of the area, which then become the baseline. This baseline is used to evaluate the project's potential impacts.

10.4		Private property rights	Property owners rights with regards to demolition are set by the local authorites, generally the planning office. Any demolition that would occur as a result of the proposed project under CEC review would be evaluated for potential environmental impacts.
10.5		Impacts to Cathedral Canyon	The area known as Cathedral Canyon is located approximately 2 miles to the east of the project site and outside of the Project Area of Analysis (PAA) . However, Staff did visit the area during a site visit and noted that the integrity has been severely compromised. The majority of the statuary and other decorations, the bridge that once spanned the canyon, and the stairs leading down into the canyon have all been removed. Additionally the project site is not visible from in the canyon.
10.6		Suggested mitigation - preserve Cathedral Canyon.	As required by CEQA mitigation measures have been developed in an effort to reduce significant impacts to cultural resources. Please see **CUL-10** in the **FSA** for more detailed information.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
12	**July 23, 2012**	**Intervenor Old Spanish Trail Association**	
12.1		Integrity of the OST National Historic Trail	Please see full discussion, analysis and suggested mitigation measures releated to the OST in the **FSA**
12.2		OST - Applicant's eligibility determination	These comments relate to the applicant's consultant's work; therefore, CEC Staff cannot appropriately and accurately reply.
12.3		NRHP eligiblity of the OST	The commentor quotes and summarizes National Register Bulletin - Guidelines for Evaluating Rural Historic Landscapes, which are discussed in the **FSA**.

12.4		Springs associated with OST	**CUL-9** of the FSA requires a more in depth study of the OST in the Pahrum Valley including several of the springs located east of the project site. See the FSA for more details on **CUL-9**.
12.5		SHPO consultation	Consultation with SHPO is under the perview of the BLM and will be done as a part of BLM's Section 106 process related to the natural gas pipeline and Valley Electric Association's (VEA) Hidden Hills Transmission Project and its NEPA review process.
12.6		Cumulative Impacts to the OST, the adjacent springs, and the surrounding desert enviornment.	As required by CEQA, the FSA evaluates the cumulative impacts of a number of projects in the vicinity including the total impact of those projects on significant historical resources as well as the proposed project's contribution to those impacts. Please see "Cumulative Impacts" analysis in the **FSA** for more details.
12.7		Visual/setting impacts	The **Visual Resources** section of the FSA discusses the impacts to the scenic vistas. The Cultural Resources section of the FSA discusses the impacts of the proposed project on significant historical resources including visual/setting impacts to resources partially or wholly outside of the project site boundary.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
13	**July 23, 2012**	**Applicant, BrightSource Energy, Inc. -- p. 142**	
13.1		Applicant appears to imply that the appropriate scope of the cultural resources analysis would be a geographic area relatively tightly wound around the proposed facility site and only in California.	The scope of staff's cultural resources analysis is the geographic area that encompasses the physical components of the proposed project in California and the area across which those components have the potential to affect historical resources. The latter area includes parts of California and Nevada.

13.1 (1)		Applicant states that the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape is entirely in Nevada.	There is a factual error in the applicant's assertion. As presently delineated, the landscape overlaps the boundary between California and Nevada. As stated in the analysis, the present landscape boundary is preliminary and subject to future refinement.
13.1 (2)a		Salt Song Landscape conceptual or metaphysical	The landscape is not a concept as it exists on and about the ground of Pahrump Valley. It is a “concept” (as is anything else) when rendered into a report, that requires a reader to “conceptualize.” Some aspects of the Salt Song trail understandings and related practices infer “metaphysical” entities, that is, entities not subject to ordinary sensory experience. However, the landscape in which these practices take place are not metaphysical, nor are the practitioners and the practices they perform, including songs, metaphysical.
13.1 (2)b		Salt Song Landscape is a large landscape – not fully delineated	The ethnographer would need a minimum of two years of ethnographic research to fully document the Salt Song trail. Sufficient time was not provided to conduct a full study. CEQA only requires enough information to make an informed decision. Enough information is provided in the Ethnographic study and the FSA to make an informed decision. Generally, some resources are relatively small and some resources are relatively large. CEQA does not specify that only certain sized resources require consideration. E.g. Route 66 extends from Chicago to Santa Monica and crosses 8 states. The Salt Song landscape is described in the **FSA**.

13.1 (3)		Pahrump Home Landscape is a large landscape – not fully delineated	The ethnographer would need a minimum of two years of ethnographic research to fully document the Pahrump Paiute Home Landscape. Sufficient time was not provided to conduct a full study. CEQA only requires enough information to make an informed decision. Enough information is provided in the Ethnographic study and the SSA to make an informed decision. Generally, some resources are relatively small and some resources are relatively large. CEQA does not specify that only certain sized resources require consideration. The Pahrump Paiute Home Landscape is generally delineated and described in the FSA.
13.1 (4)		Ma-hav Landscape is a large landscape – not fully delineated	The ethnographer would need a minimum of one year of ethnographic research to fully document the Ma-hav Landscape. Sufficient time was not provided to conduct a full study. CEQA only requires enough information to make an informed decision. Enough information is provided in the Ethnographic study and the SSA to make an informed decision. Generally, some resources are relatively small and some resources are relatively large. CEQA does not specify that only certain sized resources require consideration. An explanation of how the boundaries were delineated is found in the FSA.
13.1 (5)		Old Spanish Trail/Mormon Road (OST/MR) Northern Corridor	Staff is required to analyze potential project impacts to historical resources; as such Staff must first identify those historical resources. This involves determining if resources are eligible for the NRHP and/or CRHR.

13.2		The SSA does not describe the process for how the three ethnographic landscapes were identified. The process is instead sequestered in a confidential appendix. The applicant can not agree or disagree with Staff conclusions without reviewing the confidential ethnographic report.	The FSA provides information on the process for (Native American Consultation), (Ethnographic Resource Investigation – Ethnographic Methods), (Research Design), and (Interviews). Sufficient non-confidential information was carried forward from the confidential report and placed in the SSA allowing the applicant to understand staff's conclusions. However a redacted version of the confidential report has been docketed and is available to the public to facilitate understanding of the nuanced background information leading to and supporting what was found by employing the methods in the Pahrump valley and as relates to project related impacts.
13.3		Applicant states that staff has made wholly unsubstantiated assertions of historical significance for multiple cultural resources in the SSA. The applicant admonishes that determinations of historical significance under CEQA must be made with reference to "substantial evidence."	Staff made an assumption of historical significance with regard to one cultural resource, the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape.

13.4		The applicant makes the assertion that staff attempts, in the SSA, to inappropriately apply California historic preservation law in Nevada, and, further, that the use of the California Register of Historical Resources' (CRHR) eligibility yardstick is only applicable to cultural resources in California.	Staff believes that the applicant's former assertion is faulty. In the SSA, staff does not apply historic preservation law to actions that are proposed to occur in Nevada. The entire environmental analysis, one small part of which is the cultural resources analysis, explicitly states that staff's consideration of the proposed project is limited only to those components of the project that are proposed to be built and operated in California. Staff's application of California historic preservation law is focused exclusively on the analysis of how the Calfornia project components would affect historical resources, wherever those effects may occur. The focus of the actions analyzed is soley in California. Those actions have effects further afield. The applicant's latter assertion that one cannot apply the tests for historical signficance set out in the CRHR to cultural resources outside of California also does not well withstand scrutiny. In the first place, each of the five resources that the applicant enumerates are at least partly present in California. Secondly, section 15064.5(a)(4) of the CEQA Guidelines explicitly states that nothing precludes a lead agency from determining that a resource is an historical resource as defined in section 5020.1(j) of the Public Resources Code. That section states that a historical resource "includes, but is not limited to, any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant." The test is not expressly limited to the exclusive consideration of cultural resources in California. Staff believes the use of the CRHR standards of historical significance is entirely appropriate to the present analysis.

13.5 (1)		Applicant states that the SSA does not explain how a landscape or corridor can be an historical resource under California law, and that National Park Service (NPS) guidance on the evaluation of landscapes is inapplicable to California landscapes.	Sections 5020.1(j) and (h) of the Public Resources Code, respectively and together, set out a partial range of entities that qualify as historical resources under California law. Germane to the consideration of whether a landscape is an entity appropriate for consideration as an historical resource is section 2050.1(j)'s reference to "area" as one such entity. Related to this reference is section 5020.1(h)'s definition of "historic district," which is, in part, defined as a "definable unified geographic entity." It would be questionable for one to try and assert the argument that such an entity does not easily equate to the concept of "area." In the historic preservation realm, the calculus for consideration of a landscape under California law is that it equals an historic district, defined again at section 2050.1(h) as "a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development," which in turn equals an area, which in turn is one of the enumerated entities that qualify for consideration as an historical resource. The applicant asserts that NPS guidance on the evaluation of landscapes is inapplicable under California law; the guidance is not binding even under Federal law. However, it is just guidance, and wholly appropriate, as the foundation for the evaluative process for cultural resources under the CRHR, and is derived directly from the evaluative process for the National Register of Historic Places, which is administered by NPS.
13.5 (2)		Applicant states that no clear geographic boundaries are found in the SSA for four of the five resources that staff determines or assumes to be historically significant.	The geographic boundary for the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape may be found on page 45 of the SSA and is also included in the FSA.

13.5 (3)a		SSA does not provide a description of the physical identity of the landscapes that supports significance conclusions. (Ethnographic Resources)	See the **FSA** Sections entitled "Southern Paiute, Pahrump Paiute, and Ma-hav Ethnographic Landscapes Generally Described" which provides per each ethnographic landscape, sections on "Contributing Attributes," "Periods of Significance" and another section entitled "Evaluation of Ethnographic Resources" and the discussion entitled "Integrity".
13.5 (3)b		Applicant asserts that staff does not adequately describe the physical character of cultural resources during their respective periods of significance, nor describe the present integrity of the resources and their consequent abilities to convey their respective significance. (Archaeological Resources)	The applicant is referred to the Archaeological Resources discussion in the **FSA** for more information.
13.5 (3)c		(Built-environment Resources)	See pages 65-70 if the SSA:.http://www.energy.ca.gov/sitingcases/hiddenhills/documents/2012-06-15_Supplemental_Staff_Assessment_and_Schedule_Update_TN-65775.pdf
13.6 (1)a		Applicant asserts that staff provides no rationale for the eligibility of the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape under CRHR Criterion 1.	The *Landscape Interpretation* subsection of the cultural resources analysis in the **FSA** provides a relatively thorough discussion of the role of the landscape in the economy and ethnogeography of the people whose home the landscape was in prehistory.

13.6(1)b		Applicant asserts that staff's discussion of the eligibility of the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape under CRHR Criterion 4 is speculative and not supported by substantial evidence.	This is a reiteration of the applicant's Comment No. 13.3. Please refer to staff's response to that comment.
13.6 (2)		SSA does not provide a description of the events (Criterion 1) or the high artistic value (Criterion 3) of the songs that substantiate eligibility of the Salt Song Landscape	See the **FSA** section "Southern Paiute Salt Song Landscape." Also, see Ethnographic Study.
13.6 (3)		SSA does not provide a description of the events (Criterion 1) or the (Criterion 2) of the life and times of Chief Tecopa that substantiates eligibility of the Pahrump Paiute Home Landscape	See page "Pahrump Paiute Home Landscape" discussion in the **FSA**. Also see Ethnographic Study .http://www.energy.ca.gov/sitingcases/hiddenhills/documents/2012-06-15_Supplemental_Staff_Assessment_and_Schedule_Update_TN-65775.pdf
13.6 (4)		SSA does not provide a description of the events (Criterion 1) or the (Criterion 4) or potential to yield information that substantiates eligibility of the Pahrump Paiute Home Landscape	See "Ma hav landscape" discussion in **FSA**. Table A (Ma-hav period of significance and events) inadvertently omitted from SSA. Ma-hav landscape has information potential in both history and prehistory. While some of the Ma-hav landscape has been surveyed and did not yield eligible prehistoric historical resources, not all of the landscape has been surveyed.
13.6 (5)		Applicant is questioning the scope of the consideration of the Old Spanish Trail/Mormon Road.	Traces of the OST have been documented on the project site by OSTA as well as by the applicant's own consultant. Staff has determined that the study prepared by the applicant was inadequate. Tracks and traces on the project site, and the larger PAA, were not evaluated in the proper context of either the OST specifically in the Pahrump Valley or the larger 2,700+ miles long resource.

13.7		The applicant appears to assert, with reference to section 15064.5(b) of the CEQA Guidelines, that only physical effects to a subject resource constitute material impairment of the significance of that historical resource.	The key reference in section 15064.5(b)(1) is that a substantial adverse change in the signficance of an historical resource means changes not only to the resource under consideration but also to that resource's "immediate surroundings." In the historic preservation field, when a cultural resource is under consideration for historical significance for that resource's potential associative values, for its association with events or persons important in local, regional, or national prehistory or history, the medium through which such a resource may or may not be able to convey its significance to others is its surroundings. The full complement of characteristics relative to which one must consider a project's potential effects includes the characteristics of a resource under consideration and the characteristics of its surroundings. Material changes to the characteristics of either the resource itself or to the resource's surroundings constitute material impairment under section 15064.5(b). Please see the discussion of integrity at section 4852(c) of the California Code of Regulations, which relates to the CRHR, for further clarification on this issue.
13.7 (1)		The applicant reiterates the prior mistaken claim that the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape is entirely in Nevada (see staff response to **Comment No. 13.1 (1)**), and asserts that the proposed project would not physically demolish or materially alter any aspect of the landscape.	The commentor is refered to the *Impacts and Recommended Mitigation* subsection of the SSA on pages 45 and 46 exactly how the constructed project would irreparably alter, materially impair the visual surroundings of the landscape and permanently degrade the landscape's ability to convey its historical significance. The aspects of the landscape that the proposed project would materially alter are the aspects of integrity referred to in the historic preservation field as setting, feeling, and association.

13.7 (2)		Salt Song Trail Landscape	The Salt Song Landscape in which these practices take place is not metaphysical, nor are the practitioners and the practices they perform, including songs, metaphysical. The Salt Song is generally delineated at **Figure 2**. The landscape is defined by various contributing elements which are physical. The Salt Song is based upon substantial practitioner interaction witht he landscape and were the landscape not physically present then the Salt Song would not be possible to conduct.
13.7 (3)		Pahrump Paiute Home Landscape	The Pahrump Paiute Home landscape is not precisely defined at its margins. Staff did not have sufficient research time to define the perimeter boundaries in consultation with nieghboring tribes. However the project is in or near the middle of the Homeland and that portion of territory is unequivocally the Pahrump Paiute's Homeland. The homeland is physically defined by a list of contributing elements. One subset of the Pahrump Paiute Homeland is the Ma-hav Landscape, which is also a physical area, defined in part by a seperate set of contributing elements.
13.7 (4)		Ma-hav Landscape	The Ma-hav landscape is physically bounded and a map is included in the Ethnographic report, and the **FSA** shows the landscape boundaries. The Ma-hav landscape is defined by contributing elements.
13.7 (5)		[Old Spanish Trail/Mormon Road]	See response to comment 13.6 (5).
13.8		No historic resources are on site	Staff disagrees with this comment. Traces of the OST have been documented on the project site by OSTA as well as by the applicant's own consultant.

13.9		Applicant asserts that staff needs to cite some authority for the footnote definition of the term "lifeway" is the SSA.	The term is one of common useage. (see http://www.thefreedictionary.com/lifeway life·way (lfw) n. 1. A customary manner of living; a way of life. 2. A custom, practice, or art: the traditional lifeways of a tribal society.) A definition has been provided in the FSA.
13.10		The FSA should define "ethnographic landscape"	The definition is included in the **FSA**
13.11		Location of OST	Comment noted
13.12		Federal land mis-spelling	This typo has been corrected in the **FSA**.
13.13		Add Antiquities Act, NHPA, ARPA, BLM Cultural Resources Permit, NAGPRA	These federal laws do not pertain to the applicant, with the exception of the BLM permit, which may be issued to the applicant's consultants in general. The BLM permit is not a Law, Ordinance, Regulation or Standard.
13.14		Federal Use of Human Subjects regulations do not apply.	Use of Human Subjects does not apply to the applicant and will be removed.
13.15		Applicant asserts that staff needs to revise the Project Site and Vicinity subsection of the SSA to more explicitly emphasize the present degree of degradation to the natural landscape in the vicinity of the proposed project area and to emphasize the potential for further future development on the project area.	Staff made note of these issues in the SSA where staff felt the issues were relevant to the consideration of cultural resources. The baseline visual effects of Charleston View is obliquely referred to in relation to the Pahrump Metapatch Mesquite Woodland Coppice Dune Landscape on page 45 of the SSA. Begining on page 69 of the SSA is the discussion of the baseline conditions of the project site in relation to the Built-Environment resources.

13.17		Applicant asserts that staff needs to revise the Project Site and Vicinity subsection of the SSA to more accurately portray the character of the cultural resources associated with the proposed project.	Revisions have been made to paragraphs 3 and 4 of that subsection to address this comment.
13.19		PAA	The rational for the PAA was discussed at length beginning on page 6 of the SSA. A map has been provided in the **FSA,** see **Figure 2**
13.20		PAA	Comment noted.
13.21		Applicant objects to staff's characterization of the mesquite populations along the fault system to the northeast of the project site as "woodlands." The applicant apparently prefers the term "thicket," and requests that staff make this global change.	In the Biological Resources section of the PSA, staff acknowledged the inconsistency in the literature and among resource agencies in the terminology used to describe mesquite habitats, but the argument is academic and irrelevant to the consideration of the cultural value of the populations in the project vicinity. Staff noted in that section that in the project area, mesquite range from low shrubby thickets on dunes to taller, lusher stands in the incised washes. Staff ultimately chose to be consistent with the terminology used in the most relevant literature. Please refer to the **Biological Resources** section of the **FSA** for a more detailed discussion of the terminology, habitat values, and conservation importance of the area's mesquite resources.

13.22		Applicant requests that staff provide appropriate citations for the definition of "archaeological landscape" as set out in the Project Area of Analysis (PAA) subsection of the SSA.	The concept of an archaeological landscape is discussed in the subject subsection as a broad, basic introduction for the layperson. Please see the *Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape (Pahrump Metapatch Landscape)* subsection in the SSA for the technical discussion of the concept and for the technical evaluation of the archaeological landscape in the project area of analysis for the proposed project.
13.23		Applicant reiterates assertion that staff's assessment of the historical signficance of the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape is not supported by substantial evidence. The applicant further asserts a similar lack of substantial evidence for staff's finding that the proposed project would be a visual intrusion upon the subject landscape.	The discussion that the applicant cites as the basis for this comment, as with **Comment No. 22**, is a broad, basic introduction for the layperson of the subject landscape and the proposed project's potential effects on it. With regard to the applicant's reiterated assertion that staff provides no substantial evidence to support the historical significance of the landscape, please see the response above to **Comment No. 13.3**. With regard to the applicant's desire for substantial evidence in relation to the proposed project's potential effects on the landscape, please see the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape (Pahrump Metapatch Landscape) subsection in the SSA.

13.24		Applicant reiterates assertion that staff's discussion of the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape does not rely on substantial evidence and can, therefore, not serve as the basis for the evaluation of the historical significance of the resource or justify any requirement to mitigate any significant effect that the proposed project may have on it.	With regard to the applicant's reiterated assertion that staff provides no substantial evidence to support the historical significance of the landscape or any of its components, please see the response above to Comment No. 13.3.
13.25		Location of Mound Spring	Comment noted.
13.26		PAA	The rational for the PAA was discussed at length beginning on page 6 of the SSA. A map has been provided in the FSA.
13.27		Visibility of project	Please see the **Visual Resources** Section of the **FSA**.
13.28		Applicant requests that staff revise the portion of the Archival and Library Research subsection that discusses archaeological site CA-INY-2492.	The discussion in the SSA of CA-INY-2492 related to the resource's CRHR eligibility status at the time of the record search in which the resource came to light. The relevant text is now absent from the **FSA.**
13.29		Applicant disputes staff's description of the itinerary of the August 2, 2011 meeting among local Native American communities, the applicant, and BLM and Energy Commission staffs.	The distinction that staff attempts to make in the text is between "project area" and "project site." Subsequent to meeting at a local community center in the Town of Pahrump, meeting participants toured the vicinity of the project, but not the facility site itself. The text has been revised to clarify this scenario.

13.30		Applicant wants a summary of the CEC-NA meetings, wants to attend such meetings.	The applicant is entitled to request/hold meetings with Tribes at any time before or after filing AFC. The applicant's consultant CH2MHill) handled these arrangements on behalf of the applicant.
13.31		CEC staff should specify in the FSA the ethnographic research that was conducted.	The Ethnographic research is specifically described at SSA pages 21-28.http://www.energy.ca.gov/sitingcases/hiddenhills/documents/2012-06-15_Supplemental_Staff_Assessment_and_Schedule_Update_TN-65775.pdf This information will be repeated in the FSA.
13.32		Applicant wants to see a confidential ethnographic study as part of "due process" and "fundamental fairness"	Sufficient ethnographic information was provided in the SSA with the exception of the failure to include plant and animal tables and the Ma-hav period of significance table. The FSA will include the erroneously omitted data tables. In addition, a redacted copy of the confidential ethnographic report has been docketed.
13.33		The commentor disagrees with Staff's eligibility determinations.	Comment noted. Staff is tasked with performing an independent analysis and disagrees with the commentor. The eligiblity determination have not changed between the SSA and the **FSA**.
13.34		The FSA should explain in more detail how the research design was developed.	More specific info for how the research design was developed and provided in the **FSA --** "Research Design"
13.35		Why were the seven elements/attributes specifically selected. FSA should explain the selection criteria.	The seven elements were general categories that ensued from the research data. A sentence will be added to the **FSA** to state that the seven attributes were derived from the research data.

13.36		Table data regarding plant / animal / Ma-hav	Sufficient ethnographic information was provided in the SSA with the exception of the failure to include plant and animal tables and the Ma-hav period of significance table. The **FSA** will include the erroneously omitted data tables. In addition, a redacted copy of the confidential ethnographic report has been docketed.
13.37		The Salt Song landscape is metaphysical, not delineated, not based on substantive evidence and is assumptive.	The Salt Song Landscape in which these practices take place is not metaphysical, nor are the practitioners and the practices they perform, including songs, metaphysical. The Salt Song is generally delineated at **Figure 2**. The Salt Song is based upon substantive evidence that was derived from literature of the annals of California, Nevada and the United States and from oral history interviews of people who know of or have directly participated in a Salt Song ceremony.
13.38		The Pahrump Paiute Home Landscape is predominately outside of California and is based upon assumption not substantial evidence.	Comment noted. Please see the **FSA** for a complete discussion of the Pahrump Paiute Home Landscape.
13.39		The Ma-hav Landscape is delineated upon four justifications without authority and no rational for why this landscape is more precisely delineated than the other two ethnographic landscapes.	The four justifications are a result of and ensue from the research. The boundary is conservatively delineated. It is more precisely delineated because it is the ethnographic landscape that most closely fits the project area and for which the impacts will be the most direct. A sentence describing why the Ma-hav landscape is more precisely delineated than the other two ethnographic landscapes will be added to the **FSA**.
13.40		Two landscapes can be considered subsets of a larger landscape. Is there one landscape or three landscapes?	There are three landscapes. Two landscapes stand on their own and also contribute to a larger landscape.

13.41		Applicant admonishes that the criteria related in the Method and Threshold for Determining Signficance of Impacts to Historical Resources subsection of the SSA should include legal citations. The applicant also asserts that staff did not meet the criteria in the SSA, nor did staff refer to the pertinent information that the applicant has provided.	The criteria set out in the Method and Threshold for Determining Signficance of Impacts to Historical Resources subsection of the SSA were general analytic tests derived from the California Environmental Quality Act, the CEQA Guidelines, and the regulations for the California Register of Historical Resources. The said subsection of the SSA has been revised to clarify the flow of staff's effects analysis, and to distinguish technical regulatory contexts from derived practice. Staff disagrees with the applicant's perspective that staff has not met the original criteria in the SSA, and staff has cited the applicant's submitted information, where pertinent.
13.42		Applicant emphatically states that staff's position that the proposed project's potential effects on presently unknown buried resources must be taken into account and that mitigation measures for any such effects must be developed is "contrary to CEQA."	Staff refers the applicant to section 15064.5(f) of the California Code of Regulations, which states, in part, that "a lead agency should make provisions for historical or unique archaeological resources accidentally discovered during construction."
13.43		Applicant reiterates perspective that the potential effects of a proposed project on buried cultural resources do not need to be taken into account, and focuses on project-specific concerns about buried cultural resources on the proposed facility site.	The discussion of the broad regulatory context for the analysis is explained in the **FSA**.
13.44		Eligibility Determinations	Staff refers applicant to the response above to **Comment No. 13.33**
13.45		Applicant notes incomplete paragraph.	Paragraph strings entirely eliminated during development of the **FSA**.
13.46		Applicant reiterates objection to the characterization of mesquite populations proximal to the proposed facility site as "woodlands."	Staff refers applicant to the response above to **Comment No. 13.21**.

13.48		Applicant asserts that staff's statement in the SSA that the applicant repeatedly objected to staff's numerous requests for primary field data to support the evaluation of the historical significance of the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape is incorrect.	The applicant repeatedly denied staff requested information that staff stated was necessary to the development of a legally defensible analysis. Staff doesn't share in the applicant's perspective, and believes it is in the interest of public transparency to enter into the record why key information was not available for use in staff's analysis. The applicant goes on in **Comment No. 48** to justify not having provided staff with this key information on the basis of the applicant's mistaken and reiterated belief that the subject landscape is entirely in Nevada (see above response to **Comment No. 13.1 (1)**), that the request of field research is contrary to standards of professional practice, a topic area for which no formal professional standards exist, that the scope and the potential cost of the research that staff requested is unreasonable, despite never having offered to negotiate the matter with staff, and that the applicant has provided staff with information on the landscape that the applicant thought staff had agreed would be sufficient for the PSA but staff failed to incorporate into that document, not acknowledging that the applicant submitted that information, response to **Data Request 105**, too late in the preparation of the SSA to incorporate it. **CUL-9** in the **FSA** will establish the process for ascertaining this information, as **DR 105** was not sufficient in establishing the specifics of this Landscape.
13.49		Applicant reiterates that the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape is entirely in Nevada, and that staff has not provided substantial evidence to support the landscape's consideration as an historical resource.	Staff again refers the applicant to above responses to **Comment Nos. 13.1 (1) and 13.3**, respectively.

13.50		Applicant reiterates question about the legitimacy of staff's technical assumption of the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape's historical significance, and again makes the inapplicable assertion that CRHR criteria for historical significance cannot be applied to cultural resources not in California.	With regard to the question of the subject landscape's historical significance, staff refers the applicant to the above response to **Comment No. 13.3**. With regard to the applicant's concern with the provenience of the landscape, staff refers the applicant to the above response to **Comment No. 13.1 (1)**. Staff would also like to note that one logical implicantion of the applicant's insistence that the CRHR does not apply under CEQA to non-California resources would be that developers of energy projects in California, and their State regulators, have the freedom to visually degrade cultural resources in adjacent states despite being bound under CEQA to preserve analogous resources in California. That would seem to staff to be contradictory to the intent of CEQA.
13.51		Applicant makes assertions that 1) the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape is not in California, 2) the landscape includes some land that is Federally managed, 3) that Federally managed land is managed specifically by the BLM, and 4) the Nevada BLM is the lead Federal agency for the consideration of the proposed project in that state.	With regard to 1), see above response to **Comment No. 13.1 (1)**. With regard to 2) through 4), the applicant is correct. Staff, however, believes that none of this information is relevant to the Energy Commission's responsibility to comply with CEQA, or constrains our authority to comment on the potentially significant effects that the proposed project may have on cultural resources, whatever the provenience of those resources, and to recommend mitigation for any such effects.

13.52		Applicant asserts that staff clearly says in the *Impacts and Recommended Mitigation* subsection of the SSA that the proposed project's potential effects on the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape would be entirely indirect and entirely visual. The applicant goes on to take issue with the depth of staff's analysis of these visual effects and mistakenly asserts that the present baseline of visual degradation to the subject landscape is given no mention.	Staff never states that the subject effects would be indirect. Under section 15358(a) of the CEQA Guidelines, the visual effects to which the landscape would be subject as a result of the construction of the proposed project would be "direct or primary" in nature. Staff affirms the original analysis of the proposed project's potential visual effects, and has clarified the disucssion in the **FSA**.
13.53		Applicant states that staff provides no metrics to quantify the analysis of three inherently subjective, not to be confused with arbitrary, aspects of the integrity of the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape. Those particular aspects of integrity are setting, feeling, and association. The applicant then reiterates the applicant's belief from **Comment No. 13.52** that the present baseline of visual degradation to the landscape is not discussed, and reiterates the applicant's belief that the landscape is in Nevada and should more properly be dealt with under Federal environmental law.	Staff affirms the original analysis of the proposed project's potential visual effects, and has added language for the FSA to elaborate and reaffirm the point of view of that analysis. With regard to the applicant's issue with the discussion of the present visual baseline for the landscape, see the above response to **Comment No. 13.52**, and, with regard to the question of the landscape's geographic provenience, see the above response to **Comment No. 13.1 (1)**.

13.54		Baseline conditions	Prior to assessing a project's potential impact Staff determines the Project Area of Analysis (PAA). The PAA includes the project site and a buffer around the project site in an effort to identify both direct and indirect impacts. The PAA is established based on the characteristics of the project components as well as the types of cultural resources in the area. After the PAA is established Staff documents the current condidtions of the area, which then become the baseline. This baseline is used to evaluate the project's potential impacts.
13.56		Applicant questions how staff can arrive at the conclusion that the proposed project's effects on the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape would be significant and unmitigable, when no systematic survey of the landscape has been made.	The survey of the subject landscape is an effort the purposes of which would have been, in part, to identify, inventory, and evaluate the historical significance of the landscape, not to assess effects.

13.57		Although not particularly clear, the applicant seems to be asserting that documentation equivalent to Federal Historic American Building Survey (HABS) and Historic American Engineering Record (HAER) documentation has been considered, in other planning contexts, to be sufficient mitigation in itself, and that this might be an appropriate resolution to the proposed project's effects on the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape, particularly given, in the applicant's opinion, that the proposed project's effects are indirect. The applicant admonishes staff for alledgedly precluding the input of others as part of the development of mitigation for the landscape, again citing the mistaken assertion that the confidential ethnographic report, appendix A, has some material bearing on the subject landscape.	Staff believes that field investigations to support a State-level variant of Federal Historic American Landscape Survey (HALS) documentation should be one aspect of mitigation for the direct effects (see response to **Comment No. 13.52**) that the proposed project would have on the subject landscape. Staff does not believe that such documentation alone is adequate as mitigation for the virtually permanent loss of a large part of an important landscape.
13.58		Applicant asserts that there is no public loss associated with the proposed project's potential effects to the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape, because an unspecified portion of the dunes that are one component of the landscape are presently in private hands, and the applicant is unaware that the public has expressed any "substantial" concerns about the loss.	Although staff does not possess precise information on the ratio of public to private land acreage for the subject landscape, staff can state that public lands would make up an easy majority of the resource. There would, therefore, be a real and immediate public loss associated with the proposed project's direct visual effects to the landscape. Under CEQA, present land ownership status does not have any bearing on the identification and the evaluation of the historical significance of cultural resources. The heritage values of these resources transcend historic changes in land ownership, and are ascribed the status of a public trust by virtue of the values' consideration in the planning process.

13.59		Applicant reiterates that staff has merely made an unsubstantiated assumption that the construction and operation of the proposed project would constitute a significant visual degradation to the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape, and asserts further that because staff's effects assessment was developed in secrecy, largely on the basis of the confidential ethnographic report, appendix A, and on the basis of meetings that expressly excluded the applicant, any mitigation for the resource is unwarranted, absent the transparent and formal establishment of a significant effect.	Staff affirms the original analysis of the proposed project's potential visual effects, and has added language for the FSA to elaborate and reaffirm the point of view of that analysis. Staff reiterates the commentary made above in reference to **Comment Nos. 13.55 and 13.57** that the confidential ethnographic report, appendix A, has nothing to do with the subject of archaeological landscapes.
13.60		Applicant asserts that mitigation for the Pahrump Metapatch Mesquite Woodland Coppice Dune Archaeological Landscape proposed under **CUL-11** is inappropriate, as the applicant feels there would be no direct effects of the proposed project on the subject landscape.	Staff reiterates the position that the proposed project would indeed have direct effects on the subject landscape and refers the applicant to the above response to **Comment No. 13.52**.
13.61		Ethnographic Landscapes not supported by applicable law, no substantive evidence and outside of California	Ethnographic landscapes are supported by CEQA, there is substantial ethnographic evidence as provided in the SSA and the redacted Confidential Ethnographic Study, and the landscapes are in the project area, in California, in Nevada and in other states.

13.62 (1)		Provide an explanation of the Pahrump Tribe that further details how they are listed by the State of California, how they have been informally recognized by the federal government and how they have over 100 tribal members.	The information provided in the **FSA** describes who the Pahrump Paiute are as a tribal government.
13.62 (2)		"No amount of land alteration can prevent a people from continuing their traditions, therefore the project will have a less than significant impact."	Duly noted. The statement does not speak to a quality of life or the demise of a way of life, only the fact that a way of life will endure until it ceases. The quote is a statement of a resolution to endure, and is not a statement as to the quality or tenuousness of the endurance.
13.63		Ethnographic Report availablity	The Ethnographic report was docketed and is available for public review, as noted earlier: .http://www.energy.ca.gov/sitingcases/hiddenhills/documents/2
13.64		Can project impacts be mitigated or not to a level of less than significant?	Please refer to the Impact Analysis in the **FSA**.
13.65		**VIS-6**	Please see the **Visual Resource** Section of the **FSA**.
13.66		Eligibility determination	Comment noted.
13.67		Eligibility determination	Comment noted.
13.68		Eligibility determination	Comment noted.
13.69		Eligibility determination	Comment noted.
13.70		Eligibility determination	Comment noted.
13.71		Visual/setting impacts	Comment noted.
13.72		Eligibility determination	Comment noted.
13.73		Visual/setting impacts	Comment noted.
13.75		Eligibility determination	Comment noted.
13.77		Eligibility determination	Comment noted.

13.78		Cannot agree with proposed Findings of Fact until a review of the confidential ethnographic report is afforded.	The Ethnographic report was docketed and is available for public review as indicated above.
13.79		Applicant wishes to delete **CUL-1** language that articulates the CPM's authority to both approve and revoke the approval of Cultural Resources Specialists (CRS). Applicant states that this language is redundant, because the CPM's authority to approve the CRS is stated elsewhere in the condition.	Comment noted
13.80		Applicant appears to wish to eliminate redundancy in monthly reports to the CPM, and to restrict the distribution of monthly reports to the CPM.	**CUL-2** revised to clarify the use of the MCR and to reaffirm Energy Commission staff's recommendation that the MCR be made available to those who have an interest in it.
13.81		Applicant wishes to restrict to the project site the applicability of the requirement to pay for the curation of the artifacts recovered and related documentation produced as a result of cultural resources investigations conducted in conjunction with the licensing of this project. for the project	As the effects of the construction and operation of the project extend beyond the boundary of the project site, Energy Commission staff believes that the applicant's responsibility to curate cultural materials and the records related to the recovery of those materials must extend beyond the boundary of the project site to the limits of the project's effects.

13.82		Applicant notes no desire to change **CUL-4**.	n/a
13.83		Applicant eliminates the requirement under **CUL-5** to provide cultural resources awareness training to new workers on any part of the project outside of California, elimanates the option of having other members of the cultural resources compliance team besides the CRS conduct the training, and attempts to further clarify the extent of the temporary avoidance area that must be established around the discovery of new cultural resources during project construction and operation.	Energy Commission staff does not object to the applicant's restriction of worker training to only the California portions of the project or to the elimination of the option to have others besides the CRS conduct training. **CUL-5** has been revised accordingly. Staff finds the further clarification to the extent of temporary avoidance areas to be unnecessary and therefore declines to incorporate that comment.
13.84		Applicant seeks to reduce cultural resources construction monitoring on the basis of the applicant's mistaken statement that Energy Commission staff concurs in applicant's assessment that there are no known archaeological resources on project site.	**CUL-6** revised to reflect Energy Commission staff's perspective that the alluvial landforms of Holocene-age on the eastern portion of the project site (Qa1 and Qa2) have the potential to contain archaeological deposits due to the age of the landforms and to their depositional character.

13.85		Applicant seeks to clarify the scope of the CRS', Alternate CRS', or Cultural Resources Monitor's (CRM) authority to halt construction around an archaeological discovery, and seeks to vest complete authority in the CRS, rather than the CPM, to make determinations of exceptional signficance for finds of more recent age.	With regard to the scope of the authority of the applicant's cultural resources specialists to halt construction around a discovery, staff believes that **CUL-7**, as written, is sufficiently clear. Paragraph two of the condition states that "ground disturbance shall be halted or redirected in the immediate vicinity of the discovery sufficient to ensure that the resource is protected from further impacts." Clear enough. With regard to the CRS being given sole authority to make determinations of exceptional significance, staff declines this suggestion. As the lead agency under CEQA, the Energy Commission has the responsibility to make determinations on the historical significance of cultural resources in accordance with California Register of Historical Resources (CRHR) criteria. The Energy Commission will not wholly delegate that responsibility to a third party.
13.86		Applicant seeks to limit action under **CUL-8** to non-commercial fill borrow or disposal sites in California.	**CUL-8** revised to clarify that the condition is only applicable to the use or disposal of fill on the California components of the project, and the effects of any such use or disposal, wherever those effects may occur on non-commercial borrow or disposal sites, in California or elsewhere.
13.87		**CUL-9**	Comment noted.
13.88		**CUL-10**	Comment noted.

13.89		Applicant wishes **CUL-11** to be deleted. Applicant makes unsubstantiated assertion that a research study as mitigation for the Pahrump Metapatch Mesquite Woodland-Coppice Dune Archaeological Landscape is inappropriate, and further indicates that it is even more inappropriate to analyze the project's effects on the landscape due to its multi-state character, notwithstanding the fact that the project's potential effects are also multi-state in character. The applicant also curiously asserts that the May 17, 2012 response to Data Request 105 (tn 65322) provides sufficient information on the landscape despite the fact that the response is a research design for a paleoenvironmental study that details how much is not known about the landscape.	Please see the **FSA**.

CULTURAL RESOUCES - PLATE 1

Hidden Hills Solar Electric Generating System (HHSEGS) - View Southeast across Hidden Hills Unit 2 toward the southern terminus of the Nopah Range.

CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Staff Photo

CULTURAL RESOUCES - PLATE 2

Hidden Hills Solar Electric Generating System (HHSEGS) - From North of Old Spanish Trail Highway looking toward Northwest. On coppice dune looking across Hidden Hills Units 1 and 2 toward Pahrump Dry Lake and the Nopah Range.

SOURCE: Staff Photo

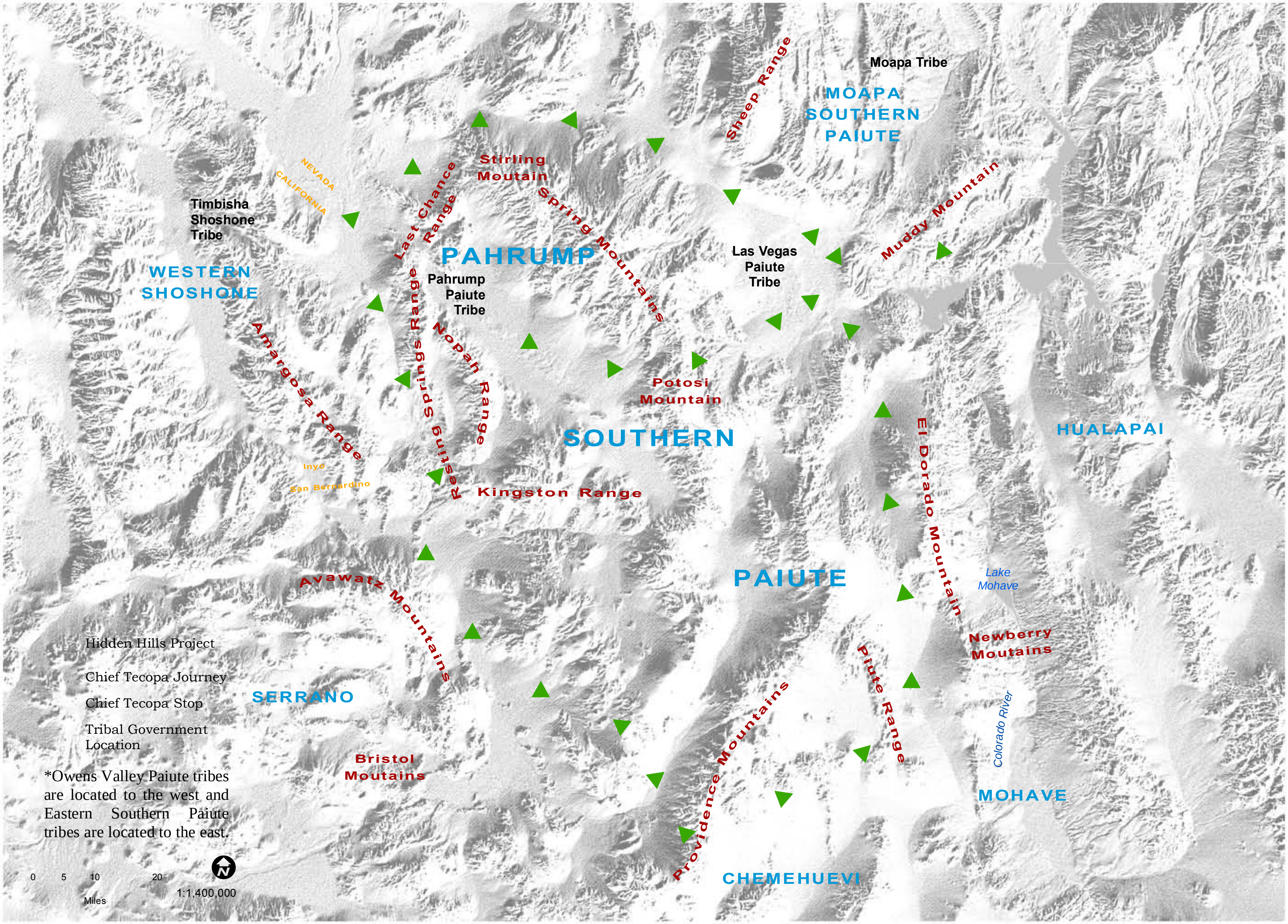
CULTURAL RESOUCES - PLATE 3

Hidden Hills Solar Electric Generating System (HHSEGS) - View Northeast toward Griffith or Charleston Peak from dune field.

SOURCE: Staff Photo

CULTURAL RESOUCES - FIGURE 1

Hidden Hills Solar Electric Generating System (HHSEGS) - Tribal Ancestral Territories and Tribal Government Locations in and around Pahrump Valley



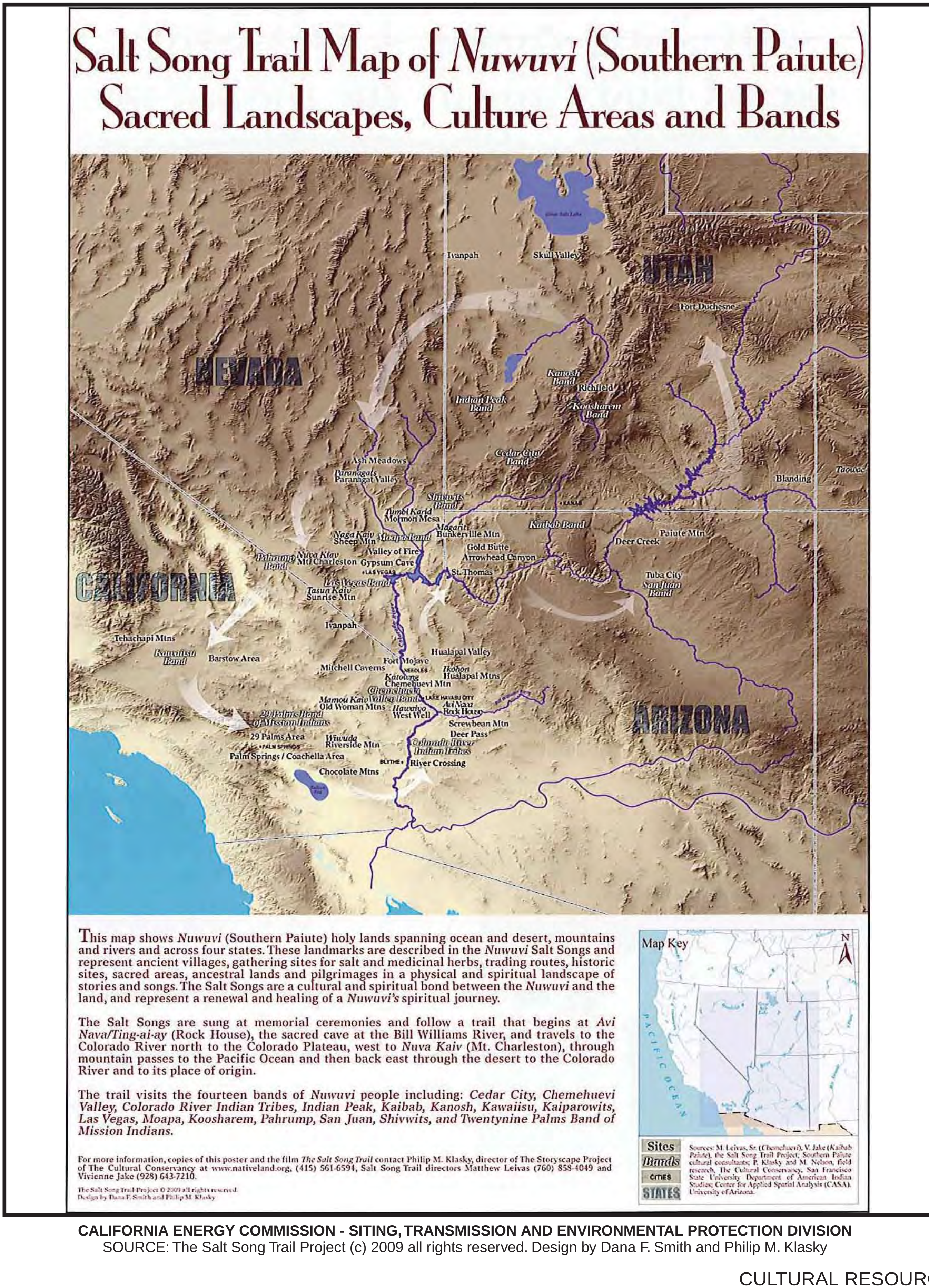
CULTURAL RESOURCES

CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Adapted from *Handbook of North American Indian* Volumes 8 and 11, and *Chief Tecopa and The Hikos* by Celeste Lowe.

CULTURAL RESOURCES - FIGURE 2

Hidden Hills Solar Generating System (HHSEGS) - Salt Song Trail Map of Nuwuvi (Southern Paiute) Sacred Landscapes, Culture Areas and Bands



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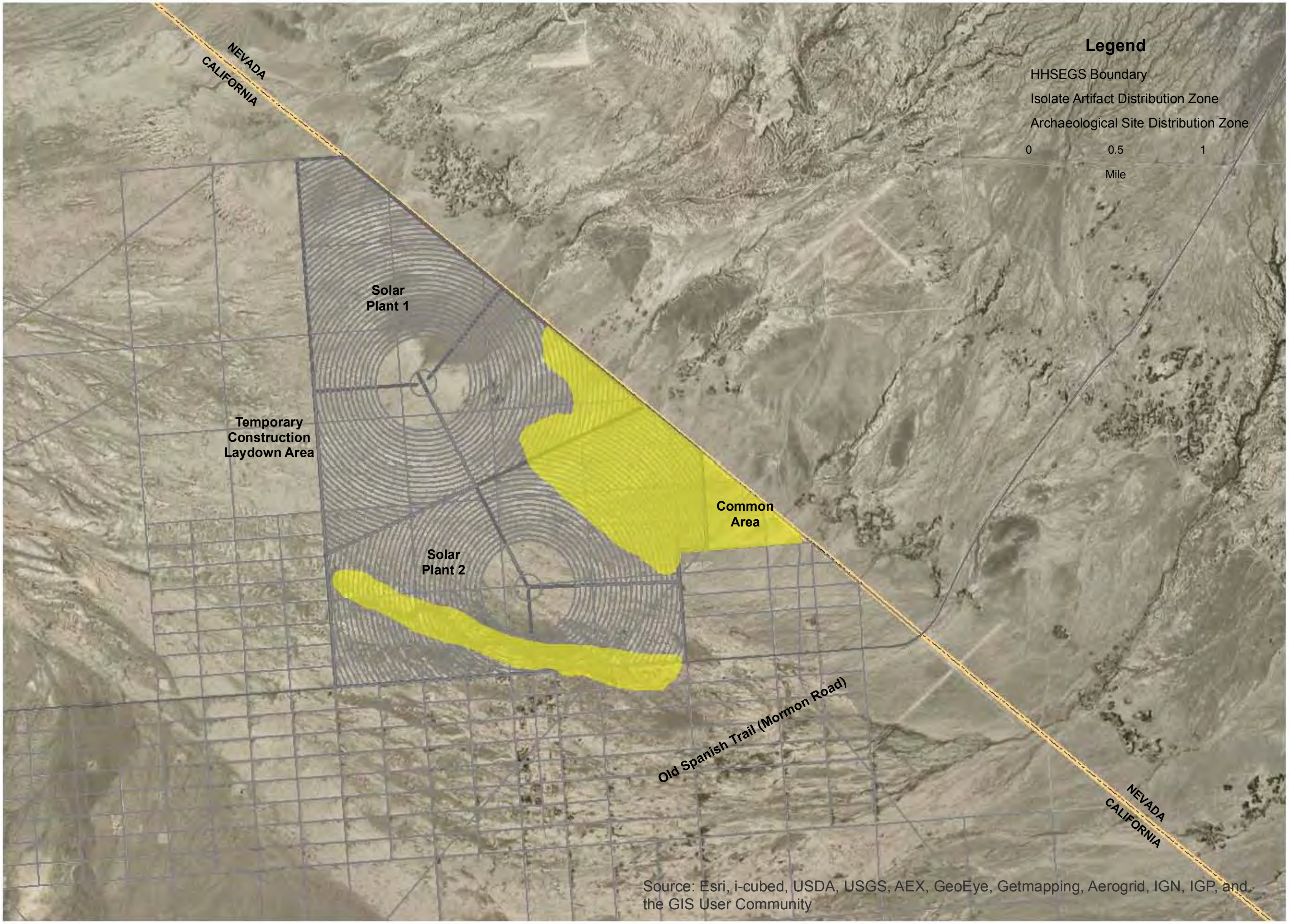
SOURCE: The Salt Song Trail Project (c) 2009 all rights reserved. Design by Dana F. Smith and Philip M. Klasky

CULTURAL RESOUCES - FIGURE 3

Hidden Hills Solar Electric Generating System (HHSEGS) - Distribution of Archaeological Sites and Isolate Artifacts

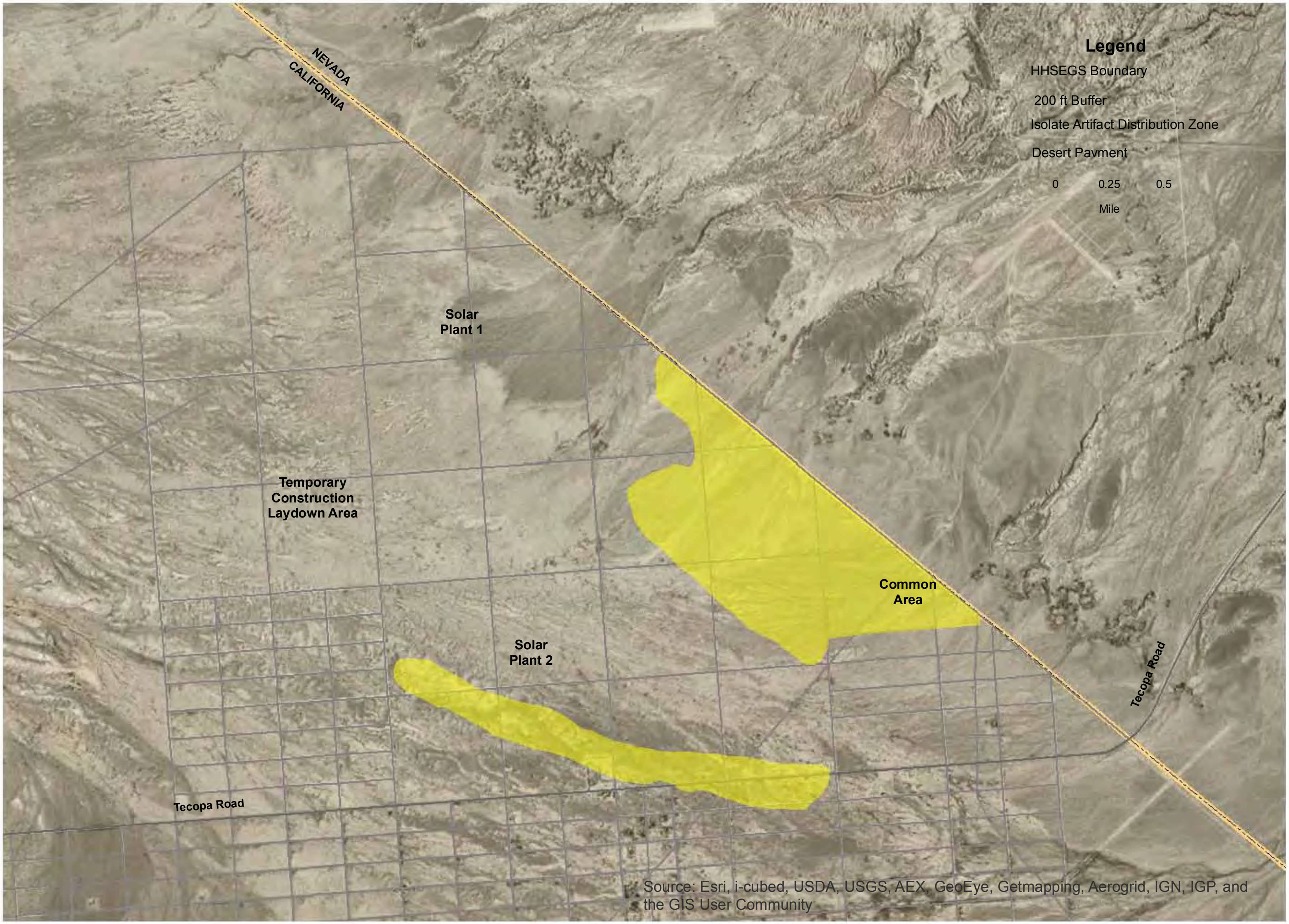


CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CH2M HILL - Figure 3

CULTURAL RESOUCES - FIGURE 4

Hidden Hills Solar Electric Generating System (HHSEGS) - Covariatial of Isolate Artifacts and Facility Site Desert Pavements

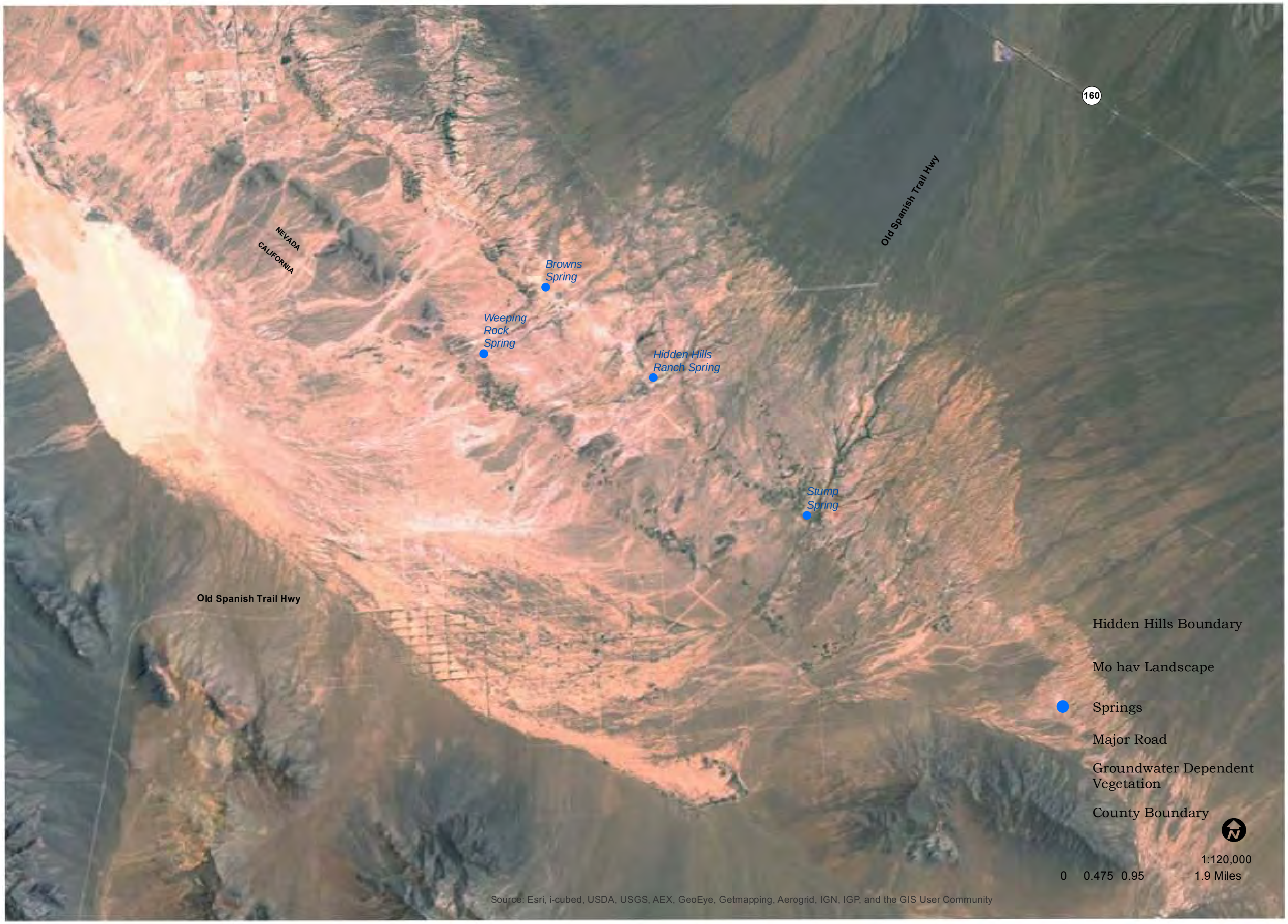


CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: DR127-2 & Facility Data from CH2MHILL. Archaeological features by Commission Staff

CULTURAL RESOUCES - FIGURE 5

Hidden Hills Solar Electric Generating System (HHSEGS) - Mo hav Landscape Vicinity Map

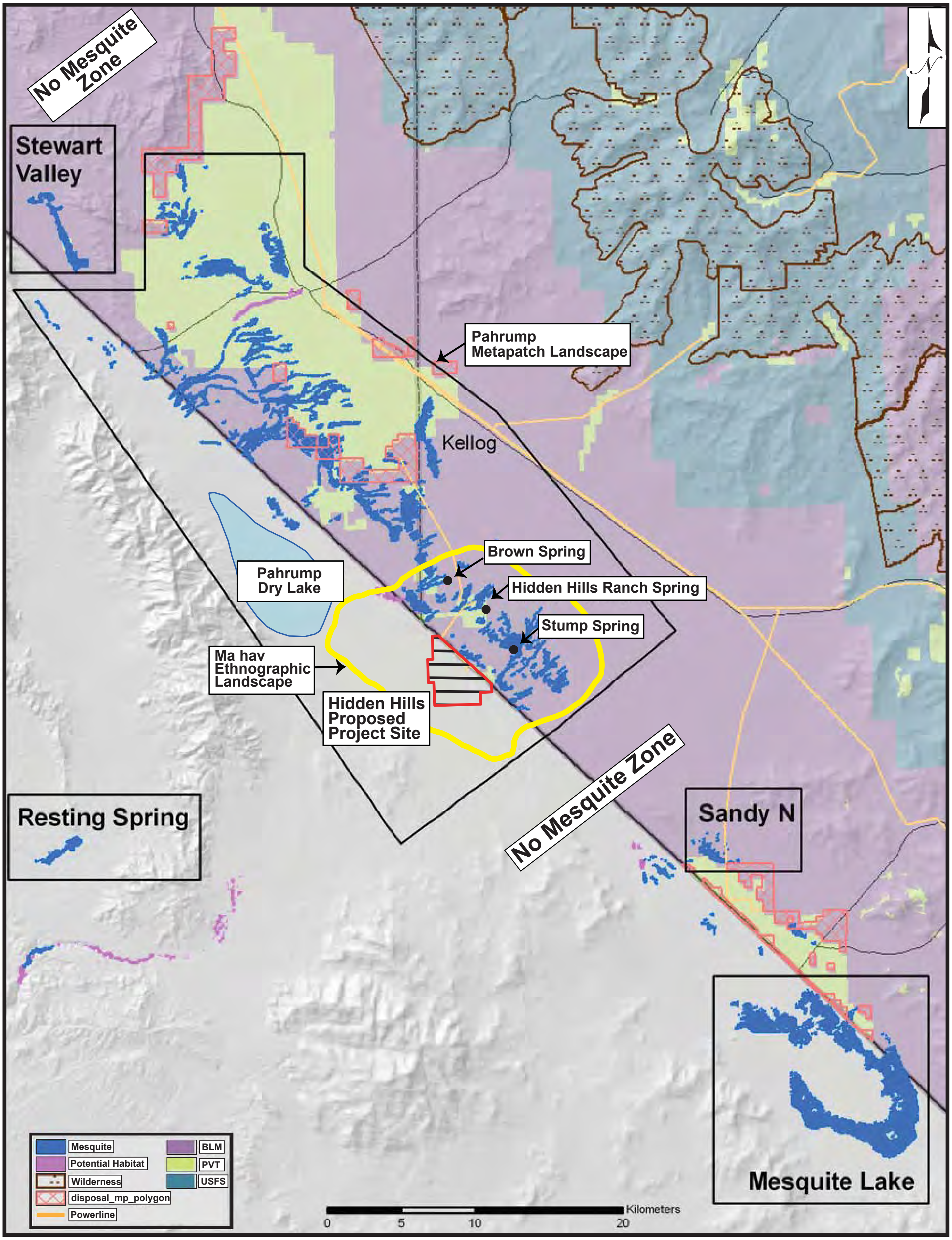


CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: US Major Highway - USDA National Agriculture Imagery Program (NAIP) imagery and USGS Digital Ortho Quarter, Quad, CH2M HILL, Tele Atlas North America, Inc (2010).

CULTURAL RESOURCES - FIGURE 6

Hidden Hills Solar Generating System (HHSEGS) - Initial Boundary of Pahrump Metapatch Mesquite Woodland – Coppice Dune Archaeological Landscape

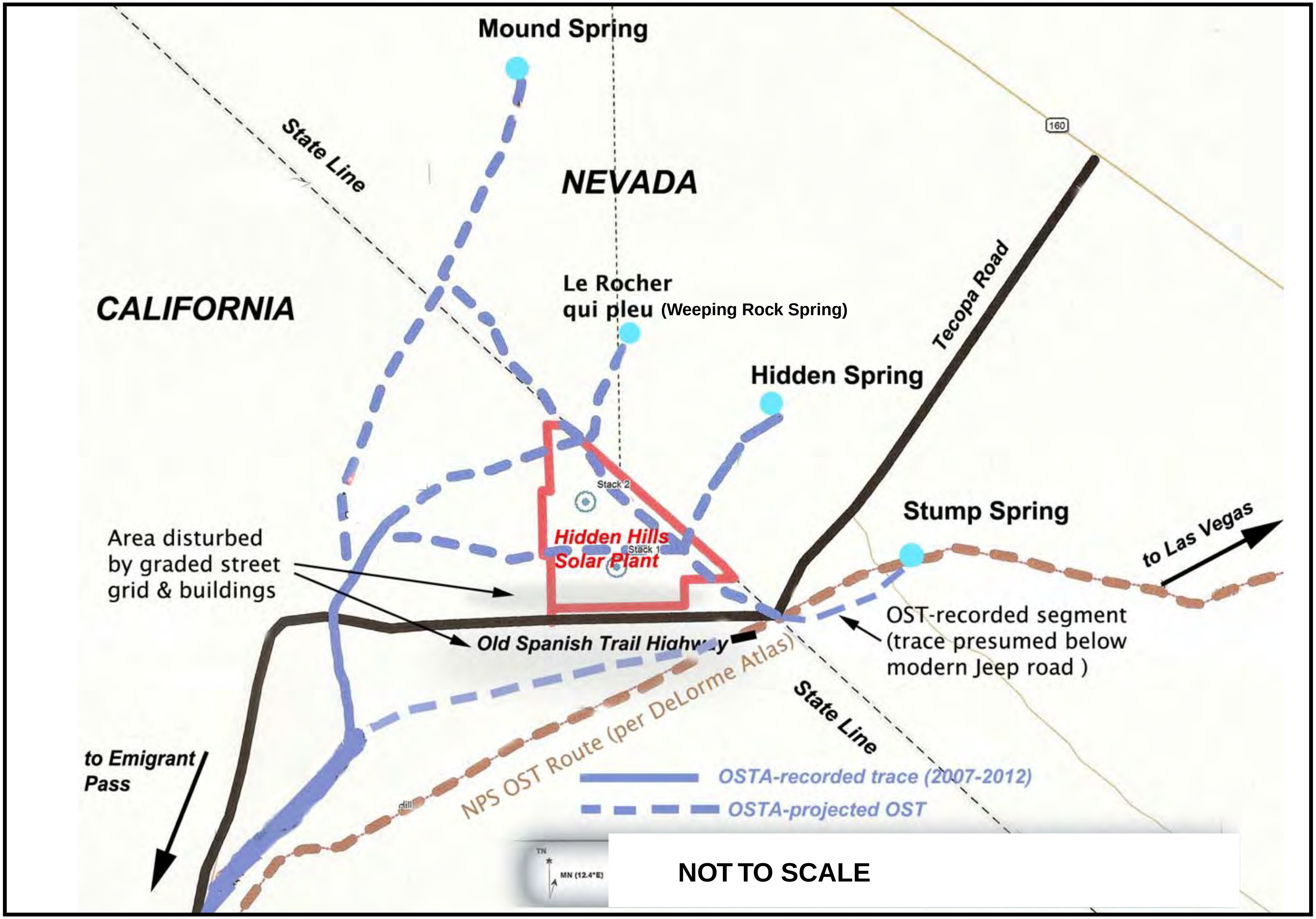


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Lisa Crampton, PhD, et al. 2006. Archaelogical Features by Commission Staff

CULTURAL RESOUCES - FIGURE 7

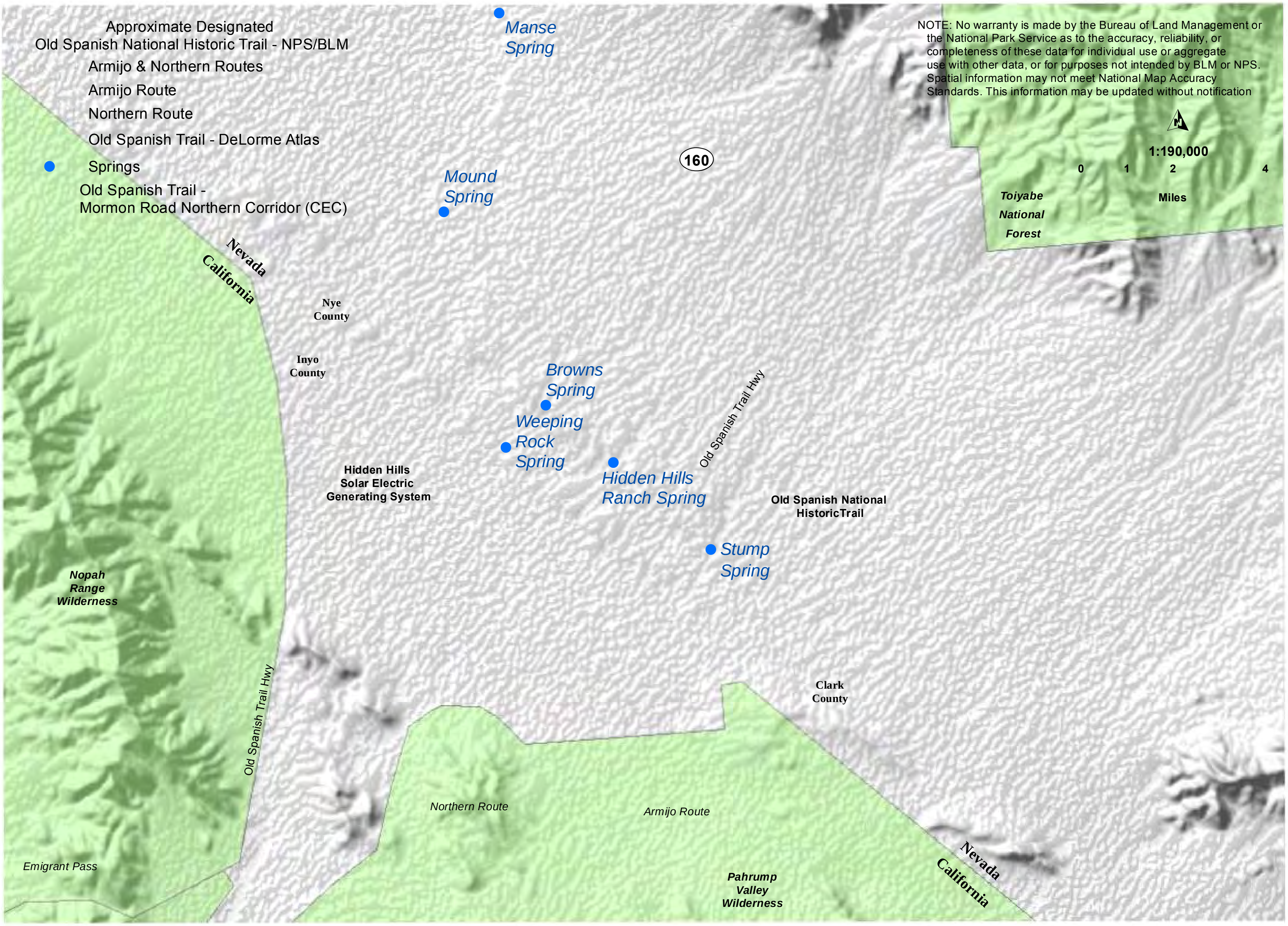
Hidden Hills Solar Electric Generating System (HHSEGS) - Traces of the Old Spanish Trail studied by the OSTA



SOURCE: Old Spanish Trail Association

CULTURAL RESOURCES - FIGURE 8

Hidden Hills Solar Electric Generating System (HHSEGS) - Historic Trails in the Project Vicinity



CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CH2MHILL, MultiNet, DeLorme Atlas, Bureau of Land Management/National Park Service

HAZARDOUS MATERIALS MANAGEMENT

Testimony of Geoff Lesh, PE and Rick Tyler

SUMMARY OF CONCLUSIONS

Staff concludes that hazardous materials use at the proposed HHSEGS would not present a significant impact on the public or environment. With adoption of the proposed mitigation measures/conditions of certification, the proposed project would comply with all applicable laws, ordinances, regulations, and standards (LORS).

These Conditions of Certification meet the Energy Commission's responsibility to comply with the California Environmental Quality Act and serve as staff's recommendations for the Energy Commission to consider in its decision to avoid or reduce the severity of hazardous material-related impacts to less than significant and for the project to conform to all applicable LORS.

INTRODUCTION

The purpose of this **HAZARDOUS MATERIALS MANAGEMENT** section of this Final Staff Assessment (FSA) is to determine if the proposed HHSEGS could potentially cause significant impacts on the public from the use, handling, storage, or transportation of hazardous materials at the proposed project site. If significant adverse impacts on the public are identified, Energy Commission staff must evaluate facility design alternatives and additional mitigation measures to reduce those impacts to the extent feasible.

This analysis does not address the potential exposure of workers to hazardous materials used at the proposed project site. Employers must inform employees of hazards associated with their work and provide those employees with special protective equipment and training to reduce the potential for health impacts from the handling of hazardous materials. The **WORKER SAFETY AND FIRE PROTECTION** section of this document describes the protection of workers from those risks.

For this analysis, staff examines plausible potential loss of containment incidents (spills) for the hazardous materials to be used at the proposed facility. The worst case plausible event, regardless of cause, is considered, and analyzed to see whether the risk to local populations is significant. Hazardous material handling and usage procedures are designed to reduce the likelihood of a spill, to reduce its potential size, and to prevent or reduce the potential migration of a spill off site to the extent that there won't be significant off-site impacts. These measures look at potential direct contact from runoff of spills, air-borne plume concentrations, and the potential for spills to mix with runoff water and be carried offsite. Generally, staff seeks to confirm that the applicant has proposed secondary containment basins for containing hazardous material liquids, and that volatile chemicals would have a restricted exposure to the atmosphere after capture. Containment basins are designed to be able to hold the contents of a full tank plus the potential rainfall from a 25-year storm without any loss of containment. In the event of a spill, the spilled material, along with any mixed-in water and any contaminated soils, would then be placed into containers and processed and disposed of as required by regulations.

Hazardous materials such as mineral and lubricating oils, corrosion inhibitors, herbicides, and acids and bases to control pH would be present at the proposed project site. Hazardous materials used during the construction phase include gasoline, diesel fuel, motor oil, lubricants, and small amounts of solvents and paint. No acutely toxic hazardous materials would be used on-site during construction. None of these materials pose a significant potential for off-site impacts as a result of the quantities on-site, their relative toxicity, their physical states, and/or their environmental mobility.

Although no natural gas is stored, the project will involve the handling of moderate amounts of natural gas. Natural gas poses some risk of both fire and explosion.The risk of a fire and/or explosion on-site can be reduced to insignificant levels through adherence to applicable codes and the development and implementation of effective safety management practices.

The HHSEGS would also require the transportation of certain liquid and solid hazardous materials to the facility. This document addresses all potential impacts associated with the use, storage, and transport of hazardous materials.

LAWS, ORDINANCES, REGULATION, AND STANDARDS

The following federal, state, and local laws and policies (see **HAZARDOUS MATERIALS MANAGEMENT Table 1** below) apply to the protection of public health and hazardous materials management. Staff's analysis examines the project's compliance with these requirements.

HAZARDOUS MATERIALS MANAGEMENT Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	
The Superfund Amendments and Reauthorization Act of 1986 (42 USC §9601 et seq.)	Contains the Emergency Planning and Community Right To Know Act (also known as SARA Title III).
The Clean Air Act (CAA) of 1990 (42 USC 7401 et seq. as amended)	Establishes a nationwide emergency planning and response program, and imposes reporting requirements for businesses that store, handle, or produce significant quantities of extremely hazardous materials.
The CAA Section on Risk Management Plans (42 USC	Requires states to implement a comprehensive system to inform local agencies and the public when a significant quantity of such materials is stored or handled at a facility. The requirements of both SARA Title III and the CAA are reflected in the California Health and Safety Code, section 25531, et seq.

Applicable Law	Description
§112(r)	
49 CFR 172.800	Requires that the suppliers of hazardous materials prepare and implement security plans in accordance with U.S. Department of Transportation (DOT) regulations.
49 CFR Part 1572, Subparts A and B	Requires that suppliers of hazardous materials ensure that their hazardous material drivers comply with personnel background security checks.
The Clean Water Act (CWA) (40 CFR 112)	Aims to prevent the discharge or threat of discharge of oil into navigable waters or adjoining shorelines. Requires a written spill prevention, control, and countermeasures (SPCC) plan to be prepared for facilities that store oil that could leak into navigable waters.
6 CFR Part 27	The CFATS (Chemical Facility Anti-Terrorism Standard) regulation of the U.S. Department of Homeland Security (DHS) that requires facilities that use or store certain hazardous materials to submit information to the DHS so that a vulnerability assessment can be conducted to determine what certain specified security measures shall be implemented.
State	
California Health and Safety Code, sections 25531 to 25543.4	The California Accidental Release Program (Cal-ARP) may require the preparation of a Risk Management Plan (RMP) and Off-site Consequence Analysis (OCA) and submittal to the local Certified Unified Program Authority (CUPA) for approval.
Title 8, California Code of Regulations, section 5189	Requires facility owners to develop and implement effective safety management plans to ensure that large quantities of hazardous materials are handled safely. While these requirements primarily provide for the protection of workers, they also indirectly improve public safety and are coordinated with the RMP process.
Title 8, California Code of Regulations, section 5189	Sets forth requirements for design, construction, and operation of the vessels and equipment used to store and transfer ammonia. These sections generally codify the requirements of several industry codes including the American Society for Material Engineering (ASME) Pressure Vessel Code, the American National Standards Institute (ANSI) K61.1, and the National Boiler and Pressure Vessel Inspection Code. These codes apply to anhydrous ammonia but are also used to design storage facilities for aqueous ammonia.
California Health and Safety Code, sSection 41700	Requires that “No person shall discharge from any source whatsoever such quantities of air contaminants or other material which causes injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency

Applicable Law	Description
	to cause injury or damage to business or property.”
California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)	Prevents certain chemicals that cause cancer and reproductive toxicity from being discharged into sources of drinking water.
LOCAL	
None	

The Certified Unified Program Agency (CUPA) with the responsibility to review the Hazardous Materials Business Plan (HMBP) is the Inyo County Environmental Health Services Department (ICEHSD). With regard to seismic safety issues, the site is located in a seismically active region of California. Construction and design of buildings and vessels storing hazardous materials will meet the appropriate seismic requirements of the 2010 California Building Code.

METHODOLOGY AND THRESHOLDS FOR DETERMININGENVIRONMENTAL CONSEQUENCES

Staff reviewed and assessed the potential for the transportation, handling, and use of hazardous materials to impact the surrounding community. All chemicals and natural gas were evaluated. Staff’s analysis examines the potential impacts on all members of the population including the young, the elderly, and people with existing medical conditions that may make them more sensitive to the adverse effects of hazardous materials. In order to accomplish this goal, staff utilizes the most current acceptable public health exposure levels (both acute and chronic) to protect the public from the effects of an accidental chemical release.

In order to assess the potential of released hazardous materials traveling off-site and affecting the public, staff analyzed several aspects of the proposed use of materials at the facility. Staff recognizes that some hazardous materials must be used at power plants. Therefore, staff conducted its analysis by focusing on the choice and amount of chemicals to be used, the manner in which the applicant would use the chemicals, the manner by which they would be transported to the facility and transferred to facility storage tanks, and the way in which the applicant plans to store those materials on-site.

Staff reviewed the applicant’s proposed engineering and administrative controls for hazardous material use. Engineering controls are physical or mechanical systems such as storage tanks or automatic shut-off valves that can prevent a spill of hazardous material from occurring, or that can limit the spill to a small amount or confine it to a small area. Administrative controls are rules and procedures that workers must follow to help either prevent accidents or keep them small if they do occur. Both engineering and administrative controls can act as either methods of prevention or methods of response and minimization. In both cases, the goal is to prevent a spill from moving off-site and harming the public.

Staff reviewed and evaluated the proposed use of hazardous materials, as described by the applicant (HHSEG 2011a, section 5.5). Staff's assessment followed the five steps listed below:

- Step 1: Staff reviewed the chemicals and amounts proposed for on-site use, as listed in the revised Table 5.5-3R2of the Application for Certification (AFC) (CEC 2012jj), and determined the need and appropriateness of their use. Only those that are needed and appropriate are allowed to be used. If staff feels that a safer alternative chemical can be used, staff would recommend or require its use, depending upon the impacts posed.
- Step 2: Those chemicals, proposed for use in small amounts or whose physical state is such that there is virtually no chance that a spill would migrate off the site and impact the public, were removed from further assessment.
- Step 3: Measures proposed by the applicant to prevent spills were reviewed and evaluated. These included engineering controls such as automatic shut-off valves and different size transfer-hose couplings and administrative controls such as worker training and safety management programs.
- Step 4: Measures proposed by the applicant to respond to accidents were reviewed and evaluated. These measures also included engineering controls such as catchment basins and methods to keep vapors from spreading, and administrative controls such as training emergency response crews.
- Step 5: Staff analyzed the theoretical impacts on the public of a worst-case spill of hazardous materials even with the mitigation measures proposed by the applicant. When mitigation methods proposed by the applicant are sufficient, no further mitigation is recommended. If the proposed mitigation is not sufficient to reduce the potential for adverse impacts to an insignificant level, staff would propose additional prevention and response controls until the potential for causing harm to the public is reduced to an insignificant level. It is only at this point that staff can recommend that the project be allowed to use hazardous materials.

PROPOSED PROJECT

SETTING AND EXISTING CONDITIONS

The Hidden Hills Solar Electric Generating System (HHSEGS) will be located on privately-owned land, leased in Inyo County, California, adjacent to the Nevada border. It will comprise two solar fields and associated facilities: the northern solar plant (Solar Plant 1) and the southern solar plant (Solar Plant 2). Each solar plant will generate 270 megawatts (MW) gross (250 MW net), for a total net output of 500 MW. Solar Plant 1 will occupy approximately 1,483 acres (or 2.3 square miles), and Solar Plant 2 will occupy approximately 1,510 acres (or 2.4 square miles). A 103-acre common area will be established on the southeastern corner of the site to accommodate an administrative building, warehouse, maintenance complex, a gas metering station, and an onsite 138 kV switchyard. A temporary construction laydown and parking area on the west side of the site will occupy approximately 180 acres.(HHSG 2011a, section 5.5.1)

Each solar plant will use heliostats, which are elevated mirrors guided by a tracking system mounted on a pylon, to focus the sun's rays on a solar receiving steam generator (SRSG) on top of a 750-foot tall solar power tower near the center of each solar field. In each plant, one Rankine-cycle steam turbine will receive steam from the SRSG (or solar boiler) to generate electricity. The solar field and power generation equipment will start each morning after sunrise and will shut down when insolation drops below the level required to keep the turbine online.

Several characteristics of an area in which a project is located affect its potential for an accidental release of a hazardous material. These include:

- local meteorology;
- terrain characteristics; and
- location of population centers and sensitive receptors relative to the project.

METEOROLOGICAL CONDITIONS

Meteorological conditions, including wind speed, wind direction, and air temperature, affect both the extent to which accidentally released hazardous materials would be dispersed into the air and the direction in which they would be transported. This affects the potential magnitude and extent of public exposure to such materials, as well as their health risks. When wind speeds are low and the atmosphere is stable, dispersion is severely reduced and can lead to increased localized public exposure.

Recorded wind speeds and ambient air temperatures are described in the **AIR QUALITY** section of the Application for Certification (AFC) (HHSG 2011a) and **FSA**.

TERRAIN CHARACTERISTICS

HHSEGS will be located in southern California's Mojave Desert in Inyo County adjacent to the California−Nevada border. The project site is located in a rural area and is currently undeveloped and unoccupied. The topography of the project site slopes gently, with the highest point in the southeastern corner and the lowest point along the northwest boundary. Sandy alluvium extends onto the project site from the northeast and larger ephemeral washes enter the project site from the east near the California-Nevada state line. The climate at the project site is arid with extreme fluctuations in daily and seasonal temperatures. Rainfall mostly occurs from November through March with late summer rainfall (approximately 0.3 inch per month) a regular occurrence. According to the California Department of Forestry and Fire Protection (CAL FIRE) 2008 Local Responsibility Fire Severity Maps, the project site is within a moderate fire hazard severity zone. (CH2 2012z, p. 70)

Access to the project site is provided via Tecopa Road (also known as Old Spanish Trail Highway), located to the east and south of the project site. State Route 160 (SR 160), located approximately 9 miles to the east of the project site in Nevada, is connected to the project site via Tecopa Road. Tecopa Road connects Nevada SR 160 to California State Route 127 (SR 127) located approximately 28 miles to the west of the project site. Regional access to the project area is provided via Interstate 15 (I-15) located approximately 37 miles to the southeast of the project site. Secondary access to the project site will be from Tecopa Road along the west side of the project site and then along a paved road between the two solar plants. The internal roadway and utility corridors for each heliostat field and its power block will contain a 20-foot-wide paved or hardscape access road from the entrance of the solar plant site to the power block, and then around the power block.

LOCATION OF EXPOSED POPULATIONS AND SENSITIVE RECEPTORS

The general population includes many sensitive subgroups that may be at greater risk from exposure to emitted pollutants. These sensitive subgroups include the very young, the elderly, and those with existing illnesses. In addition, the location of the population in the area surrounding a project site may have a large bearing on health risk.

Identification of sensitive receptors is typically done to ensure that notice of possible impacts is provided to the community. No daycare, hospital, park, preschool, or school receptors were found within 6 miles of the project site. A sparsely populated rural residential community, Charleston View, lies immediately south of the proposed project site and Tecopa Road. The St. Therese Mission, a commercial facility, is under construction approximately 0.5 mile southeast of the HHSEGS site (immediately north of Tecopa Road). Because this development is planned to include a chapel, garden, restaurant, visitor center that will include a children’s playground, and a residential unit, this future development will be treated as a sensitive receptor. The Front Sight Firearms Training Institute is located in Nevada approximately 1.7 miles north of the project site. This facility offers firearm classes during both the day and nighttime hours, including nighttime courses. The nearest residence to any power block equipment is approximately 3,500 feet south of the Solar Plant 2 power block and about 950 feet south of the project’s southern boundary (HHSG 2011a, Sect 5.9.3).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Direction/Indirect Impacts and Mitigation

Small Quantity Hazardous Materials

In conducting this analysis, staff determined in Steps 1 and 2 that most of the proposed materials, although present at the proposed facility, pose a minimal potential for off-site impacts since they would be stored in either solid form or in small quantities, have low mobility, low vapor pressure, or low levels of toxicity. These hazardous materials, which were eliminated from further consideration, are discussed briefly below.

During the construction phase of the project, the only hazardous materials proposed for use include paint, cleaners, solvents, gasoline, diesel fuel, motor oil, welding gases, and lubricants. Any impact of spills or other releases of these materials would be limited to the site because of the small quantities involved, the infrequent use and hence reduced chances of release, and/or the temporary containment berms used by contractors. Petroleum hydrocarbon-based motor fuels, mineral oil, lube oil, and diesel fuel all have very low volatility and would represent limited off-site hazards, even in larger quantities.

During operations, hazardous chemicals such as cleaning agents, lube oil, sodium hydroxide, diesel fuel, acqueous ammonia (19 percent), sulfuric acid (96 percent) and other various chemicals (see **Hazardous Materials Appendix A** for a list of all chemicals proposed to be used and stored at HHSEGS) would be used and stored on-site and represent limited off-site hazard due to a combination of their small quantities, low volatility, and/or low toxicity[1].

After removing from consideration those chemicals that pose no risk of off-site impact in Steps 1 and 2, staff continued with Steps 3, 4, and 5 to review the remaining hazardous material: natural gas.

Large Quantity Hazardous Materials

Natural Gas

Although no natural gas is stored, the project would involve the handling of moderate amounts of natural gas. Natural gas poses some risk of both fire and explosion. The solar heat used in the boiler (steam) process would be supplemented by burning natural gas to heat a partial load steam boiler when solar conditions are insufficient. Each solar plant will include two types of gas-fired boilers: the auxiliary boiler and the nighttime preservation boiler (described previously). The auxiliary boiler will have a capacity of 350,000 pounds per hour (lb/hr) at 950° F and 1,450 psia. The night preservation boiler will provide superheated steam to the STG and boiler feedwater pump gland systems overnight and during other shutdown periods when steam is not available from the SRSG. The night preservation boiler will produce 8,000 lb/hour at 680° F and 145 psia.

Natural gas poses a fire and/or possible explosion risk because of its flammability. Natural gas is composed mostly of methane, but also contains ethane, propane, nitrogen, butane, isobutene, and isopentane. It is colorless, odorless, and tasteless and is lighter than air. Natural gas can cause asphyxiation when methane is 90 percent in concentration. Methane is flammable when mixed in air at concentrations of 5 to 14 percent, which is also the detonation range. Natural gas, therefore, poses a risk of fire and/or possible explosion if a release occurs under certain confined conditions. However, it should be noted that, due to its tendency to disperse rapidly (Lees 1998), natural gas is less likely to cause explosions than many other fuel gases such as propane or liquefied petroleum gas, but can explode under certain conditions (as demonstrated by the natural gas detonation in Belgium in July 2004).

The risk of a fire and/or explosion on site can be reduced to insignificant levels through adherence to applicable codes and the development and implementation of effective safety management practices. The National Fire Protection Association (NFPA) code 85A requires both the use of double-block and bleed valves for gas shut off and automated combustion controls. These measures will significantly reduce the likelihood of an explosion in gas-fired equipment. Additionally, start-up procedures would require air purging of the gas-fired boilers prior to start up, thereby precluding the presence of an explosive mixture. The safety management plan proposed by the applicant would

1 Boiler Optimization Plan, Hazardous Material Handling, CH2 2012p, pp 5-6:

address the handling and use of natural gas and would significantly reduce the potential for equipment failure because of either improper maintenance or human error.

While natural gas would be used in significant quantities, it would not be stored on site. It would be delivered via a new 12-inch-diameter natural gas pipeline to the HHSEGS project site. The gas pipeline would enter the HHSEGS site in the common area where it would connect with an onsite gas metering station. It would exit the HHSEGS site at the California-Nevada border, extending 32.4 miles to the Kern River Gas Transmission (KRGT) existing mainline system just north of Goodsprings in Clark County, Nevada.

The transmission and natural gas pipeline alignments will be located in Nevada, primarily on federal land managed by the U.S. Bureau of Land Management (BLM). A detailed environmental impact analysis of the transmission and natural gas pipeline alignments will be prepared by BLM (HHSG 2011a, Sect 5.12.1).

On site, the gas line will enter the project in the common area and travel about 900 feet to the gas metering station, from there it will continue northwest along the edge of the Solar Plant 2 solar field to the common road between Solar Plants 1 and 2. It will continue down that road to the access road going to each power block. The total distance of the on-site gas line from the gas metering station to the metering set at the power block is 2.4 miles for Solar Plant 1 and 2.3 miles for Solar Plant 2 (see **PROJECT DESCRIPTION FIGURE 2).**

A gas-metering station will be required at the KRGT tap point to measure and record gas volumes. Additionally, a gas meter station will be required in the common area and a gas metering set will be installed at each power block. Construction activities related to the metering station will include grading a pad and installing above- and belowground gas piping, and metering equipment. Pigging facilities will be installed at the HHSEGS meter station, and at the KGRT meter station. A distribution power line for the metering station operation lighting and communication equipment will be installed, and the metering station perimeter will be fenced for security (HHSG 2011a, section 4.2.2).

The natural gas pipeline will be designed to comply with 49 CFR 192, federal standards for gas transmission pipelines (HHSG 2011a, section 4.3). The natural gas pipeline must be constructed and operated in accordance with the Federal Department of Transportation (DOT) regulations, Title 49, Code of Federal Regulations (CFR), Parts 190, 191, and 192 (see Table 1 LORS), and ASME B31 piping codes. Staff concludes that existing LORS are sufficient to ensure minimal risks of pipeline failure. Additionally, in-California portions of the gas pipeline that would be constructed for this project would be located entirely on-site, which greatly reduces the risks of impacts to the public from a rupture or failure.

Recent incidents have demonstrated significant risks associated with purging of new pipelines with natural gas. On June 28, 2010, the United States Chemical Safety and Hazard Board (CSB) issued Urgent Recommendations to the United States Occupational Safety and Health Administration (OSHA), the National Fire Protection Association (NFPA), the American Society of Mechanical Engineers (ASME), and major gas turbine manufacturers to make changes to their respective regulations, codes, and guidance to require the use of inherently safer alternatives to natural gas blows for the purposes of pipe cleaning. Recommendations were also made to the fifty states to enact legislation applicable to power plants that prohibits flammable gas blows for the purposes of pipe cleaning. In accordance with those recommendations, staff proposes Condition of Certification **HAZ-6** which prohibits the use of flammable gas blow for pipe cleaning at the facility either during construction or after the start of operations.

All fuel gas pipe purging activities shall vent any gases to a safe location outdoors, away from workers and sources of ignition. Fuel gas pipe cleaning and purging shall adhere to the provisions of most current versions of the National Fuel Gas Code (NFPA 54 and 56-PS) including all Temporary Interim Amendments.

Mitigation

Staff believes that this project's use of hazardous materials poses no significant risk but only if mitigation measures are used. These mitigation measures are discussed in this section. The potential for accidents resulting in the release of hazardous materials is greatly reduced by the implementation of a Safety Management Program, which includes both engineering and administrative controls. Elements of facility controls and the safety management plan are summarized below.

Engineering Controls

Engineering controls help prevent accidents and releases (spills) from moving off-site and impacting the community by incorporating engineering safety design criteria into the project's design. Engineering safety features proposed by the applicant include:

- Usage of secondary containment areas surrounding each of the hazardous materials storage areas, designed to contain accidental releases during storage;

  Physical separation of stored chemicals in isolated containment areas, separated by a noncombustible partition in order to prevent the accidental mixing of incompatible materials, which may in turn cause the formation and release of toxic gases or fumes.

Administrative Controls

Administrative controls help prevent accidents and releases (spills) from moving off-site and impacting the community by establishing worker training programs and process safety management programs.

A Worker Health and Safety Program would be prepared by the applicant and include (but not be limited to) the following elements (see the **WORKER SAFETY AND FIRE PROTECTION** section in this **FSA** for more details and specific regulatory requirements):

- Worker training on chemical hazards, health and safety issues, and hazard communication;
- Procedures to ensure the proper use of personal protective equipment;
- Safety operating procedures for the operation and maintenance of systems that use hazardous materials;
- Fire safety and prevention; and

- Emergency response actions including facility evacuation, hazardous material spill cleanup, and fire prevention.

At HHSEGS, the project owner would be required to designate an individual who would have the responsibility and authority to ensure a safe and healthful workplace. This project health and safety official would oversee the health and safety program and would have the authority to halt any action or modify any work practice in order to protect the workers, facility, and the surrounding community in the event that the health and safety program is violated.

Staff proposes Condition of Certification **HAZ-1** to ensure that no hazardous material would be used at the facility except as listed in the AFC and reviewed for appropriateness, unless there is prior approval by the Energy Commission compliance project manager (CPM). Staff reviewed the chemicals and amounts proposed for on-site use, as listed in Table 5.5-3 of the AFC and determined the need and appropriateness of their use. **HAZ-1** also requires changes to the allowed list of hazardous materials and their maximum amounts as listed in **Hazardous Materials Appendix A** to be approved by the CPM. Only those that are needed and appropriate would be allowed to be used. If staff feels that a safer alternative chemical can be used, staff would recommend or require its use, depending upon the impacts posed.

A Hazardous Materials Business Plan (HMBP) would also be prepared by the project owner that would incorporate state requirements for the handling of hazardous materials (HHSG 2011a, section 5.5.4). The HMBP includes:

- Inventory and Site Map,
- Emergency Response Plan
- Owner/Operator Identification
- Employee Training

Staff proposes Condition of Certification **HAZ-2**, which ensures that the HMBP would be provided to the Southern Inyo Fire Protection District (SIFPD), so that SIFPD can better prepare emergency response personnel for handling emergencies which could occur at the facility. In accordance with Condition of Certification **HAZ-3**, the project owner would also be responsible to develop and implement a Safety Management Plan for delivery of liquid hazardous materials. The plan would include procedures, protective equipment requirements, training and a checklist. It would also include a section describing all measures to be implemented to prevent mixing of incompatible hazardous materials. This plan would be applicable during construction, commissioning, and operation of HHSEGS.

On-site Spill Response

In order to address spill response, the facility would prepare and implement an emergency response plan which includes information on hazardous materials contingency and emergency response procedures, spill containment and prevention systems, personnel training, spill notification, on-site spill containment, prevention equipment and capabilities, etc. Emergency procedures would be established which include evacuation, spill cleanup, hazard prevention, and emergency response.

A Spill Prevention Control and Countermeasure (SPCC) Plan is required by Federal Regulations (see LORS above) and would be prepared for the petroleum-containing hazardous materials (HHSG 2011a, Sect 5.5.6.4.3).

Southern Inyo Fire Protection District (SIFPD) operates one year-round fire station, the Tecopa Station, located at 410 Tecopa Hot Springs Road in Tecopa, California, approximately 27 miles southwest of HHSEGS. The station has an approximate 30- to 40-minute response time to the project site. The SIFPD equipment consists of two Light Rescue Units, two Type 2 Engines, one Basic Life Support Ambulance, and one Ambulance (not staffed). SIFPD indicated in communications in March and July of 2011 that local firefighters are equipped to handle simple HazMat incidents, but that Pahrump Valley Fire Rescue Services (PVFRS) and Nye County Emergency Services (NCES) would need to be called in for assistance with more complex situations given their mutual aid agreements with Inyo County (CEC 2011j).

The PVFRS Main Station[2] in Pahrump, Nevada, is the closest HazMat responder. It is located 26 road miles from the project site, and has an approximately 40 minute response time. Nye County Emergency Services[3] has a HazMat team that operates through the Nye County Fire Department's Station 51 in Pahrump, which is 28 road miles from the project site, and has an approximate response time of 45 minutes. Station 51 is staffed with 15 to 20 volunteers who are trained as HazMat technicians. The team has the following equipment, as of April 2011: one HazMat truck with 25-foot trailer, one biohazard unit, one fire engine, and one ambulance (HHSG 2011a, Sect 5.5.4.3).

Staff concludes that, given the remote location and the very unlikely potential for any spill to cause an off-site impact, the hazardous material response time is acceptable. The remote location lengthens the response but, at the same time, eliminates the risk of off-site consequences to the public.

Transportation of Hazardous Materials

Containerized hazardous materials and cleaning chemicals would be transported periodically to the facility via truck and will occur over prearranged routes. While many types of hazardous materials would be transported to the site, previous modeling of spills involving much larger quantities of more toxic materials, (aqueous ammonia and 93 percent sulfuric acid) - two hazardous materials that would be used, stored, and transported at the proposed power plant – has demonstrated that minimal airborne concentrations would occur at short distances from the spill.

The primary regional transportation corridors within the project area include Interstate 15 (I-15), Nevada State Route 160 (NSR160), and California State Route 127 (CSR 127). The project area is primarily served by NSR 160 and local streets, including

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[2] www.pahrumpfire.biz

[3] www.nyecounty.net

Tecopa Road that serves the project site. Although the HHSGS would be located in California, due to the location of the project site adjacent to the California-Nevada border, it is anticipated that the majority of the employees and construction workers would access the project site by way of the NSR 160/Tecopa Road intersection in Nevada. For a more detailed discussion traffic impacts associated with both the construction and operation of HHSEGS, please see the **Traffic and Transportation** section of this **FSA**.

During construction and operation of HHSEGS, staff believes that minimal amounts, small shipment sizes, and the types of hazardous materials (water treatment chemicals, paint, cleaners, solvents, gasoline, diesel fuel, motor oil, lubricants, and welding gases in standard-sized cylinders) do not pose a significant risk of either spills or public impacts along any transportation route. Staff therefore does not recommend a specific route.

Transportation of hazardous materials will comply with the applicable regulations for transporting hazardous materials, including the U.S. Department of Transportation, EPA, California Department of Toxic Substances Control, California Highway Patrol (CHP), and California State Fire Marshal. Specifically, California Vehicle Code sections 31303 and 32105 require that hazardous materials be transported along the shortest route possible and that transporters obtain a Hazardous Materials Transportation License from the CHP. Also, Nevada Administrative Code 459.9785 requires the transporter to hold a uniform permit and a safety permit issued by the Federal Motor Carrier Safety Administration of the United States Department of Transportation and to certify that it has a satisfactory security program as required by 49 CFR 385.407(b), including a written route plan that meets the requirements of 49 CFR 397.101. If the use of routes within Clark or Nye counties is needed, their respective codes specify the permitting requirements (HHSG, section 5.12.4.3.1).

Seismic Issues

The possibility exists that an earthquake could cause the failure of a hazardous materials storage tank. A quake could also cause the failure of the secondary containment system (berms and dikes), as well as electrically controlled valves and pumps. The failure of all these preventive control measures might then result in a vapor cloud of hazardous materials that could move off-site and impact residents and workers in the surrounding community. The effects of the Loma Prieta earthquake of 1989, the Northridge earthquake of 1994, and the earthquake in Kobe, Japan, in January 1995, heighten concerns about earthquake safety.

Information obtained after the January 1994 Northridge earthquake showed that some damage was caused to several large and small storage tanks at the water treatment system of a cogeneration facility. The tanks with the greatest damage, including seam leakage, were older tanks, while newer tanks sustained lesser damage with displacements and attached line failures. Therefore, staff conducted an analysis of the codes and standards, which should be followed to adequately design and build storage tanks and containment areas that could withstand a large earthquake.

Staff also reviewed the impacts of the February 2001 Nisqually earthquake near Olympia, Washington, a state with similar seismic design codes as California. No hazardous materials storage tanks were impacted by this quake. Referring to the sections on **GEOLOGY AND PALEONTOLOGY** and **FACILITY DESIGN** in the AFC, staff notes that the proposed facility would be designed and constructed to the applicable standards of the 2010 California Building Standards Code (HHSG 2011a, section 2.3.1.1). Therefore, on the basis of occurrences at Northridge with older tanks and the lack of failures during the Nisqually earthquake with newer tanks, staff determined that tank failures during seismic events are not likely and do not represent a significant risk to the public.

<u>Site Security</u>

HHSEGS proposes to use hazardous materials where special site security measures should be developed and implemented to prevent unauthorized access. US EPA published a *Chemical Accident Prevention Alert* regarding site security (EPA 2000a), the U.S. Department of Justice published a special report on Chemical Facility Vulnerability Assessment Methodology (US DOJ 2002), the North American Electric Reliability Corporation (NERC) published *Security Guidelines for the Electricity Sector* in 2002 (NERC 2002), and the U.S. Department of Energy published a draft *Vulnerability Assessment Methodology for Electric Power Infrastructure* in 2002 (DOE 2002). The energy generation sector is one of 14 areas of critical Infrastructure listed by the U.S. Department of Homeland Security. On April 9, 2007, the U.S Department of Homeland Security published, in the Federal Register (6 CFR Part 27), an Interim Final Rule requiring facilities that use or store certain hazardous materials to conduct vulnerability assessments and implement certain specified security measures. This rule was implemented with the publication of Appendix A, the list of chemicals, on November 2, 2007. Staff believes that all power plants under the jurisdiction of the Energy Commission should implement a minimum level of security consistent with the guidelines listed here.

In order to ensure that this facility (or a shipment of hazardous material) is not the target of unauthorized access, staff's proposed Conditions of Certification **HAZ-4** and **HAZ-5** address both Construction Security and Operations Security Plans. These plans would require the implementation of site security measures that are consistent with both the above-referenced documents and Energy Commission guidelines.

The goal of these conditions of certification is to provide the minimum level of security for power plants needed to protect California's electrical infrastructure from malicious mischief, vandalism, or domestic/foreign terrorist attacks. The level of security needed for this power plant is dependent upon the threat imposed, the likelihood of an adversarial attack, the likelihood of success in causing a catastrophic event, and the severity of consequences of that event.

In order to determine the level of security, the Energy Commission staff used an internal vulnerability assessment decision matrix modeled after the U.S. Department of Justice Chemical Vulnerability Assessment Methodology (July 2002), the NERC 2002 guidelines, the U.S. Department of Energy VAM-CF model, and U.S. Department of Homeland Security regulations published in the Federal Register (Interim Final Rule 6 CFR Part 27). Staff determined that HHSEGS would fall into the “low vulnerability” category, so staff proposes that certain security measures be implemented but does not propose that the project owner conduct its own vulnerability assessment.

These security measures[4] include perimeter fencing and breach detectors, possibly guards, alarms, site access procedures for employees and vendors, site personnel background checks, and law enforcement contact in the event of a security breach. Site access for vendors would be strictly controlled. Consistent with current state and federal regulations governing the transport of hazardous materials, hazardous materials vendors would have to maintain their transport vehicle fleets and employ only drivers who are properly licensed and trained. The project owner would be required, through its contractual language with vendors, to ensure that vendors supplying hazardous materials strictly adhere to the U.S. Department of Transportation (DOT) requirements that hazardous materials vendors prepare and implement security plans per 49 CFR 172.800 and ensure that all hazardous materials drivers are in compliance with personnel background security checks per 49 CFR Part 1572, Subparts A and B. The Energy Commission's compliance project manager (CPM) may authorize modifications to these measures, or may require additional measures in response to additional guidance provided by the U.S. Department of Homeland Security, the U.S. Department of Energy, or the North American Electric Reliability Corporation (NERC), after consultation with appropriate law enforcement agencies and the applicant.

Intentional Destructive Acts

Solar generation projects can be the subject of intentional destructive acts ranging from random vandalism and theft to sabotage and acts of terrorism intended to disable the facility. Acts of vandalism and theft are far more likely to occur than sabotage or terrorism. Theft usually involves equipment at substations and switchyards that contain salvageable metal when metal prices are high. Vandalism usually occurs in remote areas and is more likely to involve spontaneous acts such as shooting at equipment. Theft or opportunistic vandalism is more likely than sabotage or terrorist acts, which are considered to be a negligible risk.

As indicated above, in order to keep the project infrastructure secure from threats from intentional destructive acts, the project site would be physically secured and staffed. Furthermore, uncontrolled access would be prevented through the use of access controls. Discussion of the project's site security plan also occurs in the **SOCIOECONOMICS** and **WORKER SAFETY / FIRE PROTECTION** sections of this **FSA**.

Protection of widely dispersed electrical generation equipment, substations, and thousands of miles of transmission lines from destructive acts is not practical. Damaged equipment and transmission lines may be quickly repaired or replaced in the same manner that storm damaged equipment are returned to service. The results of any such acts could be expensive to repair, but no substantial impacts to continued electrical

[4] Draft Construction Site Security Plan provided by applicant under confidential cover on April 16, 2012 as Supplemental Data Responses Set 3, Data Response SE-6.

service would be anticipated. No significant environmental impacts would be expected from physical damage to the proposed HHSEGS project or from loss of power delivery.

Facility Closure and Decommissioning

The requirements for handling of hazardous materials remain in effect until such materials are removed from the site, regardless of facility closure. Therefore, the facility owners are responsible for continuing to handle such materials in a safe manner, as required by applicable laws. In the event that the facility owner abandons the facility in a manner that poses a risk to surrounding populations, staff would coordinate with the California Office of Emergency Services, the Inyo County Environmental Health Services Department, and the California Department of Toxic Substances Control (DTSC) to ensure that any unacceptable risk to the public is eliminated.

CEQA Level of Significance

Staff's analysis of impacts associated with the storage, use, and handling of hazardous materials at the proposed HHSEGS has determined that impacts would be below the level of significance if staff's proposed conditions of certification are adopted.

CUMULATIVE IMPACTS AND MITIGATION

Staff considered the potential for impacts due to a simultaneous release of any of the hazardous chemicals from the proposed HHSEGS with other existing or foreseeable nearby facilities as listed in the **Cumulative Scenario** section. Because of the small amounts of the hazardous chemicals to be stored at the facility, staff determined that there was essentially no possibility of producing an offsite impact. Because of this determination, and the additional fact that there are no nearby facilities using large amounts of hazardous chemicals (the closest proposed major projects in the general area such as Element Solar and Sandy Valley Solar being five or more miles away, see **Cumulative Effects Figure 2**), there is little (if any) possibility that vapor plumes would mingle (combine) to produce an airborne concentration that would present a significant risk.

COMPLIANCE WITH LORS

Staff concludes that construction and operation of HHSEGS would be in compliance with all applicable LORS for both long-term and short-term project impacts in the area of hazardous materials management.

CONCLUSIONS

Staff's evaluation of the proposed project (with proposed mitigation measures) indicates that hazardous material use, storage, and transportation would not pose a significant impact on the public. Staff's analysis also shows that there would be no significant cumulative impact. With adoption of the proposed conditions of certification, the proposed project would comply with all applicable LORS. Other proposed conditions of certification address the issues of site security matters.

Staff recommends that the Energy Commission impose the proposed conditions of certification, presented below, to ensure that the project is designed, constructed, and operated in compliance with applicable LORS, and would protect the public from significant risk of exposure to an accidental release of hazardous materials. If all mitigation proposed by the applicant and by staff are implemented, the use, storage, and transportation of hazardous materials would not present a significant risk to the public.

Staff concludes that there is insignificant potential for hazardous materials release to have significant impact beyond the facility boundary, and therefore concludes there is also insignificant potential for significant impact to the environment. For any other potential impacts upon the environment, including vegetation, wildlife, air, soils, and water resulting from hazardous materials usage and disposal at the proposed facility, the reader is referred to the **BIOLOGICAL RESOURCES**, **AIR QUALITY**, **SOILS and SURFACE WATER, WATER SUPPLY**, **WASTE MANAGEMENT** sections of this **FSA**.

Staff proposes six conditions of certification, some of which are mentioned in the text (above), and listed below. **HAZ-1** ensures that no hazardous material would be used at the facility except as listed in the AFC, unless there is prior approval by the Energy Commission compliance project manager. **HAZ-2** ensures that local emergency response services are notified of the amounts and locations of hazardous materials at the facility, **HAZ-3** requires the development of a Safety Management Plan that addresses the delivery of all liquid hazardous materials during the construction, commissioning, and operation of the project that would further reduce the risk of any accidental release not specifically addressed by the proposed spill prevention mitigation measures, and further prevent the mixing of incompatible materials that could result in the generation of toxic vapors. Site security during the construction phase is addressed in **HAZ-4** and **HAZ-5** addresses site security during the operational phase. Condition **HAZ-6** addresses safety in cleaning and purging new gas piping.

PROPOSED CONDITIONS OF CERTIFICATION/ MITIGATION MEASURES

The following conditions of certification meet the Energy Commission's responsibility to comply with the California Environmental Quality Act and serve as staff's recommendations for the Energy Commission to consider in its decision to avoid or reduce the severity of hazardous material-related impacts to less than significant and for the project to conform to all applicable LORS.

HAZ-**1** The project owner shall not use any hazardous materials not listed in **Hazardous Materials Appendix A**, below, or in greater quantities than those identified by chemical name in **Hazardous Materials Appendix A,** unless approved in advance by the Compliance Project Manager (CPM).

Verification: The project owner shall provide to the CPM in the Annual Compliance Report, a list of hazardous materials contained at the facility.

HAZ-2 The project owner shall concurrently provide a Hazardous Materials Business Plan to the Southern Inyo Fire Protection District (SIFPD), Inyo County

Environmental Health Services Department (ICEHSD) and the CPM for review. After receiving comments from the SIFPD, ICEHSD,and the CPM, the project owner shall reflect all received recommendations in the final documents. If no comments are received from the county within 30 days of submittal, the project owner may proceed with preparation of final documents upon receiving comments from the CPM. Copies of the final Hazardous Materials Business Plan shall then be provided to the ICEHSD and the Southern Inyo Fire Protection District for information and to the CPM for approval.

Verification: At least 60 days prior to receiving any hazardous material on the site for commissioning or operations, the project owner shall provide a copy of a final Hazardous Materials Business Plan to the CPM for approval.

HAZ-3 The project owner shall develop and implement a Safety Management Plan for delivery of liquid hazardous materials. The plan shall include procedures, protective equipment requirements, training and a checklist. It shall also include a section describing all measures to be implemented to prevent mixing of incompatible hazardous materials. This plan shall be applicable during construction, commissioning, and operation of the power plant.

Verification: At least sixty (60) days prior to the delivery of any liquid hazardous material to the facility, the project owner shall provide a Safety Management Plan as described above to the CPM for review and approval.

HAZ-4 At least thirty (30) days prior to commencing construction, a site-specific Construction Site Security Plan for the construction phase shall be prepared and made available to the CPM for review and approval. The Construction Security Plan shall include the following:

1. Perimeter security consisting of fencing enclosing the construction area;
2. Security guards;
3. Site access control consisting of a check-in procedure or tag system for construction personnel and visitors;
4. Written standard procedures for employees, contractors and vendors when encountering suspicious objects or packages on-site or off-site;
5. Protocol for contacting law enforcement and the CPM in the event of suspicious activity or emergency; and
6. Evacuation procedures.

Verification: At least thirty (30) days prior to commencing construction, the project owner shall notify the CPM that a site-specific Construction Security Plan is available for review and approval.

HAZ-5 The project owner shall prepare a site-specific Operation Security Plan for the operational phase that shall be made available to the CPM for review and approval. The project owner shall implement site security measures addressing physical site security and hazardous materials storage. The level of security to be implemented shall not be less than that described below (as per NERC 2002[5]).

The Operation Security Plan shall include the following:

1. Permanent full perimeter fence or wall, at least eight feet high around the Power Block and Solar Field;

2. Main entrance security gate, either hand operable or motorized;

3. Evacuation procedures;

4. Protocol for contacting law enforcement, the CPM in the event of suspicious activity or emergency;

5. Written standard procedures for employees, contractors and vendors when encountering suspicious objects or packages on-site or off-site;

6. a. A statement (refer to sample, attachment "A") signed by the project owner certifying that background investigations have been conducted on all project personnel. Background investigations shall be restricted to ascertain the accuracy of employee identity and employment history, and shall be conducted in accordance with state and federal law regarding security and privacy;

   b. A statement(s) (refer to sample, attachment "B") signed by the contractor or authorized representative(s) for any permanent contractors or other technical contractors (as determined by the CPM after consultation with the project owner) that are present at any time on the site to repair, maintain, investigate, or conduct any other technical duties involving critical components (as determined by the CPM after consultation with the project owner) certifying that background investigations have been conducted on contractor personnel that visit the project site.

7. Site access controls for employees, contractors, vendors, and visitors;

8. Closed Circuit TV (CCTV) monitoring system, recordable, and viewable in the power plant control room and security station (if separate from the control room) capable of viewing, at a minimum, the main entrance gate; and

9. Additional measures to ensure adequate perimeter security consisting of either:

[5] North American Electric Reliability Council, www.nerc.com/files/V1-Communications.pdf

a. Security guard present 24 hours per day, seven days per week, **OR**

b. Power plant personnel on-site 24 hours per day, seven days per week and **one** of the following:

   1) The CCTV monitoring system required in number 8 above shall include cameras that are able to pan, tilt, and zoom (PTZ), have low-light capability, are recordable, and are able to view 100% of the perimeter fence to the power block, the outside entrance to the control room, and the front gate from a monitor in the power plant control room; **OR**

   2) Perimeter breach detectors **<u>or</u>** on-site motion detectors for the power block.

The project owner shall fully implement the security plans and obtain CPM approval of any substantive modifications to the security plans. The CPM may authorize modifications to these measures, or may require additional measures, such as protective barriers for critical power pant components (e.g., transformers, gas lines, compressors, etc.) depending on circumstances unique to the facility or in response to industry-related standards, security concerns, or additional guidance provided by the U.S. Department of Homeland Security, the U.S. Department of Energy, or the North American Electrical Reliability Council, after consultation with appropriate law enforcement agencies and the project owner.

<u>Verification:</u> At least 30 days prior to the initial receipt of hazardous materials on-site, the project owner shall notify the CPM that a site-specific Operations Site Security Plan is available for review and approval. In the Annual Compliance Report, the project owner shall include a statement that all current project employee and appropriate contractor background investigations have been performed, and updated certification statements are appended to the Operations Security Plan. In the Annual Compliance Report, the project owner shall include a statement that the Operations Security Plan includes all current hazardous materials transport vendor certifications for security plans and employee background investigations.

HAZ-6: The project owner shall Comply with NFPA 56(PS) and not allow any fuel gas pipe cleaning activities on site, either before placing the pipe into service or at any time during the lifetime of the facility, that involve “flammable gas blows” where natural (or flammable) gas is used to blow out debris from piping and then vented to atmosphere. Instead, an inherently safer method involving a non-flammable gas (e.g. air, nitrogen, steam) or mechanical pigging shall be used. Exceptions to any of these provisions will be made only if no other satisfactory method is available, and then only with the approval of the CPM.

<u>Verification:</u> At least 30 days before any fuel gas pipe cleaning activities conducted onsite involving fuel gas pipe of four-inch or greater external diameter, the project owner shall submit a copy of the Fuel Gas Pipe Cleaning Work Plan which shall indicate the method of cleaning to be used, what gas will be used, the source of pressurization, and whether a mechanical PIG will be used, to the CBO for information and to the CPM for review and approval.

SAMPLE CERTIFICATION (Attachment "A")

Affidavit of Compliance for Project Owners

I, ____
(Name of person signing affidavit)(Title)

do hereby certify that background investigations to ascertain the accuracy of the identity and employment history of all employees of

____
(Company Name)

for employment at

____
(Project name and location)

have been conducted as required by the California Energy Commission Decision for the above-named project.

____
(Signature of Officer or Agent)

Dated this ____________________ day of ____________________, 20 _______.

THIS AFFIDAVIT OF COMPLIANCE SHALL BE APPENDED TO THE PROJECT SECURITY PLAN AND SHALL BE RETAINED AT ALL TIMES AT THE PROJECT SITE FOR REVIEW BY THE CALIFORNIA ENERGY COMMISSION COMPLIANCE PROJECT MANAGER.

SAMPLE CERTIFICATION (Attachment "B")

Affidavit of Compliance for Contractors

I, ____

(Name of person signing affidavit)(Title)

do hereby certify that background investigations to ascertain the accuracy of the identity and employment history of all employees of

____

(Company Name)

for contract work at

____

(Project name and location)

have been conducted as required by the California Energy Commission Decision for the above-named project.

____

(Signature of Officer or Agent)

Dated this ____________________ day of ____________________, 20 _______.

THIS AFFIDAVIT OF COMPLIANCE SHALL BE APPENDED TO THE PROJECT SECURITY PLAN AND SHALL BE RETAINED AT ALL TIMES AT THE PROJECT SITE FOR REVIEW BY THE CALIFORNIA ENERGY COMMISSION COMPLIANCE PROJECT MANAGER.

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Hazardous Materials
Appendix A

Hazardous Materials Proposed for Use
At the
HHSEGS Power Project

Source: Table 5.5-3R2 (CEC 2012jj)

CH2M-Hill 10/19/2012

Table 5.5-3R2 HHSEGS Chemical Inventory								
Trade Name	Chemical Name	CAS Number	Maximum Quantity Onsite	CERCLA SARA RQ[a]	RQ of Material as Used Onsite[b]	EHS TPQ[c]	Regulated Substance TQ[d]	Prop 65
Nalco Elimin-OX (or similar oxygen scavenger)	Carbohydrazide	497-18-7	1,200 gallons	[e]	[e]	[e]	[e]	No
Aqueous Ammonia (19% concentration)	Ammonium hydroxide	1336-21-6	1,200 gallons	1000 lb	1000 lb	500 lb	[e]	No
Acid	Sulfuric acid (93% - 66° Baumé)	7664-93-9	1,200 gallons	1000 lb	1075 lb	1000 lb	[e]	No
Lead Acid Batteries	Composed of the following: Lead (45-60% of battery) Sulfuric Acid (10-30% of battery)	 7439-92-1 7664-93-9	420,000 lbm	10 lb	16 lb	[e]	[e]	Yes (lead)
Caustic	Sodium hydroxide 50%	1310-73-2	1,200 gallons	1000 lb	2000 lb	[e]	[e]	No
Diesel Fuel (No. 2)	Diesel Fuel	None	34,000 gallons	42 gal[f]	42 gal[f]	[e]	[e]	Yes
Cleaning Chemicals and Detergents	Various	None	2,500 gallons	[e]	[e]	[e]	[e]	No
Wastewater Treatment System Anti-scalant	Nalco 5200M or similar	Proprietary	1,200 gallons	[e]	[e]	[e]	[e]	No
Wastewater Treatment System Anti-foaming Agent	Nalco 7468 or similar	Proprietary	1,200 gallons	[e]	[e]	[e]	[e]	Yes
WSAC Corrosion Inhibitor	Nalco 3DT-187 or similar (Phosphoric acid 5%)	7664-38-2	1,200 gallons	5000 lb	100,000 lb	[e]	[e]	No
WSAC Dispersant	Nalco 73801WR or similar	Proprietary	1,200 gallons	[e]	[e]	[e]	[e]	No
Closed Cooling Water Corrosion Inhibitor	Nalco TRAC107 or similar	1310-73-2 & 1330-43-4	500 gallons	1000 lb	2000 lb	[e]	[e]	No
Bisulfite	Sodium bisulfite 30%	7631-90-5	1,500 gallons	5000 lb	16,667 lb	[e]	[e]	No
Sodium hypochlorite	Sodium hypochlorite 12% (trade)	7681-52-9	1,500 gallons	100 lb	800 lb	[e]	[e]	No
Lubricating Oil	Oil	None	40,000 gallons (does not include oil contained within individual equipment and reservoirs)	42 gal[f]	42 gal[f]	[e]	[e]	Yes

Table 5.5-3R2 HHSEGS Chemical Inventory								
Trade Name	Chemical Name	CAS Number	Maximum Quantity Onsite	CERCLA SARA RQ[a]	RQ of Material as Used Onsite[b]	EHS TPQ[c]	Regulated Substance TQ[d]	Prop 65
Mineral Transformer Insulating Oil	Oil	8012-95-1	100,000 gallons	42 gal[f]	42 gal[f]	[e]	[e]	Yes
Hydraulic Oil	Various Oil	None	5,000 gallons (does not include oil contained within individual equipment and reservoirs)	42 gal[f]	42 gal[f]	[e]	[e]	No
Sulfur hexafluoride	Sulfur hexafluoride	2551-62-4	880.4 lb (contained in circuit breakers)	[e]	[e]	[e]	[e]	No

[a] Reportable quantity for a pure chemical, per CERCLA [Ref. 40 CFR 302, Table 302.4]. Release equal to or greater than RQ must be reported. Under California law, any amount that has a realistic potential to adversely affect the environment or human health or safety must be reported.
[b] Reportable quantity for materials as used onsite. Since some of the hazardous materials are mixtures that contain only a percentage of a reportable chemical, the reportable quantity of the mixture can be different than for a pure chemical. For example, if a material only contains 10% of a reportable chemical and the RQ is 100 lb., the reportable quantity for that material would be (100 lb.)/(10%) = 1,000 lb.
[c] Threshold Planning Quantity [Ref. 40 CFR Part 355, Appendix A]. If quantities of extremely hazardous materials equal to or greater than TPQ are handled or stored, they must be registered with the local Administering Agency.
[d] TQ is Threshold Quantity from 19 CCR 2770.5 (state) or 40 CFR 68.130 (federal)
[e] No reporting requirement. Chemical has no listed threshold under this requirement.
[f] State reportable quantity for oil spills that will reach California state waters [Ref. CA Water Code Section 13272(f)]

HAZARDOUS MATERIALS
Appendix B

Basis for Staff's Use of 75 Parts Per Million Ammonia Exposure Criteria

BASIS FOR STAFF'S USE OF 75 PARTS PER MILLION AMMONIA EXPOSURE CRITERIA

Staff uses a health-based airborne concentration of 75 parts per million (PPM) to evaluate the significance of impacts associated with potential accidental releases of ammonia. While this level is not consistent with the 200-ppm level used by the U.S. Environmental Protection Agency and the California Environmental Protection Agency in evaluating such releases pursuant to the Federal Risk Management Program and State Accidental Release Program, it is appropriate for use in staff's analysis of the proposed project. The Federal Risk Management Program and the State Accidental Release Program are administrative programs designed to address emergency planning and ensure that appropriate safety management practices and actions are implemented in response to accidental releases. However, the regulations implementing these programs do not provide clear authority to require design changes or other major changes to a proposed facility. The preface to the Emergency Response Planning Guidelines states that "these values have been derived as planning and emergency response guidelines, **not** exposure guidelines, they do not contain the safety factors normally incorporated into exposure guidelines. Instead they are estimates, by the committee, of the thresholds above which there would be an unacceptable likelihood of observing the defined effects." It is staff's contention that these values apply to healthy adult individuals and are levels that should not be used to evaluate the acceptability of avoidable exposures for the entire population. While these guidelines are useful in decision making in the event that a release has already occurred (for example, prioritizing evacuations), they are not appropriate for and are not binding on discretionary decisions involving proposed facilities where many options for mitigation are feasible. The California Environmental Quality Act requires permitting agencies making discretionary decisions to identify and mitigate potentially significant impacts through feasible changes or alternatives to the proposed project.

Staff has chosen to use the National Research Council's 30-minute Short Term Public Emergency Limit (STPEL) for ammonia to determine the potential for significant impact. This limit is designed to apply to accidental unanticipated releases and subsequent public exposure. Exposure at this level should not result in serious effects but would result in "strong odor, lacrimation, and irritation of the upper respiratory tract (nose and throat), but no incapacitation or prevention of self-rescue." It is staff's opinion that exposures to concentrations above these levels pose significant risk of adverse health impacts on sensitive members of the general public. It is also staff's position that these exposure limits are the best available criteria to use in gauging the significance of public exposures associated with potential accidental releases. It is, further, staff's opinion that these limits constitute an appropriate balance between public protection and mitigation of unlikely events and are useful in focusing mitigation efforts on those release scenarios that pose real potential for serious impacts on the public. Table 1 provides a comparison of the intended use and limitations associated with each of the various criteria that staff considered in arriving at the decision to use the 75-ppm STPEL.

HAZARDOUS MATERIALS Appendix B Table-1
Acute Ammonia Exposure Guidelines

Guideline	Responsible Authority	Applicable Exposed Group	Allowable Exposure Level	Allowable* Duration of Exposures	Potential Toxicity at Guideline Level/Intended Purpose of Guideline
IDLH[2]	NIOSH	Workplace standard used to identify appropriate respiratory protection.	300 ppm	30 minutes	Exposure above this level requires the use of "highly reliable" respiratory protection and poses the risk of death, serious irreversible Injury, or impairment of the ability to escape.
IDLH/10[1]	EPA, NIOSH	Work place standard adjusted for general population factor of 10 for variation in sensitivity	30 ppm	30 minutes	Protects nearly all segments of general population from irreversible effects.
STEL[2]	NIOSH	Adult healthy male workers	35 ppm	15 minutes, 4 times per 8-hour day	No toxicity, including avoidance of irritation.
EEGL[3]	NRC	Adult healthy workers, military personnel	100 ppm	Generally less than 60 minutes	Significant irritation, but no impact on personnel in performance of emergency work; no irreversible health effects in healthy adults. Emergency conditions one-time exposure.
STPEL[4]	NRC	Most members of general population	50 ppm 75 ppm 100 ppm	60 minutes 30 minutes 10 minutes	Significant irritation, but protects nearly all segments of general population from irreversible acute or late effects. One-time accidental exposure.
TWA[2]	NIOSH	Adult healthy male workers	25 ppm	8 hours	No toxicity or irritation on continuous exposure for repeated 8-hour work shifts.
ERPG-2[5]	AIHA	Applicable only to emergency response planning for the general population (evacuation) (not intended as exposure criteria) (see preface attached)	200 ppm	60 minutes	Exposures above this level entail** unacceptable risk of irreversible effects in healthy adult members of the general population (no safety margin).

1) (EPA 1987) 2) (NIOSH 1994) 3) (NRC 1985) 4) (NRC 1972) 5) (AIHA 1989)
* The (NRC 1979), (WHO 1986), and (Henderson and Haggard 1943) all conclude that available data confirm the direct relationship to increases in effect with both increased exposure and increased exposure duration.
** The (NRC 1979) describes a study involving young animals, which suggests greater sensitivity to acute exposure in young animals. The WHO (1986) warned that the young, elderly, asthmatics, those with bronchitis, and those that exercise should also be considered at increased risk based on their demonstrated greater susceptibility to other non-specific irritants.

REFERENCES FOR HAZARDOUS MATERIALS APPENDIX B, TABLE 1

AIHA. 1989. American Industrial Hygienists Association, Emergency Response Planning Guideline, Ammonia, (and Preface) AIHA, Akron, OH.

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NRC. 1985. National Research Council, Criteria and Methods for Preparing Emergency Exposure Guidance Levels (EEGL), Short-Term Public Emergency Guidance Level (SPEGL), and Continuous Exposure Guidance Level (CEGL) documents, NRC, Washington, D.C.

NRC. 1972. Guideline for Short-Term Exposure of the Public to Air Pollutants. IV. Guide for Ammonia, NRC, Washington, D.C.

NIOSH. 1994. National Institute of Occupational Safety and Health, Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services, Washington D.C., Publication numbers 94-116.

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ABBREVIATIONS FOR HAZARDOUS MATERIALS APPENDIX B, TABLE 1

ACGIH: American Conference of Governmental and Industrial Hygienists

AIHA: American Industrial Hygienists Association

EEGL: Emergency Exposure Guidance Level

EPA: Environmental Protection Agency

ERPG: Emergency Response Planning Guidelines

IDLH: Immediately Dangerous to Life and Health Level

NIOSH: National Institute of Occupational Safety and Health

NRC: National Research Council

STEL: Short Term Exposure Limit

STPEL: Short Term Public Emergency Limit

TLV: Threshold Limit Value

WHO: World Health Organization

HAZARDOUS MATERIALS MANAGEMENT

List of Comment Letters

		Haz Mat Comments?
1	Inyo County	
2	Bureau of Land Management	
3	National Park Service	
4	The Nature Conservancy	
5	Amargosa Conservancy	
6	Basin & Range Watch	
7	Pahrump Paiute Tribe	
8	Richard Arnold, Pahrump Piahute Tribe	
9	Big Pine Tribe of Owens Valley	
10	Intervenor Cindy MacDonald	X
11	Intervenor Center for Biological Diversity	
12	Intervenor, Old Spanish Trail Association	
13	Applicant, BrightSource Energy, Inc.	X

Comment #	DATE	COMMENT TOPIC	RESPONSE
10	**July 21, 2012**	**Intervenor Cindy MacDonald**	
10.1	**p. 8-2**	Lead Acid Batteries -- What is the number on site?	The lead acid batteries used for pointing heliostats will number one per heliostat or about 85,000. These would small batteries (garden vehicle size). There might also be several hundred more, larger, located inside a building to provide emergency backup power.
10.2	**p. 8-2**	Lead Acid Batteries -- What is the number for heliostats?	The lead acid batteries used for pointing heliostats will number one per heliostat or about 85,000.
10.3	**p. 8-2**	Lead Acid Batteries -- What are their lifetimes?	Typically, lead acid batteries last 3-6 years, depending on their usage and environmental conditions.
10.4	**p. 8-2**	Lead Acid Batteries -- What is their placement?	The batteries would be mounted near the heliostat motor, beneath the mirror of the heliostat. They would be above the ground.

10.5	p. 8-2	Lead Acid Batteries -- What are their environmental impacts to soil, water, biological resources?	There should be no impacts. The batteries are sealed. They contain a small amount of dilute suphuric acid, which should never get spilled. If it did, individual spills would be small and not consequential. Disposal of end-of-life batteries as hazardous waste is regulated.
10.6	p. 8-2	Lead Acid Batteries -- What are their impacts to human health and public safety?	There should be no impacts, either onsite or offsite.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
13	**July 23, 2012**	**Applicant, BrightSource Energy, Inc.**	
13.1	p. 207	suggested change to PSA page 4.5-5 Step 1, requests revision to first sentence re on-site chemicals and use	Revision to text made to reference revised Table 5.5-3R2.
13.2	p. 207	suggested change to PSA page 4.5-8, 3rd full paragraph through p. 4.5-9, 1st full paragraph: request for update on natural gas supply system, as reflected in General Comments (PROJECT DESCRIPTION)	Revision to text made.
13.3	p. 207	Suggested change to PSA page 4.5-9, 1st full paragraph, 3rd sentence re: pigging facilities for natural gas supply system.	Revision to text made.
13.4	p. 207	Suggested change to PSA page 4.5-10, last paragraph, first sentence, request to update sentence to reflect Condition of Certification, HAZ-1.	Keep standard condition language.
13.5	p. 208	Suggested change to PSA page 4.5-10, last paragraph, second sentence, request to reword sentence re: Table 5.5-3R1.	Revision to text made to reference revised Table 5.5-3R2.
13.6	p. 208	Question regarding PSA page 4.5-11, first partial paragraph, last sentence, requests that certain words be stricken, i.e. "or require" for alternative chemicals.	Revision to text made as requested.

13.7	**p. 208**	Add word "Verification" to second paragraph of condition HAZ-1	Revision made to **HAZ-1**.
13.8	**p. 208**	Reword HAZ-2 for better clarity.	Revision made to **HAZ-2**.
13.9	**p. 208**	Request to change 60 days to 30 days for submittal of Hazardous Materials Business Plan prior to delivery.	Staff believes 60 days is prudent considering volume of submittals to the CPM to occur during the pre-construction period.
13.10	**p. 208**	Request to reword requirement for a Safety Management Plan for hazardous materials to apply to those delivered in large, bulk quantities by tanker trucks. Request to change review time from 60 to 30 days.	Revision to text made as requested regarding Safety Management Plan. Review period of 60 days seems reasonable considering volume of submittals to the CPM to occur during the pre-construction period.
13.11	**p. 209**	Request to reword/reformat HAZ-4 for clarity.	Revision to text made.
13.12	**p. 209**	Request to reword/reformat HAZ-5 for clarity.	Revision to text made.
13.13	**p. 209**	Request to change language of Haz 5 to move requirements of the condition to the verification section.	Keep standard condition language to maintain requirements in condition, rather than move to verification portion of HAZ-5..
13.14	**p. 211**	Suggest revision to language of HAZ-6 Verification.	Revision to text made.

LAND USE

Testimony of Christina Snow

SUMMARY OF CONCLUSIONS

This section of the Final Staff Assessment (FSA) analyzes the potential effects on land use that would occur by construction and operation of the proposed Hidden Hills Solar Electric Generating System (HHSEGS). Energy Commission staff concludes the proposed project would not result in the conversion of any farmland (as classified by the Farmland Mapping and Monitoring Program) to non-agricultural use or conflict with existing agricultural zoning or Williamson Act contracts; would not disrupt or divide the physical arrangement of an established community; and would not conflict with any applicable habitat conservation plan, natural community conservation plan or biological opinion. However, staff has determined that the proposed project would not be consistent with applicable County of Inyo laws, ordinances, regulations, and standards (LORS) pertaining to land use planning. Staff has further determined that the proposed project's conflict with such plans, policies and regulations of Inyo County would result in a significant impact under the California Environmental Quality Act (CEQA) Guidelines.

Socioeconomics Figure 1 and **Socioeconomics Table 2** do not identify the presence of an environmental justice community. Therefore, the minority population in the six-mile buffer does not constitute an environmental justice population as defined by *Environmental Justice: Guidance Under the National Environmental Policy Act* and would not trigger further scrutiny for purposes of an environmental justice analysis.

INTRODUCTION

This land use analysis addresses project compatibility with existing or reasonably foreseeable[1] land uses; consistency with County of Inyo applicable laws, ordinances, regulations, and standards (LORS); and potential project related direct, indirect, and cumulative environmental effects.

The HHSEGS solar fields and associated facilities are located on privately owned land that is adjacent to the Nevada border in unincorporated Inyo County, California. The electric transmission line and natural gas pipeline alignments begin on the project site and then exit the eastern border of the project site extending into Nevada. The project linears will be located primarily on federal land managed by the U.S. Bureau of Land Management (BLM). The California Energy Commission has jurisdiction over the portion of the proposed project that lies within California, which is subject to CEQA. Land use impacts associated with the portions of the project located in Nevada will be analyzed in a separate environmental analysis prepared by the Bureau of Land Management pursuant to the National Environmental Policy Act (NEPA) and are exempt from CEQA pursuant to Public Resources Code § 21080(b)(14).

[1]Whether a project is reasonably foreseeable (i.e., a "probable future project") for purposes of cumulative impact analysis depends on the nature of the resource in question, the location of the project, and the type of project. (14 California Code of Regulations, Section 15130(b)(2)).

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

Land Use Table 1 lists the local land use LORS applicable to the proposed project. The proposed project's consistency with these LORS is analyzed under **Assessment of Impacts and Discussion of Mitigation** and in **Land Use Table 2**. The project site does not involve federally managed lands, therefore, there are no identified applicable federal land use related LORS.

Land Use Table 1
Applicable Laws, Ordinances, Regulations, and Standards (LORS)

Applicable LORS	Description
State	
California Subdivision Map Act	Governs the creation, recognition, consolidation/reconfiguration, adjustment and elimination of parcels on land within California.
Local	
County of Inyo General Plan	The County of Inyo General Plan, adopted December 11, 2001, consists of seven elements: Government Element, Land Use Element, Economic Development Element, Housing Element, Circulation Element, Conservation and Open Space Element and Public Safety Element. Although there are no specific plans in Inyo County, the General Plan provides information on the population, housing units and other characteristics of several communities within the county. The proposed project site is located within the Charleston View area of the county.
County of Inyo Title 18 Zoning Ordinance	The Zoning Ordinance establishes zones in the unincorporated areas of the County of Inyo regulating the use of land, height of buildings, area of lots, building sites and provides maps showing the zoning classification boundaries.
County of Inyo Title 16 Subdivision Ordinance	The Subdivision Ordinance provides procedures and standards governing the design, improvements and survey of subdivisions in the county. Its purpose is to promote the orderly development of the land within the unincorporated area of the county; to protect purchasers and land owners; to prevent circumvention of existing subdivision, zoning and building ordinances and regulations; to insure the reservation of adequate streets for vehicular traffic and adequate access to land so divided; to assure compliance with the sewer and water ordinances of the county; to avoid danger and expense to the public through adequate control and regulation of surface drainage; and to provide for the local administration of the State Subdivision Map Act.
County of Inyo Title 21 Renewable Energy Development Ordinance	The Renewable Energy Ordinance, adopted August 17, 2010, is intended to support, encourage and regulate the development of the County's solar and wind resources while protecting the health, safety and welfare of its citizens and its environment.

SETTING

PROJECT SITE

The project site is approximately eight miles[2] directly south of Pahrump, Nevada and approximately 45 miles west of Las Vegas, Nevada. The city of Los Angeles is located approximately 180 miles southwest and Edwards Air Force Base is located approximately 130 miles west-southwest of the site. The unincorporated towns of Tecopa and Shoshone are the two closest California communities, located approximately 24 miles southwest and 36 miles west of the project site. Death Valley National Park is located approximately 20 miles west of the project site.
The HHSEGS is proposed to be located on approximately 3,097 acres (5.12 square miles) of privately owned land in southeastern Inyo County, California immediately adjacent to the Nevada border. The project site is not developed, but contains unimproved dirt roads as a result of a previously approved development consisting of 170 parcels. Currently, there are no agricultural uses on the proposed HHSEGS site, although approximately 12 acres of land within the project boundary had previously been used as an orchard.

HHSEGS will consist of two solar fields and associated facilities that include a northern solar plant (Solar Plant 1) and a southern solar plant (Solar Plant 2). Solar Plant 1 consists of approximately 1,483 acres (2.3 square miles), and Solar Plant 2 will consist of approximately 1,510 acres (2.4 square miles). A common area encompassing 103 acres will be established on the southeastern corner of the site and will accommodate an administration, warehouse, switchyard and maintenance complex as well as an asphalt-paved visitor and employee parking area. The administration complex will occupy approximately 4.8 acres of the 103-acre common area (AFC, Figure 1.2-3).

The temporary construction laydown area, consisting of 180 acres (AFC, Figure 2.1-3), would be located immediately west of the Solar Plant 1 area. The project site and adjacent construction laydown area have not been developed except for the previously mentioned unimproved roads and trails throughout the site and the abandoned 12-acre orchard. Immediately south of the proposed project lies a sparsely populated residential area, Charleston View. Approved in the 1970s, Charleston View contains parcels ranging in size from two acres to 40 acres. The land use adjacent to the western and northern sides of the proposed project site is predominately undeveloped land with parcels ranging from 20 acres to larger tracts of land that are managed by BLM. Lands adjacent to the project on the eastern boundary within Nevada are also undeveloped with a large portion managed by the BLM and a privately owned smaller portion. Refer to **Land Use Figure 2**, which depicts the project site and surrounding designations.

The access to the HHSEGS site would be from the existing two-lane Old Spanish Trail Highway[3] to the project entrance road on the east side of the project. Secondary access

[2] 28 miles is the driving distance from the proposed project to Pahrump, Nevada. Eight (8) miles is the direct distance from southern Pahrump to the proposed project's northern boundary (Solar Field 1).

[3] The road is referred to as Tecopa Road/Highway in Nevada, although Old Spanish Trail Highway and Tecopa Road have been used interchangeably.

would be from Old Spanish Trail Highway along the west side of the site, then along a paved road between the two solar plants.

Transmission Lines

The HHSEGS project will interconnect to the Valley Electric Association (VEA) system[4]. The interconnection would require an approximately 10-mile-long generation tie-line (gen-tie line) from the HHSEGS project site to the proposed Crazy Eyes Tap Substation[5], where the project would interconnect to the VEA electric grid. The gen-tie line would originate at the HHSEGS's onsite switchyard, cross the state line, avoiding the mesquite vegetation to the south, and continue east for approximately 1.5 miles until reaching Tecopa Road. At Tecopa Road, the route would head northeast paralleling Old Spanish Trail Highway until it reaches the Crazy Eyes Tap Substation, which would be located immediately east of the Tecopa Road/SR 160 intersection. The Crazy Eyes Tap Substation would interconnect to the existing VEA Pahrump-Bob Tap 230-kV line.

Natural Gas Pipeline

A 12-inch-diameter natural gas pipeline would be required for the project. Kern River Gas Transmission Company (KRGT) proposes to construct the pipeline from the HHSEGS meter station, to be located in the HHSEGS common area, extending 32.4 miles to KRGT's existing mainline system just north of Goodsprings in Clark County, Nevada. (CH2 2012ee)

A meter station, approximately 300 by 300 feet, including the pig receiver facilities, would be constructed and would be surrounded by a 6-foot-tall chain-link fence with three strands of barbed wire (approximately 7 feet high total). The meter station would be shaded by a canopy to cover the meter runs and associated instrumentation and valving. A data acquisition and control (DAC) building would be located within the meter station. Data acquisition, control, uninterrupted power supply (UPS), and communication equipment would be installed inside the DAC building. Yard lights would be installed on the DAC building and meter building exterior. The light fixtures would be shielded or hooded and directed downward.

As indicated earlier, the natural gas pipeline would be located in Nevada, primarily on federal land managed by the BLM and will be analyzed in a separate environmental document prepared by BLM.

SURROUNDING AREA

Inyo County has a total land area of approximately 6.5 million acres and is the second largest county in California. Although the county contains a large land area, only 1.9 percent of the land is held in private ownership. Federal agencies own 91.6 percent, the State of California owns 3.5 percent, the Los Angeles Department of Water and Power (LADWP) owns 2.7 percent, and Inyo County and other local agencies (including reservation lands) make up the remaining 0.3 percent.

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[4] In January 2013, VEA will become a participating transmission owner (PTO) and will turn operational control of its facilities over to the California Independent System Operator (CAISO).

[5] In the HHSEGS Application for Certification (and in the Preliminary Staff Assessment, CEC 2012u), this substation was referred to as the Tap Substation.

The project site is located on private land within a community identified in the General Plan as Charleston View. The Charleston View area contains various parcels of different sizes and is sparsely populated. The 2010 U.S. Census data[6] indicates there are 68 residents living in California within six miles of the project site.

Existing land uses immediately adjacent to and nearby the proposed HHSEGS project site within Charleston View include:

- North: The area to the north of the project site consists of lands within California and Nevada. These areas contain undeveloped land owned and managed by the BLM.
- South: The area immediately adjacent to the project site consists of the Charleston View rural residential community that was approved in the 1960s that consists of several lots that are predominately 2.5 acres in size. The area is sparsely populated and consists of scattered residences, trailers and outbuildings.
- East: Consists of a large area of land within Nevada that is predominately undeveloped and is managed by BLM. There are also scattered private inholdings within these BLM lands. A 550-acre firearms training institute (Front Sight Firearms Training Institute) is located approximately two miles northeast of the project site in Nevada. A portion of the land to the east lies within California and is partially developed for residential use as part of the Charleston View area. In addition, the recently approved St. Therese Mission located slightly southeast of the project site is currently under construction.
- West: Larger undeveloped parcels in private ownership and undeveloped land owned and managed by BLM.

The project site and surrounding area do not contain land identified as Important Farmlands (California Department of Conservation, 2008).

A military airspace area, called R-2508 Special Use Airspace Complex, lies approximately 10 to 15 miles west of the project site. The R-2508 Complex provides the largest single area of overland Special Use Airspace (SUA) in the United States and is an important national military asset that provides an area for realistic military training. The airspace and associated land area consists of bombing ranges, supersonic flight corridors, low altitude high speed maneuver areas, radar testing areas, warfare training areas, and refueling training areas. The R-2508 Special Use Airspace Complex includes more than 20,000 square miles and consists of the overlying Restricted Area R-2508, five underlying restricted areas, and ten Military Operations Areas (MOA).

The Department of Defense administered a Joint Land Use Study (JLUS) that was coordinated by the Governor's Office of Planning and Research. The JLUS was a collaborative effort between local communities, active military installations, and other stakeholders to encourage a collaborative planning process to ensure that land uses surrounding the SUAs are compatible and strategies are developed to reduce the impact of existing community and military activities on each other. Compatibility issues considered as part of this study include alternative energy development. The concern of alternative sources of energy projects include compatibility issues related to glare or

[6] Source: U.S. Census Bureau, 2010 Census

vertical obstruction or other interference with military operations.

GENERAL PLAN LAND USE

PROJECT SITE

The 2001 Inyo County General Plan Update was approved by the Inyo County Board of Supervisors on December 11, 2001. The general plan identifies the project area as the Charleston View area. The general plan land use designation on the proposed site is Open Space and Recreation (OSR) and Resort/Recreational (REC) and the zoning is Open Space 40-acre minimum (OS-40).

The OSR general plan designation allows for existing and planned public parks, ball fields, horse stables, greenbelts, and similar compatible uses and typically has a minimum parcel size of 40 acres. The permitted uses for the Open Space zone includes single-family dwellings, farms and ranches for a variety of agricultural activities (including livestock), animal hospitals or kennels, wildlife refuges, and wilderness areas and uses. Additional accessory and conditional uses are allowed in the Open Space zone related to dwellings and signs as well as public, quasi public, agricultural and mining uses.

As part of a statewide initiative to help identify the transmission projects needed to accommodate California's renewable energy goals, called the Renewable Energy Transmission Initiative (RETI), the Energy Commission and stakeholders identified areas within California that could be developed for renewable energy (Competitive Renewable Energy Zones or CREZs).

Recognizing that the county would potentially be subject to large renewable energy development, Inyo County requested to participate in the RETI Stakeholder Steering Committee (SSC) and identified areas within the county that could be potential CREZs. At that time, the Charleston View area was identified as a potential CREZ by the Inyo County Board of Supervisors and later, on August 17, 2010, the Inyo County Board of Supervisors adopted a Renewable Energy Ordinance, Title 21, to provide a framework for renewable energy projects and to ensure that potential adverse impacts from such development were addressed.

To further support potential renewable energy projects, Inyo County Board of Supervisors adopted a Solar and Wind Renewable Energy General Plan Amendment (REGPA) on April 26, 2011, which identified on a programmatic level, the Charleston View area as well as 14 other areas within the county for potential development of renewable energy. This REGPA was in place at the time the HHSEGS AFC was submitted to the Energy Commmission on August 5, 2011. On September 6, 2011, the Inyo County Board of Supervisors rescinded the County's REGPA due to a legal challenge from the Sierra Club and the Center for Biological Diversity, which effectively eliminated the overlay zone that was discussed in the AFC. As a result of the revocation of the REGPA, the proposed project site is now subject to the original general plan designations of OSR and REC.

SURROUNDING AREA

Lands adjacent to the project site in California and Nevada include both private lands as well as public lands that are managed by BLM. The area directly to the south is identified in the general plan as a Resort/Recreational (REC) designation with a portion designated Rural Residential Medium Density (RRM), while areas further to the south and along the western portion are designated as OSR. The majority of the parcels in the Charleston View area directly south of the site contain scattered residences that vary in parcel size from two to 40 acres. Larger parcels are dominant further out from the project site.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

Energy Commission staff has analyzed the information provided in the Application for Certification (AFC) and has acquired information from other sources to determine consistency of the proposed HHSEGS project with applicable land use LORS and the proposed project's potential to have significant adverse land use-related impacts.

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

Significance criteria used in this document are based on Appendix G of the CEQA Guidelines and performance standards or thresholds identified by Energy Commission staff, as well as applicable LORS utilized by other governmental regulatory agencies.

An impact may be considered significant if the proposed project results in:

- Conversion of Farmland or Forest Land.
  - Conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide or Local Importance (Farmland) as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use.[7]
  - Conflict with existing zoning for agricultural use, or a Williamson Act contract.
  - Conflict with existing zoning for, or cause rezoning of, forest land [as defined in Pub. Resources Code §12220 (g)), timberland (as defined by Pub. Resources Code §4526), or timberland zoned Timberland Production (as defined by Gov. Code §51104(g)).
  - Result in the loss of forest land or conversion of forest land to non-forest use.
  - Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use[8] or conversion of forest land to non-forest use.

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[7] FMMP defines "land committed to non-agricultural use" as land that is permanently committed by local elected officials to non-agricultural development by virtue of decisions which cannot be reversed simply by a majority vote of a city council or county board of supervisors.

[8] A non-agricultural use in this context refers to land where agriculture (the production of food and fiber) does not constitute a substantial commercial use.

- Physical disruption or division of an established community.
- Conflict with any applicable habitat conservation plan, natural community conservation plan, or biological opinion.
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction, or that would normally have jurisdiction, over the project adopted for the purpose of avoiding or mitigating environmental effects. This includes, but is not limited to, a General Plan, redevelopment plan, or zoning ordinance.
- Result in incremental impacts that, although individually limited, are cumulatively considerable when viewed in connection with other project-related effects or the effects of past projects, other current projects, and probable future projects.[9]

In general, a power plant and its related facilities may also be incompatible with existing or planned land uses, resulting in potentially significant impacts, if they create unmitigated noise, dust, or a public health or safety hazard or nuisance; result in adverse traffic or visual impacts; or preclude, interfere with, or unduly restrict existing or future uses. Refer to other sections of this document for a detailed discussion of any additional potential project-related impacts and recommended conditions of certification.

DIRECT/INDIRECT IMPACTS AND MITIGATION

This section discusses the applicable potential project impacts and associated methods and thresholds of significance referenced above. As part of this analysis, staff has also considered if there are any environmental justice populations in the vicinity of the project and whether land use impacts would occur as a result of the proposed HHSEGS project.

AGRICULTURE AND FOREST

Would the project convert Farmland to non-agricultural use?

The Department of Conservation Farmland Mapping and Monitoring Program (FMMP) produces *Important Farmland Maps* and statistical data used for analyzing impacts on California's agricultural resources. The FMMP is required to prepare, update, and maintain *Important Farmland Series Maps* and other soils and land capability information. The *Important Farmland Maps* depict categories of Prime Farmland, Farmland of Statewide Importance, Unique Farmland, Farmland of Local Importance, Grazing Land, Urban and Built-up Land, Other Land and Water. The FMMP designates the proposed HHSEGS project site and the construction laydown area as "Other Land" which is defined as land not included in any other mapping category (CDOC 2008).

The proposed HHSEGS project site does not contain, and would therefore not convert,

[9] Cumulative impacts refer to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts. The individual effects may be changes resulting from a single project or a number of separate projects and can result from individually minor, but collectively significant actions taking place over a period of time (CEQA Guidelines §15355; 40 CFR 1508.7)

any farmland with FMMP designations of Prime Farmland, Farmland of Statewide Importance, Unique Farmland, or Farmland of Local Importance to non-agricultural use. Therefore, the proposed HHSEGS project would have no impact with respect to farmland conversion.

Would the project conflict with existing zoning for agricultural use or a Williamson Act contract.

The California Land Conservation Act, commonly referred to as the Williamson Act, enables local governments to enter into contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space uses. (Chapter 7, Agricultural Land, Gov. Code § 51200-51297.4) There are no existing agricultural uses present on the proposed project site or laydown area. The proposed HHSEGS project is not located on land that is under a Williamson Act contract and as a result would not conflict with any Williamson Act contracts.

Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Pub. Resources Code §12220(g)), timberland (as defined by Pub. Resources Code §4526), or timberland zoned Timberland Production (as defined by Gov. Code §51104(g)).

The proposed project site and laydown area are not zoned for forest land, timberland, or for timberland production. In addition, there is no land zoned for such purposes within one mile of the project site. Therefore, there would be no conflict with, or cause for, rezoning of forest land or timberland and as a result there would be no impact to forest land or timberland.

PHYSICAL DISRUPTION OR DIVISION OF AN ESTABLISHED COMMUNITY

The proposed HHSEGS project and laydown area would be located in an area that is designated as open space in unincorporated Inyo County. The power plant and laydown area would be located entirely on leased private property, on a 3,097-acre site. The nearest residence to any of the power blocks is approximately 3,500 feet south of the Solar Plant 2 power block, and about 950 feet south of the project's southern boundary. There are scattered dwellings and trailers located beyond these residents to the south and east of the project site.

There would not be a need to relocate any residences as a result of the HHSEGS project. The HHSEGS project would be located entirely within an area that does not contain any residential development. Therefore, the HHSEGS project would not physically divide or disrupt any community within the Charleston View area. In addition, the proposed project would not involve the displacement of any existing development or result in new development that would physically divide an existing community.

The project's linear facilities would not present new physical barriers. The proposed transmission and gas lines would originate from the HHSEGS property in California and traverse the California-Nevada border before connecting to facilities within Nevada.

CONFLICT WITH ANY APPLICABLE HABITAT OR NATURAL COMMUNITY CONSERVATION PLAN

The HHSEGS project is not located within any Habitat Conservation Plan or Natural Community Conservation Plan and there will be no conflicts as a result of the proposed project.

CONFLICT WITH ANY APPLICABLE LAND USE PLAN, POLICY OR REGULATION

Energy Commission staff evaluates (Cal. Code Regs. Tit. 20, § 1744) the information provided by the applicant in the AFC (and any amendments), project design, site location, and operational components to determine if elements of the proposed project would conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project, or that would normally have jurisdiction over the project except for the Energy Commission's exclusive authority. As part of the licensing process, the Energy Commission must determine whether a proposed facility complies with all applicable state, regional, and local LORS (Pub. Resources Code § 25523[d][1]). The Energy Commission must either find that a project conforms to all applicable LORS or make specific findings that a project's approval is required for public convenience and necessity even where the project is not in conformity with all applicable LORS (Pub. Resources Code § 25525). When determining LORS compliance, staff is required to give "due deference" to a local agency's assessment of whether a proposed project is consistent with that agency's zoning and general plan (Cal. Code Regs. Tit. 20, § 1714.5). On past projects, staff has requested that the local agency provide a discussion of the findings and conditions that the agency would make when determining whether a proposed project would comply with the agency's LORS, were they the permitting authority. Any conditions recommended by an agency are considered by Energy Commission staff for inclusion in the proposed conditions of certification for the project.

As part of staff's analysis of local LORS compliance and to determine the county's view of the project's consistency with its general plan and zoning code, staff has reviewed Inyo County's General Plan, Zoning Ordinance and Renewable Energy Ordinance with respect to the proposed project and has had personal communications with Inyo County staff regarding LORS compliance. As a follow-up, Inyo County submitted a letter, dated November 29, 2011 (INYO 2011a), to Energy Commission staff that stated the proposed HHSEGS project is inconsistent with the general plan designation and zoning on the project site and indicated that the project is inconsistent with the Renewable Energy Ordinance.

An additional letter submitted by Inyo County to BrightSource Energy, Inc (February 23, 2012, INYO 2012c), reconfirmed Inyo County's determination that the project as proposed is not consistent with the general plan or zoning ordinance.

In addition to determining whether the project complies with local LORS, staff also makes a determination as to whether or not the project would create a significant impact. There may be instances where a project would conflict with LORS and not create a significant impact under CEQA.

Based on staff's independent review and analysis of the AFC and the local land use

LORS, staff concludes that the County of Inyo's General Plan, Zoning Ordinance, Subidivion Ordinance and Renewable Energy Ordinance are applicable to the proposed HHSEGS project.

COMPLIANCE WITH LORS

The AFC identified several LORS (Table 5.6-2) and indicated that the proposed HHSEGS project was in compliance with all applicable local LORS. Since the time of the AFC submittal to the Energy Commission, most of the LORS identified in the AFC have been rescinded as part of the revocation of the Solar and Wind Renewable Energy General Plan Amendment (REGPA) on September 6, 2011.

Land Use Table 2 summarizes the HHSEGS project conformance with applicable LORS.

Land Use Table 2
Project Compliance with Adopted and Applicable LORS

Applicable LORS	Description	Consistency Determination	Basis for Consistency
State			
California Subdivision Map Act	Governs the creation, recognition, consolidation/reconfiguration, adjustment and elimination of parcels on land within California.	No	The project site consists of 172 legally created parcels that will need to be combined to create one to three parcels.
Local			
Inyo County General Plan	Provides comprehensive, long-range plans, policies, and goals to guide the physical development of the county.	No	The project site is designated Open Space and Recreation (OSR) and Resort/Recreational (REC). Large renewable energy projects are not allowed in these land use designations.
Chapter 3 Government Element Goal Gov – 10: Energy Resources Policy Gov-10.1: Development	Encourages development of energy resources on both public and private lands consistent with policies and within the bounds of economic reason and sound environmental health.	Yes	The project is a renewable energy project that is consistent with this general goal and policy.
Chapter 4 Land Use Element Commercial Goal LU-3: Provide commercial land uses that adequately serve the existing and anticipated future needs of the community and surrounding environs.	Policy LU-3.4: Resort/Recreational Designation (REC) This designation provides for a mixture of residential and recreational commercial uses, such as resorts, recreational facilities, motels, campgrounds, trailer parks, restaurants, general stores, service stations, and similar compatible uses. This designation is oriented toward tourist use, however, it also permits permanent residential use and public and quasi-public uses. The Floor Area Ratio (FAR) shall not exceed 0.40. The base residential density shall be 1 du/25 acres. Clustering of	No	A portion of the project site is designated as REC and the project is not consistent with the intent of this policy. Inyo County has indicated that the tourist use is desired in this area. The intensity of the proposed project is not consistent with these goals and policies and a determination as to whether the project can incorporate elements that reduce this conflict has not been made by Inyo County.

	residential units is encouraged, with density of developed area allowed up to 24 du/net acre.		
Chapter 4 Land Use Element Commercial Goal LU-5: Provide adequate public facilities and services for the existing and/or future needs of communities and their surrounding environs, and to conserve natural and managed resources.	Policy LU-5.1: Open Space and Recreation Designation This designation provides for existing and planned public parks, ball fields, horse stables, greenbelts, and similar compatible uses. The FAR shall not exceed 0.20. The minimum parcel size is generally 40 acres.	No	The majority of the project site is designated as OSR. As indicated in the General Plan goals and policies, the project as proposed is inconsistent with those uses and there has been no review by Inyo County to determine appropriate measures to resolve this inconsistency.
Zoning Ordinance of the County of Inyo – Title 18	Provides a framework for development by indicating allowable uses and development standards that support the General Plan.	No	The project site is zoned Open Space with a 40-acre Minimum (OS-40). Large renewable energy projects are not allowed in this zone district.
Inyo County Renewable Energy Ordinance – Title 21	Provides a mechanism for Inyo County to regulate the development of large scale renewable energy projects. Provides procedures outside of those that are within the Title 18 Zoning Ordinance.	No	Renewable energy projects must be found to be consistent with the Inyo County General Plan prior to receiving a renewable energy impact determination or renewable energy permit or prior to entering into a renewable energy development agreement (Section 21.20.060 Consistency with the Inyo County General Plan)
Inyo County Subdivision Ordinance – Title 16	Provides a county process for implementing the California Subdivision Map Act.	No	The project applicant has not submitted a Reversionary Map for county approval. The project applicant has not submitted a request for the abandonment of public road rights-of-way, as requested by Inyo County.

Inyo County General Plan

State law requires each county and city to prepare and adopt a comprehensive and long-range general plan for its physical development (Government Code Section 65300). The general plan must include elements such as land use, circulation, housing, open-space, conservation, safety, and noise as identified in state law (Government Code Section 65302), to the extent that the topics are locally relevant. Once a general plan is adopted, its maps, diagrams, and development policies form the basis for a jurisdiction’s zoning, subdivision, and public works actions. Under California law, no specific plan, area plan/community plan, zoning, subdivision map, nor public works project may be approved unless the jurisdiction finds that it is consistent with the adopted general plan.

The Inyo County General Plan comprises several related documents, including the General Plan Summary, Goals and Policies Report, Background Report, Issues and Alternatives Report, and the Environmental Impact Report (EIR). The EIR prepared for the general plan was prepared in order to meet the requirements of CEQA. As part of that analysis, impacts were analyzed and mitigation measures were developed to reduce potential environmental impacts to less than significant levels where feasible. The Inyo County General Plan and EIR were approved on December 11, 2001.

The land use element of the general plan designates the general distribution and intensity of land uses within the planning area while the open-space element describes measures for the preservation of open space for the protection of natural resources, the managed production of resources, and for public health and safety. The HHSEGS project site was identified in the general plan as Open Space and Recreation (OSR) and Resort/Recreational (REC).

As previously indicated, at the time the AFC was submitted to the Energy Commission (August 5, 2011), the County of Inyo had a Solar and Wind Renewable Energy General Plan Amendment (REGPA) in place that had been adopted by the Board of Supervisors on April 26, 2011. The REGPA was applicable to the Charleston View area, where the HHSEGS project site is located, as well as 14 other areas within the county.

The AFC Land Use Section 5.6 refers to this Inyo County General Plan REGPA as the primary planning document applicable to the project site. The REGPA provided the basis for approvals of solar or wind renewable energy facilities and established policies to encourage development of renewable energy in overlay zones in any zoning district under Title 18 of the Inyo County Code. The proposed project was identified by the REGPA as being within the Charleston View overlay zone. Projects that were within these overlay zones were subject to additional site-specific studies and appropriate environmental review according to Inyo County Code Title 21, Renewable Energy Development.

On September 6, 2011, the Inyo County Board of Supervisors rescinded the County's REGPA due to a legal challenge from the Sierra Club and the Center for Biological Diversity, which effectively eliminated the overlay zone that was discussed in the AFC. As a result of the revocation of the REGPA, the proposed project is now subject to the original general plan designations of OSR and REC.

In Chapter 4 of Inyo County's General Plan (Land Use Element), Land Use Policy 5.1 indicates that the OSR designation provides for existing and planned parks, ball fields, horse stables, greenbelts, and similar compatible uses. Although most of the project site is designated as OSR, there are some parcels in the southeastern portion of the site that are designated as REC. In addition, several parcels directly south of the project site are designated as REC, with some being designated as Rural Residential Medium Density (RRM).

The REC designation provides for a mixture of residential and recreational commercial uses, such as resorts, recreational facilities, motels, campgrounds, trailer parks, restaurants, general stores, service stations, and similar and compatible uses. The designation is oriented toward tourist use, but also permits permanent residential use; public and quasi-public uses.

A large solar electric generating system is not identified as an allowed use on lands designated as OSR or REC. The land uses identified as consistent with the project site would include uses that are generally open space uses that provide potential recreational opportunities. The proposed HHSEGS project is a large solar project that includes mirrors and solar power towers that would preclude open space uses on the project site. For these reasons, staff concludes that the proposed project is inconsistent with Inyo County's General Plan and the corresponding analysis in the General Plan EIR.

As part of the responses to the PSA, the applicant contends that the proposed HHSEGS project is a public or quasi-public use and therefore, is allowed within the REC designation. The Inyo County General Plan, Chapter 8, Recreation Section 8.9, includes some discussion on examples of uses that are considered consistent with the REC designation. These include:

> **Active Recreation Area.** Sites that have been modified with structures or facilities designed for their enjoyment, such as a playground or recreation center. Examples in the County would include Dehy County Park in Independence and the hot springs in Tecopa.
>
> **Open Space.** A publicly owned or managed area that may be enjoyed for recreational activities even though its primary purpose may be some other activity (watershed protection, habitat protection, rangeland).
>
> **Passive Recreation Area.** Areas used in their natural state with few structures or facilities other than parking and trails.
>
> **Recreation Area.** Any public or private space set aside or primarily oriented to recreational use.

Staff confirmed with Inyo County as to the allowed uses within a public or quasi-public area; uses that would potentially be allowed include, churches, communication facilities, public parks and neighborhood-serving utilities such as an electrical substation, a cable routing box, a telephone exchange and similar types of small utilities that serve a neighborhood. It is therefore staff's determination that the HHSEGS project is inconsistent with the REC designation.

An additional response from the applicant indicated that the project as proposed is consistent due to the adoption of the General Plan Amendment 2004-06, which identifies all privately owned parcels with the Natural Resource and OSR designations to be designated as Rural Protection (RP). The significance being that the majority of the project site that is designated as OSR is now designated as RP. The applicant correctly identifies that the RP designation provides for the preservation of natural resources. The applicant further states that the General Plan Government Section indicates that renewable energy resources should be treated as natural resources and therefore, the HHSEGS project, as a natural resource, is allowed in the RP designation.

Staff reviewed this resolution and determined that although the General Plan Amendment did re-designate parcels that were OSR to RP, it was applicable only to properties listed on the attachment to the resolution. The HHSEGS project site does not contain any of the attached listed parcels and the RP designation is not applicable to the project site. The intent of the RP designation is to apply to land or water areas that are essentially unimproved and planned to remain open in character, providing for the preservation of natural resources, the managed production of resources, low intensity agriculture including grazing, park and other low-intensity recreation, wildlife refuges, hunting and fishing preserves, horse stables, cemeteries, greenbelts and similar compatible uses. This designation would not be appropriate for a large solar project such as the HHSEGS project. Staff confirmed that the General Plan 2004-06 Resolution was not applicable to the HHSEGS project site with Inyo County staff.

In order for the HHSEGS project to be consistent with the general plan, the County of Inyo has indicated that a General Plan Amendment (GPA) would need to be approved.

According to Inyo County, the general plan land use designations that would potentially allow for the proposed HHSEGS project would include State and Federal Lands (SFL), Agriculture (A), or General Industrial (GI). In this instance Inyo County has indicated that the GI designation is the most suitable. On November 17, 2011, staff requested information as to whether the applicant would submit, or planned to submit, an application for local land use entitlements to change the land use designation (CEC 2011g, Data Requests Set 1C). The applicant indicated that they would discuss these requirements with Inyo County to determine whether such filings were necessary (CH2 2011f, Data Responses Set 1C, dated December 19, 2011).

On March 13, 2012, the Inyo County Board of Supervisors conducted a public meeting and received input from several county departments on the potential impact to county services from the construction and operation of the HHSEGS project (INYO 2012i). Several county departments (including Public Works, Sherrif's Department, Assessor, Health & Human Services and Waste Management) identified their concerns over the proposed project and the resources they estimated would be needed to address the potential impacts (INYO 2012i, pp 45-73). During this meeting, the applicant made a presentation to the Board on the benefits of HHSEGS, and were asked several specific questions by Boardmembers over concerns related to socioeconomics, land use, and project schedule (INYO 2012i, pp 80-98). The Board specifically asked if the applicant was going to submit a general plan amendment prior to the Energy Commission's decision. The applicant stated that they would discuss this with appropriate county staff and submit an application (INYO 2012i, pp. 99-101).

Shortly after the PSA publication, Inyo County received a GPA and Zoning Reclassification application from the applicant that was deemed complete on July 10, 2012. The GPA consisted of a Solar Overlay general plan designation for the project site with a Solar Overlay Zone district. The base zoning district and general plan designation would not change as a result of the requested application. This application is similar in nature to the REGPA that Inyo County had initially adopted for several areas within the County, including approximately 33,154 acres in the Charleston View area. As part of this process, Inyo County would review the application and determine appropriate development standards through their public land use entitlement process. As part of that process, Inyo County has initiated Native American Consultation as required under Senate Bill 18.

On August 6, 2012, a letter from the Briggs Alexander Law Corporation was received by the Energy Commission and posted online on August 8, 2012 (BRIGG 2012a). The letter was submitted on behalf of a property owner (Tsiamis) and stated that a 20-acre parcel located within the HHSEGS project site had not been secured (either through purchase or lease agreement) by BrightSource. Purchase or lease of the parcel would give BrightSource site control, and thus legal authority to seek a GPA and Zone Reclassification from Inyo County. The 20-acre Tsiamis parcel is located on the southeastern portion of the HHSEGS project site (See **Land Use - Figure 3**).

On August 10, 2012, Inyo County submitted a letter to Brightsource Energy, LLC stating that the GPA and Zoning Reclassification was incomplete since it was not signed by all the property owners, or by a designated representative of the owners. In a follow up email sent to a representative of BrightSource, Inyo County Counsel stated that they had not received three of the four property owners signatures located on the HHSEGS project site necessary to process the GPA and Zoning Reclassification (CEC 2012bb, tn 66647, August 13, 2012). Two of the three property owners who have not signed are related to the Wiley Trust, which has an existing lease agreement already in place with the applicant. Status of the remaining third property owner (Tsiamis parcel) remains in question, as the applicant continues to negotiate and finalize a settlement agreement.

On August 29, 2012, the Inyo County Planning Department conducted a public meeting at the Tecopa Senior Center to receive public input on the GPA and Zoning Reclassication for the HHSEGS project. Although, a representative of BrightSource indicated to Inyo County that they were moving forward with negotiations with the Tsiamis parcel, staff has not received official notice of site control. For further information on the issues associated with the Tsiamis parcel as it relates to site control, please see the *Land Use Compatibility* discussion of this **Land Use** section.

The applicant expects to obtain all the required signatures to process the GPA with the county. Once Inyo County receives a complete GPA application, the county will proceed with obtaining public input and continue to work closely with Energy Commission staff to incorporate appropriate anlalysis and development standards. Inyo County would use either the FSA or the Presiding Member's Proposed Decision (PMPD) for their CEQA-level analysis and review of the GPA.

County Of Inyo Zoning Ordinance

The County of Inyo Zoning Code does not specifically identify large solar projects as an allowed use in any one zoning district. However, a letter from the County of Inyo Board of Supervisors (INYO 2011a dated November 29, 2011), states that a large solar project would potentially be consistent with the General Industrial and Extractive zone district (M-1).

The General Industrial and Extractive zone allows for several types of uses including, but not limited to, agricultural, manufacturing, commercial, railroad yards, airports and landing fields and industrial uses. A conditional use permit (CUP) allows for other manufacturing and industrial uses and more intensive uses such as mining and processing of natural resources.

Currently, the project site is zoned Open Space with a 40-acre minimum lot size. The proposed HHSEGS project is not a permitted use within the OS-40 district. According to the Inyo County Zoning Ordinance, the Open Space zone is for areas designated as open space to encourage the protection of mountainous, hilly upland, valley, agricultural, potential agricultural, fragile desert areas, and other mandated lands from fire, erosion, soil destruction, pollution and other detrimental effects of intensive land use activities.

Permitted uses in the OS zone include single-family dwellings, farms and ranches for a variety of agricultural activities, livestock ranches, animal hospitals or kennels, wildlife refuges and hunting and fishing preserves, and wilderness areas and uses. Various accessory uses are also allowed in support of the permitted uses.

Uses such as public stables, public and quasi-public buildings, golf courses, farm labor, cemeteries, crematories, mausoleums and columbariums, airports, refuse disposal sites, and mining and processing of natural resources are also potentially allowed with a CUP. Renewable energy projects, such as HHSEGS, are not identified as an allowed use on the project site.

In order for the HHSEGS to be consistent with the zone district, a Zone Reclassification would need to be processed to change the OS-40 zone district to the General Industrial and Extractive district (M-1). As part of this process Inyo County would normally require a CUP to ensure applicable development standards were implemented for the proposed project. Because the HHSEGS is a renewable energy project, it is also subject to standards as determined under the county's Title 21 code, Renewable Energy Ordinance process.

As indicated in the general plan discussion, the applicant submitted a GPA and Zoning Reclassification to Inyo County that was initially deemed complete and then determined to be incomplete due to the lack of the project site property owners signatures on the application. The applicant expects to obtain all the appropriate signatures for the GPA and Zone Reclassification, although a discussion of the potential ramifications of not obtaining the signatures is included in the "Land Use Compatibility" subsection in this FSA section.

The proposed Zoning Reclassification submitted to Inyo County requests a Solar Overlay zoning district. Inyo County has provided staff with appropriate development standards for the proposed HHSEGS project. Inyo County has determined that the applicable development standards for the proposed project are the development standards of the M-1 zone district. However, Inyo County's Renewable Energy Ordinance (discussed below), allows the county flexibility with regard to development standards for renewable energy projects.

Although the M-1 zone height requirements for structures and buildings are limited to a maximum of forty (40) feet, the proposed HHSEGS project would exceed this limit by 710 feet with the two 750-foot solar power towers. If Inyo County were the permitting agency, they would require a variance for the exceedance of height restrictions. However, for those projects subject to Title 21 (see following section), the county may determine different development standards based upon the type of renewable project proposed. Other development standards include parking and setback requirements. The parking requirement in the M-1 zone is one parking space for each full-time employee, plus guest parking and loading space as deemed appropriate. The M-1 zone setbacks for the project site would be 25 feet for the front, 15 feet for the rear and 10 feet for the side. In the applicant's data responses Set 2E received on May 4, 2012 (CH2 2012y), the applicant proposes a landscape area of 20 feet deep and a non-paved roadway setback of 12 feet deep behind the fencing along the project's frontage with Old Spanish Trail Highway. However, a recent letter from Inyo County Department of Public Works has requested right-of-way for road improvements at a minimum of 24 feet wide along the project frontage. Inyo County has told staff that a setback of 25 feet, plus an additional 24-foot right-of-way (ROW) would be required for the proposed HHSEGS. The 24-foot right of way was requested from Inyo County Public Works for future improvements on Old Spanish Trail Highway (see Condition of Certification **TRANS-2** in the **Traffic and Transportation** section of the **FSA**). Because the 24-foot right of way is for future road improvements, Inyo County has indicated that no trees or other large landscaping features should be placed within the ROW and that an additional setback of 25 feet should be required for landscaping/screening.

Inyo County Renewable Energy Ordinance

The County of Inyo has adopted a Renewable Energy Ordinance (Title 21) to support, encourage and regulate the development of solar and wind resources. Proposed renewable energy projects submitted under the previously approved REGPA were also subject to Title 21. Title 21 remains in effect and states that any person proposing to construct a renewable energy facility within Inyo County must either obtain a Renewable Energy Permit, enter into a Renewable Energy Development Agreement with Inyo County or, if the project is under the jurisdiction of another agency, obtain a "renewable impact determination" from the planning commission. These options are in lieu of submitting a rezone to a zone designation that is identified as compatible in the zoning ordinance (Title 18).

Title 21 provides Inyo County options to implement necessary development standards and mitigation measures and also identifies a process where a renewable energy project can be consistent with applicable LORS regardless of the zone district under Title 18. Under Title 21 the project must also be consistent with the County General Plan before an applicant can either obtain a Renewable Energy Permit from, or enter into a Renewable Energy Development Agreement (Section 21.08.100) with, the county prior to commencing construction of the proposed project. For projects not subject to the permit, the Planning Commission issues a Renewable Energy Impact Determination and also determines whether or not the project is consistent with the general plan.

Inyo County can use Title 21 to implement the requirements of a development agreement, renewable energy permit or impact determination that could replace those of the Zoning Code in the following areas: (1) Permitted, conditional, and/or accessory uses related to a facility and its accessory uses and structures; (2) distance between buildings; (3) height, density and intensity; (4) light and glare; (5) noise; and (6) wireless communications facilities directly related to the facility (ICC 21.20.20).

Inyo County staff in their discussions with the applicant, have requested the applicant submit a GPA. In addition to the GPA, the county has requested the applicant to submit either a Zone Reclassification (Title 18), or alternatively under Title 21, enter into a Renewable Energy Development Agreement or apply for a Renewable Energy Permit or impact determination in lieu of a Zoning Reclassification.

To ensure that the proposed project complies with Title 21, the following development standards have been determined applicable to the HHSEGS site:

Height: The height limit in the M-1 zone district is forty feet, although Title 21 can allow a different height depending upon the type of proposed renewable energy project. The solar power towers are 750-feet tall and are therefore, not consistent with the M-1 zoning height requirements. Although the height of the solar power towers is considerably over the height limits, Title 21 allows for the exceedance if the renewable energy project requires such a project feature to operate. The project as proposed does not comply with the height restrictions identified in Inyo County's Zoning Ordinance and staff has determined that an exceedance to the height limits would be required for project operation in accordance with Title 21.

The proposed fencing along the perimeter of the project would consist of a galvanized eight-foot tall chain link security fence. The proposed fencing height is not in compliance with the Inyo County Zoning Ordinance's height limit of six feet (Section 18.78.160 Fences, walls and hedges – Generally). However, Section 18.78.170, Fences, walls and hedges – Exceptions to height limitations, states that the height limitations shall not apply if a greater height is required by another ordinance, or is allowed by a variance specified in connection with the authorization of a conditional use.

Under Title 21, in lieu of the standards in Title 18 concerning permitted, conditional or accessory uses related to the facility and its structures, including setback requirements, other standards that are either necessary or appropriate may be adopted. Staff has determined that the eight foot tall fence would be required for security purposes.

Setbacks: As indicated in the previous Inyo County Zoning Ordinance discussion, Inyo County is requesting a 25-foot setback consistent with the M-1 zone. Staff is proposing Condition of Certification **LAND-3** to ensure that the setback is consistent with the M-1 zone district and Title 21. This setback will be in addition to a 24-foot ROW requirement for Old Spanish Trail Highway (**TRANS-2**) and includes landscaping as required by the Condition of Certification **VIS-2** in the **Visual Resources** section of the **FSA**. The applicant's proposed 20-foot landscaping would be required to be within this 25-foot setback.

Lighting: The Visual Resources section is proposing Condition of Certification **VIS-3** to address project lighting requirements.

Parking: Parking standards in the M-1 District require one parking space for each full-time employee, plus guest parking and loading space as deemed appropriate. However, Title 21 allows for flexibility in determining parking requirements. The applicant has proposed 62 parking spaces (58 for non-handicapped and four for handicapped) in the common area and 26 parking spaces at each power block (24 non-handicapped and four handicapped). The number of employees that will work at the HHSEGS site is 120, which would require an additional 32 parking spaces per county code. Because 40 employees will work during the day shift and 80 will work during the night shift, staff has determined that the proposed parking is adequate and consistent with the intention to provide adequate parking for employees as each shift will have adequate parking for every employee and additional parking for guests and loading.

Signage: Chapter 18.75 of the Zoning Ordinance identifies requirements for signage. The applicant has indicated that during construction, speed limit signs will be posted that will comply with the M-1District sign height limits of 25-feet and that any additional signs proposed will conform with the requirements of the Inyo County Code. Condition of Certification **LAND-4** has been included to ensure compliance with Chapter 18.75.

Financial Assurances: As part of the Title 21 entitlements, the applicant is required to provide a reclamation/revegetation plan and financial assurances for implementation of this plan, should the applicant fail to implement the reclamation/revegetation plan. In support of this requirement, staff submitted Data Requests 2E (4/5/2012, Docket Log #64606), following receipt of an April 2, 2012 letter from Inyo County (INYO 2012), that asked the applicant how they intend to comply with the financial assurances requirement in Title 21. The applicant's responses (CH2 2012y, dated May 4, 2012) stated that the Energy Commission has not required financial assurances as a condition of certification in the past, and that this requirement would create an undue burden on the applicant and would distinctly single out this facility.

It should be noted that in accordance with the Surface Mining and Reclamation Act of 1975, financial assurances have been used on large mining operations to protect state and local agencies from bearing the costs of reclamation. Should a large solar facility fail and be abandoned, or if a project owner is unable to perform appropriate reclamation/revegetation requirements then the local agencies may be burdened with the cost to remedy the situation. BLM also requires financial assurances on large solar projects to ensure compliance with the terms of their Right-of-Way (ROW) grant, including reclamation of the site upon completion of the term[10]. As a result, the Rice Solar Energy Project (09-AFC-10) and Ivanpah (09-AFC-5C) projects both required posting of a surety bond to ensure restoration of BLM's ROW.

Large solar projects pose new challenges for local agencies. Many local jurisidictions are considering ordinances that would require financial assurances for large scale utility projects. In addition, in response to the increase in large solar projects proposed on both private and public land within California, the California County Planning Directors Assocation, in cooperation with several agencies (including the Energy Commission), published a "*Solar Energy Facility Permit Streamlining Guide*" (February 3, 2012). Although the focus was on large solar projects that are approved by local jurisdictions, the document provided guidance on developing local ordinances and policies that would alleviate several concerns including financial assurances.

Title 21 requires financial assurances that may be in the form of surety bonds, irrevocable letters of credit, trust funds or other mechanism to ensure that reclamation/revegetation plans will proceed and be accomplished in accordance with an approved reclamation plan. The County has expressed intent to require such security if the Energy Commission does not, although the type of financial assurances that it would require is not known at this time.

[10] The BLM has issued policy guidance for determining bonding requirements (Instruction Memorandum (IM) 2009-153, dated June 19, 2009) which provides detailed information about the process for determining the appropriate financial guarantees for intensive land uses on public lands.

Other Considerations

The project site consists of 170 undeveloped parcels with each parcel having property lines delineated on a recorded parcel map. There appears to be some easements for utilities and roadways associated with those parcels that were dedicated to Inyo County. A letter from County of Inyo to BrightSource Energy, Inc. (INYO 2012c, dated February 23, 2012) states that the applicant will need to rectify this by one or more of the following: (1) subdivision, (2) merger, or (3) reversion to acreage. Inyo County has adopted Title 16 Subdivisions Ordinance that provides the county with a process to implement the California Subdivision Map Act.

The applicant provided information in their Supplement Response to Data Adequacy Review (HHSG 2011b, posted September 9, 2011) that stated the parcels would be combined to create either one large single legal parcel or three or more parcels due to ownership interests. In this response, the applicant indicated that given the nature of the heliostats, it was not clear whether or not a merger or reversionary map would be required under Inyo County ordinances or the Subidivision Map Act.

According to Inyo County some of the unimproved road dedications on the project site have become public roads and these particular roads can only be eliminated through a discretionary decision by the Board of Supervisors. Staff reviewed the subdivision parcel maps that are applicable to the project site and the maps show private roadway easements along all of the parcels within the project site. The subdivision maps also contain wording indicating that the roadways were an offer of dedication. If these roadways are in fact public rights-of-way that were recorded as a result of the initial subdivision approval, the Inyo County Board of Supervisors may need to abandon those public rights-of-way prior to the HHSEGS construction. The applicant disputes Inyo County's claims in their entirety.

The question of whether the roads are in fact public rights-of-way that Inyo County would require the land owner to abandon is a legal one whether common law or statutory law applies. Such a determination is beyond the scope of this analysis. The premise is that under common law, the intent of the owner to dedicate road easements and the use of the road easements by the public constitutes acceptance of the dedication and results in public rights-of-way. Under statutory law, pursuant to the California Subdivision Map Act, the road easement dedication must be formally accepted by the jurisidiction (the hearing body of Inyo County).

Inyo County contends that common law applies and has requested a Condition of Certification requiring the applicant to submit a formal request to abandon these public rights-of-way. The applicant contends that statutory law applies and because Inyo County has not formally accepted the road easements pursuant to the California Subdivision Map Act, the road easements are not public rights-of-way.

Because the road abandonment is a legal issue between the land owner and Inyo County, staff has not proposed a condition of certification requiring that roads on the HHSEGS site be abandoned.

Compliance with the General Plan, Zoning Ordinance and Title 21 and Impact Determination

When determining whether a project is consistent, the project is evaluated for consistency with detailed local standards and requirements as well as with the broader context of the general plan and its elements, environmental plans and policies, and regional environmental plans. The project elements that conflict with the plans or policies are evaluated and whether these conflict(s) would result in the project being inconsistent with the land use designation and/or environmental goals and policies of the county. Often in instances where the project is inconsistent, an applicant would also submit a proposed general plan (land use) amendment and/or zone change to the local jurisdiction. As part of this process, the local agency would determine whether all elements of the inconsistency have been addressed. These elements could include density, design, measures to reduce land use compatibility and other items as deemed appropriate by the local agency.

When a general plan and corresponding documents are adopted by a local agency, an environmental analysis identifies those areas that would have potential significant impacts and proposes mitigation measures to the extent feasible to decrease those impacts to a less than significant level. This analysis is considered and incorporated into the general plan through goals and policies and the zoning ordinance supports the land use patterns that were established by the general plan. When a project applicant proposes a land use that is not consistent with the general plan, the local agency requires a GPA and other required land use applications along with a corresponding environmental review to ensure that the project is analyzed through a local public process to determine the associated impacts and appropriate mitigation or project requirements that would decrease any land use impacts.

Inyo County staff have indicated that there are several ways in which the applicant can comply with LORS. In each case, a GPA would be required. Options include either a Zone Reclassification, or in compliance with Title 21, submit a Renewable Energy Permit, or enter into a Renewable Energy Development Agreement in lieu of a Zoning Reclassification. These entitlements would normally be required if the county were approving the project. In this instance, since the county is not the permitting agency, the applicant would be required to obtain a Renewable Energy Impact Determination from the Planning Commission in accordance with Title 21. This determination requires a general plan consistency determination and allows the county to also incorporate appropriate development standards and mitigation measures. Although the Energy Commission is the permitting agency staff considers county land use requirements in their analysis to determine consistency with LORS. Staff has worked with Inyo County to obtain as much information as possible with regard to what would be required if they were the permitting agency.

As indicated in the previous sections, the applicant has submitted a GPA and Zoning Reclassification for a solar overlay on the project site. However, this application has been determined to be incomplete due to the lack of a signature of one property owner (Tsiamis), whose parcel is located on the southeastern portion of the project site (see **Land Use Figure 3**). Currently, the applicant is working with the property owner, but at the time of publication of this **FSA**, applicant has not yet submitted evidence that

Tsiamis' parcel has been secured. Until the applicant has submitted the signatures of all the property owners, Inyo County cannot process the application for the GPA and Zoning Reclassification, and the proposed HHSEGS remains inconsistent with county LORS. Should the county receive a completed application, however, they would use one of the Energy Commission's environmental documents as a basis for their CEQA review of the GPA and Zone Reclassification.

The project as proposed is inconsistent with County of Inyo's LORS. In determining whether this inconsistency would be a significant impact with regard to Land Use, Appendix G of the CEQA Guidelines is considered as well as independent analysis of the county's standards or thresholds. Specifically, the proposed HHSEGS project conflicts with an applicable land use plan, policy, or regulation of an agency with jurisdiction (in this case Inyo County), that was adopted for the purpose of avoiding or mitigating environmental effects.

The HHSEGS project would conflict with Inyo County's General Plan, Zoning Ordinance and the Renewable Energy Ordinance and staff has determined that this is a significant impact. The HHSEGS project is an intensive land use and the project site does not allow such intensive land uses. The project site is zoned to allow for open area recreational uses that are tourist oriented. The land uses in the area surrounding the project are also not consistent with the proposed project.

Without appropriate Inyo County land use approvals described above, the project would be inconsistent with LORS, would have significant land use impacts under CEQA, and would require an override for approval and certification.

<u>Transmission and Natural Gas Lines</u>

Although the HHSEGS project would be located on privately owned land in California, the transmission and natural gas lines, once they leave the eastern edge of the HHSEGS site along the California border, would be located on public land managed by the BLM Southern Nevada District Office. Therefore, the environmental impacts of the transmission and gas pipelines and associated facilities are being analyzed in a separate environmental process in accordance with NEPA, for which BLM will be the lead agency. The Valley Electric Assocation (VEA) project BLM is currently reviewing is called the "Hidden Hills Transmission Project". A Notice of Intent (NOI) for this project was prepared and published by the BLM in the Federal Register on October 11, 2011, and three public scoping meetings were held on November 8, 9 and 10, 2011 in Pahrump, Jean and Boulder City, Nevada. The draft Environmental Impact Statement (EIS) is currently being prepared by BLM, and is expected to be released for public review by late December, 2012 or early January, 2013.

The Hidden Hills Transmission Project would require a 10-mile-long generation tie-line (gen-tie line) from the HHSEGS site to the proposed Crazy Eyes Tap Station,[11] where the project would interconnect to the VEA electric grid. The gen-tie line would originate at the HHSEGS' onsite switchyard, cross the Nevada state line, and continue east for approximately 1.5 miles until reaching Tecopa Road. At Tecopa Road, the route would

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[11] In the HHSEGS AFC, and in the Preliminary Staff Assessment (CEC 2012u), this substation was referred to as the "Tap Substation."

head northeast paralleling Tecopa Road until it reaches the Crazy Eyes Tap Substation, which would be located immediately east of the Tecopa Road/SR 160 intersection. The Crazy Eyes Tap Substation would interconnect to the existing VEA Pahrump-Bob Tap 230-kV line.

The Hidden Hills Transmission Project also encompasses a 12-inch-diameter natural gas pipeline. The natural gas pipeline would enter the HHSEGS site in the common area where it would connect with an onsite gas metering station. It would exit the HHSEGS site at the California-Nevada border, and extend 32.4 miles to the Kern River Gas Transmission (KRGT) existing mainline system just north of Goodsprings in Clark County, Nevada.

Laydown Area

The proposed construction laydown area is a permitted use under the County of Inyo Zoning Ordinance, Temporary Use Regulations (Section 18.78.190). The Section indicates that a temporary building or use necessary and incidental to the construction of a building or group of buildings, when located in the same or abutting property and only during the period of construction may be allowed. The laydown area consists of 180 acres located to the west of the site and would be used for equipment laydown, construction parking, construction trailer, a tire cleaning station, heliostat assembly buildings, and other construction support facilities. This area is also designated as OSR and zoned OS-40.

LAND USE COMPATIBILITY

When a jurisdictional authority, such as the County of Inyo, establishes zoning designations to implement its general plan, it is that agency’s responsibility to ensure the compatibility of adjacent zoning and permitted uses and incorporate conditions and restrictions that ensure those uses will not result in a significant adverse impact to surrounding properties. As noted in the discussion above under the section titled **Physical Disruption or Division of an Established Community** and in **Land Use Table 2,** development of the proposed project and its associated facilities would not divide an established community.

In general, a power plant and its related facilities may also be incompatible with existing or planned land uses, resulting in potentially significant impacts, if they create unmitigated noise, odor, public health or safety hazards, visual, adverse traffic, interfere with, or unduly restrict, existing or future land uses or cause other environmental impacts which conflict with surrounding land uses and the activities and conditions typically associated with those land uses.

As indicated in staff’s previous sections, the HHSEGS project is inconsistent with the general plan designation, zoning ordinance and renewable energy ordinance. Normally this land use inconsistency would be remedied through a general plan amendment and rezone. However, Inyo County’s renewable energy ordinance is applicable to the proposed project. As part of any land use entitlements, the county would also consider the surrounding land uses and make determinations or findings as part of their approvals.

At this time, Inyo County is considering BrightSource's application for a GPA and Rezone to ensure that the project would be consistent with their General Plan and Zoning. Some of the findings that Inyo County would have to make for a GPA include whether or not the proposed project is consistent with the goals and policies of the Inyo County general plan and with the intent of the zoning ordinance. Should Inyo County deny or not act upon the proposed GPA or rezone, the proposed HHSEGS would continue to be inconsistent with Inyo County LORS.

In certain instances the county could determine that a project would create significant impacts with regard to surrounding land use conflicts and still approve a project and corresponding environmental document with overriding considerations. Inyo County has provided input to staff in order to implement appropriate development standards to the extent possible in lieu of their approval process, but the project remains inconsistent with the general plan designation and zone district.

Assessment of Surrounding Land Uses

The nearest residence to the proposed HHSEGS project would be within approximately 300 feet east of the fence line, and the nearest residence to any power block equipment is approximately 3,500 feet south of the Solar Plant 2 power block and about 950 feet south of the project's southern boundary. The St. Therese Mission, a commercial facility that recently broke ground, is located approximately 0.5 mile east from the HHSEGS boundary. The St. Therese Mission will consist of a chapel, columbarium, garden restaurant, visitor's center, playground, restrooms, and an onsite caretaker home. The St. Therese Mission is in the process of constructing the various project buildings.

Please refer to the **Air Quality, Hazardous Materials Management, Noise and Vibration, Public Health, and Transmission Line Safety and Nuisance** sections of this **FSA** for detailed analyses of the air quality, dust, hazardous materials, noise, public health hazards and nuisance impacts on surrounding occupants.

Visual impacts of the project on surrounding land uses are also considered with regard to land use compatibility. The surrounding land uses include the unincorporated community of Charleston View, BLM land and wilderness areas, and the Old Spanish National Historic Trail. The area adjacent to the site in Nevada is largely BLM land with a smaller portion in private ownership. No development has occurred in Nevada close to the project site that would be subject to nuisance impacts.

The HHSEGS project is a large solar thermal power plant with two 750-foot power towers and related facilities. This use is an intensive land use that will be adjacent to land designated as OSR and zoned OS. In addition, the project is proposed near existing residences (nearest residence is approximately 300 feet east of the solar field with remaining Charleston View residences slightly further to the south) and would be visible from the surrounding BLM wilderness areas and the Old Spanish National Historic Trail. The Inyo County Zoning Ordinance requires a variance for structures over 30 feet in the OS zone and 40 feet in the M-1 zone. There are several other requirements related to visual resources in the Inyo County General Plan that are applicable to this project, discussed in further detail in the **Visual Resources** section of this **FSA**.

From a land use perspective, the proposed project could have a significant impact on surrounding land uses if it poses land use incompatabilities for surrounding parcels. Such land use incompatabilities could occur if there are uses that are inconsistent or would pose substantial changes that would impact surrounding land uses. The project proposes changes to the existing visual character of the area by the addition of 170,000 heliostats, each heliostat consisting of two mirrors approximately 12-feet high by 8.5-feet wide mounted on pylons (total area of 24-feet high by 17-feet wide), and two 750-foot tall solar power towers.

The project would pose a substantial change in the existing visual character and although not many residents surround the proposed project, the visual impacts represent a substantial change in the rural open space character of the area. The height of the power towers are substantially over the height limit in the OS and M-1 zone and cannot be screened from the adjacent residents or the public that use the various recreational and wilderness areas within California and Nevada.

In addition to the visual impacts on surrounding land uses, the applicant needs to demonstrate site control of the Tsiamis parcel, which would provide them with the legal right to seek a GPA and Zoning Reclassification from Inyo County. The applicant has not yet demonstrated that the parcel has been purchased or leased. Therefore, should the applicant fail to obtain the necessary approval to use the Tsiamis parcel, an additional land use incompatibility would exist, and Inyo County may not move forward with approval of the GPA and Zoning Reclassification. An approval of the HHSEGS project without the Tsiamis parcel would ultimately result in the Tsiamis parcel being surrounded on three sides by large heliostats. In addition, the only road providing access to the Tsiamis parcel is the eastern access road that leads into the project site and to the common area. The applicant would need to provide adequate access to the Tsiamis parcel, in compliance with the Subdvision Map Act and Inyo County requirements; it is not clear how that would occur. If the HHSEGS project were to be built around the Tsiamis parcel, it would result in a significant land use incompatibility.

Visual Resources staff has concluded that the project would have significant and unmitigable adverse direct and cumulative impacts. It is staff's conclusion that the proposed project is not compatible with surrounding land uses, and would result in a significant and unmitigable impact that will have an impact on surrounding land uses.

Military Special Use Airspace

A military airspace area, called R-2508 Special Use Airspace Complex, lies approximately 10 to 15 miles from the project site. The airspace and associated land area consists of bombing ranges, supersonic flight corridors, low altitude high speed maneuver areas, radar testing areas, warfare training areas, and refueling training areas.

An Obstacle Evaluation Study (August 16, 2010), was prepared for the HHSEGS project (AFC Appendix 5.12 Traffic and Transportation: Capitol Airspace Group, August 16, 2010) to identify obstacle clearance surfaces established by the Federal Aviation

Administration (FAA) that would limit the height or location of proposed solar towers within the defined study area. As a part of this study Mr. Anthony Parisi, Head of the Sustainability Office for NAVAIR Ranges for the Department of Defense, was contacted to determine whether there would be an impact from the solar power tower development with regard to military mission operations. Mr. Parisi's response indicated that although the initial review did not identify any conflicts with military training, a more formal review under the United States Code 49, Section 44718, may still result in objections from the Department of Defense (DOD).

A follow up email was sent by staff to Mr. Parisi and a confirmation of the assessment that no conflicts were identified was received from Mr. Parisi on February 27, 2012 (CEC 2012l*)*. The Capitol Airspace Group Obstacle Evaluation Study stated that, "Over the past year, the DOD has been objecting to renewable energy projects via the environmental review and local permitting processes". The study also encouraged the applicant to enter into discussions with the FAA and DOD as early as possible to identify and overcome potential objections from the military regarding impacts to long range radar systems and military operations. Mr. Parisi stated that although a more formal review may be conducted, the formal response would likely not be any different. Therefore, at this time, the HHSEGS project is not anticipated to create any land use compatibility impacts with regard to the surrounding airspace and military operations area.

CUMMULATIVE IMPACTS

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects (Cal. Code Regs.§15065(a)(3).

The cumulative impact assessment identifies other known projects or land use changes proposed in the vicinity of the project that may either combine with the proposed project to create a land use incompatibility or nuisance impacts with the existing land uses.

The cumulative land use and planning analysis considers past, current and probable future projects that are relatively near the proposed project that would contribute to cumulative impacts by impacting agricultural or forest lands, disrupt or divide an established community, conflict with applicable land use plans, policy or regulation, or conflict with an applicable habitat conservation plan or natural community conservation plan. The geographic scope for the analysis of cumulative land use impacts related to this land use analysis includes the surrounding area in Inyo County and the lands near the California-Nevada state line that extend partially into the Pahrump and Sandy Valley area in Nevada. Staff reviewed known past, current, and probable future projects within California and near the project in Nevada that are in the vicinity of the proposed HHSEGS project that may either combine with the proposed project to create a land use incompatibility or nuisance impacts with the existing land uses.

Refer to the projects identified in **Land Use Table 3, Cumulative Projects** below and shown on Figure 5.6-3 in the AFC. (please also see **Cumulative Effects Figure 1** and **Figure 2** in the **EXECUTIVE SUMMARY**)

Land Use Table 3
Cumulative Projects

Jurisdiction	Project	Project Description	Location/ Distance from Proposed HHSEGS Project Site	Status of Project
County of Inyo	St. Therese Mission	A 17.5 acre environmental park development that includes a chapel, a meditation garden, a restaurant facility, a visitor's center, an enclosed columbarium, an outdoor garden area, above-ground vaults and an on-site caretaker home.	881 E. Old Spanish Trail; approximately 0.5 mile southeast of project site	**Approved** The applicant has initiated rough grading and laying base work for facilities.
Nye County (Nevada)	Pahrump Airport	International Airport to supplement the McCarran International Airport in Las Vegas. 5,934 acre site adjacent to Pahrump, NV. 7,000 acre sphere of influence.	Approximately 12 miles NW of HHSEGS	Draft EIS was in progress, but suspended June 2010. New reports in June 2010 suggest project on hold.
Nye County (Nevada)	Element Power-Solar	100 MW Photovoltaic, 2,560 acres	6 ½ miles north of proposed HHSEGS in Nevada.	On hold
Nye and Clark County, (Nevada)	Hidden Hills Valley Electric Transmission Project (NVN089669)	A new substation located just east of HHSEGS in Nevada, 230 kV transmission line along Old Spanish Trail Highway to Highway 160. A new 10-acre substation at Highway 160 in Nevada.53.7 miles of new 500kV transmission lines to El Dorado substation in Nevada. A new 230 kV transmission line to Pahrump, Nevada. Introduction of significant industrial-scale electric facilities.	Less than one mile from HHSEGS, extending 9.7 miles to Highway 160, Nevada and beyond.	DEIS Pending (BLM lead)
Clark County (Nevada)	Sandy Valley (NVN090476)	Solar Power Tower Plant on BLM-managed land (750 MW).	8 miles east-southeast of HHSEGS near Highway 160.	Plan of Development

Source: Hidden Hills Solar Electric Generating System AFC Figure 5.6-3, Cumulative Projects; St. Therese Mission Notice of Determination (Filed on June 23, 2010), Inyo County Current List of Projects (http://inyoplanning.org/projects.htm). California Energy Commission list of cumulative projects (May 2012)

The St. Therese Mission is the only current project that is being developed in California near the project site (approximately 0.5 miles southeast of HHSEGS). The St. Therese Mission is a 17.5 acre campus-style environmental park functioning primarily as a columbarium with garden niches and outdoor seating for reflection. It is a low-profile development with structure heights meeting the limitations of the Open Space designation and was found to be consistent with both the Inyo County General Plan and Zoning Ordinance[12]. It is slated to use desert plantings and colors in order to blend in with its environment. The County has reserved the right for additional 10 foot right-of-way along Old Spanish Trail Highway for turning lanes. Therefore it is assumed the project will be set back from the roadway. There are no other projects in California in the project area that are planned, proposed, or recently approved.

The Pahrump Valley General Aviation Airport is proposed to be located approximately 10 to 12 miles northwest of the HHSEGS site in Nye County, Nevada on BLM land. The Pahrump Valley Aviation Airport is currently going through environmental review. The EIS will analyze two 650-acre alternative airport sites, both located on BLM-administered federal public lands. Recent information on the status has revealed that BLM has had some concern over the land lease and the financial viability of the project and it may currently be placed on hold.

The Element Power Solar Project proponent filed a ROW application with the BLM Las Vegas Field Office on September 9, 2010 for the development of a solar photovoltaic project approximately seven miles north of HHSEGS. The ROW application covers approximately 2,560 acres of land in Nye County. According to the BLM solar project listing, the ROW application is on hold until 2013 and is not identified as a BLM priority project. Although the project may proceed forward, there is a possibility that the project may not be constructed due to issues identified in the BLM screening process.

BLM is currently preparing a Draft EIS for the Valley Electric Associatino (VEA) Hidden Hills Transmission Project. The transmission lines and associated facilities will be constructed on BLM-managed property in Nevada. The project includes new transmission lines/poles and upgrades to existing lines along with a new Tap (Gamebird) Substation, located at the intersection of Old Spanish Trail Highway (Tecopa) and Highway 160. The Hidden Hills Transmission Project would also include a new 12-inch diameter natural gas pipeline extending 32.4 miles from the HHSEGS site to the Kern River Gas Transmission (KRGT) existing mainline system just north of Goodsprings in Clark County, Nevada.

Another project under consideration is the proposed BrightSource Energy (BSE) Sandy Valley project. This project will use BSE’s proprietary “power tower” technology on BLM land in Nevada, approximately five miles east of the proposed HHSEGS site. BSE has submitted their ROW application to BLM and is currently awaiting approval.

CUMULATIVE IMPACTS ANALYSIS

The following land use areas have been analyzed with regard to cumulative land use impacts.

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[12] Notice of Determination, Inyo County, Conditional Use Permit #2010-02//St.Therese Mission, June 23, 2010.

Agriculture and Forest

The project as proposed does not have any impacts to agricultural or forest lands or conflict with any land that is zoned for agricultural purposes and therefore, does not contribute to cumulative impacts related to this land use area.

Physical Disruption or Division of an Established Community

Because the HHSEGS project does not directly physically divide an established community it would not contribute to a cumulative impact in this land use area.

Conflict with Any Applicable Habitat or Natural Community Conservation Plan

The HHSEGS project does not conflict with any habitat or natural community conservation plans and will not contribute to any cumulative impacts in this land use area.

Conflict with Any Applicable Land Use Plan, Policy or Regulation

The HHSEGS currently conflicts with Inyo County's general plan, zoning and renewable energy ordinance. The nearest project to HHSEGS in California is the St. Therese Mission. No other projects have been approved or planned in the area. The St. Therese Mission is consistent with existing land uses and was found to have less than significant impacts with regard to land use.

In California, the proposed HHSEGS project will not contribute to significant cumulative impacts. Although the project is currently inconsistent with applicable land use plans and policies, there are no other projects that can be considered together with the HHSEGS project that would create cumulative impacts with regard to land use conflicts.

The other proposed projects identified for cumulative impact analysis include projects in Nevada: Pahrump Airport, Element Power Solar, VEA Hidden Hills Transmission Project, and the Sandy Valley solar power tower project. All of these projects are several miles away from the HHSEGS project site, although staff has noted that they are all on BLM designated lands.

BLM has designated areas that allow for solar development, while other areas provide limited potential for solar development. BLM is currently analyzing large solar utility projects throughout California and Nevada, as well as other western states, and is in the process of preparing a programmatic Solar Energy Development EIS (PEIS). The PEIS will consider, among other things, how the projects would interfere with existing land uses (grazing, wild horse and burro management, military uses, and minerals production). In addition, BLM will be considering how solar facilities could impact the use of nearby specially designated areas such as wilderness areas, areas of critical environmental concern (ACEC), or special recreation management areas. When the PEIS is completed, it will assist BLM in making landscape-based siting decisions that will help to avoid land disturbance and land use impacts. Currently, BLM is reviewing projects that submit ROW applications and performing environmental review for each of these projects on an individual basis.

The projects that are proposed in Nevada would have cumulative land use impacts if considered with the HHSEGS project, they conflicted with applicable Nye or Clark

County general plans or policies, the Resource Management Plan prepared by BLM, or were close enough to the HHSEGS project site that they would contribute to impacts related to land use conflicts in the area surrounding the project site.

The area where the Nevada projects are proposed are within the 1998 Las Vegas Resource Management Plan (RMP), which is currently being updated. An RMP is a set of comprehensive, long-range decisions regarding the use and management of resources administered by BLM. In general, an RMP provides an overview of goals, objectives, and needs associated with public land management and establishes what land uses can occur on the public lands, where they can occur, and under what conditions.

RMPs include specific areas of critical environmental concern (ACEC) as well as recreational management areas and visual resource management areas. An area designated as an ACEC, Stump Springs, is approximately 2.3 miles east of the project site. Areas of ACEC are special management areas designated by BLM to protect significant historic, cultural, or scenic values, fish and wildlife resources, natural process or systems, and natural hazards. In southern Nevada, twelve ACECs protect and preserve irreplaceable significant cultural resource sites that include prehistoric rock art sites, prehistoric village and habitation sites, and historic mining, town, railroad, and trail sites.

The Stump Springs ACEC is identified as an area set aside for cultural purposes as it is believed to be located on a segment of the Old Spanish National Historical Trail and/or the Mormon Trail and was used previously by the Native Americans who lived in and around Pahrump Valley.

In addition, the area surrounding the project site in Nevada is designated as lying within a visual resource management area that is classified as a Class IV area. Class IV areas provide for management activities which require major modification of the existing character of the landscape and allows for a high level of of change to the landscape charachteristic.

The proposed projects in Nevada, when combined with the HHSEGS project, would not conflict with any of the RMP designations and the area adjacent and further out from the project site is in a visual resource area that BLM has designated as allowing for a high level of landscape change. It should be noted that the projects in Nevada are expected to go through environmental review and the impacts related to those projects have not yet been determined by BLM. The proposed VEA Hidden HillsTransmission Project EIS will also be considering impacts of the HHSEGS project as a connected action under NEPA.

Staff has determined that the HHSEGS project, when considered together with the surrounding projects in Nevada, would not contribute to a significant cumulative impact to land use inconsistencies within the area surrounding the project site.

FACILITY CLOSURE

At some point in the future, the proposed power plant facility would permanently cease operation and close down. At that time, it would be necessary to ensure that closure is carried out in such a way that public health, safety and the environment are protected from adverse impacts.

The AFC states the planned lifetime of the plant is 25-30 years; however, if the plant is still economically viable, it can operate longer. It is also possible that the plant could become economically noncompetitive earlier than 25-30 years, and be permanently closed at that time. When the time comes to consider permanently closing the plant, a decommissioning process would commence, whereby a plan would be developed detailing the closure procedure to ensure that public health, safety and the environment are protected. At least 12 months prior to decommissioning, the applicant would prepare a Facility Closure Plan for Energy Commission review and approval. The review and approval process would be publicly noticed, and allow participation by interested parties and other regulatory agencies, including Inyo County. At the time of closure, all pertinent LORS would be identified, and the closure plan would discuss conformance of decommissioning, restoration, and remediation activities with these LORS. All of these activities would be under the authority of the Energy Commission. There are two other circumstances in which a facility closure can occur; unplanned temporary closure or unplanned permanent closure.

An unplanned temporary closure occurs when the facility is closed suddenly and/or unexpectedly, on a short-term basis, due to unforeseen circumstances such as a natural disaster or an emergency. An unplanned permanent closure occurs if the project owner closes the facility suddenly and/or unexpectedly, on a permanent basis. An on-site contingency plan will be required (see **GENERAL CONDITIONS** section of this **FSA**) to ensure that all necessary steps to mitigate public health and safety impacts and environmental impacts are taken in a timely manner for such unexpected events.

The County of Inyo’s Title 21, Renewable Energy Ordinance, states that a reclamation plan is required to ensure that after the project is decommissioned or otherwise ceases to be operational the county will have assurances that the area will be restored and revegetated. The Energy Commission requires these assurances as part of the licensing process and although the applicant has not initiated this process under Title 21, Inyo County will be able to provide input on the facility closure plan and on-site contingency plan when these plans are submitted. In addition, in order to ensure that the financial assurances aspect of Title 21 is resolved (as discussed in the Inyo County Renewable Energy Ordinance section in this analysis), staff is recommending Condition of Certification **LAND-2** requiring establishment of appropriate financial assurances for site reclamation.

NOTEWORTHY PUBLIC BENEFITS

While the development of the proposed project is intended to address the requirements of federal and state mandates to develop renewable energy, it would not yield any noteworthy public benefits related to land use.

RESPONSE TO PUBLIC AND AGENCY COMMENTS

Commission staff has received several letters from the County of Inyo. In a letter dated November 29, 2011, the County of Inyo requested participation in the Energy Commission process and provided information as it relates to land use and socioeconomics. The letter also provided information on the applicable Inyo County code that should be considered in staff's analysis. Among other things, the County indicated that the project was subject to the Inyo County Renewable Energy Ordinance (Title 21), that the project conflicts with the general plan designation and the zoning for the site and the power towers would require a variance from height limitations. The letter also identified ways that the applicant could rectify the inconsistencies.

In a letter dated February 23, 2012 (INYO 2012c), the County of Inyo restated that the proposed project was inconsistent with the general plan and zoning ordinance. Additionally, the letter stated that the project site has easements over many of the 170 parcels on the site that would need to be extinguished through one or more of the following methods: subdivision, merger, or a reversion to acreage. The applicant has indicated in the AFC that they will be requesting a reversion to acreage from the County of Inyo after certification by the Energy Commission.

Inyo County submitted a letter (INYO 2012f, dated March 20, 2012) identifying visual elements such as landscaping, screening, entryways and setbacks. Open Space zoning requires a 50-foot setback, although if the zoning was changed to the county suggested zone of General Industrial and Extractive (M-1) zone district, the setbacks for the project site would be 25 feet for the front, 15 feet for the rear and 10 feet for the side. However, Inyo County indicated that additional setbacks may be necessary and that the 50-foot setback may be appropriate to buffer the project from nearby properties and Old Spanish Trail Highway. Since that time, staff has received additional input from the county and has included the requested development standards.

Several comments were received on the PSA during the public review period. Staff has reviewed these comments and has incorporated applicable edits and discussion into this FSA. To review staff's responses, please refer to **Appendix 1** at the end of this section (PSA Response to Comments).

CONCLUSIONS

The proposed HHSEGS would be located within the Charleston View area in unincorporated Inyo County.

Staff concludes the HHSEGS:

- Would not convert any Farmland (as classified by the Farmland Mapping and Monitoring Program) to non-agricultural use, conflict with existing agricultural zoning or Williamson Act contracts or convert forest land to non-forest use.
- Would not conflict with existing zoning for agricultural use or a Williamson Act contract.

- Would not conflict with existing zoning for, or cause rezoning of, forest land, timberland, or timberland zoned Timberland Production.
- Would not result in the loss of forest land or conversion of forest land to non-forest use.
- Would not directly or indirectly divide an established community or disrupt an existing or recently approved land use.
- Would conflict with applicable land use plan, policy, or regulation of an agency with jurisdiction, or that would normally have jurisdiction, over the project, adopted for the purpose of avoiding or mitigating environmental effects.
- Would not conflict with any applicable habitat conservation plan or natural community conservation plan.
- Would not result in incremental impacts that, although individually limited, are cumulatively considerable when viewed in connection with other project-related effects or the effects of past projects, other current projects, and probable future projects.
- Would create a land use incompatibility due to significant and unavoidable visual impacts.

Staff concludes that the HHSEGS project would not be consistent with the County of Inyo General Plan, Zoning Ordinance and Renewable Energy Ordinance. The proposed project conflicts with all of the applicable land use plans. Staff has determined that the substantial size of the project, the degree of variance from local planning designations, and the presence of other potential impacts is a conflict with these LORS, and therefore causes a significant environmental impact under CEQA Guidelines Appendix G (Land Use and Planning).

BrightSource is currently in the process of obtaining the signatures of all the property owners on the project site so the county can process the GPA and Zone Reclassification. Should BrightSource resubmit a completed application and should it be approved by Inyo County, the project would be consistent with the County of Inyo General Plan and Zoning Ordinance. However, approval of the application will not resolve the issue of placing the project structures across lot lines or whether the abandonment of public rights-of-way on the project site is required.

PROPOSED FINDINGS OF FACT

Based on the evidence, staff makes the following findings:

1. The HHSEGS project site is designated "Open Space and Recreation" and “Recreation” under the Inyo County General Plan and “Open Space with a 40-acre Minimum” in the Inyo County Zoning Code.

2. A solar thermal power plant is not an allowed use in the "Open Space and Recreation" and “Recreation” general plan designations and the “Open Space” zone.

3. The HHSEGS facility will not conform with applicable provisions of the Inyo County general plan, zoning code or renewable energy ordinance.

4. The HHSEGS project would not be consistent with the Inyo County Subdivision ordinance or California statutes without the proposed conditions of certification.

5. The Inyo County Board of Supervisors holds exclusive authority to abandon public roads and land use actions, such as merging lots or reverting acreage.

6. The HHSEGS would create a land use incompatibility due to significant and unavoidable visual impacts.

PROPOSED CONDITIONS OF CERTIFICATION

LAND-1 The project owner shall comply with the Subdivision Map Act (Pub. Resources Code Section 66410-66499.58) by adhering to the provisions of Title 16, Subdivisions, Inyo County Code of Ordinances to ensure legality of parcels and site control.

Verification: At least 30 days prior to construction of the HHSEGS project, the project owner shall submit evidence to the CPM, indicating approval of the reversionary map by Inyo County, or written approval of another process (i.e., to adjust lot lines) that is acceptable to the county. The submittal to the CPM shall include evidence of compliance with all conditions and requirements associated with the approval of the Reversionary Map or Certificate of Merger by the county. If all parcels or portions of parcels are not owned by the project owner at the time of the merger, a separate deed shall be executed and recorded with the county recorder. A copy of the recorded deed shall be submitted to the CPM, as part of the compliance package.

LAND-2 The project owner shall submit evidence of a financial assurance mechanism or agreement to the CPM and Inyo County for review (i.e. bond, letters of credit, trust funds, etc.) and comment to ensure sufficient financial assurances are in place to fully restore the project site to pre-project conditions. The CPM shall have final approval to ensure the agreement allows the Energy Commission to use the decommissioning fund to restore the property to pre-project conditions in the event that the project owner, or its successors or assigns, does not properly decommission the project or restore the property to pre-project conditions within a reasonable time following the cessation of business operations or the abandonment of the project or property for whatever reason.

The agreement shall provide that the amount of the decommissioning fund shall be calculated to fully implement the decommissioning activities as described in the preliminary and the final closure plan for the HHSEGS project and the property. The project owner shall pay for the county to retain a third party expert to review the final closure plan, and confirm the adequacy of the decommissioning fund. The decommissioning fund shall be adjusted for inflation (every three years) and for any updates to the final closure plan.

With regard to the inflationary adjustment, the agreement shall specify either a process or the most appropriate inflationary index(es) to capture the actual costs to perform the necessary decommissioning work. The agreement also shall provide that, in the event that the decommissioning fund is inadequate to fully decommission the project or restore the property, the project owner, its successors or assigns, shall be liable for any amount expended by the county over the decommissioning fund balance and shall provide for termination of the decommissioning fund upon the completion of implementation of the final closure plan. The project owner shall maintain the approved financial assurance mechanism from a financial institution throughout the life of the proposed HHSEGS project and during closure activities.

Verification: At least 30 days prior to site mobilization and prior to any notice to proceed with construction issued by the CPM, the project owner shall provide the CPM with documentation of an approved financial assurance or agreement satisfactory to Inyo County and CPM. The project owner shall also provide evidence to the CPM on an annual basis, documentation from a financial institution that a financial assurance has been maintained and is valid.

LAND-3 The project owner shall provide a 25-foot wide setback -- in an addition to the 24-foot right-of-way (ROW) -- along the entire project frontage on Old Spanish Trail Highway (also known as “Tecopa Road”). Landscape screening shall only be planted within the 25-foot setback, with no trees or large landscaping features placed within the 24-foot ROW.

Verification: At least thirty (30) days prior to construction of the HHSEGS project, the project owner shall submit a site plan to the CPM for review and approval that is to scale and shows the required setback and associated landscaping features.

LAND-4 The project owner shall ensure that any proposed signs comply with the Chapter 18.75 Sign section of the Inyo County Zoning Ordinance.

Verification: At least thirty (30) days prior to the installation of any sign(s), the project owner shall submit evidence to the CPM for review and approval that the proposed signs will conform to the guidelines. The submittal shall show the location of all proposed sign(s) and include evidence of review and comment by the County of Inyo.

REFERENCES

BLM 2011 – Bureau of Land Management, 2011 Renewable Energy Priority Projects, website accessed on February 9, 2012: http://www.blm.gov/wo/st/en/prog/energy/renewable_energy/priority_projects.html

BLM 2012 – Bureau of Land Management, *Hidden Hills Transmission Project Environmental Impact Statement Scoping Report*, dated January 2012.

BRIGG 2012a -- Law Offices of Briggs & Alexander / L. Alexander (tn: 66487) Comment Letter from the Law Offices of Briggs and Alexander. 7/30/2012

BrightSource 2012 – BrightSource/C. Jensen (tn: 64139) BrightSource Letter to Inyo County. 03/02/2012

CEC 2011g – California Energy Commission/M. Monasmith (tn: 62911) Data Requests, Set 1C. 11/17/2011

CEC 2012l – California Energy Commission/M. Monasmith (tn: 63867) Report of Conversation w/ Anthony Parisi re: Military Operations. 2/27/2012

CEC 2012t – California Energy Commission/M. Monasmith (tn:65292) Report of Conversation w/Steven Kerr and Richard McCann regarding 5/9/12 Issues Resolution Workshop summary. 5/17/2012

CEC 2012u – California Energy Commission/M. Monasmith (tn: 65442) Preliminary Staff Assessment. 5/24/2012

CEC 2012y – California Energy Commission/M. Monasmith (tn: 66376) ROC Regarding Inyo County's Process for Issuing Building and Well Permits for Development of a Single Family Residence. 7/27/2012

CEC 2012bb – California Energy Commission/M. Monasmith (tn: 66647) ROC with Dana Drom, Inyo County Dpty Counsel. 8/13/2012

CCR 2011 – California Code of Regulations, Title 14, CEQA Guidelines.

CH2 2011f – CH2MHill/J. Carrier (tn: 63168) Applicant's Data Responses, Set 1C. 12/19/2011

CH2 2012y – CH2MHill/J. Carrier (tn: 65092) Applicant's Data Response, Set 2E 5/04/2012

CH2 2012ee– CH2MHill/J. Carrier (tn: 66319) Applicant's PSA Comments, Set 2. 7/23/2012

CDOC 2008 – California Department of Conservation, Farmland Mapping and Monitoring Program, website accessed on November 23, 2011: http://www.conservation.ca.gov/dlrp/FMMP/Pages/Index.aspx

CH2 2011b – CH2MHill/J. Carrier (tn: 63056) Applicant's Data Responses Set 1B. 12/05/2011

CH2 2011d – CH2MHill/J. Carrier (tn: 63168) Data Response, Set 1C. 12/19/2011

Clark County, Nevada, Land Use Planning 2008 – *South County Land Use Plan*, adopted on August 20, 2008, website accessed on February 15, 2012: http://www.clarkcountynv.gov/depts/comprehensive_planning/land_use/Pages/default.aspx

County of Inyo 2001 – General Plan Goals and Policies Report, Guide to Inyo County Communities, Chapter 2.

County of Inyo 2001 – General Plan Goals and Policies Report, Land Use Element, Chapter 4.

County of Inyo 2001 – General Plan Goals and Policies Report, Conservation/Open Space Element, Chapter 8.

County of Inyo 2012 – Title 18 Zoning Code.

County of Inyo 2012 – Title 21, Renewable Energy Ordinance.

County of Inyo 2012 – List of Current Projects, website accessed on February 7, 2012: http://inyoplanning.org/projects.htm.

County of Inyo 2010i – Notice of Determination and Draft Mitigated Negative Declaration, Conditional Use Permit #2010-02 for St. Therese Mission, June 23, 2010.

HHSEGS 2010 – Hidden Hills Solar Electric Generating System Application for Certification Volume 1 & 2, dated August 2011. Submitted to CEC/Docket Unit on August 5, 2010, *tn: 61756.*

HHSG 2011a – BrightSource Energy/J. Woolard (tn: 61756) Application for Certification, Volume 1 & 2. 08/5/2011

HHSG 2011b – BrightSource Energy/C. Jensen (tn: 62125) Supplement to AFC for HHSEGS. 09/07/2011

INYO 2011a – Inyo County/J. Hart (tn: 63054) Request for Agency Participation.11/29/2011

INYO 2012b – Inyo County/K. Carunchio (tn: 63719) Letter from Inyo County regarding Preliminary Estimates for the Fiscal Impacts of the Constrution and Operation. 02/16/2012

INYO 2012c – Inyo County/J. Hart (tn: 63772) Inyo County letter to BrightSource re: General Plan Amendment. 02/23/2012

INYO 2012d – Inyo County/J. Hart (tn: 63869) Inyo County Letter Regarding Reclamation Plan. 2/27/2012

INYO 2012e – Inyo County/J. Hart (tn: 64136) Inyo County Letter to BrightSource Energy. 3/9/2012

INYO 2012f – Inyo County/J. Hart (tn: 64221) Inyo County Letter to CEC's Melissa Mourkas Regarding Aesthetics and Visual Impacts. 3/20/2012

INYO 2012h – Inyo County/D. Wilson (tn: 65181) Inyo County Dept. of Public Works letter and exhibit re: setbacks and turn-lanes on Tecopa Road. 5/9/2012

INYO 2012i – Inyo County/D. Wilson (tn: 65282) Inyo County Board of Supervisors transcript from March 13, 2012 BrightSource presentation. 5/17/2012

INYO 2012j – Inyo County/M. Fortney (tn: 66310) Inyo County Comments on PSA. 7/17/2012

MAC 2012c -- Cindy MacDonald (tn: 66290) Cindy McDonald's PSA Comments. 07/23/2012

MAC 2012b -- Cindy MacDonald (tn: 66291) Cindy McDonald's Supplemental Comments and Analysis. 07/23/2012

Nye County, Nevada 2010 – Renewable Energy Resource Development, Pending Solar Rights-Of-Way Applications, November 5, 2010, website accessed on February 15, 2012: http://www.nye-renewables.com/solar.htm

Office of Energy Efficiency and Renewable Energy, Department of Energy, Bureau of Land Management and Department of the Interior 2010 – *Programmatic Environmental Impact Statement* and *Supplement*, website and documents accessed February 8, 2012: http://solareis.anl.gov/documents/index.cfm, dated December 2010 and October 2011.

LAND USE

List of Comment Letters

		Land Use Comments?
1	Inyo County	**X**
2	Bureau of Land Management	
3	National Park Service	
4	The Nature Conservancy	
5	Amargosa Conservancy	
6	Basin & Range Watch	
7	Pahrump Paiute Tribe	
8	Richard Arnold, Pahrump Piahute Tribe	
9	Big Pine Tribe of Owens Valley	
10	Intervenor Cindy MacDonald	**X**
11	Intervenor Center for Biological Diversity	
12	Intervenor, Old Spanish Trail Association	
13	Applicant, BrightSource Energy, Inc.	**X**

Comment #	DATE	COMMENT TOPIC	RESPONSE
1	**July 17, 2012**	**Inyo County**	
1.7		Requirements of Resolution 2012-29 and Title 21 as it pertains to financial assurances for reclamation/revegetation	Staff has proposed Condition of Certification **LAND-2** to address the applicable Inyo County LORS regarding financial assurances.
1.28		Suggested revisions regarding the status of the applicant's general plan amendment and zoning reclassification. Additional language requested related to lot lines and public roads on the project site.	Staff has revised the discussion accordingly and has provided more detail with regard to the lot lines and public roadways on the project site.
1.29		Suggested findings of fact regarding public roadways, property lines, Inyo County Subdivision Ordinance and the exclusive authority of the Board of Supervisors to abandon public roads and merging or reverting acreage.	Partially revised as requested.

1.3O		Suggested revisions to Condition of Certification LAND-2	Staff will revise some of the language in the Condition of Certification **LAND-2**. However, the final approval of any required submittals lie within the CPM's authority with input from Inyo County.
1.31		Request for a new condition related to the abandonment of public roads on the project site.	Revised as requested.
Comment #	**DATE**	COMMENT TOPIC	**RESPONSE**
10	**July 21, 2012**	**Intervenor Cindy MacDonald**	
10.1		Question as to whether the additional acreage in the lease agreement between the applicant and land owner should be included in the CEQA analysis.	The proposed project is located on 3,096 total acres (plus a temporary construction laydown are of 180 acres). No additional acreage is proposed to be developed as part of this project and staff is not aware of any plans to develop additional acreage.
10.2		Who would have jurisdiction over additional acreage in lease agreement?	The Energy Commission does not have jurisdiction over any additional acreage that is "not a part of the project" and is agreed to between the lessee and lessor. If a future revision to the HHSEGS project included additional acreage, the Energy Commission would be required to analyze the impacts under CEQA at such time a license amendment was submitted. However, staff is not aware of any plans to develop additional acreage.
10.3		Can CEC assume jurisdiction on the additional acreage?	As indicated above, the Energy Commission cannot assume jurisdiction of any additional acreage "not a part of the project" that is agreed to in a lease. Staff is not aware of any plans to develop additional acreage for the HHSEGS project and to assume that the additional acreage will be developed is speculative and outside the scope of the CEQA analysis.

10.4		Can the applicant or landowner develop the additional acreage if the CEC has no jurisdiction?	As indicated above, if the applicant/landowner (or future project owner) were to revise the HHSEGS project they would be subject to the Energy Commission's license amendment process and CEQA review. If the Energy Commission does not have jurisdiction over development, then Inyo County, as lead agency would perform the CEQA review on all non-public lands in the county.
10.5		Can CEC propose limits on water use for the additional acreage?	No. Please see prior answers. The additional acreage is not a part of the required HHSEGS CEQA analysis.
10.6		What are the reasonably forseeable impacts to the additional acreage as a result of the HHSEGS project?	Staff has analyzed the reasonably forseeable impacts of the proposed HHSEGS project, including the area surrounding the proposed project as it relates to housing, commercial and industrial development as well as growth inducement. The additional acreage is not proposed for development as part of the HHSEGS project.
10.7		Who is legally responsible and has jurisdiction for evaluating and analyzing growth inducing impacts in Nevada as a result of the HHSEGS project?	Energy Commission staff has analyzed growth inducing impacts along with other impacts that occur in Nevada as a result of HHSEGS -- Please see the **Socioeconomics** section of the **FSA** for more details.
10.8		Why didn't the CEC include a specific recommendation for setting aside additional private land in the Condition of the Permit?	The 6,800 acres that is referred to is the approximate acreage of compensatory mitigation that is required for the project impacts. The actual amount of acreage is 6,480 acres and was determined by staff in consultation with the California Department of Fish and Game (CDFG) and U.S. Fish and Wildlife Service (USFWS). This requirement is a Condition of Certification, **BIO-12**. Please see the **Biological Resources** section.

10.9		Why would CEC staff assume that 6,800 acres could be used for mtiigation when the applicant does not own lands for that purpose?	All projects that are analyzed under CEQA that significantly impact biological resources require mitigation. The location of mitigation is determined by the type of biological resources that are being impacted. Lands may be purchased outside of Inyo County if they have been approved by CDFG and USFWS. Please see Condition of Certification **BIO-12** in the Biological Resources section.
10.1O		If the 6,800 acres was set aside for mitigation purposes, it should be considered temporary. What happens to the land when the project is terminated?	All lands set aside for mitigation purposes require some type of conservation easement or other legal instrument to ensure that the lands remain viable for the biological resources in perpetuity regardless of whether the project is terminated or abandoned. Please see Condition of Certification **BIO-12**.
10.11		How does it serve the public interest to use private lands for protection/preservation when the protection can be immediately withdrawn once the applicant terminates the lease?	As indicated above, lands used for biological preservation due to a project's impacts, must remain viable to mitigate the project. Certain restrictions and requirements are legally binding based upon state and federal laws that protect such resources. Please see the Biological Resources and other pertinent sections relating to mitigation requirements.
10.12 through 10.16		Questions pertaining to temporary worker housing.	The text "from temporary worker housing" was a typo in **SOILS-8**. Please refer to the Response to Comments table in the **Soils and Surface Water** section of this **FSA**.
10.17		Is the reference to a 3,900 acre project a typo or accurate?	The 3,900 acre reference is incorrect. The land use section identifies the project site acreage as 3,097 acres, with a temporary construction laydown area of 180 acres.
10.18		If accurate, what other project elements are within the 700 acres?	As indicated above, the 3,900 acreage reference is incorrect.

10.19		What is the acreage of the switchyard should it be moved offsite?	The switchyard is proposed to be located on the project site, in the Common Area.
10.2O		Question pertaining to other design elements that will be utilizing the additional 700 acres.	As indicated in response 10.17 and 10.18, the reference of 3,900 acres is incorrect. The accurate project site acreage is 3,097 acres.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
13	**July 23, 2012**	**Applicant, BrightSource Energy, Inc. -- Land Use**	
13.6	**p.217**	Suggested change to PSA page 4.6-1 re: CEQA	Revised as requested.
13.7	**p.217**	Suggested change to PSA page 4.6-2 re: LORS	Staff has identified the Subdivision Map Act as an appropriate LORS.
13.8	**p.217**	Suggested change to PSA page 4.6-2 re: designation of communities	Revised as requested.
13.9	**p.217**	Suggested change to PSA page 4.6-3 re: Tecopa Rd.	Revised as requested.
13.1O	**p.217**	Suggested change to PSA page 4.6-3 re: orchard	Revised as requested.
13.11	**p.217**	Suggested change to PSA page 4.6-4 re: Natural Gas pipeline	Revised as requested.
13.12	**p.217**	Suggested change to PSA page 4.6-4, deletion request of 2nd paragraph, last sentence re: "use"	Revised as requested.
13.13	**p.217**	Suggested change to PSA page 4.6-5, Surrounding Area, 3rd bullet -- insertion request re: BLM lands	Revised as requested.
13.14	**p.218**	Suggested change to PSA page 4.6-5, Surrounding Area, 3rd bullet re: St. Therese Mission inclusion	Revised as requested.
13.15	**p.218**	Suggested change to PSA page 4.6-5, General Plan Land Use, 1st paragraph -- request to discuss Inyo County's Renewable Wind and Solar Energy General Plan Amendment + request to "revise" discussion to include "Rural Protection" land use designation and 2004 amendment to Inyo County General Plan	Staff has incorporated additional information on Charleston View and the Renewable Energy GPA. Staff has reveiwed Resolution No. 2004-61 and has determined that this is not applicable to the project site or surrounding area. Please see additional discussion in the Compliance With LORS (Inyo County General Plan) subsection.

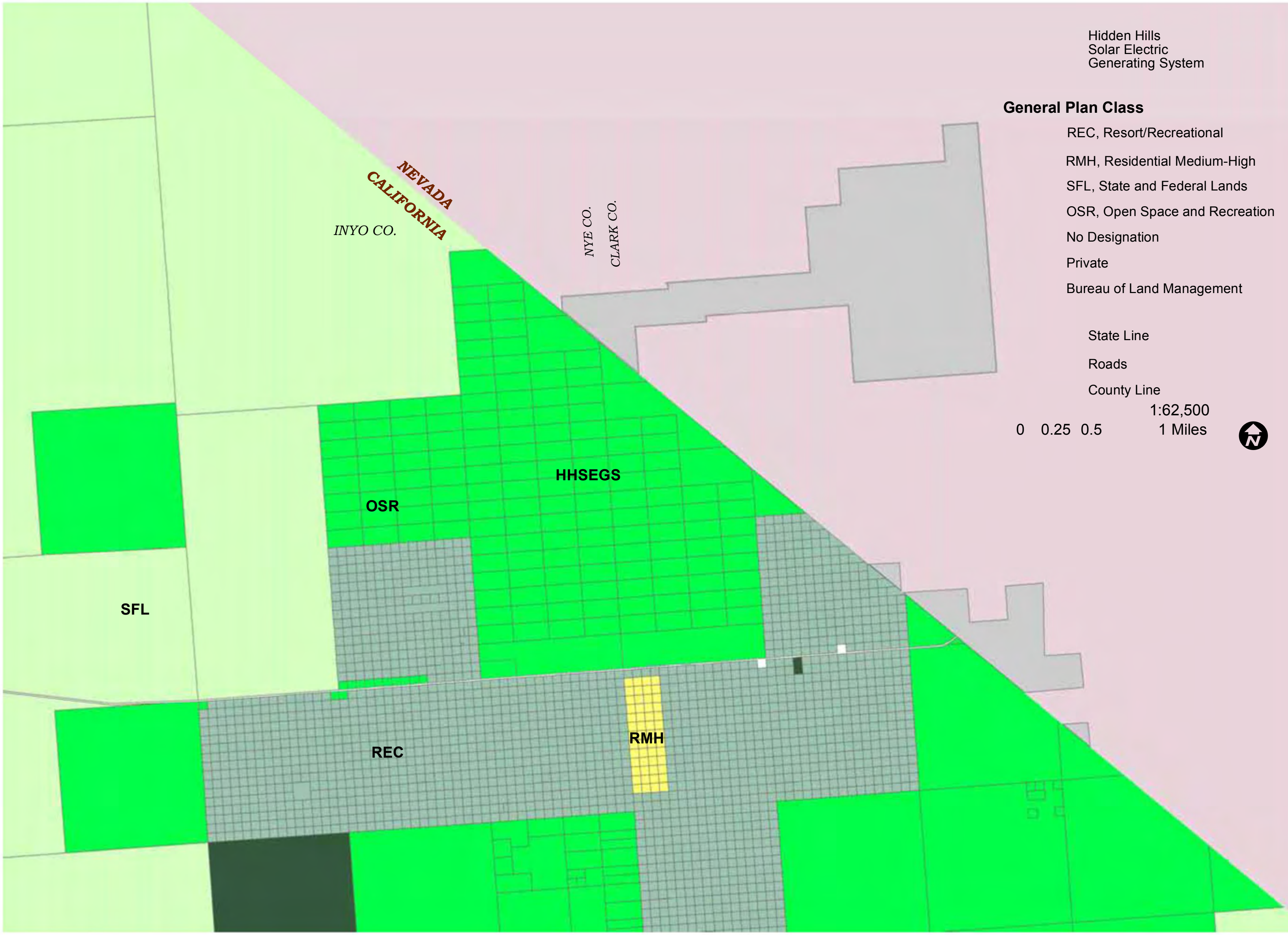
13.16	**p.218**	Suggested change to PSA page 4.6-6, Surrounding Area, re: "Rural Protection" for surrounding parcels	The area surrounding the project is not designated as Rural Protection. Staff has reviewed Resolution No. 2004-61 and has determined that it is not applicable to the project site or surrounding area.
13.17	**p.218**	Suggested change to PSA page 4.6-10, Land Use Table 2 -- LORS, deletion request re: CA Subdivision Map Act	Staff has identified the California Subdivision Map Act as an applicable state LORS. Recent Energy Commission decisions, including Rice Solar, Abengoa and Ivanpah contain conditions of certification related to the Subdivision Map Act and the applicable local jurisdiction ordinances.
13.18	**p.218**	suggested change to PSA page 4.6-10, Land Use Table 2 -- LORS, request for discussion on Inyo County General Plan	Comment noted.
13.19	**p.218**	Suggested change to PSA page 4.6-10, Land Use Table 2 -- LORS, Chapter 3 Gov't Element Goal Gov-10: Energy Resoces Policy Gov-10.1: Development.	Revised as requested.
13.2O	**p.218**	Suggested change to PSA page 4.6-10, Land Use Table 2 -- LORS, Chapter 3 Gov't Element Goal Gov-10: Energy Resoces Policy Gov-10.1: Development.	Revised as requested.
13.21	**p.218**	Suggested change to PSA page 4.6-10, Land Use Table 2 -- LORS, Chapter 4 Land Use Element Commerical, Goal LU-3.	Staff has reviewed the Inyo County General Plan and has determined that public/quasi-public uses do not allow large renewable solar projects that are privately owned. Staff has also confirmed allowable public/quasi-public uses within the REC designation with Inyo County staff.
13.22	**p.219**	County has supported renewable energy and County Resolution 2004-61 re-designated the project site from Open Space to Rural Protection. All references to the OS designation should be deleted.	Staff has reviewed Inyo County Resolution 2004-61 and has determined that it is not applicable to the proposed HHSEGS project site.

13.23	**p.219**	Page 4.6-11, Land Use Table 2 reference to Title 18 should recognize that OS-40 district allows for mining and processing of natural resources, so the HHSEGS is consistent with this allowed use.	The OS-40 district purpose is to designate those areas that are open space and to establish standards for preservation and protection. The OS-40 district does allow mining and processing as a conditional use for mining natural resources. However, in the General Plan Government Chapter 3, Mineral Resources and Energy Resources are identified as two separate Goals and include specific separate policies. The HHSEGS project is a renewable energy project and consists of an intensely developed area with heliostats and 750-foot solar towers. Inyo County has indicated that the M-1 district (General Industrial and Extractive) is the appropriate district for the proposed project structures. Staff has reveiwed the M-1 district and has determined that the M-1 district is the appropriate district for the HHSEGS project.
13.24	**p.219**	Page 4.6-12, replace "OSR" with "RP" (Rural Protection).	The Rural Protection designation is not applicable to the proposed HHSEGS project site.
13.25	**p.219**	Page 4.6-12, replace "OSR" with "RP" (Rural Protection).	The Rural Protection designation is not applicable to the proposed HHSEGS project site.
13.26	**p.219**	Page 4.6-13, 1st paragraph, 1st sentence: Applicant disagrees with the PSA's characterization of whether renewable energy projects are permitted uses in the general plan designation and contends that the REC land use designation allows for public/quasi-public uses, which is applicable to the HHSEGS project.	Comment noted. Additional discussion addressing this topic is included in the **Land Use** section of **FSA**.
13.27	**p.219**	1) Request to insert the word expressly in language on Page 4.6-13 , County of Inyo Zoning Ordinance. 2) Delete discussion on setback requirements for traffic/transportation due to glint and glare.	1) Comment noted. 2) Revised as requested.

13.28	**p.220**	Page 4.6-15, 1st paragraph: Requested revision to discussion pertaining to Title 21 requirements.	Comment noted.
13.29	**p.220**	Delete 2nd paragraph, page 4.6-16.	Staff has not identified this discussion as an applicable LORS.
13.3O	**p.220**	Delete 3rd paragraph, page 4.6-16.	Staff has not identified this discussion as an applicable LORS.
13.31	**p.220**	Delete 4th paragraph, page 4.6-16.	Comment noted.
13.32	**p.220**	Page 4.6-16, Other Considerations, add sentence regarding conditionally offered nonexclusive easements	Staff has reviewed the recorded parcel maps for the project site. Roadway easements have been recorded in the public record for access to parcels.
13.33	**p.220**	Page 4.16, Other Considerations, add a sentence indicating that there is no evidence that the County formally accepted non exclusive easements.	Staff has reviewed the recorded parcel maps for the project site. Roadway easements have been recorded in the public record for access to parcels.
13.34	**p.220**	Request to delete 1st full paragraph on Page 4.6-17, discussing the applicant's Supplemental Response to Data Adequacy.	Staff reveiwed the Supplemental Response to Data Adequacy and has revised slightly to ensure it uses the same language that was contained in the Supplemental Response provided by the applicant.
13.35	**p.220**	Page 4.6-17, 2nd full paragraph: Request to add the sentence that the applicant disputes County's claims in their entirety.	Staff has added additional discussion in this section of the **FSA**, and also incorporated the applicant's requested revision accordingly.
13.36	**p.220**	Page 4.6-20, 4th full paragraph: This paragraph should be deleted. The County has no jurisdiction.	Revised discussion.
13.37	**p.220**	Page 4.6-20, 5th full paragraph: Question regarding findings and that the County has not made any findings.	Revised as requested.

13.38	**p.220**	Page 4.6-21, 3rd paragraph, 3rd sentence: Please revise this sentence for accuracy. The BLM lands in Nevada adjacent to the site is not designated wilderness area.	Revised as requested.
13.39	**p.220**	Page 4.6-21, 4th paragraph, 3rd sentence: Please revise for accuracy. There are no residences adjacent to the project site.	Revised as requested.
13.4O	**p.220**	Page 4.6-21, 5th paragraph: Please delete this paragraph as it describes visual impacts, not land use impacts, and therefore this discussion is irrelevant to the land use impact analysis.	Visual impacts are appropriately considered when analyzing land use conflicts, and are relevant to land use compatibility determinations/analyses.
13.41	**p.220**	Page 4.6-22, Military Special Use Airspace: Section should be revised to state that the Department of Defense has reviewed the project, and concluded that the project will not have any military mission impacts.	Staff has a Record of Conversation (February 27, 2012, tn 63867, CEC 2012l) that confirms staff's assessment of the Department of Defense's review determination. No revision is necessary.
13.42	**p.220**	Requested language identifying Noteworthy Public Benefits on Page 4.6-28.	Please refer to the **Socioeconomics** section of this **FSA** for discussion regarding public benefits.

LAND USE - FIGURE 1
Hidden Hills Solar Electric Generating System (HHSEGS) - General Plan Designations

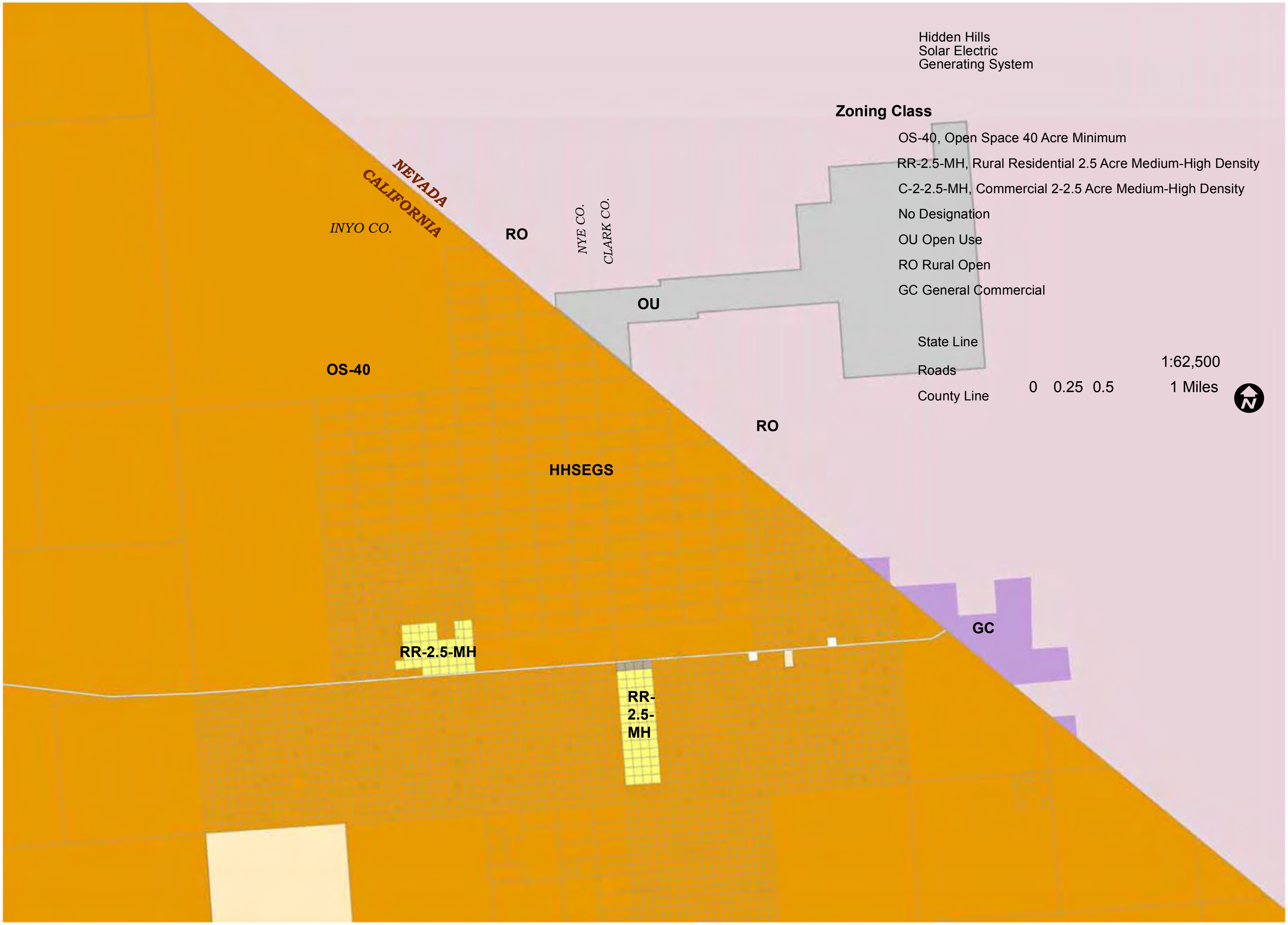


CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: CH2MHILL, Inyo County Assessor and Planning

LAND USE

LAND USE - FIGURE 2

Hidden Hills Solar Electric Generating System (HHSEGS) - Zoning Designations

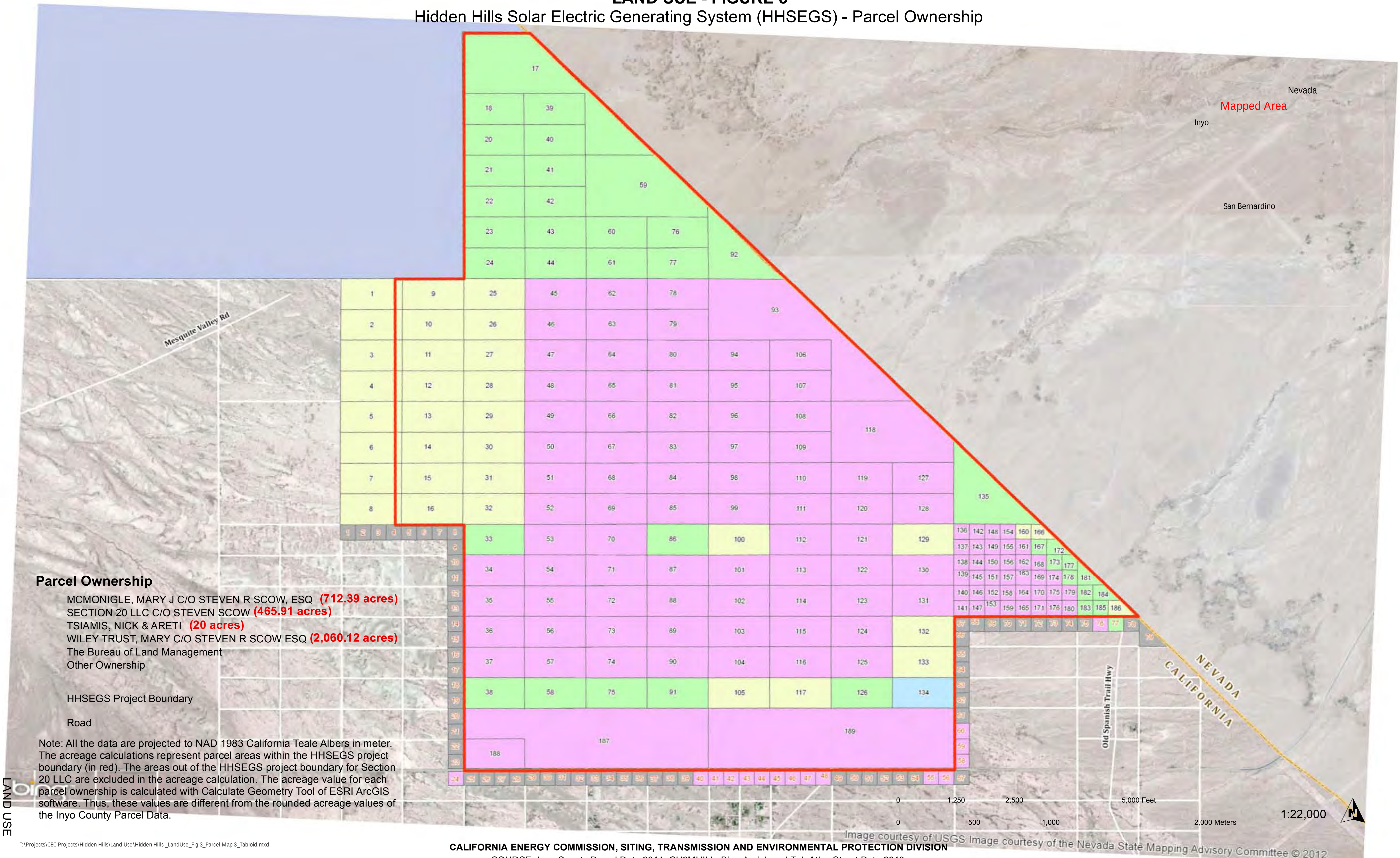


CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CH2MHILL, Inyo County Assessor and Planning

LAND USE - FIGURE 3

Hidden Hills Solar Electric Generating System (HHSEGS) - Parcel Ownership



LAND USE

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CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: Inyo County Parcel Data 2011, CH2MHILL, Bing Aerial, and TeleAtlas Street Data 2010.

NOISE AND VIBRATION

Testimony of Shahab Khoshmashrab

SUMMARY OF CONCLUSIONS

The Hidden Hills Solar Electric Generating System (HHSEGS), if built and operated in conformance with the proposed conditions of certification below, would comply with all applicable noise and vibration laws, ordinances, regulations and standards, and would produce no significant adverse noise impacts on people within the affected area, directly, indirectly, or cumulatively. The applicant has proposed appropriate mitigation, in the form of good design practice and selection of appropriate project equipment that would avoid any significant adverse impacts.

INTRODUCTION

The construction and operation of any power plant creates noise or unwanted sound. The character and loudness of this noise, the times of day or night that it is produced, and the proximity of the facility to sensitive receptors all combine to determine whether the facility would meet applicable noise control laws and ordinances and whether it would cause significant adverse environmental impacts. In some cases, vibration may be produced as a result of power plant construction practices such as blasting or pile driving. The ground-borne energy of vibration has the potential to cause structural damage and annoyance.

The purpose of this analysis is to identify and examine the likely noise and vibration impacts from the construction and operation of the HHSEGS project, and to recommend procedures to ensure that the resulting noise and vibration impacts would be adequately mitigated to comply with applicable laws, ordinances, regulations and standards (LORS). For an explanation of technical terms used in this section, please refer to **Noise Appendix A**, immediately following.

For noise and vibration impacts on biological resources, please see the **BIOLOGICAL RESOURCES** section of this Final Staff Assessment (**FSA**).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHODS AND THRESHOLDS FOR DETERMINING SIGNIFICANCE

California Environmental Quality Act

The California Environmental Quality Act (CEQA) requires that significant environmental impacts be identified and either eliminated or mitigated to the extent feasible. Section XI of Appendix G of CEQA's guidelines (Cal. Code Regs., tit. 14, App. G) describes some characteristics that could signify a potentially significant impact. Specifically, a significant effect from noise may exist if a project would result in:

1. exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
2. exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels;
3. substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or
4. substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

The Energy Commission staff, in applying Item 3, above, to the analysis of this and other projects, has concluded that a potential for a significant noise impact exists where the noise of the project plus the background exceeds the background by more than 5 dBA at the nearest sensitive receptor.

Staff has concluded that a permanent increase in background noise levels up to and including 5 dBA in a residential setting is insignificant; an increase of more than 10 dBA, however, is significant. An increase of above 5 and up to10 dBA should be considered adverse, but could be either significant or insignificant, depending upon the particular circumstances of a case.

Factors to be considered in determining the significance of an adverse impact as defined above include:

1. the resulting noise level[1];
2. the duration and frequency of the noise;
3. the number of people affected; and
4. the land use designation of the affected receptor sites.

Noise due to construction activities is usually considered to be insignificant in terms of CEQA compliance if:

- the construction activity is temporary; and
- the use of heavy equipment and noisy[2] activities is limited to daytime hours.

Staff uses the above method and threshold to protect the most sensitive populations.

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[1] For example, a noise level of 40 dBA would be considered quiet in many locations. A noise limit of 40 dBA would be consistent with the recommendations of the California Model Community Noise Control Ordinance for rural environments and with industrial noise regulations adopted by European jurisdictions. If the project would create an increase in ambient noise no greater than 10 dBA at nearby sensitive receptors, and the resulting noise level would be 40 dBA or less, the project noise level would be insignificant.

[2] Noise that draws legitimate complaint (for the definition of "legitimate complaint", see the footnote in Condition of Certification **NOISE-4**)

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Noise Table 1

Laws, Ordinances, Regulations and Standards

Applicable Law	Description
Federal: Occupational Safety & Health Act (OSHA): 29 U.S.C. § 651 et seq. U.S. Environmental Protection Agency (USEPA)	Protects workers from the effects of occupational noise exposure Assists state and local government entities in development of state and local LORS for noise
State: California Occupational Safety & Health Act (Cal-OSHA): 29 U.S.C. § 651 et seq., Cal. Code Regs., tit. 8, §§ 5095-5099	Protects workers from the effects of occupational noise exposure
Local: Inyo County General Plan	Establishes acceptable levels for noise, based on land use. Establishes hourly limits for construction activities within 500 feet of existing noise-sensitive land uses.

FEDERAL

Under the Occupational Safety and Health Act of 1970 (OSHA) (29 U.S.C. § 651 et seq.), the Department of Labor, Occupational Safety and Health Administration, (OSHA) adopted regulations (29 C.F.R. § 1910.95) designed to protect workers against the effects of occupational noise exposure. These regulations list permissible noise exposure levels as a function of the amount of time during which the worker is exposed (see **Noise Appendix A, Table A4**, immediately following this section). The regulations further specify a hearing conservation program that involves monitoring the noise to which workers are exposed, assuring that workers are made aware of overexposure to noise, and periodically testing the workers' hearing to detect any degradation.

Guidelines are available from the U.S. Environmental Protection Agency (USEPA) to assist state and local government entities in developing state and local LORS for noise. Because there are existing local LORS that apply to this project, the USEPA guidelines are not applicable.

There are no federal laws governing off-site (community) noise.

The Federal Transit Administration (FTA) has published guidelines for assessing the impacts of ground-borne vibration associated with construction of rail projects, which have been applied by other jurisdictions to other types of projects. The FTA-recommended vibration standards are expressed in terms of the "vibration level," which is calculated from the peak particle velocity measured from ground-borne vibration. The

FTA measure of the threshold of perception is 65 vibrational decibels (VdB), which correlates to a peak particle velocity of about 0.002 inches per second (in/sec). The FTA measure of the threshold of architectural damage for conventional sensitive structures is 100 VdB, which correlates to a peak particle velocity of about 0.2 in/sec.

STATE

California Government Code Section 65302(f) encourages each local governmental entity to perform noise studies and implement a noise element as part of its general plan. In addition, the California Office of Planning and Research has published guidelines for preparing noise elements, which include recommendations for evaluating the compatibility of various land uses as a function of community noise exposure.

The State of California, Office of Noise Control, prepared the Model Community Noise Control Ordinance, which provides guidance for acceptable noise levels in the absence of local noise standards. This model also defines a simple tone, or “pure tone,” as one-third octave band sound pressure levels that can be used to determine whether a noise source contains annoying tonal components. The Model Community Noise Control Ordinance further recommends that, when a pure tone is present, the applicable noise standard should be lowered (made more stringent) by five A-weighted decibels (dBA).

The California Occupational Safety and Health Administration (Cal-OSHA) has promulgated occupational noise exposure regulations (Cal. Code Regs., tit. 8, §§ 5095-5099) that set employee noise exposure limits. These standards are equivalent to federal OSHA standards (see **Noise Appendix A, Table A4**).

LOCAL

The project is located within Inyo County. The Public Safety Element of the Inyo County General Plan[3] applies to this project.

Inyo County General Plan Public Safety Element

The Public Safety Element addresses noise and establishes goals, policies and implementation measures that regulate noise occurring within the county’s jurisdiction. For residences, schools and churches, the Noise Element establishes a Normally Acceptable Day-Night Noise Level (L_{dn}) of 60 dBA. The Normally Acceptable L_{dn} of 60 dBA equates to an Equivalent Noise Level (L_{eq}) of 54 dBA continuously throughout the day and night.

The General Plan also requires that construction activities occurring within 500 feet of existing noise sensitive uses be limited to the hours of 7:00 a.m. to 7:00 p.m. Monday through Saturday (INYO2001a).

[3] The Inyo County General Plan may be accessed online at the following link - http://inyoplanning.org/general_plan/index.htm.

SETTING AND EXISTING CONDITIONS

HHSEGS would be located on approximately 3,097 acres of privately owned land leased in Inyo County, California, adjacent to the Nevada border. The project site is approximately eight miles south of Pahrump, Nevada, and approximately 45 miles west of Las Vegas, Nevada.

The area is sparsely populated, with a few scattered residences south and southeast of the HHSEGS site. The nearest residence to the proposed HHSEGS's nearest power block (Solar Plant 2, as shown in **Noise Figure 1**) would be approximately 3,500 feet south of this power block. This residence is referred to as CR1 in this analysis.

The St. Therese Mission, a commercial facility, referred to as location M1 in this analysis, has broken ground on 17.5 acres, approximately 1.7 miles from the nearest power block (see **Noise Figure 1**). It will consist of a chapel, columbarium, garden, restaurant, visitor's center, playground, restrooms, and an onsite caretaker home.

AMBIENT NOISE MONITORING

In order to establish a baseline for the comparison of predicted project noise with existing ambient noise, the applicant has presented the results of an ambient noise survey (HHSG 2011a, AFC § 5.7.4.1; Table 5.7-5). Ambient noise levels were measured at M1 (St. Therese Mission) and a nearby residence shown as location M2 in **Noise Figure 1**. M2 is not the closest residence; however, this location was used for the noise monitoring because, according to the applicant, the owners of M2 were the first to agree to provide access to their property for the monitoring equipment. The monitoring information gathered at M2 was used to establish existing noise levels at the closest residence, CR1. Because the existing ambient environment surrounding M2 and CR1 are similar, staff concludes this method used to establish existing noise levels at CR1 is reasonable.

The noise survey was conducted continuously from May 18 to May 27, 2011. The survey was performed using acceptable equipment and techniques. The noise survey monitored existing noise levels at or near the following noise-sensitive receptors, shown in **Noise Figure 1**.

Noise Table 2 summarizes the ambient noise measurements (HHSG 2011a, AFC § 5.7.4.1; Table 5.7-5).

Noise Table 2
Summary of Measured Noise Levels

Measurement Sites	Measured Noise Levels, dBA		
	Average During Daytime Hours (7 a.m. to 10 p.m.) L_{eq}	Average During Nighttime Hours (10 p.m. to 7 a.m.) L_{eq}	Average L_{dn}
M2, Used for Nearest Residence, **CR1**, 3,500 Feet South of Nearest Power Block	45[1]	40[1]	51
M1, St. Therese Mission, 1.7 Miles East of Nearest Power Block	42[1]	34[2]	47

Source: HHSG 2011a, AFC § 5.7.4.1; Table 5.7-5
1. Staff calculations of average of the daytime hours
2. Staff calculations of average of the nighttime hours.

DIRECT AND INDIRECT IMPACTS AND MITIGATION

Noise impacts associated with the project can be created by short-term construction activities and normal long-term operation of the project.

CONSTRUCTION IMPACTS AND MITIGATION

Construction noise is usually a temporary phenomenon. Construction of the HHSEGS project is expected to be typical of similar projects in terms of equipment used and other types of activities (HHSG 2011a, AFC § 5.7.5.2).

COMPLIANCE WITH LORS

Construction of an industrial facility such as a power plant is typically noisier than permissible under usual noise ordinances. In order to allow the construction of new facilities, construction noise during certain hours of the day is commonly exempt from enforcement by local ordinances.

The applicant has predicted construction noise levels at 50 feet and one mile away for various construction activities. Staff has used these levels to calculate the noise levels at CR1 and M1. They are shown here in **Noise Table 3**.

Noise Table 3: Predicted Construction Noise Levels

Receptor	Type of Construction Activity	Highest Construction Noise Level L_{eq} (dBA) [1]	Measured Existing Ambient, Average Daytime L_{eq} (dBA) [2]	Cumulative, Construction Plus Ambient	Change
CR1	Concrete Pouring	41	45	46	+1
	Steel Erection & Mechanical	50		51	+6
	Site Cleaning, Excavation, & Cleanup	53		54	+9
M1	Concrete Pouring	33	42	43	+1
	Steel Erection & Mechanical	43		46	+4
	Site Cleaning, Excavation, & Cleanup	44		46	+4

Sources: [1] EPA, 1971, Barnes et al., 1976, HHSG 2011a, AFC Table 5.7-6, and staff calculations
[2] Noise Table 2, above

The applicable local noise LORS do not limit the loudness of construction noise, but staff compares the projected noise levels with ambient levels (please see the following discussion under **CEQA Impacts**).

The applicant commits to performing noisy construction work during the times specified in the Inyo County General Plan, during the hours of 7:00 a.m. to 7:00 p.m. Monday through Saturday (HHSG 2011a, AFC § 5.7.7.3). To ensure that these hours are, in fact, enforced, staff proposes Condition of Certification **NOISE-6**.

Therefore, the noise impacts of the HHSEGS project construction activities would comply with the noise LORS.

CEQA IMPACTS

Since construction noise typically varies with time, it is most appropriately measured by, and compared with, the L_{eq} (energy average) metric. As seen in **Noise Table 3** above, last column construction noise would elevate the existing ambient noise levels at the noise-sensitive receptors by no more than 9 dBA. An increase of above 5 and up to10 dBA could be either significant or insignificant, depending upon the particular circumstances of a case. Because construction would be temporary, most construction activities would occur during the daytime hours, and typical industry noise abatement measures would be implemented for noise-producing equipment, staff believes construction noise during the daytime hours would not have a significant adverse impact on the project's noise-sensitive receptors.

To ensure project construction would create less than significant adverse impacts at the most noise-sensitive receptors, in addition to Condition of Certification **NOISE-6**, staff proposes Conditions of Certification **NOISE-1** and **NOISE-2**, which would establish a public notification and noise complaint process to resolve any complaints regarding construction noise.

In light of the following proposed conditions of certification below, the noise impacts of the HHSEGS project construction activities would be less than significant.

Steam Blows

Typically, the loudest noise encountered during construction, inherent in building any project incorporating a steam turbine, is created by the steam blows. After erection and assembly of the feed water and steam systems, the piping and tubing that comprise the steam path have accumulated dirt, rust, scale, and construction debris such as weld spatter, dropped welding rods, and the like. If the plant were started up without thoroughly cleaning out these systems, all this debris would find its way into the steam turbine, quickly destroying the machine.

In order to prevent this, before the steam system is connected to the turbine, the steam line is temporarily routed to the atmosphere. Traditionally, high pressure steam is then raised in the boiler or a temporary boiler and allowed to escape to the atmosphere through the steam piping. This flushing action, referred to as a "high pressure steam blow", is quite effective at cleaning out the steam system. A series of short steam blows, lasting two or three minutes each, are performed several times daily over a period of two or three weeks. At the end of this procedure, the steam lines are connected to the steam turbine, which is then ready for operation. Alternatively, high pressure compressed air can be substituted for steam.

High pressure steam blows, if unsilenced, can typically produce noise levels as high as 129 dBA at a distance of 50 feet; this would amount to roughly 90 dBA at CR1 and roughly 81 dBA at M1. Unsilenced steam blows could be disturbing at the nearest noise-sensitive receptors, depending on the frequency, duration, and noise intensity of venting. With a silencer installed on the steam blow piping, noise levels are commonly attenuated to 89 dBA at 50 feet; steam blow at the southern power block (Solar Plant 2), nearer to the noise-sensitive receptors, would amount to roughly 50 dBA at CR1 and roughly 41 at M1 (staff calculation). These levels are acceptable. Thus, staff proposes Condition of Certification **NOISE-7** (below) in order to limit steam blow noise to 89 dBA at 50 feet, and to limit this activity to daytime hours.

A quieter steam blow process, referred to as "low pressure steam blow" and marketed under names such as QuietBlow™ or Silentsteam™, has become popular. This method utilizes lower pressure steam over a continuous period of about 36 hours. Resulting noise levels reach about 86 dBA at 50 feet.

Linear Facilities

Construction of linear facilities typically moves along at a rapid pace, thus not subjecting any one receptor to noise impacts for more than two or three days. Further, construction activities would be limited to daytime hours (please see Condition of Certification **NOISE-6**).

Vibration

The only construction operation likely to produce vibration that could be perceived off site would be pile driving. The applicant anticipates that pile driving might be required for construction of the HHSEGS project (HHSG 2011a, AFC § 5.7.5.2.3).

Pile driving will not cause perceptible vibration at any of the project's receptors due to their relatively long distances to construction activities.

Information from other projects examined by staff shows the noise from pile driving could be expected to reach 104 dBA at a distance of 50 feet. The noise level from pile driving at Solar Plant 2 would thus be projected to reach a level of roughly 65 dBA at CR1 and 57 dBA at M1 (staff calculations). Assuming daytime noise levels at CR1 of 45 dBA and at M1 of 42 dBA, adding pile driving noise to the daytime ambient levels would produce increases of 20 dBA at CR1 and 15 dBA at M1. An increase of 15-20 dBA would likely constitute an annoyance. Thus, pile driving using traditional techniques can potentially cause a significant noise impact at the nearest noise-sensitive receptors. Staff recommends that pile driving be performed using a quieter process. Staff has identified several commercially available technologies that reduce pile driving noise by 20 to 40 dBA compared to traditional pile driving techniques. These include padded hammers, "Hush" noise-attenuating enclosures, vibratory drivers, and hydraulic techniques that press the piles into the ground instead of hammering them (Eaton 2000, Gill 1983, Ken-Jet, Kessler & Schomer 1980, NCT, WOMA 1999, Yap 1987). To ensure that pile driving noise will be performed with quieter equipment, staff proposes Condition of Certification **NOISE-8**. Also to ensure that pile driving noise will not cause annoyance, pile driving will be limited to daytime hours. To ensure this, staff proposes Condition of Certification **NOISE-6**, below.

Worker Effects

The applicant has acknowledged the need to protect construction workers from noise hazards and has recognized applicable LORS that would protect construction workers (HHSG 2011a, AFC § 5.7.5.2.1). To ensure that construction workers are, in fact, adequately protected, staff has proposed Condition of Certification **NOISE-3**.

OPERATION IMPACTS AND MITIGATION

The primary noise sources of the HHSEGS project would be the power blocks, where the steam turbine generators, air-cooled condensers, electric transformers, and various pumps and fans would be located. The northern power block would be located in, or, near the center of Solar Plant 1 (see **Noise Figure 1**), surrounded by a series of heliostats. This power block would be approximately 2 miles from CR1. The southern power block would be located in, or, near the center of Solar Plant 2 (see

Noise Figure 1), surrounded by a series of heliostats. This power block would be approximately 3,500 feet from CR1. The overall noise generated by the project's various noise sources would be based on the configuration of the sources, the number and power rating of the equipment, and any noise-reducing measures incorporated. Staff compares the projected project noise with applicable LORS, in this case the Inyo County noise LORS[4]. In addition, staff evaluates any increase in noise levels at sensitive receptors due to the project in order to identify any significant adverse impacts (see **CEQA Impacts**, below). The project would avoid the creation of annoying tonal (pure-tone) noises by balancing the noise emissions of various power plant features during plant design (Condition of Certification **NOISE-4**).

Compliance with LORS

The applicant performed noise modeling to determine the project's noise impacts on sensitive receptors (HHSG 2011a, AFC § 5.7.5.3.2). The applicant has predicted the operational noise levels at the nearest sensitive receptors; they are shown in **Noise Table-4** below. The County's Noise Element establishes a Normally Acceptable Day-Night Noise Level (L_{dn}) of 60 dBA. The Normally Acceptable L_{dn} of 60 dBA equates to an Equivalent Noise Level (L_{eq}) of 54 dBA continuously throughout the day and night. The applicant predicts the project's operational noise levels at receptor CR1 to be 54 dBA L_{eq} and at receptor M1 to be 52 dBA L_{eq} (**Noise Table 4** below). These levels are consistent with the LORS requirements. To ensure compliance with this LORS, staff proposes Condition of Certification **NOISE-4**. (For the reasons explained below, under **CEQA IMPACTS**, Condition of Certification **NOISE-4** limits the project's noise levels to lower than those predicted, at CR1 and M1.)

Also to ensure compliance, staff proposes Conditions of Certification **NOISE-1** and **NOISE-2** which would establish a public notification and noise complaint process requiring the applicant to resolve any problems caused by operational noise.

With implementation of the conditions of certification below, noise due to the operation of the HHSEGS project would be in compliance with the applicable LORS.

CEQA IMPACTS

The HHSEGS project would operate during the daylight hours (when the sun is shining). Thus, staff compares the project's noise levels to the existing daytime ambient noise levels at the project's noise-sensitive receptors. (Please see below for limited nighttime activities.) Typically, daytime ambient noise consists of both intermittent and constant noises. The noise that stands out during this time is therefore best represented by the average noise level, referred to as L_{eq}. Staff's evaluation of the above noise surveys shows that the daytime noise environment in the project area consists of both intermittent and constant noises. Thus, staff compares the project's noise levels to the daytime ambient L_{eq} levels at the project's noise-sensitive receptors. The applicant has predicted the operational noise level at CR1 and M1; they are shown here in **Noise Table 4**.

[4] Title 21, Chapter 21.20.20, (Development Standards for Renewable Energy Development) of the Inyo County Code - http://qcode.us/codes/inyocounty/

Noise Table 4: Predicted Operational Noise Levels at the Identified Sensitive Residential Receptors

Receptor	Project Alone Operational Noise Level (dBA) [1]	Measured Existing Ambient, Daytime L_{eq} (dBA) [2]	Cumulative L_{eq} (dBA)	Increase in Existing Ambient (dBA)
CR1	54	45	55	+10
M1	52	42	52	+10

Sources: [1] HHSG2011a, AFC § 5.7.5.3.2
[2] Noise Table 2, above

Combining the ambient noise level of 45 dBA L_{eq} (**Noise Table 4**, above) with the project noise level of 54 dBA at CR1 would result in 55 dBA L_{eq}, 10 dBA above the ambient. Combining the ambient noise level of 42 dBA L_{eq} (**Noise Table 4**, above) with the project noise level of 52 dBA at M1 would result in 52 dBA L_{eq}, 10 dBA above the ambient.

As described above (in **METHODS AND THRESHOLDS FOR DETERMINING SIGNIFICANCE**), staff regards an increase of above 5 and up to10 dBA to be adverse, but considers it to be either significant or insignificant, depending upon the particular circumstances of a case. The project would operate during the daytime hours and would not operate at night, when people are trying to sleep. Typically, staff considers an increase of up to 10 dBA to be less than significant if the noise occurs during the day. In the PSA staff concluded that a 10 dBA increase in the exisiting ambient levels at CR1 and M1 would cause a less-than-significant impact because the project would operate during the day and because staff's impression was that most of the people residing in the project vicinity commute to work; leaving their homes every weekday morning and returning home in late afternoons/evenings. After the writing of the PSA, staff learned that this situation may not exist in Charleston View, represented by CR1, and the residents may typically go about their normal daily activities mostly within the boundaries of this community.

Thus, in this **FSA** staff has further evaluated, in more details, the effect of a 10 dBA increase in the ambient noise levels at the project's sensitive noise receptors. In determining whether or not a project would create a significant adverse noise impact, one of the other factors that staff considers is the character of the existing noise regime that people are accustomed to, versus the character of the noise created by the noise source (i.e.; power plant). This is especially important in a rural environment with a generally quiet noise regime. The existing daytime noise environment in the project area is considered quiet and Charleston View is located in a rural setting. People residing near the proposed project site (i.e.; the residence of Charleston View) are more accustomed to natural sounds and noises from light human activities than to industrial noises; currently, the environment is dominated by non-industrial noise sources.

Therefore, the project's industrial noise character combined with an increase of 10 dBA at the project's noise-sensitive receptors would likely prove to cause annoyance, considering the presence of people in Charleston View during the day. Thus, staff considers the above noise impacts at CR1 and M1 to be significant.

In order to reduce the projected noise levels shown in **Noise Table 4** to a level that would result in a less than 10 dBA increase at CR1 and M1, additional mitigation measures (beyond those embedded in the design of the project) may be required. Staff believes that adequate feasible mitigation measures are available to reduce the project noise alone by up to 3 dBA at CR1, but any reduction beyond that would likely be extremely difficult to achieve, considering the quiet character of the noise environment and the lack of intervening structures or topographical/natural barriers between the project site and the noise-sensitive receptors. Thus, staff concludes that the projected project noise levels must be reduced.

A reduction of 3 dBA at CR1 would result in a project noise level of 51 dBA. Combining the ambient noise level of 45 dBA L_{eq} (**Noise Table 5**, below) with the project noise level of 51 dBA at CR1 would result in 52 dBA L_{eq}, 7 dBA above the ambient. A reduction of 3 dBA at M1 would result in a project noise level of 49 dBA. Combining the ambient noise level of 42 dBA L_{eq} (**Noise Table 5**, below) with the project noise level of 49 dBA at M1 would result in 50 dBA L_{eq}, 8 dBA above the ambient.

Noise Table 5: Staff-Proposed Operational Noise Levels at the Identified Sensitive Residential Receptors

Receptor	Project Alone Operational Noise Level (dBA) [1]	Measured Existing Ambient, Daytime L_{eq} (dBA) [2]	Cumulative L_{eq} (dBA)	Increase in Existing Ambient (dBA)
CR1	51	45	52	+7
M1	49	42	50	+8

Sources: [1] Noise Table 2, above

In order to ensure the applicant adheres to these levels, staff has revised Condition of Certification **NOISE-4** to require the project's noise to comply with the levels shown in **Noise Table 5**, rather than those in **Noise Table 4** (as appeared in the PSA).

Adverse impacts on residential receptors can also be identified by comparing predicted power plant noise levels with the nighttime ambient background noise levels at the nearest sensitive residential receptors. The project would have limited nighttime activities related to maintenance. Given the solar nature of this project, activity at night will be limited to primarily maintenance related activities such as mirror washing, with lower noise levels than those from operational activities (during the day). Mirror washing activities are expected to be similar in sound level to a heavy truck. Mirror washing will move around the project area returning to a particular group of mirrors approximately every two weeks, not having the potential to cause annoyance at the noise-sensitive residential receptors, due to its short-term nature. Therefore, staff considers this impact to be less than significant.

However, in the event that mirror washing noise becomes disturbing, the impact can be reduced by such measures as limiting the mirror washing hours near the residential receptors to the early evening hours rather than the late night hours. Also, the plant may not always operate at 100 percent of full power output, especially in the morning hours immediately following the sunrise due to the unavailability of adequate solar insolation.

This can provide an additional opportunity for mirror washing. The mirrors located near the residents can be washed during those hours instead of at night.

If further mitigation is needed, noise can be reduced by such measures as replacing the diesel-powered reflector cleaning vehicle and conventional combustion engine-powered portable lighting plant with an electric-powered vehicle and battery-powered portable lighting plant.

Tonal Noises

One possible source of annoyance could be strong tonal noises. Tonal noises are individual sounds (such as pure tones) which, while not louder than permissible levels, stand out in sound quality. To ensure that tonal noises do not cause public annoyance, staff proposes Condition of Certification **NOISE-4**, which would require mitigation measures, if necessary, to ensure the project would not create tonal noises.

Linear Facilities

All water pipes and gas pipes would be underground and therefore silent during plant operation. Noise effects from electrical interconnection lines typically do not extend beyond the lines' right-of-way easements and would be inaudible to receptors.

Vibration

Vibration from an operating power plant could be transmitted through two primary means: ground (ground-borne vibration), and air (airborne vibration).

The operating components of the HHSEGS plant would consist of high-speed steam turbine generators and various pumps and fans. All of these pieces of equipment must be carefully balanced in order to operate; permanent vibration sensors would be attached to the turbines and generators. Based on experience with numerous previous projects employing similar equipment, staff agrees with the applicant that ground-borne vibration from the HHSEGS project would be undetectable by any likely receptor.

Airborne vibration (low frequency noise) can rattle windows and objects on shelves and can rattle the walls of lightweight structures. However, none of the project equipment is known to produce noticeable low frequency noise beyond the project site boundaries. Staff concludes that the HHSEGS would not cause perceptible airborne vibration effects at any offsite noise-sensitive receptor.

Worker Effects

The applicant acknowledges the need to protect plant operating and maintenance workers from noise hazards and commits to compliance with all applicable LORS (HHSG 2011a, AFC § 5.7.5.3.1). Signs would be posted in areas of the plant with noise levels exceeding 85 dBA (the level that OSHA recognizes as a threat to workers' hearing), and hearing protection would be required and provided. To ensure that plant operation and maintenance workers are adequately protected, staff proposes Condition of Certification **NOISE-5**. For further discussion of proposed worker safety conditions of certification, please see **WORKER SAFETY AND FIRE PROTECTION** section of this document.

CUMULATIVE IMPACTS AND MITIGATION

Section 15130 of the CEQA Guidelines (Cal. Code Regs., tit. 14) requires a discussion of cumulative environmental impacts. Cumulative impacts are two or more individual impacts that, when considered together, are considerable or that compound or increase other environmental impacts. The CEQA Guidelines require that the discussion reflect the severity of the impacts and the likelihood of their occurrence, but need not provide as much detail as the discussion of the impacts attributable to the project alone.

The St. Therese Mission is the only proposed project near the HHSEGS site to potentially result in a cumulative noise effect. The facility developer estimates that as many as 1,200 visitors per month could visit the facility. The noise generated from such visitors would be predominately associated with vehicular traffic. Other features associated with the St. Therese Mission project are not anticipated to be significant sources of noise. Therefore, it is unlikely that HHSEGS, when combined with other projects, would create direct cumulative noise impact in the project area. Therefore, the project’s cumulative noise impact is considered to be less than significant.

FACILITY CLOSURE

In the future, upon closure of the HHSEGS, all operational noise from the project would cease, and no further adverse noise impacts from operation of the HHSEGS would be possible. The remaining potential temporary noise source is the dismantling of the structures and equipment and any site restoration work that may be performed. Since this noise would be similar to that caused by the original construction, it can be treated similarly. That is, noisy work could be performed during daytime hours, with machinery and equipment properly equipped with mufflers. Any noise LORS that were in existence at that time would apply. Applicable conditions of certification included in the Energy Commission decision would also apply unless modified.

STAFF PROPOSED FINDINGS OF FACT

1. Construction and operation of the HHSEGS would not significantly increase noise levels above existing ambient levels in the surrounding project area.

2. Construction noise levels are temporary and transitory in nature and would be mitigated to the extent feasible by employing measures such as sound reduction devices and limiting construction to daytime hours in accordance with the Public Safety Element of the Inyo County General Plan.

3. Measures contained in the Conditions of Certification and compliance with local LORS would assure that noise from construction and operation is mitigated to below the level of significance.

4. Operational noise would not cause significant impacts to nearby residences.

5. The project owner would implement measures to protect workers from injury due to excessive noise levels.

6. The HHSEGS would not create ground or airborne vibrations which could cause significant off-site impacts.

7. Implementation of the Conditions of Certification identified below, ensure that project-related noise emissions would not cause significant impacts to sensitive noise receptors.

CONCLUSIONS

Staff concludes that the HHSEGS project, if built and operated in conformance with the proposed conditions of certification below, would comply with all applicable noise and vibration LORS and would produce no significant direct or cumulative adverse noise impacts on people within the project area, directly, indirectly, or cumulatively.

PROPOSED CONDITIONS OF CERTIFICATION

PUBLIC NOTIFICATION PROCESS

NOISE-1 Prior to the start of ground disturbance, the project owner shall notify all residents within one mile of the project site boundaries, by mail or by other effective means, of the commencement of project construction. At the same time, the project owner shall establish a telephone number for use by the public to report any undesirable noise conditions associated with the construction and operation of the project. If the telephone is not staffed 24 hours a day, the project owner shall include an automatic answering feature, with date and time stamp recording, to answer calls when the phone is unattended. This telephone number shall be posted at the project site during construction where it is visible to passersby. This telephone number shall be maintained throughout the operational life of the project.

Verification: At least 15 days prior to ground disturbance, the project owner shall transmit to the compliance project manager (CPM) a statement, signed by the project owner's project manager, stating that the above notification has been performed, and describing the method of that notification. This communication shall also verify that the telephone number has been established and posted at the site, and shall provide that telephone number.

NOISE COMPLAINT PROCESS

NOISE-2 Throughout the construction and operation of the project, the project owner shall document, investigate, evaluate, and attempt to resolve all project-related noise complaints. The project owner or authorized agent shall:

- use the Noise Complaint Resolution Form (below), or a functionally equivalent procedure acceptable to the CPM, to document and respond to each noise complaint;
- attempt to contact the person(s) making the noise complaint within 24 hours;

- conduct an investigation to determine the source of noise in the complaint;
- if the noise is project related, take all feasible measures to reduce the source of the noise; and
- submit a report documenting the complaint and actions taken. The report shall include: a complaint summary, including the final results of noise reduction efforts and, if obtainable, a signed statement by the complainant, stating that the noise problem has been resolved to the complainant's satisfaction.

Verification: Within five days of receiving a noise complaint, the project owner shall file a Noise Complaint Resolution Form, shown below, with the CPM, which documents the resolution of the complaint. If mitigation is required to resolve the complaint, and the complaint is not resolved within a three-day period, the project owner shall submit an updated Noise Complaint Resolution Form when the mitigation is performed and complete.

EMPLOYEE NOISE CONTROL PROGRAM

NOISE-3 The project owner shall submit to the CPM for review and approval a noise control program. The noise control program shall be used to reduce employee exposure to high (above permissible) noise levels during construction in accordance to the applicable OSHA and Cal-OSHA standards.

Verification: At least 30 days prior to the start of ground disturbance, the project owner shall submit the noise control program to the CPM. The project owner shall make the program available to Cal-OSHA upon request.

NOISE RESTRICTIONS

NOISE-4 The project design and implementation shall include appropriate noise mitigation measures adequate to ensure that the operation of the project will not cause the noise levels due to plant operation alone to exceed an average of 51 dBA L_{eq} measured at or near monitoring location CR1 and an average of 49 dBA L_{eq} measured at or near monitoring location M1.

No new pure-tone components shall be caused by the project. No single piece of equipment shall be allowed to stand out as a source of noise that draws legitimate complaints[5].

When the project first achieves a sustained output of 90 % or greater of rated capacity, the project owner shall conduct a 25-hour community noise survey at monitoring locations CR1 and M1, or at a closer location acceptable to the CPM. This survey shall also include measurement of one-third octave band

[5] A legitimate complaint refers to a complaint about noise that is caused by the HHSEGS project as opposed to another source (as verified by the CPM). A legitimate complaint constitutes a violation by the project of any noise condition of certification (as confirmed by the CPM), which is documented by an individual or entity affected by such noise.

sound pressure levels to ensure that no new pure-tone noise components have been caused by the project.

The measurement of power plant noise for the purposes of demonstrating compliance with this condition of certification may alternatively be made at a location, acceptable to the CPM, closer to the plant (e.g., 400 feet from the plant boundary) and this measured level then mathematically extrapolated to determine the plant noise contribution at the affected residence. The character of the plant noise shall be evaluated at the affected receptor locations to determine the presence of pure tones or other dominant sources of plant noise.

If the results from the noise survey indicate that the power plant noise at the affected receptor sites exceed the above values, mitigation measures shall be implemented to reduce noise to a level of compliance with these limits.

If the results from the noise survey indicate that pure tones are present, mitigation measures shall be implemented to eliminate the pure tones.

Verification: The survey shall take place within 30 days of the project first achieving a sustained output of 90 % or greater of rated capacity. Within 15 days after completing the survey, the project owner shall submit a summary report of the survey to the CPM. Included in the survey report will be a description of any additional mitigation measures necessary to achieve compliance with the above listed noise limits, and a schedule, subject to CPM approval, for implementing these measures. When these measures are in place, the project owner shall repeat the noise survey.

Within 15 days of completion of the new survey, the project owner shall submit to the CPM a summary report of the new noise survey, performed as described above and showing compliance with this condition.

OCCUPATIONAL NOISE SURVEY

NOISE-5 Following the project's attainment of a sustained output of 90 % or greater of its rated capacity, the project owner shall conduct an occupational noise survey to identify any noise hazardous areas in the facility.

The survey shall be conducted by a qualified person in accordance with the provisions of Title 8, California Code of Regulations, sections 5095-5099 (Article 105) and Title 29, Code of Federal Regulations, section 1910.95. The survey results shall be used to determine the magnitude of employee noise exposure.

The project owner shall prepare a report of the survey results and, if necessary, identify proposed mitigation measures to be employed in order to comply with the applicable California and federal regulations.

Verification: Within 30 days after completing the survey, the project owner shall submit the noise survey report to the CPM. The project owner shall make the report available to OSHA and Cal-OSHA upon request.

CONSTRUCTION RESTRICTIONS

NOISE-6 Heavy equipment operation and noisy construction work relating to any project features, including pile driving, shall be restricted to the times delineated below:

Mondays through Saturdays: 7 a.m. to 7 p.m.

Construction activities may be performed outside the above hours, with CPM approval.

Haul trucks and other engine-powered equipment shall be equipped with adequate mufflers. Haul trucks shall be operated in accordance with posted speed limits. Truck engine exhaust brake use shall be limited to emergencies.

Verification: Prior to ground disturbance, the project owner shall transmit to the CPM a statement acknowledging that the above restrictions will be observed throughout the construction of the project.

At least 5 days prior to pouring of concrete outside of the above hours, the project owner shall submit a statement to the CPM, specifying the time of night and the number of nights for which concrete pouring will occur, the approximate distance of this activity to CR1 an M1, and the expected sound levels at these receptors. Also prior to pouring of concrete beyond the above hours, the project owner shall notify all residents within one mile of the project site boundaries, by mail or by other effective means, of the commencement of this activity.

STEAM BLOW RESTRICTIONS

NOISE-7 If a traditional, high-pressure steam blow process is used the project owner shall equip steam blow piping with a temporary silencer that quiets the noise of steam blows to no greater than 89 dBA measured at a distance of 50 feet. The steam blows shall be conducted between 8:00 a.m. and 5:00 p.m. unless arranged with the CPM such that offsite impacts would not cause annoyance to receptors. If a low-pressure, continuous steam blow process is used, the project owner shall submit to the CPM a description of the process, with expected noise levels and planned hours of steam blow operation.

Verification: At least 15 days prior to the first steam blow, the project owner shall notify all residents or business owners within one mile of the project site boundary. The notification may be in the form of letters, phone calls, fliers, or other effective means as approved by the CPM. The notification shall include a description of the purpose and nature of the steam blow(s), the planned schedule, expected sound levels, and explanation that it is a one-time activity and not part of normal plant operation.

PILE DRIVING MANAGEMENT

NOISE-8 The project owner shall perform pile driving using a quieter process than the traditional pile driving techniques to ensure that noise from this operation does not cause annoyance at monitoring locations CR1 and M1.

Verification: At least 15 days prior to first pile driving, the project owner shall submit to the CPM a description of the pile driving technique to be employed, including calculations showing its projected noise impacts at monitoring locations CR1 and M1.

Exhibit 1 - Noise Complaint Resolution Form

Hidden Hills Solar Electric Generating System Power Project
(11-AFC-2)

NOISE COMPLAINT LOG NUMBER ________________________

Complainant's name and address:

Phone number: ________________________

Date complaint received: ________________________
Time complaint received: ________________________

Nature of noise complaint:

Definition of problem after investigation by plant personnel:

Date complainant first contacted: ________________________

Initial noise levels at 3 feet from noise source _________ dBA Date: _____________

Initial noise levels at complainant's property: __________ dBA Date: ____________

Final noise levels at 3 feet from noise source: ________ dBA Date: _____________

Final noise levels at complainant's property: __________ dBA Date: ____________

Description of corrective measures taken:

Complainant's signature: ________________________ Date: ____________

Approximate installed cost of corrective measures: $ ____________
Date installation completed: ____________
Date first letter sent to complainant: ____________ (copy attached)
Date final letter sent to complainant: ____________ (copy attached)

This information is certified to be correct:
Plant Manager's Signature: ________________________

(Attach additional pages and supporting documentation, as required).

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NOISE APPENDIX A

FUNDAMENTAL CONCEPTS OF COMMUNITY NOISE

To describe noise environments and to assess impacts on noise sensitive area, a frequency weighting measure, which simulates human perception, is customarily used. It has been found that A-weighting of sound intensities best reflects the human ear's reduced sensitivity to low frequencies and correlates well with human perceptions of the annoying aspects of noise. The A-weighted decibel scale (dBA) is cited in most noise criteria. Decibels are logarithmic units that conveniently compare the wide range of sound intensities to which the human ear is sensitive. **Noise Table A1** provides a description of technical terms related to noise.

Noise environments and consequences of human activities are usually well represented by an equivalent A-weighted sound level over a given time period (L_{eq}), or by average day and night A-weighted sound levels with a nighttime weighting of 10 dBA (L_{dn}). Noise levels are generally considered low when ambient levels are below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. Outdoor day-night sound levels vary over 50 dBA depending on the specific type of land use. Typical L_{dn} values might be 35 dBA for a wilderness area, 50 dBA for a small town or wooded residential area, 65 to 75 dBA for a major metropolis downtown (e.g., San Francisco), and 80 to 85 dBA near a freeway or airport. Although people often accept the higher levels associated with very noisy urban residential and residential-commercial zones, they nevertheless are considered to be levels of noise adverse to public health.

Various environments can be characterized by noise levels that are generally considered acceptable or unacceptable. Lower levels are expected in rural or suburban areas than what would be expected for commercial or industrial zones. Nighttime ambient levels in urban environments are about seven decibels lower than the corresponding average daytime levels. The day-to-night difference in rural areas away from roads and other human activity can be considerably less. Areas with full-time human occupation that are subject to nighttime noise, which does not decrease relative to daytime levels, are often considered objectionable. Noise levels above 45 dBA at night can result in the onset of sleep interference effects. At 70 dBA, sleep interference effects become considerable (<u>Effects of Noise on People</u>, U.S. Environmental Protection Agency, December 31, 1971).

In order to help the reader understand the concept of noise in decibels (dBA), **Noise Table A2** has been provided to illustrate common noises and their associated sound levels, in dBA.

Noise Table A1
Definition Of Some Technical Terms Related To Noise

Terms	Definitions
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a Sound Level Meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this testimony are A-weighted.
L_{10}, L_{50}, & L_{90}	The A-weighted noise levels that are exceeded 10%, 50%, and 90% of the time, respectively, during the measurement period. L_{90} is generally taken as the background noise level.
Equivalent Noise Level, L_{eq}	The energy average A-weighted noise level during the Noise Level measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 4.8 decibels to levels in the evening from 7 p.m. to 10 p.m., and after addition of 10 decibels to sound levels in the night between 10 p.m. and 7 a.m.
Day-Night Level, L_{dn} or DNL	The Average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10 p.m. and 7 a.m.
Ambient Noise Level	The composite of noise from all sources, near and far. The normal or existing level of environmental noise at a given location (often used for an existing or pre-project noise condition for comparison study).
Intrusive Noise	That noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.
Pure Tone	A pure tone is defined by the Model Community Noise Control Ordinance as existing if the one-third octave band sound pressure level in the band with the tone exceeds the arithmetic average of the two contiguous bands by 5 decibels (dB) for center frequencies of 500 Hz and above, or by 8 dB for center frequencies between 160 Hz and 400 Hz, or by 15 dB for center frequencies less than or equal to 125 Hz.
Source: Guidelines for the Preparation and Content of Noise Elements of the General Plan, Model Community Noise Control Ordinance, California Department of Health Services 1976, 1977.	

Noise Table A2
Typical Environmental And Industry Sound Levels

Noise Source (at distance)	A-Weighted Sound Level in Decibels (dBA)	Noise Environment	Subjective Impression
Civil Defense Siren (100')	140-130		Pain Threshold
Jet Takeoff (200')	120		Very Loud
Very Loud Music	110	Rock Music Concert	
Pile Driver (50')	100		
Ambulance Siren (100')	90	Boiler Room	
Freight Cars (50')	85		
Pneumatic Drill (50')	80	Printing Press Kitchen with Garbage Disposal Running	Loud
Freeway (100')	70		Moderately Loud
Vacuum Cleaner (100')	60	Data Processing Center Department Store/Office	
Light Traffic (100')	50	Private Business Office	
Transformer (200’)	40	Quiet Residential Area Library	Quiet
Soft Whisper (5')	30	Quiet Bedroom	
	20	Recording Studio	
	10		Threshold of Hearing
Source: Handbook of Noise Measurement, Arnold P.G. Peterson, 1980			

SUBJECTIVE RESPONSE TO NOISE

The adverse effects of noise on people can be classified into three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction.
- Interference with activities such as speech, sleep, and learning.
- Physiological effects such as anxiety or hearing loss.

The sound levels associated with environmental noise, in almost every case, produce effects only in the first two categories. Workers in industrial plants can experience noise effects in the last category. There is no completely satisfactory way to measure the subjective effects of noise, or of the corresponding reactions of annoyance and dissatisfaction, primarily because of the wide variation in individual tolerance of noise.

One way to determine a person's subjective reaction to a new noise is to compare the level of the existing (background) noise, to which one has become accustomed, with the level of the new noise. In general, the more the level or the tonal variations of a new noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual.

With regard to increases in A-weighted noise levels, knowledge of the following relationships can be helpful in understanding the significance of human exposure to noise.

1. Except under special conditions, a change in sound level of one dB cannot be perceived.

2. Outside of the laboratory, a three dB change is considered a barely noticeable difference.

3. A change in level of at least five dB is required before any noticeable change in community response would be expected.

4. A ten dB change is subjectively heard as an approximate doubling in loudness and almost always causes an adverse community response. (Kryter, Karl D., The Effects of Noise on Man, 1970).

COMBINATION OF SOUND LEVELS

People perceive both the level and frequency of sound in a non-linear way. A doubling of sound energy (for instance, from two identical automobiles passing simultaneously) creates a three dB increase (i.e., the resultant sound level is the sound level from a single passing automobile plus three dB). The rules for decibel addition used in community noise prediction are:

Noise Table A3
Addition of Decibel Values

When two decibel values differ by:	Add the following amount to the larger value
0 to 1 dB	3 dB
2 to 3 dB	2 dB
4 to 9 dB	1 dB
10 dB or more	0

Source: Architectural Acoustics, M. David Egan, 1988

Sound and Distance

Doubling the distance from a noise source reduces the sound pressure level by 6 dB.

Increasing the distance from a noise source 10 times reduces the sound pressure level by 20 dB.

Worker Protection

OSHA noise regulations are designed to protect workers against the effects of noise exposure, and list permissible noise level exposure as a function of the amount of time to which the worker is exposed:

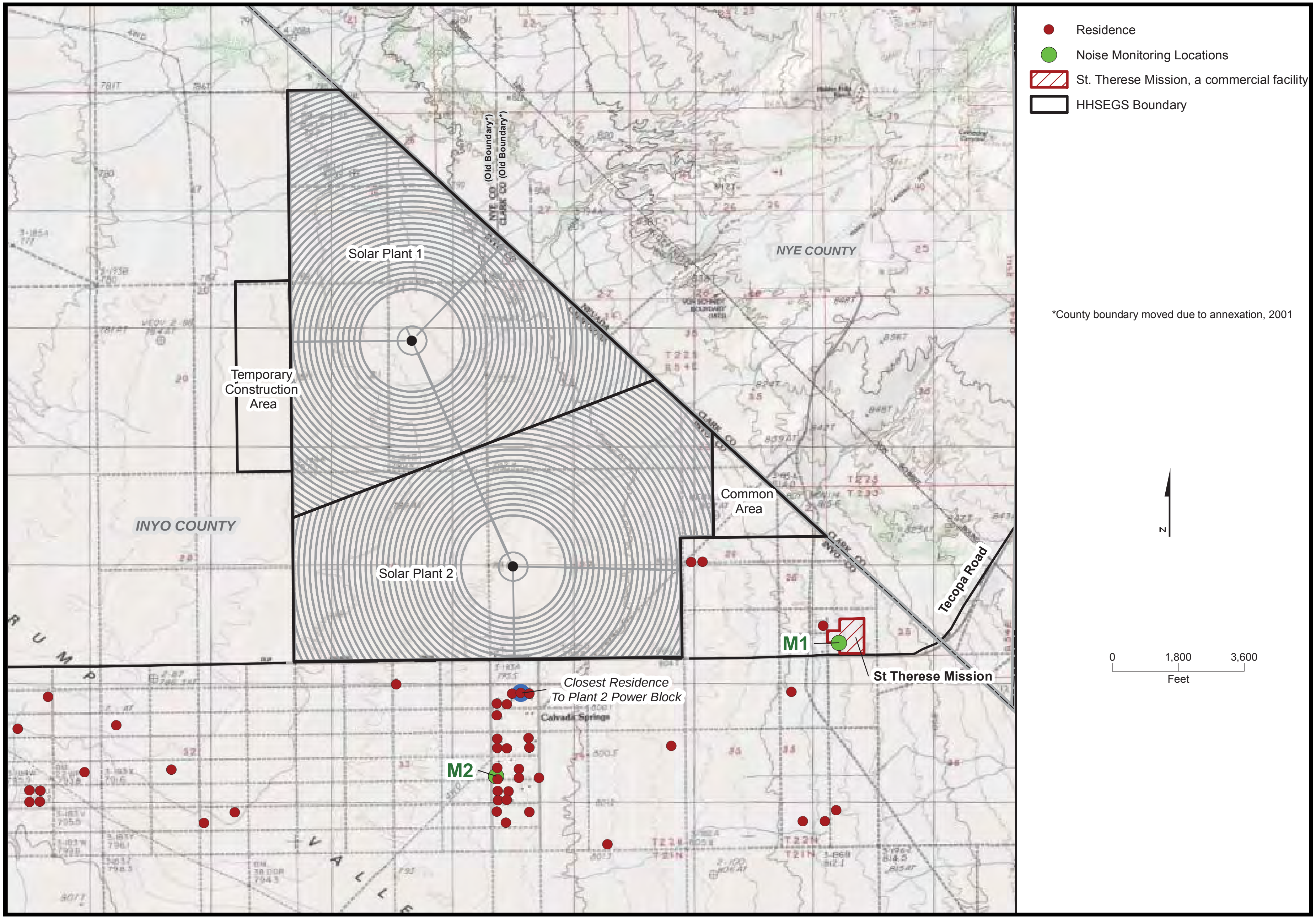
Noise Table A4
OSHA Worker Noise Exposure Standards

Duration of Noise (Hrs/day)	A-Weighted Noise Level (dBA)
8.0	90
6.0	92
4.0	95
3.0	97
2.0	100
1.5	102
1.0	105
0.5	110
0.25	115

Source: 29 C.F.R. § 1910.

NOISE - FIGURE 1

Hidden Hills Solar Electric Generating System (HHSEGS) - Noise Monitoring Locations



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: HHSEG AFC, Figure 5.7-1, August 2011

PUBLIC HEALTH

Testimony of Huei-An (Ann) Chu, Ph.D. and Obed Odoemelam, Ph.D.

SUMMARY OF CONCLUSIONS

The California Energy Commission staff analyzed the potential human health risks associated with construction and operation of the proposed Hidden Hills Solar Electric Generating System (HHSEGS) project and does not expect any significant adverse cancer, short- or long-term noncancer health effects from the project's toxic emissions. Staff's analysis of potential health and safety impacts uses a highly conservative methodology that accounts for impacts on the most sensitive individuals in a given population, including newborns and infants. According to staff's assessment, emissions from the HHSEGS would not contribute significantly to morbidity or mortality in any age or ethnic group residing in the project area.

The public health impacts from the line segments (transmission line and natural gas line portions) within the state of Nevada would be assessed by BLM under the requirements of the National Environmental Policy Act (NEPA) of 1969 (HHSG 2011a, pp. 3-2 and 3-3).

INTRODUCTION

The purpose of this Final Staff Assessment (FSA) is to determine if emissions of toxic air contaminants (TACs) from the proposed HHSEGS would have the potential to cause significant adverse public health impacts or to violate standards for public health protection. If potentially significant health and safety impacts are identified, staff would identify and recommend mitigation measures necessary to reduce such impacts to insignificant levels.

The Commission staff address the potential impacts of regulated, or criteria, air pollutants in the **Air Quality** section of this FSA, and assess the impacts on public and worker health from accidental releases of hazardous materials in the **Hazardous Materials Management** and **Worker Safety and Fire Protection** sections. The health and nuisance effects from electric and magnetic fields are discussed in the **Transmission Line Safety and Nuisance** section. Pollutants released from the project's wastewater streams are discussed in the **Soils and Surface Water** and **Water Supply** sections. Releases in the form of hazardous and nonhazardous wastes are described in the **Waste Management** section.

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS (LORS)

The federal, state, and local laws and policies applicable to the control of TAC emissions and mitigation of public health impacts for the HHSEGS are summarized in **Public Health Table 1**. Staff's analysis examines the project's compliance with these requirements and summarizes the applicable LORS.

Public Health Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
Federal	
Clean Air Act section 112 (Title 42, U.S. Code section 7412)	Section 112 of the Clean Air Act addresses emissions of hazardous air pollutants (HAPs). This act requires new sources that emit more than 10 tons per year of any specified HAP or more than 25 tons per year of any combination of HAPs to apply Maximum Achievable Control Technology (MACT).
40 Code of Federal Regulations (CFR) Part 68 (Risk Management Plan)	Requires facilities storing or handling significant amounts of acutely hazardous materials to prepare and submit Risk Management Plans.
State	
California Health and Safety Code section 25249.5 et seq. (Safe Drinking Water and Toxic Enforcement Act of 1986—Proposition 65)	These sections establish thresholds of exposure to carcinogenic substances above which Prop 65 exposure warnings are required.
California Health and Safety Code, Article 2, Chapter 6.95, Sections 25531 to 25541; California Code of Regulations (CCR) Title 19 (Public Safety), Division 2 (Office of Emergency Services), Chapter 4.5 (California Accidental Release Prevention Program)	Requires facilities storing or handling significant amounts of acutely hazardous materials to prepare and submit Risk Management Plans
California Health and Safety Code section 41700	This section states that "a person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or that endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause injury or damage to business or property."
California Health and Safety Code Sections 44360 to 44366 (Air Toxics "Hot Spots" Information and Assessment Act—AB 2588)	Requires preparation and biennial updating of facility emission inventory of hazardous substances; risk assessments.
California Public Resource Code section 25523(a); Title 20 California Code of Regulations (CCR) section 1752.5, 2300–2309 and	These regulations require a quantitative health risk assessment for new or modified sources, including power plants that emit one or more toxic air contaminants (TACs).

Applicable Law	Description
Division 2 Chapter 5, Article 1, Appendix B, Part (1); California Clean Air Act, Health and Safety Code section 39650, et seq.	
Local	
The Great Basin Unified Air Pollution Control District (GBUAPCD) Rule 220, Construction or Reconstruction of Major Sources of Hazardous Air Pollutants	Requires the evaluation of the potential impact of TACs from new or modified projects.
The Great Basin Unified Air Pollution Control District (GBUAPCD) Rule 401, Fugitive Dust	This rule is intended to minimize the formation and transport of fugitive dust from anthropogenic activity.

SETTING

This section describes the environment in the vicinity of the proposed project site from the public health perspective. Characteristics of the natural environment, such as meteorology and terrain, affect the project's potential for impacts on public health. An emissions plume from a facility may affect elevated areas before lower terrain areas because of reduced opportunity for atmospheric mixing. Consequently, areas of elevated terrain can often be subjected to increased pollutant impacts compared to lower-level areas. Also, the land use around a project site can influence the surrounding population in terms of distribution and density, which, in turn, can affect public exposure to project emissions. Additional factors affecting potential public health impacts include existing air quality and environmental site contamination. The area around the proposed HHSEGS is rural and sparsely populated, and is primarily zoned as open space (HHSG 2011a, section 1.9.3).

SITE AND VICINITY DESCRIPTION

The proposed HHSEGS site is located on privately owned land in southeastern Inyo County and is directly adjacent to the California-Nevada border, within the Great Basin Valleys Air Basin (GBVAB) and within the Great Basin Unified Air Pollution Control District (GBUAPCD). The two counties of Nevada adjacent to Inyo County are Nye County and Clark County.

The HHSEGS would have two solar fields and associated facilities (Solar Plant 1 and Solar Plant 2). Each solar plant would generate 270 megawatts (MW) of gross energy (or 250 MW of net energy), for a total net output of 500 MW. Each solar plant would include a 750-ft-tall solar power tower and two natural-gas-fired boilers: one auxiliary boiler and one night preservation boiler. The auxiliary boiler would be used to pre-warm the solar receiver steam generator (SRSG) to minimize the amount of time required for startup each morning, to assist during shutdown cooling operation, and to augment the solar operation when solar energy diminishes under cloudy conditions. The nighttime preservation boiler would be used to maintain minimum system temperatures overnight. The natural gas pipeline proposed for this project would be approximately 12 inches in diameter, and approximately 32.4 miles in total length (HHSG 2011a, section 2.0, CH2 2012ee, p.1).

According to the Application for Certification (AFC), there are no sensitive receptor locations such as daycare centers, hospitals, parks, schools or preschools within 6 miles of the project site (HHSG 2011a section 5.9.3). The St. Therese Mission (a commercial facility) is under construction at a location approximately 0.5 mile southeast of the HHSEGS. The facility is considered a sensitive receptor location because it would include a children’s playground and a residential unit.

The nearest residence to any of the power blocks is approximately 3,500 feet south of the Solar Plant 2 power block and about 950 feet south of the project’s southern boundary. The closet community to the project site is several dozen residences that comprise Charleston View, south of Tecopa Road (also known as Old Spanish Trail Highway). The closest town to the project is Pahrump, Nevada, located approximately 8 miles directly north of the project area, with a 2010 projected population of 36,441 (HHSG 2011a section 5.6.3.1 and section 5.9.3).

METEOROLOGY AND CLIMATE

Meteorological conditions, including wind speed, wind direction, and atmospheric stability, affect the extent to which pollutants are dispersed into the air as well as the direction of pollutant transport. This, in turn, affects the level of public exposure to emitted pollutants along with the associated health risks. When wind speeds are low and the atmosphere is stable, for example, dispersion is reduced, and localized exposures may increase.

Atmospheric stability is one characteristic related to turbulence, or the ability of the atmosphere to disperse pollutants from convective air movement. Mixing heights (the height marking the extent of the space within which the air is well mixed and from which pollutants can be dispersed to other areas) are lower during mornings because of temperature inversions and increase during the warmer afternoons. Staff’s **Air Quality** section presents a more detailed description of meteorological data for the area.

Southeastern Inyo County is characterized by a desert climate: low precipitation, hot summers, and cold winters. The mountain ranges surrounding the project area also have a major influence on the climate as they serve as a meteorological boundary that effectively removes the moisture from the air moving into the area. (HHSG 2011a, section 5.1.3.2)

The wind roses provided in the AFC Figures 5.1-1 thru 5.1-5 (HHSEGS 2011a) show that for most of the year, prevailing winds blow from the proposed project site into Nevada. Approximately 26 percent of prevailing winds are from Nevada. This means that the project area is not significantly impacted by emissions from Nevada. Please refer to the **Air Quality** section of this **FSA** for more details.

EXISTING SETTING

As previously noted, the proposed HHSEGS site is located within the Great Basin Valleys Air Basin (GBVAB) and within the Great Basin Unified Air Pollution Control District (GBUAPCD). By examining average toxic concentration levels from representative air monitoring sites together with the cancer risk factors specific to each carcinogenic contaminant, a lifetime cancer risk can be calculated to provide a background risk level for inhalation of ambient air. When examining such risk estimates, staff considers it important to note that the overall lifetime risk of developing cancer for the average female in the United States is about 1 in 3, or 333,333 in 1 million and about 1 in 2, or 500,000 in 1 million for the average male (American Cancer Society, 2011). From 2004 to 2008, the cancer incidence rates in California are 51.28 in 1 million for males and 39.69 for females. Meanwhile, the cancer incidence rates in Nevada are 50.76 in 1 million for males and 40.41 for females. Also, from 2004 to 2008, the cancer death rates for California are 19.74 in 1 million for males and 14.34 for females. Meanwhile, the cancer death rates in Nevada are 21.47 in 1 million for males and 16.3 for females (American Cancer Society, 2012).

EXISTING PUBLIC HEALTH CONCERNS

When evaluating a new project, staff usually conducts a detailed study and analysis of existing public health issues in the project vicinity. This analysis is prepared to identify the current rates of respiratory diseases (including asthma) and cancer, together with childhood mortality rates in the area around the proposed project site. Such assessment of existing health concerns would provide staff with a basis on which to evaluate the significance of any additional health impacts from the proposed HHSEGS project and assess the need for further mitigation.

The applicant has listed a few studies of cancer and respiratory disease rates in Inyo County and the broader Great Basin Valleys Air Basin (GBVAB). One fact that staff considers particularly important is that asthma diagnosis rates in the GBVAB area are higher than the average rates in California for both adults (age 18 and over) and children (ages 1-17). The percentage of adults diagnosed with asthma was, for example, reported as 9.3 percent in 2005 and 2007, compared to 7.7 percent for the general California population. Rates for children for the same 2005-2007 period were reported as 13.2 percent compared to 10.1 percent for the state in general (Wolstein et al., 2010). The authors did not identify any specific reasons for these higher rates of asthma in Inyo County but staff considers these findings as further support for continuing stringency in controlling the sources of pollutants in the area.

By examining the State Cancer Profiles as presented by the National Cancer Institute, staff found that cancer death rates in Inyo County have remained stable between 2005 and 2009. However, these rates (of 19.06 per 1,000,000, combined male/female) remain about 17 percent higher in Inyo County than the statewide average of 16.31 per 1,000,000 (National Cancer Institute, 2012). As with asthma, there are no specific reasons for these higher cancer rates pointing to the necessity for stringent pollution controls within the air district.

There are no ambient monitoring stations for Toxic Air Contaminants (TACs) in the

GBVAB. Therefore, staff used data from the San Joaquin Valley Air Basin (SJVAB) as the closest representation of the condition in the project area. Air quality and health risk data presented by ARB in Table C-34 of California Almanac of Emissions and Air Quality – 2009 Edition (ARB, 2009a) for the SJVAB for years 1990 and 2005 show a downward trend in Toxic Air Contaminant (TAC) emissions, along with related cancer risks (HHSG 2011a, section 5.9.3).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

This section discusses TAC emissions to which the public could be exposed during project construction and routine operation. Following the release of TACs into the air, water or soil, people may come into contact with them through inhalation, dermal contact, or ingestion via contaminated food or water.

Air pollutants for which no ambient air quality standards have been established are called non-criteria pollutants. Unlike criteria pollutants such as ozone, carbon monoxide, sulfur dioxide, or nitrogen dioxide, non-criteria pollutants have no ambient (outdoor) air quality standards that specify levels considered safe for everyone[1]. Since non-criteria pollutants do not have such standards, a health risk assessment (HRA) is used to determine if people might be exposed to those types of pollutants at unhealthy levels. The risk assessment consists of the following steps:

- identify the types and amounts of hazardous substances that HHSEGS could emit to the environment;
- estimate worst-case concentrations of project emissions in the environment using dispersion modeling;
- estimate amounts of pollutants that people could be exposed to through inhalation, ingestion, and dermal contact; and
- characterize potential health risks by comparing worst-case exposure to safe standards based on known health effects.

Staff conducts its public health analysis by evaluating and then adopting the information and data provided in AFC by each project proponent. Staff also relies upon the expertise and guidelines of the California Environmental Protection Agency (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA) to identify contaminants known to the state of California to cause cancer or other noncancer health effects and to also identify the toxicity and cancer potency factors of these contaminants. Staff relies upon the expertise of the California Air Resources Board (ARB) and in addition, the local air districts to conduct ambient air monitoring of TACs and on the California Department of Public Health to evaluate pollutant impacts in specific communities. It is not within the purview or the expertise of the Energy Commission staff to duplicate the expertise and statutory responsibility of these agencies.

[1] Carbon dioxide (CO_2) is also a non-criteria pollutant, but it is also not considered a TAC at normal consideration and is not evaluated in this analysis.

For each project, a screening-level risk assessment is initially performed using simplified assumptions that are intentionally biased toward protection of public health. That is, staff uses an analysis designed to overestimate public health impacts from exposure to project emissions. In reality, it is likely that the actual risks from the source in question would be much lower than the risks as estimated by the screening-level assessment. The risks for such screening purposes are based on examining conditions that would lead to the highest, or worst-case, risks and then using those assumptions in the assessment. Such an approach usually involves the following:

- using the highest levels of pollutants that could be emitted from the plant;
- assuming weather conditions that would lead to the maximum ambient concentration of pollutants;
- using the type of air quality computer model which predicts the greatest plausible impacts;
- calculating health risks at the location where the pollutant concentrations are estimated to be the highest;
- assuming that an individual's exposure to carcinogenic (cancer-causing) agents would occur continuously for 70 years; and
- using health-based standards designed to protect the most sensitive members of the population (i.e., the young, elderly, and those with respiratory illnesses).

A screening-level risk assessment would, at a minimum, include the potential health effects from inhaling hazardous substances. Some facilities may also emit certain substances that could present a health hazard from noninhalation pathways of exposure (OEHHA 2003, Tables 5.1, 6.3, 7.1). When these substances are present in facility emissions, the screening-level analysis would include the following additional exposure pathways: soil ingestion, dermal exposure, and mother's milk (OEHHA 2003, p. 5-3).

The risk assessment process addresses three categories of health impacts: (1) acute (short-term) health effects, (2) chronic (long-term) noncancer effects, and (3) cancer risk (also long-term).

Acute Noncancer Health Effects

Acute health effects are those that result from short-term (one-hour) exposure to relatively high concentrations of pollutants. Such effects are temporary in nature and include symptoms such as irritation of the eyes, skin, and respiratory tract.

Chronic Noncancer Health Effects

Chronic noncancer health effects are those that result from long-term exposure to lower concentrations of pollutants. The exposure period is considered to be approximately from 12 percent to 100 percent of a lifetime, or from 8 to 70 years (OEHHA 2003, p. 6-5). Chronic noncancer health effects include diseases such as reduced lung function and heart disease.

Reference Exposure Levels (RELs)

The analysis for both acute and chronic noncancer health effects compares the maximum project contaminant levels to safe levels known as Reference Exposure Levels, or RELs. These are amounts of toxic substances to which even sensitive individuals could be exposed without suffering any adverse health effects (OEHHA 2003, p. 6-2). These exposure levels are specifically designed to protect the most sensitive individuals in the population, such as infants, the aged, and people with specific illnesses or diseases which makes them more sensitive to the effects of toxic substance exposure. The RELs are based on the most sensitive adverse health effect reported in the medical and toxicological literature and include specific margins of safety. The margins of safety account for uncertainties associated with inconclusive scientific and technical information available at the time of standard setting. They are therefore meant to provide a reasonable degree of protection against hazards that research has not yet identified.

Concurrent exposure to multiple toxic substances may result in health effects that are equal to, less than, or greater than effects resulting from exposure to the individual chemicals. Only a small fraction of the thousands of potential combinations of chemicals have been tested for the health effects of combined exposures. In conformity with the California Air Pollution Control Officers Association (CAPCOA) guidelines, the health risk assessment assumes that the effects of each substance are additive for a given organ system (OEHHA 2003, pp. 1-5, 8-12). Other possible mechanisms due to multiple exposures include those cases where the actions may be synergistic or antagonistic (where the effects are greater or less than the sum, respectively). For these types of exposures, the health risk assessment could underestimate or overestimate the risks.

Cancer Risk and Estimation Process

For carcinogenic substances, the health assessment considers the risk of developing cancer and assumes that continuous exposure to the carcinogen would occur over a 70-year lifetime. The risk that is calculated is not meant to project the actual expected incidence of cancer, but rather a theoretical upper-bound estimate based on the worst-case assumptions.

Cancer risk is expressed in terms of chances per million of developing cancer and is a function of the maximum expected pollutant concentration, the probability that a particular pollutant would cause cancer (called potency factors and established by OEHHA), and the length of the exposure period. Cancer risks for individual carcinogens are added together to yield a total cancer risk for each potential source. The conservative nature of the screening assumptions used means that the actual cancer risks from project emissions would be considerably lower than estimated.
As previously noted, the screening analysis is performed to assess the worst-case risks to public health associated with the proposed project. If the screening analysis were to predict a risk below significance levels, no further analysis would be necessary and the source would be considered acceptable with regard to carcinogenic effects. If however, the risk were to be above the significance level, then further analysis, using more realistic site-specific assumptions, would be performed to obtain a more accurate estimate.

Significance Criteria

Energy Commission staff assesses the maximum cancer impacts from specific carcinogenic exposures by first estimating the potential impacts on the maximum exposed individual. This is a person hypothetically exposed to project emissions at a location where the highest ambient impacts were calculated using the worst-case assumptions as described above. Since the individual's exposure would produce the maximum impacts possible around the source, staff uses this risk estimate as a marker for acceptability of the project's carcinogenic impacts.

Acute and Chronic Noncancer Health Risks

As described earlier, non-criteria pollutants are evaluated for short-term (acute) and long-term (chronic) non-cancer health effects, as well as the noted cancer impacts from usually long-term exposures. The significance of project-related impacts is determined separately for each of the three health effects categories. Staff assesses the noncancer health effects by calculating a hazard index. A hazard index is a ratio obtained by comparing exposure from facility emissions to the safe exposure level (i.e. Reference Exposure Level, or REL) for that pollutant. A ratio of less than 1.0 suggests that the worst-case exposure would be below the limit for safe levels and would thus be insignificant with regarding to health effects. The hazard indices for all toxic substances with the same type of health effect are added together to yield a Total Hazard Index for the source. The Total Hazard Index is calculated separately for acute effects and chronic effects. A Total Hazard Index of less than 1.0 would indicate that cumulative worst-case exposures would not lead to significant noncancer health effects. In such cases, noncancer health impacts from project emissions would be considered unlikely even for sensitive members of the population. Staff would therefore presume that there would be no significant noncancer project-related public health impacts. This assessment approach is consistent with those in the risk management guidelines of both California OEHHA and U.S. EPA.

Cancer Risk

Staff relies upon regulations implementing the provisions of Proposition 65, the Safe Drinking Water and Toxic Enforcement Act of 1986, (Health & Safety Code, §§25249.5 et seq.) for guidance in establishing its significance levels for carcinogenic exposures. Title 22, California Code of Regulations section 12703(b) states that "the risk level which represents no significant risk shall be one which is calculated to result in one or less excess cancer cases within an exposed population of 100,000, assuming lifetime exposure." This risk level is equivalent to a cancer risk of 10 in 1 million, which is also written as 10×10^{-6}. In other words, under state regulations, an incremental cancer risk of greater than 10 in 1 million from a project should be regarded as suggesting a potentially significant carcinogenic impact on public health. The 10 in 1 million risk level is also used by the Air Toxics "Hot Spots" (AB 2588) program as the public notification threshold for air toxic emissions from existing sources.

An important distinction between staff's and the Proposition 65 risk characterization approach is that the Proposition 65 significance level applies separately to each cancer-causing substance, whereas staff determines significance based on the total risk from all the cancer-causing pollutants to which the individual might be exposed in the given case. Thus, the manner in which the significance level concept is applied by staff is more conservative (health-protective) than that applied by Proposition 65. The significant risk level of 10 in 1 million is also consistent with the level of significance adopted by many California air districts. In general, these air districts would not approve a project with a cancer risk estimate of more than 10 in 1 million.

As described above, the initial risk analysis for a project is typically performed at a screening level, which is designed to overstate actual risks, so that health protection could be ensured. Staff's analysis also addresses potential impacts on all segments of the population including the young, the elderly, people with existing medical conditions that may render them more sensitive to the adverse effects of toxic air contaminants, and any minority or low-income populations that are likely to be disproportionately affected by impacts. To accomplish this goal, staff uses the most current acceptable public health exposure levels (both acute and chronic) set to protect the public from the effects of air toxics in question. When a screening analysis shows the cancer risks to be above the significance level, refined assumptions would be applied for likely a lower, more realistic risk estimate. If after refined assumptions, the project's risk is still found to exceed the significance level of 10 in 1 million, staff would require appropriate measures to reduce the risk to less than significant levels. If, after all risk reduction measures have been considered, a refined analysis still identifies a cancer risk of greater than 10 in 1 million, staff would deem such a risk to be significant and would not recommend project approval.

DIRECT /INDIRECT IMPACTS AND MITIGATION

Proposed Project's Construction Impacts and Mitigation Measures

Construction of HHSEGS is expected to take place from the second quarter of 2013 to the fourth quarter of 2016 (a total of 29 months). Construction of the commonly shared facilities would occur concurrently with the construction of Solar Plant 1. Solar Plant 2 construction would occur about 3 months behind that of Solar Plant 1. The applicant conducted the Construction Emissions and Impact Analysis for this site and concluded that "no significant public health effects would be expected during construction." (HHSG 2011a, Appendix 5.1F) Staff concurs with the applicant based upon staff's evaluation of the mitigation measures specified by the applicant as necessary to minimize such impacts. Such potential construction risks are normally associated with exposure to fugitive dust and combustion emissions. Fugitive dust emissions could occur from:

- Dust entrained during site preparation and grading/excavation/trenching at the construction site;
- Dust entrained during onsite movement of construction vehicles on unpaved surfaces;
- Fugitive dust emitted from an onsite concrete batch plant; and
- Wind erosion of areas disturbed during construction activities.

Combustion emissions during construction would result from:

- Exhaust from the diesel construction equipment used for site preparation, grading, excavation, trenching, and construction of onsite and offsite (transmission- and gas pipeline-related) structures;

- Exhaust from water trucks used to control construction dust emissions;
- Exhaust from portable welding machines, small generators, and compressors;
- Exhaust from pickup trucks and diesel trucks used to transport workers and materials around the construction areas;
- Exhaust from diesel trucks used to deliver concrete, fuel, and construction supplies to the construction areas; and
- Exhaust from automobiles used by workers to commute to and from the construction areas.

Diesel Exhaust

The operation of construction equipment would result in air emissions from diesel-fueled construction equipment. Diesel exhaust is a complex mixture of thousands of gases and fine particles and contains over 40 substances listed by the U.S. Environmental Protection Agency (U.S. EPA) as hazardous air pollutants (HAPs) and by the California Air Resources Board (ARB) as toxic air contaminants (TACs). The diesel particulate matter (DPM) is primarily composed of aggregates of spherical carbon particles coated with organic and inorganic substances. Diesel exhaust deserves particular attention mainly because of its ability to induce serious noncancer effects and its status as a likely human carcinogen. The DPM emissions from on-site HHSEGS construction activities are summarized in **Public Health Table 2**.

Public Health Table 2
Maximum Onsite DPM Emissions during Construction

Emitting Activity	Pounds per Day	Tons per Year
Construction Equipment	4.4	0.1

Source: HHSG 2011a, Table 5.9-3.

Diesel exhaust is characterized by ARB as “Particulate Matter from Diesel-Fueled Engines”. The impacts from human exposure may include both short- and long-term health effects. Short-term effects can include increased coughing, labored breathing, chest tightness, wheezing, and eye and nasal irritation. Effects from long-term exposure can include increased coughing, chronic bronchitis, reductions in lung function, and inflammation of the lung. Epidemiological studies strongly suggest a causal relationship between occupational diesel exhaust exposure and lung cancer. Diesel exhaust is listed by the EPA as “likely to be carcinogenic to humans.” (US. EPA, 2003)

Based on a number of health effects studies, the Scientific Review Panel (SRP) on Toxic Air Contaminants in 1998 recommended a chronic REL for diesel exhaust particulate matter of 5 micrograms of diesel particulate matter per cubic meter of air (µg/m3) and a cancer unit risk factor of $3x10^{-4}$ $(\mu g/m3)^{-1}$. The Scientific Review Panel did not recommend a specific value for an acute REL since available data in support of a value was deemed insufficient. On August 27, 1998, ARB listed particulate emissions from diesel-fueled engines as a toxic air contaminant and approved the panel’s recommendations regarding health effects. (OEHHA 2009, Appendix A)

The applicant conducted a health risk assessment for diesel exhaust from construction activities and the results are listed in **Public Health Table 3**. The assessment used the Hot Spots Reporting Program (HARP) - derived risk values for diesel particulate matter together with a nine-year exposure period to calculate this construction-related cancer risk. This approach is as specified in the OEHHA guidelines (OEHHA, 2003). The maximum modeled annual average concentration of diesel particulate matter at any location was calculated to be 0.139 $\mu g/m^3$. The cancer unit risk value from HARP for an assumed 9-year exposure is $5.33 x 10^{-5}$ per $\mu g/m^3$, which is lower than the cancer unit risk of $3 x 10^{-4}$ $(\mu g/m^3)^{-1}$ from SRP/ARB since the one from SRP/ARB is derived for longer-term exposures. The calculated cancer risk is approximately 7.41 in one million[2] which is below the significance level of 10 in one million. As described above, construction of the two power plants of HHSEGS is anticipated to take place over a period of 29 months, which is shorter than 9 years assumed in the applicant's calculations. Therefore, the applicant's analysis should be regarded as conservative because of the inherently conservative exposure-related assumptions made in the modeling analysis. (HHSG 2011a Appendix 5.1F) Staff regards the related conditions of certification in the **Air Quality** section as adequate to ensure that the applicant follows the strict construction practices recognized by the industry and regulatory agencies as effective mitigation against construction emissions in general.

The chronic hazard index for diesel exhaust during construction activities is 0.028 as calculated by staff using a chronic noncancer REL of 5 $\mu g/m^3$. This index is lower than the significance level of 1.0 meaning that there would be no chronic noncancer impacts from construction activities. The potential levels of criteria pollutants from operation of construction-related equipment are discussed in staff's **Air Quality** section along with mitigation measures and related conditions of certification. The pollutants of most concern in this regard are PM10, carbon monoxide (CO), sulfur dioxide (SO_2), and nitrogen dioxide (NO_2).

Public Health Table 3
Construction Hazard/Risk from DPMs

Cancer Unit Risk Used $(\mu g/m^3)^{-1}$	Cancer Risk (in one million)	Significance Level	Significant?
$5.33 x 10^{-5}$ [a]	7.41	10	No
Chronic Noncancer REL ($\mu g/m^3$)	**Hazard Index (HI)**		
5 [b]	0.028	1	No

[a] Obtained by the applicant from HARP for a 9-year exposure period (the derived adjusted method). Source: Applicant.
[b] Source: OEHHA and ARB.

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2 The risk of 7.41 in one million was calculated using the following formula:
Cancer Risk = Concentration of Diesel Exhaust × Cancer Unit Risk = 0.139 $\mu g/m^3$ × $5.33 x 10^{-5}$ per $\mu g/m^3$ = $7.41 x 10^{-6}$

HHSEGS is proposed for an area where the disease of Valley Fever[3] (*Coccidioidomycosis)* may sometimes be present. Construction could disturb a certain percentage of approximately 3,277 acres[4] of top soil that could harbor the *Coccidioides* spores possibly exposing humans to the risk of Valley Fever. On-site workers and visitors could be exposed from inhaling these fungal spores from wind-blown dust generated from soil excavation work. To minimize the risk of getting Valley Fever, Center for Disease Control and Prevention (CDC) recommends the following measures:

- Wear an N95 mask if a person must be in or near a dusty environment, such as a construction zone
- Avoid activities that involve close contact to dust including yard work, gardening, and digging
- Use air quality improvement measures indoors such as HEPA filters
- Take prophylactic anti-fungal medication if deemed necessary by a person's healthcare provider
- Clean skin injuries well with soap and water, especially if they have been exposed to soil or dust

The California Department of Public Health (CDPH) also recommends that "those exposed to dust during their jobs or outside activities in these areas should consider respiratory protection, such as a mask, during such activities." (California Department of Public Health)

Based on CDC and CDPH's recommendations, staff recommends that workers in the vicinity of such dust generation areas wet the soil before any excavation activities, wear protective masks and stay indoors during dust storms and close all doors to avoid dust inhalation. Staff also considers the applicant's dust suppression plans adequate to minimize the risk of getting Valley Fever in areas where *Coccidioides* spores are found. Please also refer to staff's **Worker Safety and Fire Protection** section for more information.

As for the concerns of Valley Fever on public health, in the **Air Quality Section** of this FSA, staff recommends some mitigation measures, including **AQ-SC3 (Construction Fugitive Dust Control)**, **AQ-SC4 (Dust Plume Response Requirement)** and **AQ-SC7 (Site Operation Dust Control Plan)** for the purposes of preventing all fugitive dust plumes from leaving the project boundary. As long as the dust plumes are kept within the project boundary, there won't be any significant concern for Valley Fever adversely affecting public health.

Small quantities of hazardous wastes may be generated during construction of the project. The applicant stated that "hazardous waste management plans will be in place so the potential for public exposure is minimal". Please, refer to staff's **Waste**

[3] Valley fever is an infection that occurs when the spores of the fungus *Coccidioides immitis* enter human's lung through inhalation. When people breathe in these *Coccidioides* spores, they are at risk of developing Valley Fever.

[4] 1,483 acres in Solar Plant 1, 1,510 acres in Solar Plant 2, 103 acres in common area, and 180 acres in the temporary construction area (HHSG 2011a, § 5.6.1).

Management section of this **FSA** for more information on the safe handling and disposal of these and all project-related wastes.

Proposed Project's Operational Impacts and Mitigation Measures

Emission Sources

As previously noted, the proposed HHSEGS facility would be a nominal 500-Megawatt (MW) heliostat mirror and power tower thermal solar electrical generating facility comprised of two plants, HHSEGS 1 (250 MW), and HHSEGS 2 (250 MW). The direct emission of air toxics from solar power generation is minimal; however, the facility would start-up each day with input of energy from natural gas-fueled boilers associated with each plant. These boiler-related emissions would be the source of most of the non-solar emission from the facility. The other sources would include specific operational and maintenance activities necessary to operate and maintain the proposed facilities. These include diesel-fueled emergency generators and fire pumps, each power block's 249-MMBtu[5]/hr natural-gas-fired auxiliary boiler and 15 MMBtu/hr nighttime preservation boilers to maintain minimum system temperatures overnight, and small wet-surface air coolers. The auxiliary boiler would be used during the morning startup cycle to help the plant come up more quickly to operating temperature and to provide power to augment solar operation when solar energy diminishes from cloud cover. It is these sources that would be mostly responsible for most toxic exposures within HHSEGS.

Potential pollutants that could be emitted are listed in **Public Health Table 4** and include both criteria and non-criteria pollutants. These pollutants include certain volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs). Criteria pollutant emissions and impacts from such non-solar sources are examined in staff's **Air Quality** analysis. Since the facility would use dry cooling, there would be no emissions of toxic metals or volatile organic compounds from cooling tower mist or drift. Also, there would be no health risk from the potential presence of the Legionella bacterium responsible for Legionnaires' disease.

[5] Million British thermal units, stands for one million BTUs. BTU is a standard unit of measurement used to denote the amount of heat energy in fuels. A BTU is the amount of heat required to increase the temperature of a pint of water (which weighs exactly 16 ounces) by one degree Fahrenheit.

Public Health Table 4
The Main Pollutants Emitted from the Proposed Project

Criteria Pollutants	Non-criteria Pollutants
Carbon monoxide	Acetaldehyde
Oxides of nitrogen	Acrolein
Particulate matter	Ammonia
Oxides of sulfur	Benzene
Volatile Organic Compounds (VOCs)	1,3-Butadiene
	Ethylbenzene
	Formaldehyde
	Hexane
	Naphthalene
	PAHs (as BaP)
	Propylene
	Toluene
	Xylene
	Diesel Particulate Matter

Source: HHSG 2011a, Table 5.9-4 and Table 5.9-5

Tables 5.9-4, 5.1B-15R, 5.1B-16R and 5.1B-17R of the AFC (HHSG 2011a and CH2 2012p) list the specific non-criteria pollutants that may be emitted as combustion byproducts from HHSEGS boilers and its small wet surface air coolers (WSACs). The emission factors for these pollutants were obtained from the Ventura County Air Pollution Control District. **Public Health Table 5** lists each such pollutant and shows how it would contribute to the total risk obtained from the risk analysis. **Public Health Table 6** (modified from Table 5.9-5 of the AFC) lists the toxicity values used to quantify the cancer and noncancer health risks from the project's combustion-related pollutants. The listed toxicity values include RELs, used to calculate short-term and long-term noncancer health effects, and the cancer unit risks, used to calculate the lifetime risk of developing cancer, as published in the OEHHA's Guidelines (OEHHA 2003) and OEHHA / ARB Consolidation Table of OEHHA/ARB Approved Risk Assessment Health Values (ARB 2011).

Public Health Table 5
Types of Health Impacts and Exposure Routes Attributed to Toxic Emissions

Substance	Oral Cancer	Oral Noncancer	Inhalation Cancer	Noncancer (Chronic)	Noncancer (Acute)
Acetaldehyde			✔	✔	✔
Acrolein				✔	✔
Ammonia				✔	✔
Benzene			✔	✔	✔
1,3-Butadiene			✔	✔	
Ethylbenzene			✔	✔	
Formaldehyde			✔	✔	✔
Hexane				✔	
Napthalene		✔	✔	✔	
Polycyclic Aromatic Hydrocarbons (PAHs, as BaP)	✔		✔		
Propylene				✔	
Toluene				✔	✔
Xylene				✔	✔
Diesel Exhaust			✔	✔	

Source: OEHHA / ARB 2011 and HHSG 2011a, Table 5.9-5

Emission Levels

As previously noted, the health risk from exposure to each project-related pollutant is assessed using the “worst case” emission rates and impacts. Maximum hourly emissions are required to calculate acute (one-hour) noncancer health effects, while estimates of maximum emissions on an annual basis are required to calculate cancer and chronic (long-term) noncancer health effects.

The next step in the assessment process is to estimate ambient concentrations using a screening air dispersion model and assuming conditions that would result in maximum impacts. The applicant’s screening analysis for the noted combustion byproducts was performed using the ARB/OEHHA Hotspots Analysis and Reporting Program (HARP). Ambient concentrations were used in conjunction with Reference Exposure Levels (RELs) and cancer unit risk factors to estimate the cancer and noncancer risks from operations. The applicable exposure pathways for the toxic emissions include inhalation, dermal (through the skin) absorption, soil ingestion, and mother’s milk. This method of assessing health effects is consistent with OEHHA’s Air Toxics Hot Spots Program Risk Assessment Guidelines (OEHHA 2003) referred to earlier.

Public Health Table 6
Toxicity Values Used to Characterize Health Risks

Toxic Air Contaminant	Inhalation Cancer Potency Factor $(mg/kg\text{-}d)^{-1}$	Chronic REL ($\mu g/m^3$)	Acute REL ($\mu g/m^3$)
Acetaldehyde	0.010	140	470 (1-hr) 300 (8-hr)
Acrolein	—	0.35	2.5 (1-hr) 0.7 (8-hr)
Ammonia	—	200	3,200
Benzene	0.10	60	1,300
1,3-Butadiene	0.60	20	—
Ethylbenzene	0.0087	2,000	—
Formaldehyde	0.021	9	55 (1-hr) 9 (8-hr)
Hexane	—	7,000	—
Napthalene	0.12	9.0	—
Polycyclic Aromatic Hydrocarbons (PAHs, as BaP)	3.9	—	—
Propylene	—	3000	—
Toluene	—	300	37,000
Xylene	—	700	22,000
Diesel Exhaust	1.1	5	-

Sources: ARB 2011 and HHSG 2011a, Table 5.9-5

The applicant's HRA was prepared using the latest version (1.4d) of the ARB's HARP model (ARB, 2009b), the ARB February 2011 health database (ARB, 2011), and the OEHHA Hot Spots Program Guidance Manual (OEHHA, 2003). Emissions of non-criteria pollutants from the project were analyzed using emission factors previously approved by ARB. Air dispersion modeling combined the emissions with site-specific terrain and meteorological conditions to analyze the mean short-term and long-term concentrations in air for use in the HRA. The EPA-recommended air dispersion model, AERMOD, was used along with 5 years (2006–2010) of compatible meteorological data from the Pahrump and Henderson, Nevada, meteorological stations. The meteorological data combined surface measurements made at Pahrump and Henderson with upper air data from Elko, Nevada. Because HARP was based on a previous EPA-approved air dispersion model, Industrial Source Complex Short Term, Version 3 (ISCST3), the HARP On-Ramp (ARB, 2009b) was used to integrate the air dispersion modeling output from the required air dispersion model, AERMOD, with the risk calculations in the HARP risk module.

Cancer Risk at the Point of Maximum Impact (PMI)

The applicant first presented the numerical cancer risk for the maximally exposed individual (MEI) which is the individual located at the point of maximum impact (PMI) as well as risks to the MEI at a residence (MEIR). Human health risks associated with emissions from the proposed and similar projects are unlikely to be higher at any other location than at the PMI. Therefore, if there is no significant impact associated with concentrations at the PMI location, it is assumed that there would be insignificant impacts in any other location in the project area. The cancer risk to the MEI at the PMI is referred to as the Maximum Incremental Cancer Risk (MICR). However, the PMI (and thus the MICR) is not necessarily associated with actual exposure because in many cases, the PMI is in an uninhabited area. Therefore, the MICR is generally higher than the maximum residential cancer risk. MICR is based on 24 hours per day, 365 days per year, 70 year lifetime exposure.

Project-Related Impacts within Area Residences

The applicant-calculated cancer risk from maximal residential exposure was for a residence located approximately 1 mile west of the center of Hidden Hills Solar Plant 2, and approximately 300 feet west of the HHSEGS project boundary. Staff's specific interest in the risk to the maximally exposed individual (MEI) in a residential setting is because this risk most closely represents the maximum project-related lifetime cancer risk calculated from the present regulatory assumption of exposure 24 hours per day and 365 days a year over a 70-year lifetime.

Risk to Workers

Cancer risk to potentially exposed workers was presented by the applicant in terms of risk to the maximally exposed individual worker or MEIW. The applicant's assessment is for potential workplace risks, from exposure of shorter duration than for residential risks from 70 years of exposure. Workplace risk is presently assumed by the regulatory agencies to result from exposure lasting 8 hours per day, 245 days per year, over a 40-year period.

As described above, the inhalation cancer potency factors and RELs used to characterize health risks associated with modeled ambient concentrations are taken from the Consolidated Table of OEHHA/ARB Approved Risk Assessment Health Values (ARB, 2011) and are presented in **Public Health Table 6**. Health risks potentially associated with ambient concentrations of carcinogenic pollutants were calculated in terms of excess lifetime cancer risks. The total cancer risk at any specific location is found by summing the contributions from the individual carcinogens.

The applicant's screening health risk assessment for the project including emissions from all sources resulted in a maximum acute Hazard Index (HI) of 0.003 and a maximum chronic HI of 0.001 (CH2 2012p, Table 5.9-6R). As **Public Health Table 7** shows, both acute and chronic hazard indices are less than 1.0, indicating that no short- or long-term adverse health effects are expected. As shown in **Public Health Table 7**, total worst-case individual cancer risk was calculated by the applicant to be 2.8 in 1 million at the point of maximum impact (PMI).

Public Health Table 7
Operation Hazard/Risk at Point of Maximum Impact: Applicant Assessment

Type of Hazard/Risk	Hazard Index/Risk	Significance Level	Significant?
Acute Noncancer	0.003	1.0	No
Chronic Noncancer	0.001	1.0	No
Cancer Risk			
PMI[a]	2.8 in one million	10 in one million	No
MEIR[b]	0.5 in one million		No
MEIW[c]	0.4 in one million		No

[a] PMI = Point of Maximum Impact
[b] MEIR = MEI of residential receptors
[c] MEIW = MEI for workers
Source: CH2 2012p, Table 5.9-6R

To evaluate the applicant's analysis, staff used data from 2010 and conducted another analysis of cancer risks and acute and chronic hazards due to combustion-related emissions from the proposed HHSEGS project. The analysis was conducted for the general population, sensitive receptors, nearby residences, and the workers. The sensitive receptors, as previously noted, are subgroups that may be at greater risk from exposure to emitted pollutants, and include the very young, the elderly, and those with existing illnesses. Health risks were also evaluated at the nearest residence because population in the vicinity of a project could be seen as having a greater chance of long-term exposure to TACs at potentially significant levels. The nearest residence to the HHSEGS property boundary is approximately 300 feet west of the project boundary. The nearest residence to any power block equipment is approximately 3,500 feet south of the Solar Plant 2 power block and about 950 feet south of the project's southern boundary. The previously noted St. Therese Mission project, a commercial facility under construction, is approximately 0.5 mile southeast of the HHSEGS site. It is considered a potential sensitive receptor location because the facility would include a chapel, garden, restaurant, a visitor's center that will include a children's playground, and a care-taker residential unit.

The following is a summary of the most important elements of staff's heath risk assessment for HHSEGS:

- The analysis was conducted using the ARB/OEHHA Hotspots Analysis and Reporting Program (HARP), Version 1.4d.

- Emissions would be from the concurrent operation of all four natural-gas-fired boilers, three emergency diesel generators (one in the common facility area), and three diesel fire pump engines (one in the common facility area). Because evaporative drift emissions from the wet surface air coolers (WSACs) would be so low and potential impacts would be minimized through the use of high efficiency drift eliminators and deionized water with very low total dissolved solids (TDS) levels, these units were not included in the HRA.

- Exposure pathways included inhalation, dermal absorption, soil ingestion, and mother's milk.

- The local meteorological data, local topography, grid, residence and sensitive receptors, source elevations and site-specific and building-specific input parameters used in the HARP model were obtained from the AFC and modeling files provided by the applicant.
- The emission factors and toxicity values used in staff's analysis of cancer risk and hazard were obtained from the AFC and are listed in **Public Health Table 6**.
- Cancer risk was determined under the derived (OEHHA) risk assessment method.
- The following receptor locations were quantitatively evaluated in staff's analysis:
  - point of maximum impact (PMI), approximately 1 mile west of the center of Hidden Hills 2 (70-year residential scenario);
  - location of the nearest residence, also approximately 1 mile west of the center of Hidden Hills 2, approximately 300 feet west of the HHSEGS project boundary (70-year residential scenario);
  - St. Therese Mission, approximately 0.5 mile southeast of the HHSEGS site (70-year residential scenario); and,
  - Workers: occupational exposure patterns assuming exposure of 8 hours/day, 145 days/year for 40 years

Results of staff's analysis are summarized in **Public Health Table 8** and are compared to the results estimated by the applicant and presented in the AFC. The results estimated by staff and applicant are very similar, which verified the analysis of the applicant. It can also be seen from these results that the cancer and noncancer risks from HHSEGS operation would be significantly below their respective significance levels meaning that no health impacts would occur within all segments of the surrounding population. Since the project's combustion emissions of concern reflect the efficacy of the applicant's proposed emission controls, (use of natural gas as fuel and oxidative catalyst for emission minimization) staff recommends neither mitigation measures nor related conditions of certification.

As for potential impact in Nevada, the results show that the risks of receptors in California close to HHSEGS are lower than the significance level. Therefore, staff concludes that there won't be any impacts from HHSEGS on either California or Nevada.

Public Health Table 8
Results of Staff's and Applicant's Analyses for Cancer Risk and Chronic Hazard – HHSEGS Operations

	Staff's Analysis (by using data from 2010)			Applicant's Analysis		
Receptor Location	Cancer Risk[a] (per million)	Chronic HI[b]	Acute HI[b]	Cancer Risk[a] (per million)	Chronic HI[b]	Acute HI[b]
PMI	2.64	0.0013	0.0028	2.8	0.001	0.003
Nearest residence [c] MEIR	0.42	0.00031	0.0015	0.5	0.0002	0.002
Worker MEIW	0.4	-	-	0.4	-	-
St. Therese Mission	0.113	0.000059	-	-	-	-

[a] Significant level = 10 per million.
[b] HI = Hazard Index, Significant level = 1.
[c] Location of the nearest residence with a 70-year residential scenario.

CUMULATIVE IMPACTS AND MITIGATION

Within the 6-mile radius of the HHSEGS site, neither newly permitted sources nor other sources of toxic air pollutants are reasonably anticipated in the near future except for the St. Therese Mission project. Additional planned development projects that have not filed applications for air permits include the Pahrump Valley General Aviation Airport (approximately 10 miles away), the Element Power Solar Project (approximately 7 miles northeast of the proposed project), and the Sandy Valley Solar Project (approximately 5 miles east of the proposed project). Potential cumulative impacts of other development projects within 10 miles of the project site are discussed in Appendix 5.1G of the AFC. Since all related toxic emissions would be below significant thresholds and highly localized, staff does not expect their additive impacts to be significant, particularly in light of their distance from the project site.

As discussed above, the contribution of HHSEGS to both cancer risk and chronic and acute noncancer impacts would be very small even in a cumulative context including other regional sources; the estimates of cancer and noncancer risks from the project would be less than significant. Its contribution to area health impacts would thus be less than significant in a cumulative context.

COMPLIANCE WITH LORS

Staff has conducted a human health risk assessment for the proposed HHSEGS project and found no potentially significant adverse impacts for any receptors, including sensitive receptors. In arriving at this conclusion, staff notes that its analysis complies with all directives and guidelines from the Cal/EPA Office of Environmental Health Hazard Assessment and the California Air Resources Board. Staff's assessment is biased towards protection of public health and takes into account the most sensitive individuals in the population. Using extremely conservative (health-protective) exposure and toxicity assumptions, staff's analysis demonstrates that members of the public potentially exposed to toxic air contaminant emissions of this project—including sensitive receptors such as the elderly, infants, and people with pre-existing medical conditions—will not experience any acute or chronic significant health risk or any significant cancer risk as a result of that exposure.

Additionally, staff has reviewed **Socioeconomics Figure 1**, which shows the environmental justice population is not greater than fifty percent within a six-mile buffer of the proposed HHSEGS and therefore, there would not be a disproportionate **Public Health** impact resulting from construction and operation of the proposed project to an environmental justice population.

Staff believes that it incorporated every conservative assumption called for by state and federal agencies responsible for establishing methods for analyzing public health impacts. The results of that analysis indicate that there would be no direct or cumulative significant public health and safety impact on any population in the area. Staff therefore concludes that construction and operation of the HHSEGS will be in compliance with all applicable LORS regarding long-term and short-term project impacts in the area of public health.

NOTEWORTHY PUBLIC BENEFITS

It is noteworthy that a solar electric generating facility such as the proposed HHSEGS project would emit significantly less TACs to the environment than most other energy sources available in California such as natural gas or biomass, thereby reducing the general public's health risks that would otherwise occur with these other energy sources. At the same time, the proposed HHSEGS would provide much needed electrical power to California residences and businesses, and contribute to electric reliability. Electrical power is not only necessary to maintain a functioning society, but it also benefits many individuals who rely on powered equipment for their health (such as dialysis equipment and temperature control equipment). For example, it is documented that during heat waves in which elevated air-conditioning use causes an electrical blackout, hospitalizations and deaths due to heat stroke are increased.

PUBLIC AND AGENCY COMMENTS ON THE PSA

Staff received some comments regarding soil stabilization chemicals, Valley Fever and health risk assessment. Please refer to **Appendix 1**, PSA Comment matrix – Public Health section, for details.

PROPOSED FINDINGS OF FACT

Based on the analysis, staff recommends the following findings:

- The HHSEGS project would be located in the Great Basin Valleys Air Basin (GBVAB) and within the Great Basin Unified Air Pollution Control District (GBUAPCD).
- During construction, no significant public health effects from diesel exhaust are

expected and no mitigation measures are necessary. Applicant should follow strict construction practices that incorporate safety and compliance with applicable LORS.

- During operation, the potential public health risks associated with operation of the HHSEGS would be insignificant. No significant adverse cancer, short-term or long-term health effects to any members of the public, including low income and minority populations, from project toxic emissions would be expected.
- Staff conducted an adequate analysis of the project's contributions to cumulative public health impacts. The TAC emissions contribution from the HHSEGS project would be relatively small regionally and locally, thus the overall impact of the project on regional and local public health would not be CEQA significant.
- Construction and operation of the HHSEGS would be in compliance with all applicable LORS regarding long-term and short-term project impacts in the area of public health.

CONCLUSIONS

Staff has analyzed the potential public health risks associated with construction and operation of the HHSEGS and does not expect any significant adverse cancer, short-term, or long-term health effects to any members of the public, including low income and minority populations, from project toxic emissions. Staff also concludes that its analysis of potential health impacts from the proposed HHSEGS uses a highly conservative methodology that accounts for impacts to the most sensitive individuals in a given population, including newborns and infants. According to the results of staff's health risk assessment, emissions from the HHSEGS would not contribute significantly or cumulatively to morbidity or mortality in any age or ethnic group residing in the project area.

MITIGATION MEASURES/PROPOSED CONDITIONS OF CERTIFICATION

No conditions are proposed.

ACRONYMS

AFC	Application for Certification
ARB	California Air Resources Board
ATC	Authority to Construct
Btu	British thermal unit
CAA	Clean Air Act (Federal)
CAL/EPA	California Environmental Protection Agency
CAPCOA	California Air Pollution Control Officers Association
CDC	Center for Disease Control and Prevention
CDPH	California Department of Public Health
CEC	California Energy Commission (or Energy Commission)
CEQA	California Environmental Quality Act
CO	Carbon Monoxide
CO_2	Carbon Dioxide
DPMs	Diesel Particulate Matters
FSA	Final Staff Assessment
GBUAPCD	Great Basin Unified Air Pollution Control District
GVAB	Great Valleys Air Basin
HAPs	Hazardous Air Pollutants
HARP	Hot Spots Reporting Program
HRA	Health Risk Assessment
HHSEGS	Hidden Hills Solar Electric Generating System (proposed project)
HI	Hazard Index
lbs	Pounds
LORS	Laws, Ordinances, Regulations and Standards
MACT	Maximum Achievable Control Technology
mg/m^3	milligrams per cubic meter
MMBtu	Million British thermal units
MW	Megawatts (1,000,000 Watts)
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_3	Nitrates
NOx	Oxides of Nitrogen *or* Nitrogen Oxides
O_2	Oxygen
O_3	Ozone

OEHHA	Office of Environmental Health Hazard Assessment
PAHs	Polycyclic Aromatic Hydrocarbons
PM	Particulate Matter
PM10	Particulate Matter less than 10 microns in diameter
PM2.5	Particulate Matter less than 2.5 microns in diameter
ppm	Parts Per Million
ppmv	Parts Per Million by Volume
ppmvd	Parts Per Million by Volume, Dry
PSA	Preliminary Staff Assessment (this document)
RELs	Reference Exposure Levels
SO_2	Sulfur Dioxide
SO_3	Sulfate
SOx	Oxides of Sulfur
SJVAB	San Joaquin Valley Air Basin
SRP	Scientific Review Panel
SRSG	Solar Receiver Steam Generator
TACs	Toxic Air Contaminants
TDS	Total Dissolved Solids
VOCs	Volatile Organic Compounds
WSACs	Wet Surface Air Coolers

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PUBLIC HEALTH

List of Comment Letters

		Public Health Comments?
1	Inyo County	
2	Bureau of Land Management	
3	National Park Service	
4	The Nature Conservancy	
5	Amargosa Conservancy	
6	Basin & Range Watch	
7	Pahrump Paiute Tribe	
8	Richard Arnold, Pahrump Piahute Tribe	
9	Big Pine Tribe of Owens Valley	
10	Intervenor Cindy MacDonald	X
11	Intervenor Center for Biological Diversity	
12	Intervenor, Old Spanish Trail Association	
13	Applicant, BrightSource Energy, Inc.	X

Comment #	DATE		COMMENT	RESPONSE
10	**July 21, 2012**	**Intervenor Cindy MacDonald**		
10.1	**p. 3-16 #6**		What are the public health implications (if any) if any of these considerations increase fugitive and windblown dust (PM10/PM2.5 particles) due to lack of site suitability (soils, road surface, aggregate, natural drainage) in terms of applying either of these two CARB pre-certified products?	Soil stabilizers are only one of a suite of mitigation measure used to control onsite fugitive and windblown dust, and will be used where effective and appropriate. Staff also recommends other mitigation measures and best practices, such as **AQ-SC3 (Construction Fugitive Dust Control)**, **AQ-SC4 (Dust Plume Response Requirement)** and **AQ-SC7 (Site Operation Dust Control Plan)**, for the purpose of minimizing all fugitive dust plumes and preventing them from leaving the project boundary. Preventing dust plumes from leaving the project boundary is a way to minimize concern for public health. Please note that dust plumes are transitory and temporary, depending on specific project activities under way, soil conditions, and meteorological conditions.
10.2	**p. 3-22 #3**		What mitigation measures does the CEC Staff recommend to protect public health during the construction and operational phases of the proposed project to insure air quality standards don't exceed significant thresholds of PM10/PM2.5 fugitive and windblown dust emissions for wind speeds occurring in the project area outside the currently undefined definition of "normal"?	The mitigation measures and best practices that address PM10/PM2.5 are included in **AQ-SC1** through **AQ-SC7** and **AQ-SC9** for construction and operation of the project. Please see the **Air Quality** section for details.

10.3	**p. 3-22 #4**		How will the CEC or the GBUAPCD monitor fugitive and windblown dust levels during the operational portion of the proposed project to detect levels and frequency of PM10/PM2.5 emissions exceeding significant thresholds and posing threats to public health?	The mitigation measures include **AQ-SC7** for operation of the project. Please see **Air Quality** section for details.
10.4	**p. 3-23 # 1**		Which regulatory agencies are CEC Staff referring to that recognize this is an appropriate mitigation measure the public can take to protect themselves from Valley Fever?	Staff used regulatory agencies to reflect the fact that the necessary exposure reduction measures are those specified by regulatory agencies such Center for Disease Control and Prevention (CDC) and California Department of Public Health (CDPH) as responsible for minimizing public exposure to dust and the causative agent of Valley Fever. To avoid confusion, in response to public comments staff has edited the **Public Health** section. Please see **Public Health** and **Worker Safety and Fire Protectio**n sections for details.
10.5	**p. 3-23 # 2**		Where have these regulatory agencies posted this policy and does it supersede laws aimed at protecting public health from known infections such as those produced by the fungus responsible for inducing Valley Fever?	Staff edited this section to indicate that these regulatory agencies such as CDC and CDPH recommend measures to reduce the risk of exposure to dust and the causative agent of Valley Fever. Please see **Public Health** section for details.
10.6	**p. 3-23 # 3**		How will tourists passing through and those visiting the area for recreational purposes protect themselves from air borne fungus resulting from project site disturbances as they have no place to go indoors?	As noted before, staff proposed some mitigation measures in the **Air Quality** section to keep any generated windblown dust within the project area to protect the workers and the public, including visitors. Also, based on the recommendations of CDC and CDPH, tourists and others can reduce their risk of getting valley fever by wearing N95 masks. Please note that dust plumes are transitory and temporary, depending on the specific project activities under way, soil conditions, and meteorological conditions.
10.7	**p. 3-23 # 4**		How will customers at the St. Theresa Mission and Front Site Training Institute protect themselves from exposure due to the proposed projects volume of site disturbance during both the construction and operational phase of the proposed project?	Based on the recommendations of CDC, the following measure can be taken to reduce the risk of getting valley fever: • They should stay inside or wear an N95 mask when a dust storm occurs. • The St. Theresa Mission and Front Site Training Institute can use HEPA filters in the heating, ventilation and air conditioning (HVAC) system to improve the indoor quality. • See **Public Health** section for general remedies recommended by CDC and CDPH.
10.8	**p. 3-23 # 5**		What is the feasibility of local residents and others in the area “staying indoors” during times when wind events last for longer than 1 day as is known to occur in the area?	Based on the recommendations of CDC, people venturing out of doors during a dust storm can wear a N95 mask or take prophylactic anti-fungal medication as noted in **Public Health** section. Please note that dust plumes are transitory and temporary, depending on the specific project activities under way, soil conditions, and meteorological conditions.

10.9	**p. 3-23 # 6**		How does the currently proposed mitigation measure of staying indoors during potential exposure times comply with Nuisance Regulation H&SC §41700?	In this specific case, the nuisance impact of concern is from exposure to the causative agent of valley fever through wind-blown dust. To avoid this nuisance, several mitigation measures in the Air Quality Section are implemented in the form of conditions of certification, including **AQ-SC3 (Construction Fugitive Dust Control)**, **AQ-SC4 (Dust Plume Response Requirement)** and **AQ-SC7 (Site Operation Dust Control Plan)**. These are intended to keep the dust plumes within the project boundary. Please note that dust plumes are transitory and temporary, depending on the specific project activities under way, soil conditions, and meteorological conditions.
10.1O	**p. 3-23 # 7**		Considering the proposed project site will experience continued soil disturbance over the project's lifetime due to critically required maintenance activities, is this the only mitigation plan that can be utilized to protect public health for the next 25-30 years if the project is approved?	In the **Air Quality** Section, staff also recommends some mitigation measures which would be implemented as required conditions of certification, including **AQ-SC3 (Construction Fugitive Dust Control)**, **AQ-SC4 (Dust Plume Response Requirement)** and **AQ-SC7 (Site Operation Dust Control Plan**). These are required for the purposes of minimizing dust plumes and preventing fugitive dust plumes from leaving the project boundary. Please note that dust plumes are transitory and temporary, depending on the specific project activities under way, soil conditions, and meteorological conditions.
10.11	**p. 3-29 #1**		What does this chart reflect and model besides cancer risks?	This chart addresses three categories of health impacts: (1) acute (short-term) health effects, (2) chronic (long-term) noncancer effects, and (3) cancer risk (also long-term). In cancer risk assessment, we use the criterion of 10 per million (10 x 10-6) as the significance criterion. If an incremental cancer risk is less than 10 in 1 million from a project, then the lifetime risk of getting cancer is less than significant and no mitigation measures are necessary. In noncancer risk assessment for both acute and chronic health effects, we use 1 as the significance criterion. If a hazard index is less than 1.0, it suggests that the worst-case exposure would be below safe levels and would thus be insignificant with regard to noncancer health effects. We assess these three health impacts for: (1) point of maximum impact (PMI), (2) residential receptors, and (3) workers. Furthermore, we assume that the person is exposed to these levels continuously for a 70-year period for PMI and residential receptors, while we assume exposure of 8 hours/day, 145 days/year for 40 years for workers.
10.12	**p. 3-29 #2**		What chemicals (by specific component) and emissions does this chart represent under "Acute Health Hazard Index" and "Chronic Health Hazard Index"?	According to Table 5.1-30R of the AFC (Summary of Toxic Air Contaminant Emissions from Project Operation), the toxic air contaminants emitted from the natural gas-fired boilers include Acetaldehyde, Acrolein, Benzene, Ethylbenzene, Formaldehyde, Hexane, Napthalene, Polycyclic Aromatics, Propylene, Toluene and Xylene. The toxic air contaminant emitted from emergency engines, fire pump engines and mirror cleaning vehicles and pump engines is Diesel Particulate Matter.
10.13	**p. 3-29 #3**		Does it incorporate just carcinogenic risks exclusively or does it incorporate other health risks such as respiratory conditions? If so, which ones?	Carcinogenic risks and non-carcinogenic risk are always calculated separately by using different assumptions, methodologies and criteria. Different toxic air contaminants may have various health effects. Please refer to **Public Health Table 5 (Types of Health Impacts and Exposure Routes Attributed to Toxic Emissions)** in staff's **Public Health** section for details.

10.14	**p. 3-30 #4**		Did the applicant model or provide any Health Risk of Diesel Exhaust assessment for potential respiratory impacts or other health impacts to workers or local populations resulting from diesel emissions besides cancer? If not, why not?	Yes. The applicant conducted a health risk assessment specifically for diesel exhaust from construction activities: the cancer risk is 7.41 in one million (below the significance level of 10) and the hazard index is 0.028 (well below the significance level of 1.0). The applicant also conducted a health risk assessment for all toxic air contaminants including diesel exhaust from operation activities.
10.15	**p. 3-30 #5**		Did the CEC Staff request any additional Health Screening Risks of Diesel Exhaust from the applicant besides the supplied cancer risk assessment or consult with the applicant in any way prior to the applicant initiating the parameters for the Health Screening Risk modeling? If not, why not?	No, staff did not request the applicant to conduct any additional screening, nor did staff consult with the applicant prior to the applicant conducting and submitting their analysis. Staff reviewed applicant's analysis and found it acceptable because it followed the ARB/CA OEHHA (2003) guidelines (Air Toxics Hot Spots Program Risk Assessment Guidelines, The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments) for health risk assessment and used appropriate assumptions (which require adjusting the 70-year lifetime exposure risk for an exposure period of 9 years). Staff also verified that the risk factors from The Scientific Review Panel (SRP) and non-cancer Reference Exposure Levels (RELs) from OEHHA/ARB (2011) are used appropriately by the applicant. Therefore, staff concluded that the applicant's analysis was appropriately conducted and therefore it was not necessary to request them to conduct any additional health risk assessment. Moreover, staff used data from 2010 and conducted our own, additional health risk assessment to evaluate health risks and compared our results to the applicant's analysis. Please refer to staff's **Public Health** section for details.
10.16	**p. 3-30 #6**		Where is the "produce ingestion pathway" referred to in the GBUAPCD's response or in the AFC files or subsequent documents?	A "produce ingestion pathway" refers to being exposed through consumption of locally grown plant foods. Toxic air contaminants may affect people directly if they inhale or ingest contaminated air, water, or soil. Exposure is also possible via secondary pathways such as a food chain. As a simplified example, TACs released from a boiler may settle onto a vegetable garden and become mixed into the soil. Plants such as fruits and vegetables growing there could absorb the TACs through their roots and into their edible portions. People who then eat the plants (or eat the animals that ate the plants) might then be exposed to the pollutant through ingestion. However, since only small amounts of TACs would be emitted from this project, and produce ingestion is an indirect pathway, staff believes the risk from this pathway is minimal, and it is reasonable to include only the following pathways in health risk assessment: inhalation, dermal (through the skin) absorption, soil ingestion, and mother's milk.
10.17	**p. 7-2 #6**		How does the CEC Staff determine potentially significant impacts, significant impacts and impacts that cannot be mitigated – including those that may affect public health and resources - if these project components have yet to be drawn, evaluated or assessed by qualified professionals in compliance with industry standards?	In cancer risk assessment, Energy Commission staff use 10 in 1 million as the significance criterion. If an incremental cancer risk is less than 10 in 1 million from a project, then the lifetime risk of getting cancer is less than significant and no mitigation measures are necessary. The 10 in 1 million risk level is also used by the Air Toxics "Hot Spots" (AB 2588) program as the public notification threshold for air toxic emissions from existing sources. In noncancer risk assessment for both acute and chronic health effects, Energy Commission staff use 1.0 as the significance criterion. If a hazard index is less than 1.0, it suggests that the worst-case exposure would be below safe levels and would thus be insignificant with regard to noncancer health effects. This assessment approach is consistent with those in the risk management guidelines of both California OEHHA and U.S. EPA. Please see "**METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE**" in **Public Health** section for details.

10.18	**p. 14-18 #7**		If the applicant and/or CEC CPM approve the use of Pennz-Suppress D for dust suppression over the life of the project, what potential impacts will this product have to water, water quality and biological resources in and around the proposed project site?	Staff found that the soil stabilizers for dust control measures which would be used by the applicant are the ones pre-certified by the California Air Resources Board (ARB). One criterion to be eligible for pre-certification by ARB is that they would "not pose a significant hazard to public health and safety or the environment." (ARB Website http://www.arb.ca.gov/eqpr/midwestevalrpttxt.pdf) In other words, soil stabilizing materials used onsite must be non-toxic as required by Energy Commission requirements, by the ARB and by most Air Districts. Therefore, staff recommends use of soil stabilizers to control fugitive dust when necessary.
Comment #	**DATE**		**COMMENT**	**RESPONSE**
13	**July 23, 2012**	**Applicant -- BrightSource Energy, Inc.**		
13.1	**p. 228 Comments #1**			Staff corrected the error.
13.2	**p. 228 Comments #2**			Staff made some changes. Please see **Public Health** section for details.
13.3	**p. 229 Comments #3**			Staff made the change.
13.4	**p. 229 Comments #4**			Staff made the change.
13.5	**p. 229 Comments #5**			Staff made the change.
13.6	**p. 229 Comments #6**			Staff made the change.

SOCIOECONOMICS

Testimony of Jim Adams – Growth-Inducing Impacts
Steven Kerr – Socioeconomics
Richard McCann – Fiscal Impact Analysis

SUMMARY OF CONCLUSIONS

Energy Commission staff concludes that construction and operation of the Hidden Hills Solar Electric Generating System (HHSEGS) would not cause significant direct, indirect, or cumulative adverse socioeconomic impacts on the project area's housing, schools, parks, fire and emergency medical services, or law enforcement. Staff also concludes that the project would not induce a substantial population growth or displacement of population, or induce substantial increases in demand for housing. In addition, the project's natural gas pipeline and electric transmission line would not induce any additional growth in the project area.

The minority population in Socioeconomics Figure 1 does not constitute an environmental justice population as defined by *Environmental Justice: Guidance Under the National Environmental Policy Act* and would not trigger further scrutiny for purposes of an environmental justice analysis.

HHSEGS would both create new fiscal revenues for Inyo County as well as new costs associated with providing project-related services and infrastructure. Staff prepared the report, *Socioeconomic and Fiscal Impacts of the Hidden Hills Solar Electric Generation System on Inyo County,* to determine the benefits and the costs of the HHSEGS to Inyo County, which is included as **Appendix Socio-1** of this document. Staff concluded that the sales tax revenue generated for the county during the construction period would be much greater than the estimated potential county expenditures.

Staff-proposed Condition of Certification **SOCIO-1** would ensure project compliance with state and local laws, ordinances, regulations, and standards (LORS) related to socioeconomics.

INTRODUCTION

Staff's socioeconomics impact analysis evaluates the project's induced changes on existing population, employment patterns, and community services (emergency medical services, police protection, schools, and parks and recreation). Staff discusses the estimated impacts of the construction and operation of the HHSEGS, as described in the Application for Certification (AFC), on local communities, community resources, and public services, and provides a discussion of the estimated beneficial economic impacts of the construction and operation of the proposed project. Staff also looked at the potential for the HHSEGS natural gas pipeline and electric transmission line to induce growth in the project area.

The subject areas of utilities, fire protection, water supply, and wastewater disposal are analyzed in the **Reliability**, **Worker Safety and Fire Protection**, and **Water Supply** sections of this Final Staff Assessment (**FSA**).

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

Socioeconomics Table 1 contains socioeconomics laws, ordinances, regulations, and standards (LORS) applicable to the proposed project.

SOCIOECONOMICS Table 1
Laws, Ordinances, Regulations, and Standards (LORS)

Applicable Law	Description
State	
California Education Code, section 17620	The governing board of any school district is authorized to levy a fee, charge, dedication, or other requirement for the purpose of funding the construction or reconstruction of school facilities.
California Government Code, sections 65996-65997	Except for a fee, charge, dedication, or other requirement authorized under Section 17620 of the Education Code, state and local public agencies may not impose fees, charges, or other financial requirements to offset the cost for school facilities.
California Revenue & Taxation Code, section 73	Allows property tax exclusion for certain types of solar energy systems. Assembly Bill 1451 extended the current property tax exclusion for new construction of solar energy systems to expire on January 1, 2017. If a project has started construction prior to the expiration date it would be eligible for the exclusion. After the exclusion sunsets, any solar energy system constructed remains exempt from property tax for so long as the property does not change ownership.

SETTING

The proposed HHSEGS is located in Inyo County, California, along the California-Nevada border. The proposed HHSEGS is located approximately 8 miles[1] south of Pahrump, Nevada, and approximately 45 miles west of Las Vegas, Nevada. A sparsely populated, rural residential community, Charleston View, lies immediately south of the proposed project site. For more information about the surrounding land uses please see the **Land Use** section of this document.

Inyo County encompasses a little over 10,000 square miles in area; approximately two percent (2%) is privately owned, and the remaining 98 percent is publicly owned. The Federal Government holds 92 percent of the land, the State of California holds 2 percent, and the City of Los Angeles holds 4 percent (US Census 2010a, INYO 2008). Over the last ten years (2000 to 2010) Inyo County's population has increased by 3.3 percent (17,945 to 18,546) (INYO 2010a). Most of the population growth occurred in the City of Bishop (8.5 percent, 3,575 to 3,879) in the northern tip of the county, while the remainder of the county grew by about 2 percent (14,370 to 14,667). Tecopa grew 51.5 percent (99 to 150) while Shoshone's population decreased by 40.4 percent (52 to 31).

[1] 28 miles is the driving distance from the proposed project to Pahrump via Old Spanish Trail Highway (also known as Tecopa Road) and Nevada State Route 160. The direct distance from southern Pahrump to the proposed project's Solar Field 1 is 8 miles.

While Inyo County is the second largest county in California by land area, it has the state's sixth smallest county population. Given most of Inyo County land is publicly owned, and with its relatively small population, it is reliant on a tax base that is much smaller than many other counties in California. This dynamic has resulted in systemic budgetary challenges for county leaders, especially as they strive to provide services to remote areas within its borders that would not necessarily be a concern in other California counties with larger populations and budgets, such as San Bernardino County directly to the south.

The median age in Inyo County is 45 years old, compared with California's median age of 34.9, and Nye and Clark counties median age of 47.4 and 35.1, respectively (INYO 2008, US Census 2010b). Inyo County's workforce is predominantly employed in the retail trades industry (14.1 percent, 1,200 workers) and in the health care and social assistance industry (14.0 percent, 1,197 workers). About 9 percent of Inyo County's workforce is employed in the construction industry (764 workers).

To assess project impacts, the AFC identified a Region of Influence as including Inyo County in California and Clark and Nye counties in Nevada (HHSG 2011a, pg. 5.10-4). Normally, for the purposes of assessing project impacts, staff defines the "local workforce" during project construction as residing within a two-hour commute of the project. Based on the Electric Power Research Institute's (EPRI's) report, *Socioeconomic Impacts of Power Plants*, construction workers will commute as much as two hours to construction sites from their homes and one hour during operations, rather than relocate. In researching the issue of where construction labor would come from, staff contacted the Kern, Inyo & Mono Counties of California Building Trades Council (BTC) and the United Association Local 525 (Plumbers, Pipefitters, and HVAC Refrigeration Technicians) in Las Vegas (CEC 2011z and 2011aa).

The responses from the BTC and United Association Local 525 both indicate if the project contractor enters into a Project Labor Agreement with the affiliates of the BTC, because of the union structure and their construction workforce dispatch rules, nearly all of the construction workforce would come from California. If the applicant does not enter into a Project Labor Agreement, the construction workforce would mostly come from Clark and Nye counties in Nevada. At the March 13, 2012 Inyo County Board of Supervisors meeting, the applicant stated that they have selected Bechtel as the engineering, procurement, and construction (EPC) contractor for the project, and that Bechtel would likely enter in to a Project Labor Agreement (INYO 2012i, p.109, p. 111). The applicant later clarified that the selection of Bechtel as the EPC contractor is not yet final, but Bechtel is performing preconstruction services under a Master Services Contract (CH2 2012ee, p. 231).

On October 1, 2012, the applicant filed an Updated Workforce Analysis (UWA). The AFC had originally stated that 95 percent of the construction workforce was anticipated to be drawn from Nevada and 5 percent from California. The applicant now anticipates that 70 percent of the construction workforce would be drawn from California and 30 percent from Nevada. The onsite peak construction workforce also increased from 1,033 workers in Month 14, to 2,293 workers in Month 19. The new UWA assumptions of average and peak workforce estimates of 1087 and 2293 workers, respectively, has been incorporated into this FSA. (CH2 2012jj)

Staff defines the study area related to project impacts on population and housing as Inyo County (including its southern towns of Tecopa and Shoshone), and Clark and Nye counties in Nevada. The study area for impacts to sheriff and emergency services is Inyo County. The study area for environmental justice is a six-mile radius buffer from the project site.

USING THE 2010 US CENSUS AND US CENSUS BUREAU'S AMERICAN COMMUNITY SURVEY IN STAFF ASSESSMENTS

The detailed social, economic, and housing information previously collected only in the decennial census was not collected for the 2010 Census (US Census 2011a). This information is now collected through the U.S. Census Bureau's American Community Survey (ACS). Decennial census data is a 100 percent count collected once every ten years and represents information from a single reference point (April 1st). The main function of the decennial census is to provide *counts* of people for the purpose of congressional apportionment and legislative redistricting. ACS estimates are collected from a sample of the population based on information compiled continually and aggregated into one, three, and five-year estimates ("period estimates"), released every year. The primary purpose of the ACS is to measure the changing social and economic *characteristics* of the U.S. population. As a result, the ACS does not provide official counts of the population in between censuses. Instead, the Census Bureau's Population Estimates Program will continue to be the official source for annual population totals, by age, race, Hispanic origin, and sex.

ACS collects data at every geography level from the largest level (nation) to the smallest level available (block group[2]). Census Bureau staff recommends the use of data no smaller than the Census tract[3] level. [4] Data from the five-year estimates is used for our analysis as it provides the greatest detail at the smallest geographic level. Because ACS estimates come from a sample population, a certain level of variability is associated with these estimates. This variability is expressed as a margin of error (MOE). The MOE is used to calculate the coefficient of variation (CV). CVs are a standardized indicator of the reliability of an estimate. While not a set rule, the US Census Bureau considers the use of estimates with a CV more than 15 percent cause

[2] Census Block Group - A statistical subdivision of a census tract. A BG consists of all tabulation blocks whose numbers begin with the same digit in a census tract; for example, for Census 2000, BG 3 within a census tract includes all blocks numbered between 3000 and 3999. The block group is the lowest-level geographic entity for which the Census Bureau tabulates sample data from the decennial census. http://www.census.gov/dmd/www/glossary.html.

[3] Census Tract - A small, relatively permanent statistical subdivision of a county or statistically equivalent entity, delineated for data presentation purposes by a local group of census data users or the geographic staff of a regional census center in accordance with Census Bureau guidelines. Designed to be relatively homogeneous units with respect to population characteristics, economic status, and living conditions at the time they are established, census tracts generally contain between 1,000 and 8,000 people, with an optimum size of 4,000 people. Census tract boundaries are delineated with the intention of being stable over many decades, so they generally follow relatively permanent visible features. http://www.census.gov/dmd/www/glossary.html.

[4] Census Workshop: Using the American Community Survey (ACS) and The New American Factfinder (AFF) hosted by Sacramento Area Council of Governments on May 11 & 12, 2011. Workshop presented by Barbara Ferry, U.S. Census Partnership Data Services Specialist.

for caution when interpreting patterns in the data (US Census 2009a). In situations where CVs for estimates are high, the reliability of estimates improves by aggregating the estimates to a larger geographic area. When projects are proposed in remote locations, there may be very little population within a six-mile buffer of the project site. In these cases, the sample size would most likely be too small to yield estimates with a reasonable CV. Staff would need to expand the study area to include a large enough population that would yield a lower CV.

PROJECT-SPECIFIC DEMOGRAPHIC SCREENING

Staff's demographic screening is designed to determine the existence of a minority, or below-poverty-level population, or both, within a six-mile area of the proposed project site. The demographic screening process is based on information contained in two documents: *Environmental Justice: Guidance Under the National Environmental Policy* Act (CEQ 1997) and *Final Guidance for Incorporating Environmental Justice Concerns in EPA's Compliance Analyses* (US EPA 1998). Due to the change in the sources and methods of collection used by the U.S. Census Bureau, the screening process relies on Year 2010 U.S. Census data to determine the number of minority populations and data from the 2006-2010 ACS to calculate the population below-poverty-level. Staff determined the 2006-2010 ACS data at the county level is appropriate to use for the HHSEGS because the estimates yielded a reasonable CV.

Minority Populations

According to *Environmental Justice: Guidance Under the National Environmental Policy Act*, minority individuals are defined as members of the following groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. A minority population is identified when the minority population of the potentially affected area is greater than fifty percent or when the minority population percentage is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis. The 2010 Census showed the total population within the six-mile buffer of the proposed project site is 782 persons, with a minority population of 179 persons, or about 23 percent of the total population (US Census 2010c). (See **Socioeconomics Figure 1**).

Socioeconomics Table 2 presents the minority population data in the six-mile buffer within California and Nevada, and data for communities and counties in a larger geographic area. On the California side of the six-mile buffer, there are 68 people residing in the Charleston View area, sixteen of whom are minorities, or about 24 percent of the population. The minority population in the Charleston View area is less than the minority population percentage in the general population of Inyo County, which is about 34 percent.

Socioeconomics Figure 1 also shows that the six-mile buffer extends into the southern portion of the Pahrump, Nevada area. As shown in **Socioeconomics Table 2**, within the six-mile buffer on the Nevada side, there are 714 people, 118 of whom are minorities, or about 17 percent of the population. The minority population on the Nevada side of the six-mile buffer is 17 percent, which is less than the percent minority of the general population in Pahrump, Nevada of about 20 percent.

Socioeconomics Figure 1 and Socioeconomics Table 2 do not indicate the presence of an environmental justice population. Based on comparisons with reference geographies, staff concludes that the minority population in the six-mile buffer is not meaningfully greater than the minority populations in the general population in Inyo County and Pahrump, Nevada. Therefore, the minority population in the six-mile buffer does not constitute an environmental justice population as defined by *Environmental Justice: Guidance Under the National Environmental Policy* Act and would not trigger further scrutiny for purposes of an environmental justice analysis within in this **FSA**.

SOCIOECONOMICS Table 2
Minority Populations within the Project Area

Area	Total:	White alone	Minority	Percent Minority
Six-Mile Buffer- CA and NV	782	603	179	22.89
Six-Mile Buffer- CA Only	68	52	16	23.53
Six-mile Buffer- NV Only	714	596	118	16.53
Shoshone*	31	28	3	9.68
Tecopa*	150	115	35	23.33
Inyo County	18,546	12,296	6,250	33.70
Pahrump*	36,441	29,055	7,386	19.99
Sandy Valley*	2,051	1,608	443	21.60
Clark County	1,951,269	935,955	1,015,314	**52.03**
Nye County	43,946	34,663	9,283	21.12
Notes: *CDP- Census Designated Place, **Bold text**- minority population 50 percent or greater. Source: US Census 2010c.				

Below-Poverty-Level-Populations

Staff has identified the below-poverty-level population based on 2006-2010 American Community Survey 5-year Estimates from the U.S. Census for Inyo County[5]. Approximately 12 percent, or 2,178 people[6] in Inyo County live below the poverty threshold. **Socioeconomics Table 3** presents poverty data for Inyo County, plus Clark and Nye counties.

[5] When projects are proposed in remote locations, there may be very little population within a six-mile radius of the project site and the resulting sample size would be too small to yield estimates with a reasonable CV. Staff determined that data at the county level would be used for this analysis, as it is the smallest geographic area available that retains reasonable accuracy. The data represents a period estimate, meaning the numbers represent an area's characteristics for the specified time period.

[6] 2,178 with an MOE of ±437 and a CV of 12.2. When a CV is 15 or less the Census Bureau considers the estimate fairly precise (US Census 2010a).

SOCIOECONOMICS Table 3
Poverty Data within the Project Area

Area	Total			Income in the past 12 months below poverty level			Percent below poverty level	
	Estimate*	MOE	CV	Estimate	MOE	CV	Estimate	MOE
Inyo County	18,308	±74	0.25	2,178	±437	12.20	11.90	±2.40
Clark County	1,870,566	±930	0.03	219,116	±6,008	1.67	11.70	±0.30
Nye County	43,377	±328	0.46	8,183	±1,065	7.91	18.90	±2.50

Notes:* Population for whom poverty status is determined.
Source: US Census 2010d.

Additional Environmental Justice Population Considerations

Final Guidance for Incorporating Environmental Justice Concerns in EPA's Compliance Analyses (US EPA 1998) also encourages outreach to community-based organizations and tribal governments early in the screening process, in order to identify the presence of distinct minority communities residing both within, and in close proximity to, the proposed project. It also identifies those minority groups that utilize or are dependent upon natural and cultural resources that could be potentially affected by the proposed action. For information regarding the Energy Commission staff's outreach program and consultations with local Native American communities, see the **Cultural Resources** sections of this **FSA**.

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

METHOD AND THRESHOLD FOR DETERMINING SIGNIFICANCE

CEQA defines a significant effect on the environment as "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project" (State CEQA Guidelines Section 15382).

Thresholds of significance serve as the benchmark for determining if a project will result in a significant adverse impact when evaluated against existing conditions (e.g., "baseline" conditions). CEQA and the State CEQA Guidelines do not provide specific, quantifiable thresholds of significance for socioeconomic impact determinations. State CEQA Guideline Section 15064(e) specifies that: "[e]conomic and social changes resulting from the project shall not be treated as significant effects on the environment." However, Section 15064(e) continues by stating that when "a physical change is caused by economic or social effects of a project, the physical change may be regarded as a significant effect in the same manner as any other physical change resulting from the project. Alternatively, economic and social effects of a physical change may be used to determine that the physical change is a significant effect on the environment. If the physical change causes adverse economic or social effects on people, those adverse effects may be used as a factor in determining whether the physical change is significant. For example, if a project would cause overcrowding of a public facility and the overcrowding causes an adverse effect on people, the overcrowding would be regarded as a significant effect."

According to Appendix G of the State CEQA Guidelines, a project may have a significant effect on population, housing, and public services if it would:

- Induce substantial population growth in an area, either directly or indirectly;
- Displace substantial numbers of people and/or existing housing, necessitating the construction of replacement housing elsewhere; or
- Adversely impact acceptable levels of service for police protection, schools, parks and recreation, and hospitals and emergency medical response.

Staff's assessment of the significance of impacts on population, housing, emergency medical services, police protection, schools, and parks and recreation are based on professional judgments, input from local and state agencies, and the industry-accepted two-hour commute range for construction workers and one-hour commute range for operational workers.

DIRECT/INDIRECT IMPACTS AND MITIGATION

Induce Substantial Population Growth

For the purpose of this analysis, staff defines "induce substantial population growth" as workers moving into the project area because of project construction and operation, thereby encouraging construction of new homes or extension of roads or other infrastructure. To determine whether the project would induce substantial population growth, staff analyzes the availability of the workforce and the population within the region, which includes Inyo County in California and Clark and Nye counties in Nevada. Labor projections for Inyo County are reported as part of the Eastern Sierra Region, which also includes labor projections for Alpine and Mono counties. Labor projections for Clark and Nye counties are reported as part of the Las Vegas-Paradise Metropolitan Statistical Area (MSA[7]). Based on information in the BTC letter and the applicant's UWA, staff included construction trades from the Bakersfield MSA (Kern County) and the Riverside-San Bernardino-Ontario MSA (Riverside and San Bernardino Counties) in its assessment of worker availability.

Affected Environment

Socioeconomics Table 4 shows the historical and projected populations for Inyo, Clark, and Nye counties. **Socioeconomics Table 5** shows the total labor by skill for the Eastern Sierra Region (Alpine, Inyo, and Mono counties), Bakersfield MSA (Kern County) and Las Vegas-Paradise MSA.

[7] An MSA contains a core urban area population of 50,000 or more, consists of one or more counties, and includes the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core.

Socioeconomics Table 4
Historical and Projected Populations

Area	Population					
	2000[1]	2010[2]	2020	2030	2010-2030	Percent Growth
Inyo County	17,945	18,546	20,495[3]	22,132[3]	4,187	22.58
Clark County	1,375,765	1,951,269	1,905,694[L4] 2,325,456[H4]	1,979,045[L4] 3,066,872[H4]	27,776[L4] 1,115,603[H4]	1.42[L4] 57.17[H4]
Nye County	32,485	43,946	44,417	46,859	2,913	6.63

Notes: - Data not available, [L]Low job growth, [H]High job growth, Inyo County projected population in 2040 (23,520) in 2050 (25,112) and the growth from 2010 – 2050 (6,566, representing 35.4% increase).
Source: [1]US Census 2000, [2]US Census 2010e, [3]CA DOF 2007, [4]NVSBDC 2010.

SOCIOECONOMICS Table 5
Total Labor by Skill in the Project Area (2008-2018)

	Boilermaker[1]	Carpenter	Cement Finisher	Electrician	Equipment Operator	Iron Worker	Laborer	Millwright	Pipefitter[2]	Teamster[3]
Eastern Sierra Region (Alpine, Inyo, and Mono counties)										
Total Workforce, 2008	-	270	860	50	60	-	120	-	50	100
Total Projected Workforce, 2018	-	270	840	40	60	-	130	-	50	110
Growth from 2008	-	0	-20	-10	0	-	10	-	0	10
Percent Growth from 2008	-	0	-2.33	-20	0	-	8.33	-	0	10
Bakersfield MSA (Kern County)										
Total Workforce, 2008	1,160	1,780	470	2,300	1,130	130	3,780	380	810	1,550
Total Projected Workforce, 2018	1,230	1,920	490	2,390	1,240	140	4,340	350	870	1,760
Growth from 2008	70	140	20	90	110	10	560	-30	60	230
Percent Growth from 2008	6.0	7.9	4.3	3.9	21	7.7	14.8	-7.9	7.4	14.8
Riverside-San Bernardino-Ontario MSA (Riverside and San Bernardino Counties)										
Total Workforce, 2008	3,230	18,380	3,780	5,020	4,460	710	17,950	120	4,330	10,340
Total Projected Workforce, 2018	3,080	18,910	3,910	4,850	4,640	710	19,500	120	4,340	11,120
Growth	-150	530	130	-170	180	0	1,550	0	10	780

	Boilermaker[1]	Carpenter	Cement Finisher	Electrician	Equipment Operator	Iron Worker	Laborer	Millwright	Pipefitter[2]	Teamster[3]
from 2008										
Percent Growth from 2008	-4.6	2.9	3.4	-3.4	4	0	8.6	0	0.2	7.5
Las Vegas-Paradise MSA										
Total Workforce, 2008	1,212	17,456	3,196	6,676	2,212	1,220	7,414	138	5,781	2,007
Total Projected Workforce, 2018	1,311	17,360	3,151	6,356	2,233	1,296	6,745	137	5,515	2,241
Growth from 2008	441	-96	-45	-320	21	76	-669	-1	-266	614
Percent Growth from 2008	8.2	-0.55	-1.41	-4.79	0.9	6.23	-9.02	-0.7	-4.6	11.7
Total Projected Workforce, 2018 for All Three MSAs										
	5,621	38,460	8,391	13,636	8,173	2,146	30,715	607	10,775	15,231
Total # of Workers for Project Construction by Craft*										
	273	130	18	365	106	138	127	155	517	29

Notes: - Data not available.
[1]Welders, [2]Plumbers, Pipefitters, and Steamfitters, and [3]Industrial Truck and Tractor Operators.
*Largest number of workers by trade by month plus 397 Non-Craft (Non-union superintendents and construction personnel onsite).needed for project construction (CH2 2012jj).
Source: CA EDD 2010, NDETR 2008, CH2 2012jj.

Construction Impacts

The AFC states that construction (from site preparation and grading to commercial operation) would take approximately 29 months. If approved, construction would begin the second quarter of 2013 and conclude the fourth quarter of 2015. The two solar plants would be constructed concurrently with a planned three-month delay between their start dates (HHSG 2011a, pgs. 2-17 & 2-18). The applicant's Table 5.10-16R2 identifies the number of workers needed at the project site. The workforce need would range from a high of 2,293 workers in month 19, a low of 128 workers in the first month, and an average of 1,087 workers during the entire 29-month construction period (CH2 2012jj).

As stated above, the applicant is working with Bechtel Corporation. If selected as the Engineering, Procurement and Construction (EPC) contractor, Bechtel would likely enter in to an official Project Labor Agreement (PLA) that would use a union workforce. Because of the union structure and their construction workforce dispatch rules, the construction labor would come primarily from California union halls. As shown in **Socioeconomics Table 5**, the labor force within the Eastern Sierra Region, Bakersfield MSA, Riverside-San Bernardino-Ontario MSA, and Las Vegas-Paradise MSA combined would be more than sufficient to accommodate the labor needs for construction of the HHSEGS.

Due to the remoteness of the project site and limited housing, services, and infrastructure, Inyo County has expressed concerns about construction workers moving to the immediate Charleston View area during project construction, potentially contributing to population growth, and impacting county services in the Tecopa area (INYO 2012b). Because staff's analysis shows there is a sufficient labor force already in California and more workers available in the Las Vegas area if needed, the project would not induce substantial permanent population growth. In addition, the amount and location of available housing also determines whether the project would induce population growth. Staff's analysis shows that the project would not impact housing or necessitate construction of additional housing to accommodate the construction and operations workforces (see discussion below).

Operation Impacts

Socioeconomics Table 6 presents the operations force for the crafts specifically needed for the construction of HHSEGS. An operations workforce of 100 workers would be permanently needed for the project.

SOCIOECONOMICS Table 6
HHSEGS Plant Operation Workforce

Operations Workforce	
Solar fields and Power Block Workers	24
Technicians	16
MWM Operators	15
Warehouse & Maintenance Staff	13
Administration & Support Staff	32
TOTAL	100
Note: Total workforce includes only the crafts specifically needed for the HHSEGS. See **SOCIOECONOMICS Table 5** for a list of crafts included in the total workforce figures. MWM = mirror washing machine. Source: CH2 2012jj	

The applicant estimates that most of the operations workforce would come from Las Vegas in Clark County, as well as from the rural areas in southern Inyo County. Some of the operation workforce would come from Pahrump in Nye County and from existing applicant staff (HHSG 2011a, pg. 5.10-28). The labor force within the Eastern Sierra Region, Bakersfield, and Las Vegas-Paradise MSA combined are more than sufficient to accommodate the labor needs for the operation of the HHSEGS. Staff agrees with the applicant's assumptions about the operations workforce and does not expect employees to relocate to the immediate project area, given the robust regional workforce. In addition, the United Association Local 525 letter stated that about 80 to 85 percent of the operations workforce would come from Clark County, with most of the workforce coming from Las Vegas. Pahrump does not have a large union labor supply. The BTC letter had no information on where the operations workforce would come from.

Displace Existing Housing and Substantial Numbers of People, Necessitating the Construction of Replacement Housing Elsewhere

As of April 1, 2010, there was a total of 613,228 housing units in the three-county project area (Inyo, Clark, and Nye counties) within a two-hour commute of the project site, with a combined vacancy of 83,441 units, representing a 13.61% vacancy rate (US Census 2010g). A five percent vacancy is largely accepted as a minimum benchmark for a sufficient amount of housing available for occupancy (Virginia Tech 2006). As **Socioeconomics Table 7** shows, the housing counts in the project area indicate a greater supply of available housing units than demand.

Socioeconomics Table 8 shows a more detailed breakdown of the vacant units in the area. Of the 83,441 vacant units, 32,064 were for rent, 16,025 were for sale, and 12,651 were listed for seasonal, recreational, or occasional use. **Socioeconomics Figure 2** provides a visual reference for the locations of each city and census designated place within about a two-hour commute of the project site listed in **Socioeconomics Tables 7 and 8**.

SOCIOECONOMICS Table 7
Housing Supply Within Two-Hour Commute of the Project Site

Geographic Area	Total	Occupied	Vacant	Percent Vacant
Shoshone CDP, Inyo Co, CA	31	17	14	45.16
Tecopa CDP, Inyo Co, CA	159	92	67	42.14
Beatty CDP, Nye Co, NV	700	508	192	27.43
Pahrump CDP, Nye Co, NV	17,824	14,870	2,954	16.57
Boulder City, Clark Co, NV	7,412	6,492	920	12.41
Enterprise CDP, Clark Co, NV	49,563	39,848	9,715	19.60
Goodsprings CDP, Clark Co, NV	124	108	16	12.90
City of Henderson, Clark Co, NV	113,586	101,314	12,272	10.80
City of Las Vegas, Clark Co, NV	243,701	211,689	32,012	13.14
Moapa Town CDP, Clark Co, NV	379	319	60	15.83
Mount Charleston CDP, Clark Co, NV	504	164	340	67.46
Nelson CDP, Clark Co, NV	43	21	22	51.16
City of North Las Vegas, Clark Co, NV	76,073	66,499	9,574	12.59
Sandy Valley CDP, Clark Co, NV	1,024	808	216	21.09
Searchlight CDP, Clark Co, NV	461	301	160	34.71
Sunrise Manor CDP, Clark Co, NV	70,255	60,874	9,381	13.35
Whitney CDP, Clark Co, NV	16,420	14,153	2,267	13.81
Winchester CDP, Clark Co, NV	14,969	11,710	3,259	21.77
Total	613,228	529,787	83,441	13.61
Source: US Census 2010f, US Census 2010g				

SOCIOECONOMICS Table 8
Vacancy Status Within Two-Hour Commute of the Project Site

Geographic Area	For Rent	For sale	For seasonal, recreational, or occasional use	Other Vacant	Total
Shoshone CDP, Inyo Co, CA	3	1	3	7	14
Tecopa CDP, Inyo Co, CA	4	4	47	12	67
Beatty CDP, Nye Co, NV	106	7	41	38	192
Pahrump CDP, Nye Co, NV	549	509	498	1,398	2,954
Boulder City, Clark Co, NV	276	144	333	167	920
Enterprise CDP, Clark Co, NV	1,925	2,045	2,985	2,760	9,715
Goodsprings CDP, Clark Co, NV	2	1	0	13	16
City of Henderson, Clark Co, NV	3,646	2,335	2,895	3,396	12,272
City of Las Vegas, Clark Co, NV	14,777	6,096	3,083	8,056	32,012
Moapa Town CDP, Clark Co, NV	26	5	5	24	60
Mount Charleston CDP, Clark Co, NV	7	30	267	36	340
Nelson CDP, Clark Co, NV	0	3	12	7	22
City of North Las Vegas, Clark Co, NV	3,410	2,241	769	3,154	9,574
Sandy Valley CDP, Clark Co, NV	10	23	63	120	216
Searchlight CDP, Clark Co, NV	20	16	87	37	160
Sunrise Manor CDP, Clark Co, NV	5,228	1,443	461	2,249	9,381

Geographic Area	For Rent	For sale	For seasonal, recreational, or occasional use	Other Vacant	Total
Whitney CDP, Clark Co, NV	721	514	337	695	2,267
Winchester CDP, Clark Co, NV	1,354	608	765	532	3,259
Total	32,064	16,025	12,651	22,701	83,441
Source: US Census 2010h					

There is little lodging immediately near the project site, or in the towns of Tecopa and Shoshone. The closest area with any meaningful lodging available is in the town of Pahrump, Nevada, approximately a 26-mile drive from the project site. **Socioeconomics Tables 9 and 10** present the available temporary lodging within an approximately one-hour commute range from the project site. **Socioeconomics Table 9** shows there are over 148,000 motel/hotel rooms within one-hour commute of the project site; **Socioeconomic Table 10** shows abundant RV park spaces within a two-hour commute of the project site.

SOCIOECONOMICS Table 9
Hotel/Motel Supply Within One-hour Commute of the Project Site

Geographic Area	Hotels/Motels	Total Number of Rooms
Tecopa, CA	2	33 rooms/4 cabins/13-bed budget hostel
Shoshone, CA	1	17 rooms
Pahrump, NV	3	314 rooms
Las Vegas, NV	numerous	148,935 rooms
Sources: DVCC 2011, PVCC 2011, SV 2011, TN 2011, LVCVA 2011a, LVCVA 2011b.		

SOCIOECONOMICS Table 10
RV Park Supply Within Two-Hour Commute of the Project Site

Geographic Area	RV Parks	Total Number of Spaces
Tecopa, CA	3	219 spaces
Shoshone, CA	1	24 spaces
Pahrump, NV	8	766 spaces
Las Vegas, NV	13	3,555 spaces
Amorgosa Valley, NV	2	143 spaces
Boulder City, NV	4	642 spaces
Beatty, NV	5	161 spaces
Henderson, NV	1	80 spaces
North Las Vegas, NV	1	196 spaces
Searchlight, NV	1	72 spaces
Sources: DVCC 2011, PVCC 2011, SV 2011, TN 2011, LVCVA 2011a, LVCVA 2011b.		

Construction Impacts

The Updated Workforce Analysis indicates that construction work would be scheduled on a five-day per week,10-hour per day basis. This would result in many construction workers commuting to the site either Sunday evening or Monday morning (depending upon if they are day or swing shift workers), seeking nearby lodging for four nights, then heading for home either Friday evening or Saturday morning. (CH2 2012jj, pp.1-2).

Because of the ample lodging available in the three counties and the fact that there is very little available housing in Tecopa and Shoshone, staff agrees that most construction workers would take advantage of existing available lodging within a two-hour commute distance in Nevada, and commute to the project site. Staff's research with Building Trades Councils and unions regarding commuting habits of construction workers shows that union workers do not bring their families with them if they temporarily relocate to a job site. Given the ample lodging options in the three-county region, staff does not anticipate any new housing construction because of the project.

Operation Impacts

The project would require 100 full-time employees during project operation. The applicant anticipates that most of the operational workforce would come from Las Vegas in Clark County and parts of surrounding rural areas in Inyo County and some may come from Pahrump in Nye County. The applicant assumed that 95 percent (95 employees) would come from Nye and Clark counties and 5 percent (5 employees) would come from Inyo County. (HHSG 2011a, pg. 5.10-28) United Association Local 525 also expects that the operations workforce would come mostly from Las Vegas and from Clark County (CEC 2012d). The applicant expects the operational workforce would commute from their existing residences to the project site. Because there are so few housing choices in Tecopa and Shoshone, staff agrees with the applicant's assumptions.

As presented above in **Socioeconomics Tables 7 and 8**, there would be an adequate housing supply in the area to accommodate the project's operational workforce.

Conclusion

The proposed project site and construction laydown area are located in an unincorporated area of Inyo County known locally as Charleston View. The site is not developed, but it contains unimproved dirt roads and trails. The proposed project is a solar power plant, an industrial use, and would not displace existing housing, induce substantial population growth, or necessitate the construction of replacement housing elsewhere. Given the ample lodging options in the three-county region, staff does not expect the project would necessitate any new housing construction to accommodate construction and operations workers.

Inyo County has expressed concerns about the project workforce and its potential to impact county services and housing. County staff has stated that the remote location of the project site raises logistical concerns for county administrators because the majority of their existing available resources such as social services are concentrated within the county's population center of Bishop, 250 miles northwest of the project site.

According to Inyo County staff, illegal camping on private property in the Charleston View area has been a problem at times. Inyo County is concerned that due to the limited supply of temporary lodging and RV parks in nearby Tecopa or Shoshone, construction workers will lease land in the adjacent community of Charleston View to park their RVs, or camp illegally on vacant land near the project site (INYO 2012b). Vacant properties in Charleston View do not have electricity and the availability of water is uncertain. Staff has identified an ample supply of existing housing, hotels/motels, and RV parks in the area for construction workers who may temporarily relocate during project construction. Staff concludes that with the ample housing choices, construction workers would not camp illegally, but would instead reside temporarily in available housing near commercial services, and would not significantly impact Inyo County services. Although staff has not identified a significant impact to housing, with the intention of taking a proactive approach to the County's concerns regarding illegal camping, staff proposes Condition of Certification **SOCIO-2**, requiring that information regarding illegal and unauthorized camping be included with the Worker Environmental Awareness Program (WEAP) training for all personnel. Additional details of the WEAP training can be found in the **Biological Resources** section of this **FSA**.

Staff concludes that the project would not induce substantial population growth in the area or displace substantial numbers of people or housing because there is a sufficient existing labor force in the region and the workforce would reside in existing, available housing.

<u>Public Services</u>

Result in Substantial Physical Impacts to Government Facilities

As discussed under the subject headings below, the HHSEGS would not cause significant impacts to law enforcement, schools, and parks. The Southern Inyo County Fire Protection District (SIFPD) and the applicant are still discussing how best to ensure adequate fire and emergency service for the project. At this time, staff cannot conclude that the proposed project would not significantly impact fire and emergency medical services. Safety and health issues including the applicant's proposed systems and procedures to provide occupational safety and health protection for the HHSEGS workers are discussed in the **Worker Safety and Fire Protection** section of this **FSA**.

Emergency Medical Services

<u>Affected Environment</u>

The project site is within the jurisdiction of the Southern Inyo Fire Protection District (SIFPD). SIFPD is the local agency authorized to provide fire prevention, fire suppression, and emergency medical services in an approximately 1,250 square mile area, including the HHSEGS site. SIFPD operates on a very limited budget, and has one station in Tecopa and one temporary location in Charleston View. SIFPD does not receive a share of the one percent property tax levied on the project site, so there would need to be provisions for financing fire and emergency services (SIFPD 2012b).

The Tecopa fire station would be the first responder for medical emergencies at the project site (CH2 2011e, pg. 14). A response from the Tecopa Station, 27 miles from the project site, would take about 30 to 40 minutes (HHSG 2011a, pg. 5.16-21, and CEC 2012h, CH2 2012z, pg. 7-2). As of February 2012, SIFPD staff at the Tecopa station consisted of two personnel with Emergency Medical Technician-Basic (EMT-B) certification, one Firefighter II (FFII), two Firefighter I (FFI) in training, and four Entry Level Firefighter/First Responders. With the exception of the Fire Chief and the Administrative Officer, which are paid, SIFPD personnel are volunteers that respond on a 24-hour, 7-day per week basis. The SFPD equipment consists of two Light Rescue Units, two Type 2 Engines, one Basic Life Support Ambulance, and one Ambulance (CH2 2012z, pg. 7-1). All firefighters in SIFPD have first response medical training called Basic Life Support (BLS) training. The Tecopa station has one ambulance staffed with three personnel and a fire truck staffed by two personnel, which would likely respond to emergencies at the project site. (CH2 2011e, pg. 14, and CEC 2012h)

At staff's request, the applicant provided a draft Fire and Emergency Services Risk and Needs Analyses (FESNA) on May 9, 2012 (CH2 2012z). The analyses suggest that by complying with LORS, the project would not create significant impacts on the local SIFPD or local emergency response resources, because any responses needed for fire, medical, or technical rescue needs would be sourced from either the Pahrump Valley Fire-Rescue Services (PVFRS) or Nye County Emergency Services (NCES) in Pahrump, Nevada. The mechanism of how these services would be sourced and paid for from another jurisdiction in the state of Nevada rather than from the local Authority Having Jurisdiction (AHJ), in this case SIFPD, has not been clearly established. Correspondence from Larry Levy, Acting Chief of the SIFPD (CEC 2012h), and William D. Ross, who provides legal representation for the SIFPD (SIFPD 2012a), states that the HHSEGS project would have an impact on SIFPD's ability to maintain its level of service for fire, hazmat, and EMS emergencies to its service district.

PVFRS has a long-standing practice of providing SIFPD mutual aid and response, but does not currently have a signed agreement. PVFRS has four stations, all located in Nevada and staffed with full-time and volunteer firefighters. All PVFRS staff has basic medical training. PVFRS has five ambulances and two medical squads distributed among their four stations. PVFRS' main station has two EMTs and one paramedic, as well as two advanced life support- (ALS) certified ambulances and one ALS-equipped medical squad vehicle (CEC 2011j). The estimated response time from Pahrump Valley Fire Station No. 3 (12 mile distance) is approximately 15-20 minutes, and from Station No.1 (18 mile distance), it is estimated to be approximately 18-25 minutes (CH2 2012z, Table 7-1). PVFRS is the closest responder to the project site with ALS capabilities and are staffed 24 hours a day.

Nye County Emergency Services (NCES) has a HazMat team that operates through the Nye County Fire Department's Station 51 in Pahrump, which is 28 road miles from the project site, and has an approximate response time of 45 minutes. Station 51 is staffed with 15 to 20 volunteers who are trained as HazMat technicians. The team has the following equipment, as of April 2011: one HazMat truck with 25-foot trailer, one biohazard unit, one fire engine, and one ambulance (HHSG 2011a, Sect 5.5.4.3).

PVFRS would respond to trauma or industrial accidents with an ALS ambulance, Heavy Rescue, and can request a helicopter for air rescue, if necessary, and based on availability (weather, other calls, etc.). Additional assistance is available from Round Mountain/Smoky Valley Fire Services in Nye County and Las Vegas as well, but it is at least a 1-hour response time from Las Vegas, and can take up to 2 hours (HHSG 2011a, pg. 5.16-21).

If a patient's condition is serious (e.g. serious cardiac arrest, stroke, large laceration, etc.), PVFRS can transport these patients via Mercy Air to University Hospital Medical Center (UMC) in Las Vegas in 20 minutes. The UMC is designated as a Level I adult and Level II pediatric trauma center, has Nevada's only burn center, has a heart center and a transplant center, and is equipped with 11 resuscitation and 18 intensive care unit beds (UMC 2011). The UMC trauma center serves an area over 10,000 square miles including southern Nevada, parts of California, Utah, and Arizona.

If the patient's condition is not serious then a PVFRS paramedic ambulance transports the patient to Desert View Regional Medical Center in Pahrump, the closest hospital to the project site with an emergency room. Drive time between the project site and Desert View Regional Medical Center is approximately 45 to 50 minutes (HHSG 2011a, pg. 5.16-23). Desert View Regional Medical Center is a 24-bed hospital with a 24-hour/7 day a week physician-staffed emergency room (DVRMC 2011). Minor injuries could also be treated at the Saint Rose Dominican Hospital in Henderson, Nevada (either the Rose de Lima or Siena campuses) or the UMC in Las Vegas. Both facilities have emergency departments, a full range of surgical and rehabilitative services, respiratory therapy, and radiology services (St Rose 2011).

<u>Construction Impacts</u>

Energy Commission staff contacted SIFPD and PVFRS staff to discuss the proposed project, ascertain their ability to provide emergency medical services to the project, and solicit comments or concerns they might have about the project. Staff has received comments from PVFRS and SIFPD and incorporated them in this analysis.

In response to staff's Emergency Medical Response Needs Assessment Form, SIFPD Acting Fire Chief, Larry Levy, stated that SIFPD would like to enhance their emergency medical services (EMS) in the Charleston View area to provide response times to the project site in the 5-10 minute range. This would require the acquisition of both facilities and equipment as well as the training of additional responders. SIFPD estimates that to achieve their desired response times they would need a three-bay station to house a new ambulance and existing fire apparatus in the project area and a minimum of two trained EMTs and four firefighters in the project area.

SIFPD expects that increased traffic would result in increased motor vehicle accident responses. The applicant estimated at least five (5) additional off-site vehicle accidents in the vicinity of the project site related to construction and workforce traffic (CH2 2012z, Table 6-4, pg. 6-10). For more information about traffic-related impacts, please see the **Traffic and Transportation** section of this **FSA**.

The applicant is actively engaged in discussions with SIFPD to ensure adequate fire and emergency service for the project. Discussions are ongoing. With the inclusion of Staff's proposed conditions of certification, **Worker Safety-6 and 7,** funding for increased emergency services would be provided, and impacts mitigated.

<u>Operation Impacts</u>

Facility operators would be trained as first responders and in safe operation, maintenance, and emergency response procedures to minimize the risk of personal injury (HHSG 2011a, pg. 2-20). HHSEGS would operate in compliance with federal and state occupational safety and health program requirements. Compliance with these programs would minimize project effects on employee safety (HHSG 2011a, pg. 2-21). The applicant states that the HHSEGS operation would not create significant adverse impacts on medical resources in the area due to the safety record of power plants and few operations staff. To protect the safety and health of workers during the construction and operation of HHSEGS, Worker Safety and Fire Protection staff is proposing two conditions of certification (**WorkerSafety-1** and **-2**) that would require the project owner to submit to the Compliance Project Manager (CPM) a copy of the Project Construction Safety and Health Program, and a copy of the Project Operations and Maintenance Safety and Health Program. Cal-OSHA's requirements are prescribed by, and contained within, the requested programs and plans. The project owner's compliance with proposed conditions of certification **WorkerSafety-1** and **-2** would help to mitigate impacts to emergency medical services.

<u>Conclusion</u>

SIFPD submitted an initial review of the draft FESNA on June 4, 2012 and the applicant and SIFPD stated they had entered into an agreement to negotiate at the June 27, 2012 PSA Workshop in Bishop, CA. At this time, Energy Commission staff has not been notified by the applicant or SIFPD that they have reached an agreement on how fire and emergency medical services will be provided and funded for the project site. Therefore, the **Worker Safety and Fire Protection** section of this document includes proposed Conditions of Certification **WORKER SAFETY-6** and **WORKER SAFETY-7** to ensure SIFPD has adequate funding. Staff concludes the HHSEGS would not significantly impact fire and emergency medical services if staff's proposed mitigations are implemented. For more information and proposed mitigation for fire protection and emergency medical services response, please see the **Worker Safety and Fire Protection** section of this document.

Law Enforcement

<u>Affected Environment</u>

The HHSEGS proposed project site is located within the jurisdiction of the Inyo County Sheriff's Department. There is a sheriff substation in Shoshone, approximately 34 miles from the project site. There are two resident deputies stationed in Shoshone who reside in County-owned housing. The patrol area for the deputies patrolling the HHSEGS site encompasses 3,200 square miles, consisting of both paved and unpaved roads (INYO 2012j, p. 19). This area includes the towns of Furnace Creek Ranch and Stovepipe Wells (both in Death Valley), which are located 60 and 90 miles from the Shoshone substation. The deputy on duty would likely respond from the patrol location, as they are usually on patrol and on call in the service area and not present at the substation. As such, response time to an emergency on the project site ranges between 30 minutes to 4 hours (INYO 2012i, pp. 50-58). Depending on the type of assistance needed, and the geographic location of the other deputies, response time for any additional or specialized assistance could be an added 3 to 4 hours on top of the 30 minutes to 4 hours initial response time (INYO 2012b).

The California Highway Patrol (CHP) is the primary law enforcement agency for state highways and roads. The agency is predominately concerned with traffic safety, service to the motoring public, and protection of state property. The CHP does not have the legal authority to be the lead agency for general law enforcement and does not contract for general law enforcement duties. When appropriate, CHP officers can provide law enforcement assistance if the Inyo County Sheriff's Department requests such aid. CHP services include law enforcement, traffic control, accident investigation, and the management of hazardous materials spill incidents (HHSG 2011a, pg. 5.16-22). CHP has one resident patrol officer in Furnace Creek and one in Pahrump (CEC 2011y). Both officers are full time staff. The officers patrol the Death Valley area and if called can respond from the patrol area, or if off duty and needed, the officers can respond from their resident posts. The main area office is in Bishop (Inyo County). The Death Valley National Park Rangers can also respond to law enforcement calls when requested (HHSG 2011a, pg. 5.16-22).

Because the HHSEGS site is on the western border of the Nevada state line, the roads and highway in the vicinity (to the east of the project) are under the jurisdiction of the Nevada Highway Patrol (NHP). The closest NHP station to the project site is the Pahrump Substation on East Postal Drive in Pahrump (HHSG 2011a, pg. 5.16-22). CHP has a mutual agreement with the Nevada Highway Patrol (NHP) giving authority for up to 50 miles into each other's state when requested to provide assistance to one another (CEC 2011y).

The letter from the Inyo County Sheriff that was included in the February 16, 2012 Inyo County correspondence on county services and anticipated costs associated with HHSEGS (INYO 2012b, pg. 8), indicated that the Sheriff would need additional resources to serve the area during both the construction and operation of HHSEGS. The Sheriff's office provided estimates categorized as one-time initial costs totaling $2,130,966.00, and annual on-going costs totaling $1,269,120.00 for the first year, with an annual 4 percent increase each year for increased expenses. The one-time initial costs include hiring, training, and equipping seven new officers, constructing a new substation, and providing officer housing. On-going costs include salaries for the seven officers and one office manager, training, utilities, and other maintenance and administrative costs (INYO 2012b). After reviewing the applicant's UWA, the Sheriff's staff determined that during the construction phase an additional $9,600 per month (in overtime costs) would be needed due to the estimated increase in peak workforce numbers and related traffic and general law enforcement. The total additional cost of overtime during the construction phase would be $278,400 (INYO 2012l).

Following receipt of the February 16, 2012 letter from the Inyo County Sheriff, staff contacted the applicant to see if they had a contact at the San Bernardino County

Sheriff's office that could share their experiences in dealing with similar existing facilities in San Bernardino County. The San Bernardino County Sheriff's office in Barstow would respond to any law enforcement incidents at the Ivanpah construction site. In terms of fire protection, for example, the Ivanpah construction has only resulted in five calls to San Bernardino County since construction commenced in October 2010, and its construction activities and workforce are similar to that of the HHSEGS. (CH2 2012z, pg. 8-2)

The existing Solar Energy Generating Systems (SEGS) solar power plants in Daggett, Kramer Junction, and Harper Lake are all within about a 40-minute drive of the Sheriff's office in Barstow with close proximity to small neighboring communities and access from highways. The SEGS projects went online in the mid-1980s through the early 1990s. Staff contacted the Barstow office to get a sense of how often they have had to respond to the SEGS plants throughout their many years of operations. Sheriff Custody Assistant, Analeah Leon Guerrero, researched Sheriff's call log records through 2006 and found no records of incidents requiring Sheriff's staff response to the SEGS facilities or the Ivanpah construction site (CEC 2012o).

Staff also contacted the Las Vegas Metropolitan Police Department for calls for service and felony crime statistics in the Primm, Nevada area, where much of the Ivanpah labor force has resided in available lodging during construction. The groundbreaking ceremony marking the start of construction at Ivanpah was on October 27, 2010, and as of August 2012, construction is halfway complete. In the Primm area[8] calls for service increased about 6 percent from 2010 to 2011; however, felony crimes decreased about 43 percent (CEC 2012ee). As most of the HHSEGS construction labor force is likely to reside in the much larger community of Pahrump, or in Las Vegas, it is not likely that Inyo County would experience changes in service calls similar to Primm.

At the March 13, 2012, Inyo County Board of Supervisors meeting, Sheriff William Lutze provided additional insights regarding the project site location based on his experience working in the vicinity (INYO 2012i, pp 50-58). He stated that comparing the HHSEGS site to the Ivanpah site is not reasonable and is likely to result in misinformation where impacts to response times and services are concerned. Sheriff Lutze grew up in the area and was the resident deputy in the area for eight years. He explained that there has been an increase in vandalism and theft in the area in recent years, such as bullet holes in signs and theft of metal items that can be sold as scrap. He expressed concern that because the project site is in such an isolated, yet accessible area, that it would be an attractive target for those who might want to steal construction equipment and materials. He also noted that the proposed project would need to be considered as part of the county's homeland security assessment because it would be a significant power plant (INYO 2012i, p. 56). For these reasons, the Sheriff advised the applicant to provide a comprehensive site security plan describing all proposed security measures for the project.

A Draft Construction Site Security Plan was filed under Confidential Cover with the Energy Commission on April 16, 2012, and later provided to the Inyo County Sherriff's Department. The Sherriff and his staff reviewed the Draft Construction Site Security

[8] Statistics include Primm, Sandy Valley, Jean, and Good Springs, within Clark County, Nevada.

Plan and determined that as presented the plan did not lessen the need for additional resources as originally presented in the County's February 16, 2012 letter.

At the May 9, 2012 Staff Workshop, Sheriff Lutze explained that he determined the need for seven additional officers based on his knowledge that a 24-hour station needs 6.4 persons per day for staffing. Additionally, he stated that the current staffing situation in the southeast County requires five patrol officers, but only two are currently on staff. (CEC 2012t)

<u>Conclusion</u>

Staff's analysis in the *Socioeconomic and Fiscal Impacts of the Hidden Hills Solar Electric Generation System on Inyo County* (**Appendix Socio-1**), including staff's review of other power plant projects and comments made in the May 9, 2012 Staff Workshop, shows that two additional resident deputies would be sufficient to provide adequate police protection and response times. With this increase in staffing at the Tecopa/Shoshone substation, it appears that patrol coverage would be sufficient such that an additional substation building would not be required.

As shown in **Appendix Socio-1,** the sales tax revenue that would be generated for the County during the construction period of HHSEGS would be far greater than the potential county expenditures estimated by Inyo County staff and by Energy Commission staff. Therefore, if Inyo County chooses to implement the full increases in Sheriff's Department resources as originally proposed in their February 16, 2012 letter, they would have the tax revenue to do so. Impacts to law enforcement from HHSEGS would be less than significant because the County would have adequate financial resources to provide appropriate Sheriff's protection to the project site and southern Inyo County.

Education

<u>Affected Environment</u>

The HHSEGS site is located within the Death Valley Unified School District (DVUSD). There are five schools in the DVUSD with a current enrollment of 64 students for the 2011/2012 school year. Staff contacted the DVUSD to obtain current enrollment counts and assess capacity of the school district. DVUSD staff reported that there would be no need to add any facilities if new students were to enroll in the District as the classrooms can physically accommodate approximately 20 students per classroom and the district has approximately 17 classrooms (CEC 2011x). DVUSD staff also explained that additional teachers may need to be hired if new students were to enroll in the district. **Socioeconomics Table 11** shows the current district enrollment and calculated capacity available for each school.

SOCIOECONOMICS Table 11
Death Valley Unified School District

Death Valley Unified School District	2011-2012 Enrollment (students)	Capacity (seats)*	Teachers
Death Valley Elementary	4	160	1
Shoshone Elementary (5th and 6th grades)	14	20	1
Tecopa-Francis Elementary (K to 4th grade)	13	40	1
Death Valley High Academy (7th to 12th grades)	32	100	5
Shoshone High (Continuation)	1	20	1
Total District	**64**	**340**	**9**
Notes: *Approximate capacity based on the number of classrooms with a capacity of 20 students per classroom. Source: CEC 2011x, CA DOE 2011, US CENSUS 2010i.			

There are 357 schools in the Clark County School District with a current enrollment of 309,480 students for the 2011/2012 school year and a capacity of 317,056 students (CEC 2011cc). The 357 total schools in the district are comprised of 217 elementary schools, 59 middle schools, 49 high schools, and 32 special/alternative schools. As **Socioeconomics Table 12** shows, the district is within capacity, but the elementary and special/alternative education schools are above capacity.

SOCIOECONOMICS Table 12
Clark County School District

Clark County School District	2011-2012 Enrollment (students)	Capacity (seats)
Elementary	147,492	139,211
Middle	72,331	83,435
High	86,788	92,744
Special/Alt. Ed.	2,869	1,637
Total District	**309,480**	**317,056**
Source: CEC 2011cc.		

Schools within the Nye County School District range widely in size from a single classroom school to a school with 40 to 50 classrooms, so staff focused on schools within the Pahrump Valley. There are six schools in Pahrump Valley, four elementary, one middle school, and one high school. **Socioeconomics Table 13** shows the enrollment and available capacity for each of the Pahrump Valley schools.

SOCIOECONOMICS Table 13
Nye County School District (Pahrump Valley)

Nye County School District (Pahrump Valley area only)	2011-2012 Enrollment (students)	Excess Capacity (seats)
Elementary	1,870	+500
Middle	1,042	+200
High	1,300	+200 to 400
Total Pahrump Valley	**4,212**	**+900 to 1,100**
Source: CEC 2011n.		

A new addition to the high school was completed in January, 2012. At that time, all students moved into the addition as a part of Phase I. Under Phase II, the existing high school will be remodeled and once completed in late 2012, the 9th graders will be moved back into the newly remodeled school. With the completion of Phase II, Pahrump Valley High will have a total capacity for 1,600 students.

<u>Construction Impacts</u>

During construction, staff expects the majority of the labor force would commute daily from the region. Based on the Updated Workforce Analysis (UWA), work would be scheduled on a five day-per-week, 10 hour-per-day basis, comprised of a day shift and swing shift. This would allow construction workers who have temporarily relocated during the construction period to commute to the site either Sunday evening (day shift) or Monday morning (swing shift), and then head home either Friday afternoon (day shift) or early Saturday morning (swing shift). Based on communication with the various BTCs, and examples from other solar projects, staff does not expect construction workers to relocate their families to the project area; therefore, staff does not expect a significant adverse impact to the schools from construction of the proposed project.

<u>Operation Impacts</u>

An estimated 100 permanent workers would be needed to operate the HHSEGS, once constructed. The AFC states that five percent of the 100 operational employees (five workers) would come from Inyo County (HHSG 2011a, pg. 5.10-30). Based on the average family size in Inyo County of 2.88 persons per household, there would be an estimated addition of five students to the Death Valley Unified School District. As shown in **Socioeconomics Table 11**, there would be ample capacity available within the school district to accommodate the additional children. The HHSEGS operation would not create any significant adverse impacts to the local school system.

As noted in **Socioeconomics Table 1**, Section 17620 of the Education Code states "The governing board of any school district is authorized to levy a fee, charge, dedication, or other requirement for the purpose of funding the construction or reconstruction of school facilities." State and local agencies are precluded from imposing additional fees or required payments on development projects for mitigating possible enrollment impacts to schools. The current statutory school fees for the 2011-2012 fiscal year for commercial or industrial development within the Death Valley Unified School District is $0.47 per square foot of covered and enclosed space (CEC

2011x). The applicable fees are calculated prior to the issuance of building permits during plan review. Based on the preliminary project design, approximately 23,673 square feet would be considered occupied structures (HHSG 2011a, pg. 5.10-30). Based on this preliminary estimate, approximately $11,126.31 in school fees would be assessed for the Death Valley Unified School District.

<u>Conclusion</u>

Staff is proposing Condition of Certification **SOCIO-1** to ensure the payment of fees to the Death Valley Unified School District and compliance with Section 17620 of the Education Code through the one-time payment of statutory school impact fees. Staff concludes the project would not adversely impact service levels for schools and would have a less than significant impact on schools.

Parks

Inyo County Parks and Recreation offers outdoor recreation by providing fifteen parks and campgrounds within the county for residents and visitors. The closest facility is the Tecopa Hot Springs Park & Campground located approximately 26 miles southwest of the project site (INYO 2010b). Staff's analysis shows that the construction and operation of the HHSEGS would not induce population growth in the project area. Given the shortage of residential, commercial, and service-oriented development in the immediate project area, staff does not expect construction or operations workers to permanently relocate to the project area. Therefore, staff concludes that the construction or operation workforce would not have a significant adverse impact on parks or necessitate construction of new parks in the area.

<u>Conclusion</u>

Staff concludes the project would have a less than significant impact on parks.

Other Services

In addition to the comments from the Sheriff's office, the February 16, 2012 letter from Inyo County included preliminary estimates of the fiscal impacts of construction and operation of the HHSEGS project on several other county departments (INYO 2012b). The County provides non-law enforcement services to the Charleston View community near the proposed HHSEGS site with limited local staff, based in Tecopa, and supplements those services with staff from other County offices located in Lone Pine, Independence and Bishop (INYO 2012j, p.19). The County's total estimated costs associated with construction of HHSEGS amount to $11.4 million in expenditures, with $1.7 million in additional annual expenditures expected during the operation period of the project.

Each department head who contributed to the February 16, 2012 letter made a public presentation of their HHSEGS impact estimations (for construction and operation) during a special Inyo County Board of Supervisors meeting held on March 13, 2012 in Independence. Departmental management and representatives from the County also attended the May 9, 2012 Issues Resolution Workshop in Sacramento to present and discuss their estimates with staff and other parties to the HHSEGS proceeding, including the applicant. County staff have consistently stated that the remote location of the project site raises legitimate logistical concerns for county administrators because the majority of their existing available offices and resources are concentrated within the communities of Independence and Bishop, more than 200 miles northwest of the project site, in the northern part of Inyo County. In addition to the Sheriff's Department, the identified fiscal impacts were to the following county departments: Agricultural Department, Assessor's Office, Health and Human Services, Information Services, the Inyo County Motor Pool Program, the Department of Public Works, Waste Management and the Inyo County Water Department.

As discussed above, Inyo County is the second largest county in California in land area and has the sixth smallest population of counties in California, with much of the land publicly owned. Because the tax base is smaller than many other counties in California and the land area so large, the county has not yet been able to invest in the level of infrastructure and public services that would be needed to service large-scale industrial developments in the remote, southeastern portion of the county, such as HHSEGS.

<u>Conclusion</u>

The applicant was available at the March 13, 2012, Inyo County Board of Supervisors meeting and was encouraged to work closely with Inyo County planning staff and department heads to understand the costs identified by the County, and to ensure that Inyo County Staff had the requisite information they need to understand the potential impacts (and benefits) from the project. At the April 26, 2012 workshop at the Energy Commission, staff and Inyo County again addressed the applicant on the potential economic and fiscal impacts of the projects on the county.

To help quantify the economic and fiscal impacts to the county noted in its February 16, 2012 letter, staff prepared a report to determine the benefits and the costs of the HHSEGS to Inyo County, which is included as **Appendix Socio-1** of this document. Staff concluded that over the life of the project, the County would gain about $33.2 million net present value. The sales tax revenue alone generated for the County during the construction period would be far greater than the potential county expenditures estimated by Inyo County staff and by Energy Commission staff.

Preliminary cost estimates from the Inyo County departments of Public Works, Agriculture, Waste Management, and Water received in the February 16, 2012 letter are addressed in the **Traffic and Transportation**, **Biological Resources**, **Waste Management**, **Soils and Surface Water** and **Water Supply** sections of this **FSA**.

CUMULATIVE IMPACTS AND MITIGATION

A project may result in significant adverse cumulative impacts when its effects are cumulatively considerable; that is, when the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, other current projects, and probable future projects [Public Resources Code Section 21083; California Code of Regulations, Title 14, Sections 15064(h); 15065 (c); 15130; and 15355]. Mitigation requires taking feasible measures to avoid or substantially reduce the impacts.

In a socioeconomic analysis, cumulative impacts could occur when more than one project in the same area has an overlapping construction schedule, thus creating a demand for workers that cannot be met locally, or a demand for public services that does not match a local jurisdiction's ability to provide such services. An influx of non-local workers and their dependents can strain housing, schools, parks and recreation, law enforcement, and medical services.

The project site is in Inyo County, along the California and Nevada border. Adjacent on the Nevada side of the state border is Nye County, with Clark County in close proximity. HHSEGS construction is anticipated to begin in the second quarter of 2013 and continue through the fourth quarter of 2015. The AFC evaluated projects within a 20-mile distance from the project site for the potential of creating cumulative impacts. Although there are a number of projects that are currently under development in the vicinity of the HHSEGS that could potentially have an adverse cumulative socioeconomic effect, most of these projects have not advanced to the point where enough is known about them in terms of construction workforce requirements or construction schedule (HHSG 2011a, pg. 5.10-31).

The HHSEGS construction labor is expected to primarily come from unions in the counties of Kern, Inyo, and Mono, which the BTC serves. As shown in **Socioeconomics Tables 5 and 6,** the project would require workers of various specialized trades, which is common for construction of similar renewable energy plants. Although there are non-renewable energy projects in the vicinity of HHSEGS that are in various stages of development, they are not expected to conflict with the construction of HHSEGS because of the requirements of the construction workforce.

The nearby St. Therese Mission project is currently under construction, and would not likely employ the same types of specialized trade workers as HHSEGS. Agreements for the Pahrump Valley Airport are being coordinated between the Town of Pahrump, BLM, and the Federal Aviation Administration (FAA); once completed, the EIS process is expected to take several years. Therefore, staff considered a geographic area for cumulative impacts of Clark, Nye, Kern, Inyo, and Mono counties and sought out reasonably foreseeable renewable energy projects that may have overlapping construction schedules with HHSEGS. Staff also included projects in San Bernardino County due to its proximity to the south of the project site and the multitude of renewable energy projects proposed there in recent years.

Socioeconomics Table 14 lists the projects considered part of the HHSEGS cumulative scenario, from a socioeconomic resources perspective. **Socioeconomics Figure 3** displays the cumulative project locations on a map. Staff reviewed project tracking information and available environmental reports and notices on the websites of local jurisdictions and the BLM, and spoke with project managers from various agencies to compile the list.

SOCIOECONOMICS Table 14
Cumulative Socioeconomic Projects

ID #	Project Name	Peak Construction Workers	Operation Workers	Construction Begin	Construction End
	HHSEGS	**2,293**	**100**	**2nd Qtr 2013**	**4th Qtr 2015**
F	Silver State South Solar	230-400	70-100	3rd Qtr 2012	4th Qtr 2014
G	Stateline Solar	500	7-10	4th Qtr 2013	4th Qtr 2015
I	Searchlight Wind Energy	250-300		2012	2013
J	Southern Owens Valley Solar Ranch	300	10	3rd Qtr 2012	3rd Qtr 2015
N	Hidden Hills Valley Electric Transmission	66		4th Qtr 2012	1st Qtr 2015
O	Calnev Pipeline Expansion	550-650		2012	2013/1014
	Total	**4,189-4,509**	**187-220**		
Source: US BLM 2012a, US BLM 2012b, US BLM 2012c, LADWP 2010, CH2 2012jj.					

The applicant estimates a peak construction workforce of 2,293 workers during HHSEGS construction. An operations workforce of 100 workers would be needed for the project. As mentioned above, the operations workforce is, by and large, not anticipated to relocate to the immediate project area. **Socioeconomics Table 5** presents the total labor force for the crafts specifically needed for the construction of HHSEGS. As shown in the table, the labor force within the Eastern Sierra Region, Bakersfield MSA, and Las Vegas-Paradise MSA are more than sufficient to accommodate the labor needs for construction and operation of the HHSEGS and other probable future projects. Staff knows of no other projects currently under construction that could overlap with the construction schedule and workforce requirements of HHSEGS.

The HHSEGS does not directly or indirectly impact parks and housing and would not contribute to a cumulative impact to law enforcement, parks and housing; the HHSEGS would not directly or indirectly induce population growth, displace substantial numbers of people and/or existing housing or contribute to a cumulative impact in these areas. Assuming six operational employees reside in Inyo County, the estimated addition of five to six children as a result of the operational employees families would be an addition the DVUSD could readily accommodate. Staff's proposed Condition of Certification **SOCIO-1** would ensure applicable school fees are paid by the project. The increased usage of neighborhood or regional parks or other recreational facilities as a result of the project would be minimal. At this time, staff cannot conclude whether the HHSEGS would significantly impact emergency services and would contribute to a cumulative impact in this area.

POTENTIAL FOR PROJECT'S GAS PIPELINE AND ELECTRIC TRANSMISSION LINE TO INDUCE GROWTH IN THE PROJECT AREA

The CEQA Guidelines (Section 15126.2(d)) address whether projects which would remove obstacles to population growth could be growth-inducing, such as a major expansion of a waste water treatment plant that allows more construction in a public service area. This section analyzes the project's natural gas pipeline and electric transmission line and the potential for this new infrastructure to induce growth in the project area.

Overview of Development in the Area

In the 2001 Inyo County General Plan, the Charleston View area was designated Open Space and Recreation (OSR) and Resort/Recreational (REC) and the zoning was Open Space 40-acre minimum (OS-40). In 2011, Charleston View was one of 14 areas within the county identified for potential renewable energy development by the Inyo County Board of Supervisors. The most recent General Plan Progress Report notes that two conditional use permits were granted in 2010 in the Charleston View area: one for the St. Therese Mission environmental park development and another for placing a temporary weather monitoring station to see if the area is viable for solar energy production (Inyo County 2011a).

Beginning in the late 1950's, the Charleston View area, including the HHSEGS site, was subdivided into small- and medium-size parcels. An unpaved road grid system remains from that past activity, which would have been used had the residential developments occurred. However, given the low level of infrastructure development, and public services in the area combined with the scarcity of groundwater resources (see discussion below), no significant development occurred, no improvements were implemented, and no infrastructure was brought to the site. The proposed project site is currently undeveloped, vacant private land.

Project Infrastructure/Service Capacity Increase

In a letter to the U.S. Bureau of Land Management (BLM), dated December 6, 2011, the Chair of the Inyo County Board of Supervisors identified the project's electric transmission line and natural gas pipeline as potential triggers for growth-inducing impacts (INYO 2011b).

The electric transmission line and natural gas pipeline would be located on BLM managed lands and an environmental analysis pursuant to NEPA will be prepared by BLM as the lead agency (HHSG 2011a, pg. 1-3). In early February 2012, BLM released a Scoping Report for the Hidden Hills Transmission Project which identified various comments on cumulative and growth-inducing impacts related to the HHSEGS electric transmission line and natural gas pipelines, and additional renewable resource generation facilities in Nevada. These comments were submitted by various local government agencies including Inyo County (INYO 2011b), environmental groups (Basin and Range Watch), and members of the public. Response to these comments would be part of the Draft Environmental Impact Statement (DEIS) which is scheduled to be published in late December, 2012 or early January, 2013.

Natural Gas Pipeline

A 12-inch-diameter natural gas pipeline would be required for the project. The gas pipeline would enter the HHSEGS site in the common area where it would connect with an onsite gas metering station. It would exit the HHSEGS site at the California-Nevada border, extending 32.4 miles to the Kern River Gas Transmission (KRGT) existing mainline system just north of Goodsprings in Clark County, Nevada. Because of the gas line's exclusive use by HHSEGS, staff concludes the gas pipeline would not induce any additional growth in the project area.

Electric Transmission Line

HHSEGS will interconnect to the Valley Electric Association (VEA) system.[9] The interconnection would require an approximately 10-mile-long generation tie-line (gen-tie line) from the HHSEGS to the proposed Crazy Eyes Tap Station,[10] where the project would interconnect to the VEA electric grid. The gen-tie line would originate at the HHSEGS' onsite switchyard, cross the Nevada state line, and continue east for approximately 1.5 miles until reaching Tecopa Road. At Tecopa Road, the route would head northeast paralleling Tecopa Road until it reaches the Crazy Eyes Tap Substation, which would be located immediately east of the Tecopa Road/SR 160 intersection**.**

Staff has reviewed the **Transmission System Engineering** section of this **FSA,** which notes that the generator tie-line is rated to carry the full output of the project. The applicant has stated that power generated at HHSEGS would go to Pacific Gas & Electric (PG&E) under two power-purchase agreements approved by the California Public Utilities Commission in 2010, and this power would serve electricity needs in PG&E's service territory (HHSG 2011b). A small amount of electric power would be used onsite to power auxiliaries such as pumps and fans, control systems, and general facility loads including lighting, heating, and air conditioning. Additionally, some power would also be converted from alternating current (AC) to direct current (DC) and stored in batteries on site, which would be used as backup power for the plant control systems and essential uses. No other electrical power would be made available, either onsite, or offsite.

For these reasons, staff concludes the project's transmission infrastructure would not induce any additional growth in the project area. Staff has not assigned significance to impacts or required mitigation for the project's electrical and gas infrastructure in Nevada since that is the responsibility of the BLM.

Limitations to Development

As discussed in the **Water Supply** section of this **FSA**, the Pahrump Valley groundwater basin (PVGB), which includes the Charleston View area, has experienced significant declines in groundwater levels during the last 100 years. The PVGB has experienced average water level declines of approximately one foot per year since the 1950s. Staff believes the scarcity of local groundwater resources is a serious constraint to any significant development. New commercial/residential development is also constrained in the local area by the Open Space Recreation and Resort/Recreation land use designations, which are more fully discussed in the **Land Use** section of this **FSA.**

[9] In January, 2013, VEA will become a participating transmission owner (PTO) and will turn operational control of its facilities over to the California Independent System Operator (CAISO).

[10] In the HHSEGS AFC, and in the Preliminary Staff Assessment published on 5/24/2012, this substation was referred to as the "Tap Substation."

RESPONSE TO COMMENTS

Several comments were received on the Preliminary Staff Assessment during the public review period. Staff has reviewed these comments and has incorporated applicable edits and discussion into this **FSA**. For a listing of all of the staff's responses, please refer to **Appendix 2**, PSA Response to Comments, Growth-Inducing Impacts.

CONCLUSIONS AND PROPOSED FINDINGS OF FACT

Natural gas used to augment the solar operation at HHSEGS would be provided by a 12-inch gas pipeline and would not be available for any additional development; therefore, the project's gas pipeline would not induce any additional growth in the project area. The bulk of electricity generated by HHSEGS would provide power to the proposed VEA Crazy Eyes Substation, which would go to PG&E pursuant to two power-purchase agreements, and a small amount would be used on site for auxillary power plant operational purposes; therefore, the project's 230-kV transmission line to the VEA Crazy Eyes Substation would not induce any additional growth in the project area. The scarcity of local groundwater resources and the existing land use designations are serious constraints to any significant economic development in the project area.

In terms of impacts on BLM land in Nevada, the HHSEGS is one of several renewable energy projects that are being reviewed by BLM. As the lead federal agency under the National Environmental Policy Act, BLM has the responsibility to analyze the various issues related to the proposed energy projects, including growth-inducing impacts. Growth-inducing and cumulative impacts were identified in several comments in the BLM Scoping Report for the VEA Hidden Hills Transmission Project, and would be discussed more fully in the forthcoming BLM DEIS. Staff has not assigned significance to impacts or required mitigation for the project's electrical and gas infrastructure in Nevada since that is the responsibility of the BLM.

PROPOSED FINDINGS OF FACT

Based on the analysis above, staff makes the following proposed findings:

1. The HHSEGS would involve the construction and operation of a 230-kV electric transmission line.

2. HHSEGS would require a 12-inch-diameter natural gas pipeline.

3. Both linears would be located on BLM managed lands and would be analyzed in a DEIS scheduled to be released in December, 2012 or January, 2013.

4. The project's natural gas pipeline and electric transmission line would not induce any additional growth in the project area.

5. The Pahrump Valley groundwater basin, which includes the Charleston View area, has experienced significant declines in groundwater levels during the last 100 years and staff believes this is a serious constraint on any significant development. Current land use designations are an additional constraint on new commercial/residential development in the local area.

NOTEWORTHY PUBLIC BENEFITS

The AFC provided an estimate of the direct, indirect, and induced impacts resulting from the construction and operation of the HHSEGS project based on an IMPLAN model analysis. IMPLAN is an input-output model that relies on a series of multipliers to provide estimates of the number of times each dollar of input or direct spending cycles through the economy in terms of indirect and induced output, or additional spending, personal income, and employment. The IMPLAN model is widely used by governmental agencies, trade associations, and public interest research groups.

According to the AFC, indirect and induced economic impacts from construction typically lag behind direct effects by 6 to 12 months, beginning approximately between the fourth quarter of 2013 and the second quarter of 2014. Indirect and induced economic impacts from the operation would lag behind direct effects by 6 to 12 months, beginning approximately between the second quarter of 2014 and fourth quarter of 2014. **Socioeconomics Tables 15 and 16** present the IMPLAN results presented in the UWA. These IMPLAN results are based on the applicant's assumption that 70 percent of the construction workforce would be drawn from California and 30 percent from Nevada.

At the March 13, 2012, Inyo County Board of Supervisors meeting, the supervisors encouraged the applicant to work with their EPC contractor to develop programs to entice young people within the county to join the project workforce (INYO 2012i, pp 141-142).

SOCIOECONOMICS Table 15
HHSEGS Economic Benefits from Construction (2011) dollars

Fiscal Benefits	5-County[1] Region, CA	Clark & Nye counties, NV	Total
State and local sales taxes:			
Construction (annual)	$3,875,000[2]	$1,721,480	$5,571,590
Non-Fiscal Benefits			
Total capital costs	$2.2 billion	$ 0	$ 2.2 billion
Construction payroll	$185.3 million	$120 million	$213.7 million
Construction materials and supplies	$50 million	$21.4 million	$71.4 million
Direct, Indirect, and Induced Benefits			
Estimated Direct Benefits			
Jobs (average)	769	329	1,098
Estimated Indirect Benefits			
Jobs	89	41	130
Income	$3,594,400	$1,687,620	$5,282,020
Estimated Induced Benefits			
Jobs	409	257	666
Income	$15,189,370	$11,131,100	$26,320,470

[1]The 5-county region is: Inyo, Mono, Kern, Riverside, and San Bernardino counties. [2] Estimate applies to Inyo County only.
Source: CH2 2012jj

SOCIOECONOMICS Table 16
HHSEGS Economic Benefits from Operation (2011) dollars

Fiscal Benefits	Inyo County, CA	Clark & Nye counties, NV	Total
Estimated annual property taxes	$3.9 million	$0	$3.9 million
State and local sales taxes:			
Operation (annual)	$2,090	$41,010	$43,100
School Impact Fees (estimated)	$11,126.31	$ 0	$ 11,126.31
Non-Fiscal Benefits			
Operations payroll (annual)	$652,180	$12,391,330	$13,043,500
Operations and maintenance supplies (annual)	$27,000	$513,000	$540,000
Direct, Indirect, and Induced Benefits			
Estimated Direct Benefits			
Jobs	5	95	100
Estimated Indirect Benefits			
Jobs	0	2	2
Income	-	$97,630	$97,630
Estimated Induced Benefits			
Jobs	2	62	64
Income	$60,150	$2,697,310	$2,757,460
Source: CH2 2012jj			

In Data Response SE-3, the applicant stated that they are willing to work with Inyo County to maximize the allocation of sales and use tax to the county given the supply chain that will be established for construction of the project. A similar arrangement has worked well with San Bernardino County at Ivanpah SEGS, and it is anticipated that a similar arrangement would work equally well with the HHSEGS Project (CH2 2012u).

Staff prepared a report on the socioeconomic and fiscal impacts of the project on Inyo County, which is included as **Appendix Socio-1** of this document. **SOCIOECONOMICS Table 17** shows that based on staff's analysis of the information available, county agencies would receive about $33.2 million more than it expends over the life of the project. Staff is proposing Condition of Certification **SOCIO-3**, to ensure economic benefits to the County by obtaining the receipt of sales and use tax revenues.

SOCIOECONOMICS Table 17
Net Fiscal Impacts on Inyo County: 28 Years

	Construction (29 Month Total)	Operation (Years 1-3)	Operation (Years 4 on)	Net Present Value
Revenues	$30,043,00	$801,000	$801,000	$37,289,000
Expenditures	$2,791,000	$388,000	$58,000	$4,054,000
Net Impact	$27,252,000	$413,000	$743,000	$33,200,000
	Source: Appendix Socio-1 *Socioeconomic and Fiscal Impacts of the Hidden Hills Solar Electric Generation System on Inyo County*			

PROPERTY TAX

The AFC states the proposed HHSEGS would generate property tax revenue to Inyo County, California. As the legislation currently stands, HHSEGS, if under construction by January 1, 2017, qualifies for the exclusion of certain parts from valuation per the Revenue and Taxation Code, Section 73. The applicable property tax rate for the project site is one percent. Assuming the property tax exemptions apply, Inyo County would receive about $3.9 million annually. This additional property tax revenue would constitute an almost 23 percent increase in the total county taxes over fiscal year 2010 amounts. (HHSG 2011a, pg. 5.10-29)

Staff's report *Socioeconomic and Fiscal Impacts of the Hidden Hills Solar Electric Generation System on Inyo County* (**Appendix Socio-1**) estimates that after the project becomes operational, Inyo County government would receive $0.75 million more in property taxes annually from the parcels within the project's boundaries than is currently being received for those parcels.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Please see **Appendix 1** – PSA Response to Comments, Socioeconomics

PROPOSED FINDINGS OF FACT

Staff concludes the HHSEGS would not cause a significant adverse direct, indirect, or cumulative socioeconomic impact as a result of the construction or operation of the proposed project in the areas of population, fire and emergency medical services, law enforcement, housing, schools, parks and recreation, based on the following proposed Findings of Fact:

1. The project's construction and operation workforces would not directly or indirectly induce a substantial population growth in the project area.

2. The project's construction and operation workforce would not have a significant adverse impact on housing within the project area and would not displace any people or housing, or necessitate construction of replacement housing elsewhere.

3. The project would not result in substantial adverse physical impacts to schools.

4. The project would not increase the use of existing neighborhood and regional parks or recreational facilities to the extent that substantial physical deterioration of the facility would occur or be accelerated, and new parks are not proposed by or needed as a result of the project.

5. The sales tax revenue generated for Inyo County during the construction period would be greater than the estimated potential County expenditures. Therefore, the County would have adequate financial resources to provide appropriate Sheriff's protection to the project site and southern Inyo County.

6. The construction and operation of the project would not significantly impact the local fire district if proposed Conditions of Certification **WORKER SAFETY-6** and **WORKER SAFETY-7** are implemented.

PROPOSED CONDITIONS OF CERTIFICATION

SOCIO-1 The project owner shall pay the one-time statutory school facility development fees to the Death Valley Unified School District as required by Education Code Section 17620.

Verification: At least 30 days prior to the start of project construction, the project owner shall provide to the Compliance Project Manager (CPM) proof of payment to the Death Valley Unified School District of the statutory development fee.

SOCIO-2 Information regarding illegal and unauthorized camping shall be provided to all onsite personnel at the time of their Worker Environmental Awareness (WEAP) training.

Verification: At least 60 days prior to the start of any project-related pre-construction site mobilization, the project owner shall provide to the CPM (for review and approval, and to Inyo County for review and comment), electronic copies of the information regarding illegal and unauthorized camping that will be provided to all onsite personnel at the time of their WEAP training. At least 30 days prior to the start of any project-related pre-construction site mobilization, the project owner will provide two copies of the final information regarding illegal camping to the CPM and implement the training for all workers at the time of their WEAP training.

SOCIO-3 In order to ensure economic benefits to the County and to the State of California as intended by the enactment of the Renewables Portfolio Standard[11] by obtaining the receipt of sales and use tax revenues, the project owner will work with the County and the contractors that will be responsible for the acquisition of materials and the construction of the Project so sales and use tax shall be accepted in the unincorporated area of the County of Inyo. A signed and notarized statement from someone authorized to sign on behalf of the project owner shall include terms mutually acceptable to the County and the project owner indicating a good faith effort will be made to ensure the receipt of sales and use tax revenue in the unincorporated area of the County of Inyo. Terms that would ensure the receipt of sales and use tax could include, but not be limited to, the following:

1. Make a good-faith effort to have all transactions that will generate sales and use taxes, including transactions of project owner's contractors, occur in the unincorporated area of the County;
2. Encourage the contractors to establish a business location and tax resale account, and take other reasonable steps, to maximize receipt of sales and use tax revenues for the County;
3. Include in a master contract and any other contract for construction, language ensuring that the County will receive the benefit of any sales

[11] The State of California's Renewables Portfolio Standard is established and amended in CA Public Utilities Code § 399.11 et seq., CA Public Resources Code § 25740 et seq., and SBX1-2.

and use tax generated by the Project to the fullest extent permitted by law;

4. Include the following provision from California Board of Equalization, Regulation 1806(b), in all construction contracts:

   The jobsite is regarded as a place of business of a construction contractor or subcontractor and is the place of sale of "fixtures" furnished and installed by contractors or subcontractors. The place of use of "materials" is the jobsite. Accordingly, if the jobsite is in a county having a state administrated local tax, the sales tax applies to the sale of the fixtures, and the use tax applies to the use of the materials unless purchased in a county having a state-administrated local tax and not purchased under a resale certificate.

5. In all agreements related to the Project, identify the jobsite as the project address, which is located within the unincorporated area of the County of Inyo;

6. If the project owner enters into a joint venture or other relationship with a contractor, supplier, or designer, the project owner shall either establish a buying company within Inyo County under the terms and conditions of Board of Equalization Regulation 1699(h), to take possession of any goods on which sales and use taxes are applicable but are not defined by Regulation 1806 and shall include in it their requests for bids, procurement contracts, bid documents, and any other agreement whereby California Sales and Use Taxes may be incurred, that the sale occurs at that place of business in the unincorporated area of Inyo County; or, alternatively, any entity that may sell goods on which sales taxes are applicable may establish its own place of business within the unincorporated area of Inyo County where delivery is ultimately made to the project owner; principle negotiations for all such sales shall be carried on in Inyo County;

7. Provide notice to all out-of-state suppliers of goods and equipment, no matter where originating, that Inyo County is the jurisdiction where the first functional use of the property is made.

Verification: At least 30 days prior to the start of any project-related pre-construction site mobilization, the project owner shall provide to the CPM (for review and approval, and to Inyo County for review and comment),a signed and notarized statement from someone authorized to sign on behalf of the company, with language acceptable to the company and the CPM specifying the terms related to sales and use taxes

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APPENDIX SOCIO-1: SOCIOECONOMIC AND FISCAL IMPACTS OF THE HIDDEN HILLS SOLAR ELECTRIC GENERATING SYSTEM ON INYO COUNTY

Dr. Richard McCann, MPP, Ph.D.

EXECUTIVE SUMMARY

This fiscal impact report estimates a range of potential economic impacts in jobs and spending under reasonably foreseeable scenarios for a solar project proposed on privately owned land in Inyo County (County). It also assesses changes in the County government's fiscal situation if the proposed project is built, using the best available data and constructing reasonably foreseeable scenarios.

The study evaluates of the following project under review by the County. The Hidden Hills Solar Electric Generating System (HHSEGS) project is proposed by BrightSource Energy. BrightSource proposes to construct and operate two solar fields, each consisting of 250 MW, for a total of 500 MW.

The two scenarios examined differ in their assumptions of county expenditures resulting from the proposed project and sales and use tax revenue to Inyo County agencies.

Scenario 1: County estimates of mitigation costs associated with the project are used. This amounts to $11.4 million in expenditures during the construction period and $1.7 million in annual expenditures during the operation period. Mirror costs are not included in sales and use tax base under the case that the vendor applies for and receives a state manufacturing exemption, and sales tax generated from employee spending are not included in revenues to the County. This amounts to revenues of $24.1 million during the construction period and annual revenues of $0.77 million during the operation period.

Scenario 2: Revised estimates of $2.7 million in construction period expenditures and $0.39 million annual operation period expenditures in the first three years and $0.06 million thereafter generated by our staff based on new information and analysis are used. Mirror costs are included in the sales and use tax base, and sales and use tax generated from employee spending is included in revenues. This amounts $30 million in revenues during the construction period and $0.80 million in annual revenue during the operation period.

The proposed project is expected to cost in the range of $2.2 billion in total to construct with direct material costs of roughly $1.05 billion, based on estimates for the solar power tower technology provided by the applicant. Using conservative assumptions about where plant components are assembled, a reasonably foreseeable scenario is that about $50 million of the total value of materials and supplies would be purchased locally over three years. However, staff assumes only $0.23 million (0.46 percent) would be spent within Inyo County, and the remaining $49.7 million (99.54 percent) would be spent in neighboring counties in California. This level of spending could be expected to directly produce two jobs within Inyo County and 1,096 jobs in the neighboring counties, indirectly create seven jobs within the County, and induce another 41 positions within the County. Such spending would increase County economic output by $41.6 million and earnings by $2.8 million over the 29-month construction period.

Annual operational payroll and spending on operating costs of the project are projected by the applicant to be about $13.04 million and $0.54 million, respectively, with 5 percent going to the County. This could directly produce five jobs, indirectly generate approximately three jobs and induce 11 jobs in the County. County economic output could rise by $2.2 million and earnings by $1 million.

The proposed project would generate between $82.9 to $100.4 million in total sales and use tax revenues over three years based on the cost estimates presented here of which $24.1 to $29.2 million would go to the County based on the representations by the project proponents and state tax allocation formulas. This amount represents the maximum available assuming the County and state take the actions necessary to ensure compliance with tax collection. Of this amount, $8 to $9.7 million would go directly to the County General Fund for city and county operations, and $5.3 to $6.5 million would go to Special Districts in the County as part of the Rural Counties Transaction Tax. $10.7 to $13 million would be provided to the County indirectly through the Local Public Safety and Local Revenue Funds allocated from state revenues. The proposed project is unlikely to qualify for a sales tax exemption that sets the lower bound on this estimate for several reasons discussed in this report. After the project becomes operational, the County government would receive a levelized annual amount of $0.75 million more in property taxes annually from the parcels encompassed in the project's boundaries than is currently being received for those parcels. The proposed project would avoid $16.25 million annually in property taxes based on this cost estimate with the state exemption. However, if the project is sold, the new owners would be liable for this amount.

Construction and operation of the project would require the County to pay additional costs for public safety and other services in the local area. As noted above, staff generated scenarios in which the cost of these services would be between $2.7 and $11.4 million during construction and approximately $0.39 million for the first three years and $58,000 annually thereafter to $1.7 million per year during plant operations.

Other County costs outside of Charleston View are not expected to change substantially. While most of the labor force will be coming from outside the County, the applicant projects that most will reside in Nevada for the duration, so the County population and workforce are expected to remain stable. Thus general County government expenditures should remain stable. Although social welfare and public health expenditures may decrease as unemployment decreases and socioeconomic conditions improve, no reliable estimation method is available to calculate those impacts. Such a study would require an in-depth analysis of affected departmental budgets that is beyond the scope of this analysis.

Appendix Socio-1 Table 1 and **Table 2** summarize the net fiscal impacts during the construction and operational periods for both scenarios. During the 29-month construction period, County agencies would receive about $12.6 to $27.3 million more than it expends. Once operational, the County would annually expend between $0.94 million more than it receives and up to $0.75 million less than it receives after the first three years of operation.

APPENDIX SOCIO-1 Table 1
Net Fiscal Impacts on Inyo County: 28 Years, Scenario 1

	Construction (29 Month Total)	Operation (Annual)	Net Present Value
Revenues	$24,069,000	$773,000	$31,471,000
Expenditures	$11,408,000	$1,714,000	$31,337,000
Net Impact	$12,661,000	($941,000)	$100,000

APPENDIX SOCIO-1 Table 2
Net Fiscal Impacts on Inyo County: 28 Years, Scenario 2

	Construction (29 Month Total)	Operation (Years 1-3)	Operation (Years 4 on)	Net Present Value
Revenues	$30,043,000	$801,000	$801,000	$37,289,000
Expenditures	$2,791,000	$388,000	$58,000	$4,054,000
Net Impact	$27,252,000	$413,000	$743,000	$33,200,000

This analysis has several key caveats which could alter the results and conclusion significantly if the situation changes. The first is that the overall project cost estimates are based on published sources and only partially reflect the actual costs that will be revealed once the project is constructed and assessed by the County Assessor. The proportion of the project costs subject to taxation also could vary as (1) the amount of material sales subject to local sales tax could vary, and (2) the County Assessor may determine that differing proportions of the plants qualify for the property tax exemption. Perhaps the largest caveat for Scenario 2 is that the manufacturing plants for the projects mirrors will not qualify for a sales tax exemption as well. However, the project still shows a positive fiscal impact on the County so long as an agreement on the point of sale is concluded to direct sales and use tax into California. And finally, the calculations of the local shares of property and sales tax are complex and uncertain due to changing fiscal conditions at the state level.

This report that follows contains further discussion of the rationale and supporting documentation for this summary.

INTRODUCTION

The HHSEGS project is proposed by BrightSource Energy, Inc. BrightSource proposes to construct and operate two 250 MW solar power plants (500 MW combined) on privately owned land in the Charleston View area of Inyo County, adjacent to the California/Nevada border. BrightSource has two purchase agreements (PPA) with Pacific Gas and Electric Company (PG&E) to deliver power that have been approved by the California Public Utilities Commission (BrightSource Energy, Inc., 2011a).

This report estimates potential economic impacts in jobs and spending, under a reasonably foreseeable scenario, from the construction and operation of the Hidden Hills project. It also assesses changes in Inyo County (County) government's fiscal situation if the proposed project is built. The economic impacts are derived from direct costs based on publicly available estimates for each of the technologies, and these costs are used in a regional economic input-output model. The economic impacts show jobs creation and increased earned income in the County.

The fiscal impacts reflect both increased net revenues and changes in County costs. This report addresses the direct fiscal impacts on the County's government agencies of the construction and operation of the plants, and not from any other induced economic activity. This report does not address the larger question of how overall changes in economic activity might affect the County's fiscal situation due to the complexity and uncertainty of the required analysis. In other words, it does not fully account for either the changes induced by increased local employment on County expenditures or revenues. The revenue changes reflect property and sales taxes generated by the project directly. The costs reflect those created directly either by the project itself, or the change in employment at the project locations.

COUNTY OF INYO SOCIOECONOMIC PROFILE

The Hidden Hills Solar Electric Generating System would be located on private property in the Charleston View area in eastern Inyo County, adjacent to the California/Nevada border. The County's 2010 population was estimated to be 18,546, and the State Department of Transportation forecasts an increase to 20,279 by 2020 and 21,592 by 2030. Most of the population resides in the County's unincorporated areas, with the three largest cities and Census-designated places being Bishop, with a population of 3,879, Dixon Lane-Meadow Creek, with 2,645 residents, and West Bishop, with 2,607 residents (United States Census, 2012a; California Department of Transportation, 2011).

Inyo County's 2010 annual average unemployment rate reached a 15-year high of 10 percent, which was still below the State's average jobless rate of 11.7 percent (U.S. Bureau of Labor Statistics, 2012). At $29,966 per capita (in 2008), personal income is 2.7 percent above the statewide average of $29,188, with the lower proportion of very-low-income people than the statewide average — 11.9 percent of the population have incomes below the poverty level in the County, compared to 13.7 percent across the state (U.S. Census Bureau, 2012b).

APPENDIX SOCIO-1 Table 3
Employment Profile of the Study Area, 2011

Industry	**Inyo County Labor Force**
Total Farm	50
Construction and Mining	200
Education and Health Services	450
Financial Activities	150
Government	3,220
Information	70
Leisure and Hospitality	1,520
Manufacturing	250
Professional & Business Services	250
Trade, Transportation, Utilities	200
Other Services	180
Total Employed	***8,480***
Unemployment Rate	***9.2%***
Source: CAEDD, 2012	

Appendix Socio-1 Table 3 displays the employment in the County by sector for 2011, the most current year available (CAEDD, 2012). As indicated in the table, government agencies are the number one employer in Inyo County. In 2008, the annual average County unemployment rate was 6.5 percent. The recession increased this rate to 9.2 percent in 2009, and the most recent reported rate for December 2011 also is 9.2 percent. This is a slight decrease from the annual average of 10 percent in 2010 but still one of the higher unemployment rates for the country in recent years (U.S. Department of Transportation, 2011).

ECONOMIC INFLUENCE OF THE HIDDEN HILLS SOLAR ELECTRIC GENERATION SYSTEM

The project has two distinct phases that have different economic consequences for the County. Construction is the first short-term phase, which will take place over a specified period, planned as 29 months in this case. This entails a fairly intensive amount of activity with substantial expenditures and material components. Operation and maintenance is the second, longer-term phase. The majority of the costs during the second phase will be for operation staff of the power plants. These expenditures, uses of resources and changes in the labor force will result in changes in the local economy and associated governmental activities.

BrightSource provided much of the required cost estimates for construction and operation of the proposed project (BrightSource Energy, Inc., 2011a; BrightSource Energy, Inc., 2011b; BrightSource Energy, Inc., 2012a; BrightSource Energy, Inc., 2012b). The cost assumptions presented here are consistent and within the range of publicly available published reports and models, and represent a reasonably foreseeable outcome. Unless explicitly stated, this report assumed manufacturing and non-labor operating expenditures would occur out of the County. The project proponents have their corporate offices or headquarters located outside of Inyo County, and no significant solar panel manufacturing plant is located locally. While a certain proportion of these expenditures are likely to occur locally, there is insufficient detail from any source to quantify this amount accurately. This report uses the applicant's estimates of local expenditures as a reasonably foreseeable scenario. Construction and operating labor costs are allocated between Inyo and outside of the County (Mono, Kern, Riverside, and San Bernardino counties in California and Clark and Nye counties in Nevada) based on the employee locations provided by the applicant and U.S. Bureau of Economic Analysis personal income data. The applicant failed to provide construction cost and employment estimates for Inyo County, opting instead to provide this data for the five-county region that includes Inyo, Mono, Kern, Riverside, and San Bernardino Counties. Staff used Inyo's share of total personal income in the 5-county region (0.46 percent) to allocate the reported construction costs between Inyo and the remaining four counties in the region. Similarly, staff used Inyo's share of personal income in the construction and wholesale trade industries (0.22 percent) to allocate construction payroll expenditures and employment between Inyo County and the rest of the five-county region.

BRIGHTSOURCE'S PROPOSED HIDDEN HILLS SOLAR GENERATING SYSTEM

The HHSEGS is a proposed 500 MW AC PV power plant. The proposed project would be developed within an approximate 3,277-acre area, with approximately 6,000 additional acres assumed to be used for mitigation measures. The plant would be composed of two solar fields and associated solar facilities. The two solar plants will use heliostats—elevated mirrors guided by a tracking system mounted on a pylon—to focus the sun's rays on a solar receiver steam generator (SRSG) atop a tower near the center of each solar field (BrightSource Energy, Inc., 2011a). **Appendix Socio-1 Table 4** details the assumptions and costs for construction and operation of the HHSEGS plant. Data on the construction period and labor force size were provided by the applicant, BrightSource, as was data on per worker labor costs. Certain cost elements were then allocated based on the U.S. Department of Energy's National Renewable Energy Laboratory's (NREL) Jobs and Economic Development Impact II, or JEDI II input-output model (NREL, 2011). The land purchase costs, which are the basis for the assessed values of the land portion of the secured property, are based on the average per acre price derived from data on 2011-2012 land sales in the Charleston View Area (Deputy County Counsel, 2012a).

APPENDIX SOCIO-1 Table 4
HHSEGS Economic Parameters and Costs

Plant Size	
Production (AC Net MW)	500
Acreage	9,277
Land cost per acre	$3,312
Total land cost if purchased – Inyo County	$30.7 million
Months of construction period	29
Construction Costs[1]	
Cost of construction	$2,176 million
Supplies & materials costs	$1,050 million
Local construction expenditures – Inyo County	$0.2 million
Local construction expenditures – outside county	$71.2 million
Annual Average Local construction payroll – Inyo County	$0.5 million
Annual Average Local construction payroll – outside county	$62.9 million
Average monthly number of construction workers – Inyo County	2
Average monthly number of construction workers – outside county	1,096
Average salary & wages – Inyo County	$0.12 million
Average salary & wages – outside county	$88.4 million
Average benefits & other overhead costs – Inyo County	$0.05 million
Average benefits & other overhead costs – outside county	$37.9 million
Operation Impacts[2]	
Annual operation and maintenance cost	$13.6 million
Local operation expenditures – Inyo County	$0.7 million
Local operation expenditures – outside county	$12.9 million
Labor portion of annual operation cost – Inyo County*	$0.7 million
Labor portion of annual operation cost – outside county	$12.4 million
Annual Number of FTE permanent positions – Inyo County	5
Annual Number of FTE permanent positions – outside county	95
Labor wage portion of annual operation cost	$9.1 million
Average salary & wages – Inyo County	$0.5 million
Average salary & wages – outside county	$8.6 million
Average benefits & other overhead costs – Inyo County	$0.2 million
Average benefits & other overhead costs – outside county	$3.8 million

Source: BrightSource, 2011; BrightSource, 2012b.
* Includes wages, benefits, and other employer costs.
1 Outside County includes Mono, Kern, Riverside, and San Bernardino counties in California and Clark and Nye counties in Nevada
2 Outside County includes Clark and Nye counties in Nevada

REGIONAL ECONOMIC IMPACT FORECAST METHODOLOGY AND RESULTS

The economic significance of the proposed solar project to the Inyo County economy can be assessed using an input-output model of the County's economy based on the NREL JEDI input-output model system of regional economic accounts (Lantz and Mosey, 2009). The "region" here is defined as the County. These County multipliers for employment, wage, and salary income and output (economic activity), and personal expenditure patterns included in JEDI are adapted from the IMPLAN Professional model (MIG, 2011). In turn, the IMPLAN data set is derived from U.S. Bureau of Economic Analysis data. These regional model assesses impacts to such variables as industry output (or gross sales), labor income (employee compensation and self-employed proprietors' earnings), other property ownership–related income (corporate profits, dividends, rents and other returns on capital assets), indirect business taxes (mainly sales and property taxes), and employment (full- and part-time jobs). These models are commonly used to evaluate economic activity in which changes in the total demand for output of the industries being studied results in changes in inputs and outputs by the local economic sectors. For example, these models have been used to estimate the impacts of such projects as construction and operation of new factories, development of tourism facilities, and military base closures. A recent study by the University of California found that IMPLAN produced an accurate estimate of actual job losses in the Central Valley related to the 2009 drought (Howitt, et al, 2011).

Economic activity is measured with two important concepts. The first is "total output," which is the total expenditures and receipts associated with all transactions in the economy. However, it includes both activity which may only be a simple transfer with little associated economic production as well as the actual economic activity that is facilitated by or facilitates the transfer.

The second concept of "value added" measures the actual economic activity associated with a transfer, and is a component of total output. It is the component that adds actual wealth to the economy. Value added is the economic value added to a product by an industry beyond the costs of purchasing the necessary inputs from other industries, as measured by labor and property income and indirect taxes. Each step of the production, delivery, and service process adds incremental value. The cumulative value added across these industries, plus any out of state imports, will equal the total cost to provide the final product to the end consumer. The sum of all of this value added for California is known as the "Gross State Product" or GSP. The GSP excludes out of state imports, and does not include the multiplier effect. The GSP is directly analogous to the U.S. Gross Domestic Product or GDP, whose growth rate is followed closely in the business and economic press.

The JEDI model uses multiplier analysis to estimate the total change in County economic activity due to an initial change in construction and plant operational activity. The total change in economic activity consists of three parts: (1) the direct impact, (2) the indirect impact, and (3) the induced impact. The direct impact is simply the initial change in activity. For example, if farm sales fall by $1 million, the direct impact is the change to farm sales, farm income, farm employment, and tax receipts caused by the fall in farm output. The indirect impact is the change in output, earnings, and employment to all businesses that are linked to the affected downstream sector and impacted by reduced demand for its inputs. The induced impact is the change in regional output, earnings, and employment caused by changes in household income and spending associated with the direct and indirect impacts. Together, direct, indirect, and induced impacts capture the full range of changes in County economic activity stemming from an initial direct change in demand for a good or service. The assumptions about the economic relationships that induce spending and job creation are embedded in the JEDI model and are complex and extensive. The reader is referred to the JEDI and IMPLAN documentation to understand these assumptions and data sources in greater depth.

ISSUES IN MODELING REGIONAL ECONOMIC IMPACTS TO THE COUNTY FROM THE PROPOSED SOLAR PROJECT

Regional economic models such as RIMS, IMPLAN and JEDI can give useful insights into how policy choices might affect the economy. However, they have several limitations on their results. The most important is that they do not account for changes in the economy over time. They rarely capture such technological changes such as the introduction of personal computers. Another shortcoming of input-output models such as IMPLAN or RIMS is that they do not account for relative price changes. For example, if beef becomes cheaper than chicken, the model does not reflect how beef consumption would increase and chicken would fall. Because of these limitations, regional models tend to overstate the economic impacts from large projects or policy changes, especially as the analysis extends further out into the future.

Three particular issues are of note for this regional economic analysis. First, some of the economic activity and flows associated with the proposed project occur outside of, or “leak” from, Inyo County economy into other counties. “Leakage” occurs in a regional economy when goods and services are bought outside of the local economy. Such leakage is common in every regional modeling exercise; however, there are some additional considerations in this case. First, most of the solar panel manufacturing would occur outside of the County. And second, a large segment of the labor force for both construction and operation would commute from outside the County due to the remote location of the proposed project. Often there is a counterbalancing inflow, as will occur with this proposed solar project.

Finally, the standard configuration for the JEDI model assumes that all construction for the project takes place in one year and that the plant begins operating in that same year once construction is complete. This is problematic because most large scale projects are not completed within one year. Construction of the Hidden Hills plant will span 29 months, not including month 0 (BrightSource Energy, Inc., 2011a). In order to calculate the construction costs by year, staff generated a separate version of the JEDI model for each year in which construction occurs and another version of the model to determine the O&M costs and impacts. To do so, staff assigned a share of the total project construction costs to each year based on the proportion of construction employees over the life of the project working that year using detailed data on the project timeline and construction personnel provided in the HHSEGS AFC and revised in a Data Response (BrightSource Energy, Inc., 2011b)

The project is expected to begin construction in the third quarter of 2012, with a three month delay between the start of plant 1 and plant 2, and end in Q2 2015.[1] This allows for an on-line date of Q1 2015 for plant 1 and Q2 2015 for Plant 2. Given this information, we determined that construction would occur for three months in 2012, 12 months in both 2013 and 2014, and three months in 2015.

Table 5.10-16R1 of the HHSEGS AFC provides number of construction personnel by month for the duration of the construction period. Using the construction timeframe noted above, each month was assigned to one of the four construction years. Staff summed the total monthly construction workforce to determine the annual construction workforce for each of the four years in which construction takes place. Staff found that of the 32,620 construction personnel employed throughout the total construction period, 1.5 percent are employed in year 1 of construction, and 32.4 percent, 61.4 percent, and 4.7 percent are employed in the following years.

Staff multiplied the annual employment percentage values by the $2.176 billion in total construction costs to calculate the construction costs for each year of the project, which were then entered into the JEDI model for the respective years. To ensure that no O&M impacts were reported in the construction year models, staff set all O&M costs to zero and set the local share of property taxes, debt and equity financing/repayment, insurance and land purchase/lease parameters to zero. These items are all used to compute the O&M impacts but have no effect on the construction impacts.

For the O&M version of the JEDI model, staff used the estimated O&M costs provided in the AFC and set the local share of the items listed in the previous paragraph to the appropriate values. The local share of construction-related sales tax was set to zero as sales tax generates impacts from plant construction in the model. To ensure that the proper property tax value was computed and used in the model, staff entered the total construction period costs; however, the local share of all construction-related costs were set to zero to ensure that the model would compute only O&M impacts.

Impacts were measured in terms of County output, earnings, and employment. Economic output accounts for the total value of forgone goods and services produced or sold in Inyo County, including the value of imports into the County. These parameters consider only the economic value generated within Inyo County. Earnings represent the portion of value-added that accrues to wage earners and business proprietors. Employment counts the number of full- and part-time positions created by the construction and operation of the proposed project.

SUMMARY OF MODELING RESULTS FOR COUNTY ECONOMIC IMPACTS

The economic impacts from the project will occur in two phases. The first will last about 29 months as the project is constructed. **Appendix Socio-1 Table 5** shows a rea-

[1] The schedule was changed from that in the AFC and reflected in the numerous data submissions by Bright Source. The project now is expected to begin construction in the second quarter of 2013, with a three month delay between the start of plant 1 and plant 2, and end in Q4 2015. This allows for an on-line date of Q3 2015 for plant 1 and Q4 2015 for Plant 2.

sonably foreseeable scenario for increased employment, earnings and output, or product and services sold, within Inyo County for the 2012-2015 period, based on the assumptions specified here and included in the JEDI model algorithms and data. The modeling results show that two jobs would be created in the County directly from construction activity and another 48 would be induced through increased activity in the County.[2] Total County earnings would rise by $2.8 million, and total output by $41.6 million for the full 29 month period, or about $1.2 million annually for earnings and $17 per year for output.

The second phase is the long-term operation of the proposed plants, which is expected to extend at least 25 years based on financing projections used in the industry and the terms of the respective PPAs. **Appendix Socio-1 Table 6** shows a reasonably foreseeable scenario for the period beginning as early as 2015, depending on the operational date for the plant. BrightSource estimates five jobs out of 100 total jobs will be created for and filled by local residents. Another 13 jobs would be induced through local activity and purchases, for a total of about 18 jobs created County-wide. Total annual earnings would increase by $0.9 million and output by $2.2 million.

APPENDIX SOCIO-1 Table 5
Proposed Project Economic Impacts during Construction 2012-2015

Impact	**Jobs**	**Earnings $million (2012)**	**Output $million (2012)**
Project development and onsite labor impacts	2	$0.4	$0.4
Module and supply chain impacts	7	$0.4	$31.5
Induced impacts	41	$2	$9.7
Totals	50	$2.8	$41.6

APPENDIX SOCIO-1 Table 6
Proposed Project Annual Economic Impacts during Operation – 25 Years

Impact	**Jobs**	**Earnings $million (2012)**	**Output $million (2012)**
Onsite labor impacts	5	$0.7	$0.7
Local revenue and supply chain impacts	2	$0.1	$0.4
Induced impacts	11	$0.3	$1.2
Totals	18	$1.1	$2.3

No economic losses from reduced agricultural activity are projected as the reasonably foreseeable impact is negligible. As discussed in AFC Section 5.6 Land Use, there are currently no agricultural uses within the HHSEGS site.

[2] Note that the JEDI model results will differ from the project specific inputs to the model, as it segments job creation pathways.

FISCAL IMPACTS ON INYO COUNTY

The proposed solar project, located within the County, would use services provided by various local government agencies, such as public safety and health inspection, and would generate additional revenues for those agencies, such as property and sales and use taxes. Construction and operation of the solar project will also generate additional tax revenues from increased economic activity at other local businesses through indirect and induced economic effects from both project expenditures and increased employment. On the other hand, the solar project would include active solar systems under AB 1451 (Revenue and Taxation Code Section 73), which states that that fully qualifying active solar systems are 100 percent exempt and dual-use equipment is 75 percent exempt, and would not be considered new construction. Therefore, a significant portion of the total assessed value of each project would be exempt from property taxes.

The project applicant is not aware of sales and use tax exemption that applies to the project (CEC, 2012c). Sales and use tax generated by the project depends on the designation of the "point of sale" and the ownership structure of the facility. The County would receive none of the sales tax if the "point of sale" is designated outside of Inyo County. However, several factors make such a designation highly unlikely, as discussed below. For this reason, we presume that the sales and use taxes will accrue to Inyo County.

Public service expenditures — such as expenditures on public health and safety — are induced by changes in the population, workforce,[3] socioeconomic conditions such as unemployment, or facilities in an area. In some cases, such as for water and other utility charges, these costs are paid for directly through property tax increments or usage bills. In other cases, new services are paid for from general fund revenues, and growth may or may not contribute sufficient new sources of revenue to pay for itself.

From an economic perspective, it is the "marginal costs" that are created by economic or population growth that must be examined to determine whether or not a new project produces additional public sector costs. That is, a large portion of public service expenditures are fixed — they cannot be changed quickly. In many cases capital-related costs are sized with extra, or flexible, capacity. Other costs, such as staffing, may vary with demand and funding, but also can be "lumpy", that is, an employee is hired after a threshold level of demand or funding is added.

Fixed costs such as school classrooms, fire stations, and roads will generally not be affected by a small increase in demand. For example, a dozen or more students can typically be added to a school with 500 students without creating a need to enlarge the facility. Similarly, two to three additional calls a year to the fire and police departments will not create the need for a new fire station, or even another officer. However, an additional student, or extra police visit, will result in additional costs associated with supplies, transportation, and other operating expenses. A series of such small

[3] Population and employment may differ as a community may have significant net inflow or outflow of commuters. For example, San Francisco has a population of about 800,000, but its daytime "population" including workforce is about 1.4 million.

incremental increases or a single large project can reach a cumulative threshold where a new school or fire station would be required.

The public costs engendered by the proposed solar project can be illustrated by examining the average cost associated with the provision of various public services. Average costs are different from marginal costs in that they simply reflect a per capita expenditure associated with a particular population, but say little about how those expenditures change given changes in the population served. Likewise, average costs do not account for revenues generated by activities (e.g., reimbursement for building code enforcement), and as a result can overstate per capita expenses. On the other hand, marginal costs estimate the specific cost of adding one additional unit of service, for example, teaching one more student.

For some activities, the private provision of quasi-public services may act to offset any additional demand that the facility may otherwise have caused. For example, the primary burden the solar project places on police services is the need for additional patrols to prevent and investigate crimes against property. In this case the use of security devices and appropriate facility design may minimize the need for professional police services.

DIRECT GOVERNMENTO SERVICE COSTS FOR THE PROPOSED PROJECT

The proposed solar project would cause the County to incur direct costs to serve the public safety, health protection, and roadways requirements in the immediate vicinity of the project.

This section presents the county's estimates of direct government service costs and our own, more conservative, estimates, which form the basis of the two expenditure scenarios used in this analysis.

Scenario 1 – Estimates Based on County Projections

Scenario 1 relies on County expenditure projections developed by nine Inyo County Departments. The County recommended the following, as well as many additional, service upgrades to meet the increased demands in the Charleston View area:

- Resurfacing of Old Spanish Trail Road to the state border.
- The Inyo County Office of the Sheriff will require seven new positions. Training is required for each of the new officers, and new officer will be provided with equipment (patrol car, uniforms, etc.) and housing.
- The Department of Public Works will need one additional road department position for the life of the plant and one 30-month limited term position.

Appendix Socio-1 Table 7 shows the recommended annual mitigation costs proposed by the County for its service agencies or departments. The total costs estimated by the managing County departments during the construction period would be $11.4 million and $1.7 million annually during the operating period for serving a solar project in Inyo County.

APPENDIX SOCIO-1 Table 7
Annual Mitigation Costs Associated with HHSEGS Construction and Operation: Scenario 1 (Inyo County Estimates)

County Service	Construction Period	Operation Period (Annual)
Inyo County Health and Human Services Department	-	$188,115*
Inyo County Assessor Department	$120,000	$120,000
Inyo County Sheriff Department	$2,409,366	$1,269,120
Inyo County Public Works Department	$8,157,000	$78,500
Inyo County Information Services	$237,600	
Inyo County Agricultural Department	$150,000	$50,000
Inyo County Waste Management Department	$156,000	-
Inyo County Motor Pool Department	$33,200	-
Inyo County Water Department	$145,000	$8,000
Total	**$11,408,166**	**$1,713,735**

Source: CEC, 2012
* Annual costs shown are for the first year. They are estimated to increase 5% per year.

APPENDIX SOCIO-1 Table 8
Annual Mitigation Costs Associated with HHSEGS Construction and Operation: Scenario 2 (Staff Estimates)

County Service	Construction Period	Operation Period (Annual)
Inyo County Health and Human Services Department	$470,000	-
Inyo County Assessor Department	-	$50,000
Inyo County Sheriff Department	$871,000	$330,000*
Inyo County Public Works Department	$1,213,000	-
Inyo County Information Services	$237,600	-
Inyo County Agricultural Department	-	-
Inyo County Waste Management Department	-	-
Inyo County Motor Pool Department	-	-
Inyo County Water Department	-	$8,000
Total	**$2,791,600**	**$388,000**

Note: * - Additional annual cost to the Sheriff is for first three years of operation.
Totals may differ due to rounding.

Scenario 2 – Estimates Revised for Updated Information

Scenario 2 consists of Staff estimates of county expenditures. **Appendix Socio-1 Table 8** shows the Staff's estimates of direct government service costs for various county agencies as a result of the proposed project. Mitigation costs in this scenario are significantly lower than in Scenario 1, with estimates of $2.8 million for the construction period and $0.4 million annually during the O&M period. A detailed discussion of how we arrived at these estimates is presented below.

Construction Housing

BSE and Bechtel considered the project area for the similarly-configured Ivanpah Solar Energy Generating Station to have a two-hour commute radius for construction. The population within this radius included large numbers of construction workers, so it was assumed that they would commute to the construction site.

"All workers would reside within commuting distance of the proposed ISEGS site, and therefore would not need to move into the area. Therefore, no construction or operation-related impacts are expected on the local housing supply availability or demand."

Similarly, the Hidden Hills site is located within one hour of the suburbs of Las Vegas, Nevada, and Pahrump, Nevada with a population of 36,441 in the 2010 U.S. Census is less than 15 minutes away (BrightSource Energy, Inc., 2011a). Given that Valley Electric Association, the electric cooperative headquartered in Pahrump, is promoting the siting of large-scale renewable power projects in its service territory, Pahrump can expect an influx of power plant construction employees for other projects as well.

Health and Human Services

In a review of Staff Assessments and environmental documents for 18 remote solar and natural gas-fired power plant projects, none have indicated additional costs to county health services (County of San Luis Obispo Department of Planning and Building, 2011a; County of San Luis Obispo Department of Planning and Building, 2011b; California Energy Commission, 2010a; California Energy Commission, 2010b; California Energy Commission, 2010c; California Energy Commission, 2010d; California Energy Commission, 2010e; California Energy Commission, 2010f; California Energy Commission, 2010g; California Energy Commission, 2010h; California Energy Commission, 2010i; California Energy Commission, 2009a; California Energy Commission, 2009b; California Energy Commission, 2008; California Energy Commission, 2006a; California Energy Commission, 2006b; California Energy Commission, 2000; California Energy Commission, 1999). While Inyo Health and Human Services indicated in their December 12, 2011 letter that additional funding would be required on an ongoing annual basis, the need for this additional funding seems to be based on costs incurred during construction, not necessarily during operation (County of Inyo, 2012). With a peak construction workforce of 2,293 personnel during Month 19 of construction, assuming that construction workers have been drawn from outside the study area, Health and Human Services costs for additional services appears reasonable for the duration of construction (BrightSource Energy, Inc., 2012b). It is likely that the operational workforce of 120 would be largely drawn from the local population, much of it in Nevada, and if not, this increase would not represent a substantial increase in demand on services. In addition, this population is likely to be employed and of working age so demands on social services should be substantially less than the average experienced in the region. Consequently, the ongoing annual cost projected by Health and Human Services has been extrapolated for the 29-month duration of construction instead of as an ongoing cost. However, these costs would not create a significant environmental impact and are beyond the regulatory purview of the Commission.

Assessor

The County projected that the average annual cost for the Assessor's Office would be approximately $120,000. Additionally, according to recent correspondence with Gruen Gruen + Associates, the assessment of the Coso Geothermal project cost the Assessor's Office approximately $200,000 per year (Gruen Gruen + Associates, 2012). These costs largely represent legal costs that would occur on an ongoing basis following the completion of construction. For the HHSEGS, staff estimates that ongoing annual legal costs to the Assessor's Office could be $50,000 (CEC, 2012d). However, given that the majority of these costs are for adversarial legal proceedings, it would be presumptive to require BSE to pay the County's legal fees prior to the determination of the outcome of proceedings that may not even occur. The Staff also believes that Inyo County can generate substantial savings by sharing information and resources with neighboring San Bernardino County, which will be assessing the largely identical Ivanpah Solar Energy Generating Station.

Sheriff

Reviewing the Energy Commission Staff Assessments for 16 remote solar and natural-gas fired power plants, project-related increases in property damage and theft were not identified as issues that would substantially increase demands on police protection services. For the projects reviewed, law enforcement response times ranged from three minutes to one hour. Each project included security fencing and nighttime lighting, with most projects specifying the inclusion of razor wire or barbed wire on the fencing. None of the projects indicated an increased demand on police protection that would require additional staffing or law enforcement facilities. For the solar and natural-gas fired power projects that did not specifically include security measures in their project descriptions, Energy Commission staff required Conditions of Certification for the power plants to implement a minimum level of security consistent with the 2002 North American Electric Reliability Corporation Security Guidelines for the Electricity Sector and the 2002 U.S. Department of Energy draft Vulnerability Assessment Methodology for Electric Power Infrastructure. These Conditions of Certification included perimeter fencing and breach detectors, guards, alarms, site access procedures for employees and vendors, site personnel background checks, and law enforcement contact in the event of a security breach (California Energy Commission, 2010a; California Energy Commission, 2010b; California Energy Commission, 2010c; California Energy Commission, 2010d; California Energy Commission, 2010e; California Energy Commission, 2010f; California Energy Commission, 2010g; California Energy Commission, 2010h; California Energy Commission, 2010i; California Energy Commission, 2009a; California Energy Commission, 2009b; California Energy Commission, 2008; California Energy Commission, 2006a; California Energy Commission, 2006b; California Energy Commission, 2000; California Energy Commission, 1999). Additionally, discussions with San Bernardino County Sheriff's Department have indicated that the Ivanpah, Kramer Junction, Daggett, and Harper Dry Lake Solar Energy Generating Systems have not increased the number of incidents requiring response by the Sheriff's Department (California Energy Commission, 2012a; California Energy Commission, 2012b).

Based on a review of other power plant projects and comments made in the May 9, 2012 Staff Workshop, Staff estimates that two additional resident deputies would be sufficient to provide adequate police protection and response times. The County Sheriff stated at the workshop that the current situation requires five patrol officers in eastern Inyo County but only two are currently on staff. Thus, the County already requires three additional deputies plus administrative staff to meet current needs, so these positions are netted from the County's estimated requirements specific to the project. With this increase in staffing at the Tecopa/Shoshone Substation, it seems that patrol coverage would be sufficient such that an additional substation building at the plant site would be unnecessary. Assuming an average tenure for officers of 12 years based on U.S. Bureau of Justice Statistics national data, and an expected average remaining tenure of officers currently employed by the County of six years, the officers hired in response to HHSEGS construction would replace other officers through attrition or retirement in six years.[4] Consequently, the cost projection for salary and annual training for these new officers is estimated for the 29 months of construction and the remaining three years and seven months following completion of HHSEGS construction.

For this cost projection, the monthly resident deputy allowance of $400 is used to estimate housing costs to the County, for a total of $24,000 for HHSEGS construction at an annual cost of $9,600.

Revising the County Sheriff's Hiring and Recruitment, Academy Training, and Initial Startup costs for two additional employees instead of seven (including the officers' salaries and housing for the duration of construction), initial and construction costs would be reduced from $2,130,966 to $871,295.

Eliminating the cost of the proposed Substation would eliminate the ongoing annual projected utilities and maintenance costs and personnel costs would be reduced proportionately for two instead of seven additional personnel. This would reduce ongoing costs from $1,269,120 to $329,998.

Public Works

Inyo County Public Works had projected that severe truck traffic loads from Hwy 127 along Old Spanish Trail Road to the HHSEGS site would require reconstruction of the entire 30.1-mile length of Old Spanish Trail Road. The projected cost estimates provided by the Department of Public Works for repair and maintenance of Old Spanish Trail Road ($8,157,000 during construction and $78,500 annually during operation) appear consistent with other road maintenance costs determined for other projects on a cost per mile basis (County of Inyo, 2012). However, BSE has stated that 100 percent of truck trips and 90 percent of all construction workforce traffic would come and go from the SR 160 along Old Spanish Trail Road. 10 percent of construction workforce traffic would use Old Spanish Trail Road west of the project site to Hwy 127 (BrightSource Energy, Inc., 2012b). Consequently, the 3.4-mile segment of Old Spanish Trail Road in Inyo County from the western boundary of the HHSEGS east to the

[4] If the average tenure within the Inyo County Sheriff's Department were less, then the projected incremental costs would decrease because the excess force could be reduced more quickly.

Nevada state line would receive 95 percent of all construction traffic including all truck trips and would be subject to the most severe damage from construction. Doug Wilson, Interim Director of Inyo County Public Works acknowledged at the May 9 Workshop that the County was unlikely to incur large costs on Old Spanish Trail west of the plant site (CEC, 2012d).

The County projection of $8,000,000 for the replacement of the 30.1-mile length of Old Spanish Trail Road translates to a per mile replacement cost of $265,781 per mile. This projection assumes that the entire length of Old Spanish Trail Road will be equally impacted by construction. As described above, however, the 3.4-mile segment of Old Spanish Trail Road from the HHSEGS to the Nevada state line will receive 90 percent of the traffic impacts and the 26.7-mile segment from the HHSEGS to Hwy 127 will receive at most 10 percent of the traffic impacts. The proportional replacement cost per mile can be determined by using the County's cost per mile and multiplying it by the percentage of impacts that segment of road will receive.

However, this calculation assumes that car and truck trips damage the road equally, which is empirically untrue (General Accounting Office, 1979). If truck trips were weighted more heavily in the calculation, then because trucks only travel on the 3.4-mile segment to the Nevada state line, the proportion of traffic impacts to the 3.4-mile segment would increase, approaching 1.0, while the proportion of traffic impacts to the 26.7-mile segment would decrease, approaching zero. If the proportion of traffic impacts to the 3.4-mile segment comes close to 1.0, the proportional replacement cost increases near $265,781/mile, giving a total replacement cost for the segment from HHSEGS to the Nevada state line of $903,655 while the replacement cost for the segment from HHSEGS to Hwy 127 nears $0.

To balance these two different estimation methods, the staff has used the average of the two, which implies 95 percent of the damages come from traffic to Nevada and the remainder for traffic to California. On this basis, for the 3.4-mile segment from HHSEGS to the Nevada state line, $265,781/mile is multiplied by 0.95 to give a proportional replacement cost per mile of $252,492. For the 26.7-mile segment from the HHSEGS to Hwy 127, $265,781/mile is multiplied by 0.05 to give a proportional replacement cost per mile of $13,289. Multiplying each by the mileage of each segment we find a total proportional replacement cost for the 3.4-mile segment to be $858,473 and a total proportional replacement cost for the 26.7-mile segment to be $354,816, for a grand total of $1,213,289.

Inyo County Public Works department anticipated that the maintenance required for the 30.1-mile length of Old Spanish Trail Road during construction and afterward during operation would require an additional staffing position, a medium sized front end loader and a pick-up truck. As replacement and maintenance activities would disproportionately occur on the 3.4-mile segment from HHSEGS to the Nevada state line, little more than 10 percent of the 30.1-mile length of Old Spanish Trail Road, it is expected that current Road Department staff and equipment would be able to accommodate the additional maintenance burden. With 95 percent of traffic coming and going from SR 160 along Old Spanish Trail Road, no additional Public Works staffing or equipment would be necessary.

Information Services

Construction activities at the HHSEGS will draw a maximum of 2,293 workers to the project area for the duration of construction, requiring the temporary installation and maintenance of information infrastructure in the Tecopa/Shoshone area for the duration of construction (County of Inyo, 2012; BrightSource Energy, Inc., 2012b). While it is expected that the communications tower proposed as part of the project would be sufficient for communication needs directly related to the HHSEGS project, additional infrastructure will be required to accommodate additional County Services. Based on ongoing AT&T monthly charges for County workstations, the County's Information Services projected cost for the duration of construction appears reasonable (County of Inyo, 2012).

Agricultural

While the costs projected by the Agricultural Commissioner appear consistent with weed management costs for other projects, it should be noted that all the power plant projects reviewed included Conditions of Certification requiring the applicants to develop and implement weed management plans (County of San Luis Obispo Department of Planning and Building, 2011a; County of San Luis Obispo Department of Planning and Building, 2011b; California Energy Commission, 2010a; California Energy Commission, 2010b; California Energy Commission, 2010c; California Energy Commission, 2010d; California Energy Commission, 2010e; California Energy Commission, 2010f; California Energy Commission, 2010g; California Energy Commission, 2010h; California Energy Commission, 2010i; California Energy Commission, 2009a; California Energy Commission, 2009b; California Energy Commission, 2008; California Energy Commission, 2006a; California Energy Commission, 2006b; California Energy Commission, 2000; California Energy Commission, 1999). With the inclusion of Conditions of Certification as described in Biological Resources section requiring HHSEGS to develop and implement a weed management plan, it is expected that additional weed management by the County will not be necessary.

Waste Management

At this point in the planning process, it is unclear how construction worker housing may be accommodated in the area, but as discussed above, it appears sufficient housing is available within commuting distance to accommodate the workforce. No such camp has been constructed at Ivanpah SEGS which is similarly remote. While a 300-space RV park to provide housing for project employees could require waste disposal services during the 30-month construction period, these plans are speculative, but sufficient for inclusion in this cost estimate (County of Inyo, 2012). Other similar projects have developed Temporary Construction Worker Accommodations Areas in which the applicant was responsible for waste management (County of San Luis Obispo Department of Planning and Building, 2011a; County of San Luis Obispo Department of Planning and Building, 2011b). Without better knowledge of the construction labor force, these costs are uncertain and could be lower or higher. The **Waste Management** section addresses issues of waste disposal services. At this time, the Staff believes that no additional costs will be incurred by the County for this project.

Motor Pool

The projected cost estimates provided for the Inyo County Motor Pool ($66,000 during construction) appear consistent with costs determined for other projects (BrightSource Energy, Inc., 2011a). However, the Commission is fully responsible for all compliance and inspection, so the County need not incur any costs to visit the work site or the operating facility.

Water Department

While Water Department costs for oversight and monitoring appear consistent with costs determined for other projects, the costs for plan and model development would be borne by the HHSEGS project. Additionally, it seems presumptive to assume that the County would lose grant funding as a result of the project based on increasing the risk of being deemed ineligible. This would eliminate the Water Department costs of $145,000 during construction, while keeping the $8,000 annual cost. The **Water Supply** section addresses issues of groundwater monitoring.

CHANGES IN INDIRECT COUNTY EXPENDITURES

Beyond the direct public safety and health protection services discussed above, the solar project could result in changes to local governmental expenses, primarily in two ways. The first is increased spending induced by increased population. The second is decreased spending caused by improved socio-economic conditions.

The first set is associated with an increase in the number of employees located in Inyo County who could be new residents. These indirect increases include both the public facility development costs identified for impact fees and other general governmental service costs such as health and social services, recreation, judiciary and detention, and permitting and licensing. These costs generally increase with the population, or with a related metric such as daytime workforce population. The usual underlying economic assumption in the studies that develop these costs is that the local economy is in a stable equilibrium represented by long-term averages that relate county expenditure growth to population growth. In turn, this assumption implies that increased employment leads to both increased jobs for current residents and attraction of immigrants from other jurisdictions, which implies a growing population, and increased County government spending.

Given the extraordinarily high unemployment rate now being experienced which is expected to continue for several years, few employees at this project can be expected to be new residents. Combined with other communities in neighboring counties, there will be an available labor supply in proximity to the proposed solar project. The applicant plans to employ up to 2,293 workers during the peak construction period should have a negligible impact on the County's current population of 18,546 and labor force of 9,550 as the majority of them will reside in neighboring counties and the California Employment Development Department employment figures indicate that approximately 1,000 members of the County's labor force are unemployed. The existing County labor force will likely fill these new jobs where needed and project developers will not need to offer higher compensation to attract outside labor. The current situation is in contrast to recent history when construction labor costs escalated through the 2000s to attract an increase labor supply across geographic regions.

While the daytime population will be shifting from neighboring areas to the Charleston View area, so that demand on services will also shift to a currently underserved portion of the County, those services will still be rendered within the County boundaries. Building and operating the proposed solar project could increase County governmental expenditures on direct services, but the County's indirect costs in total are unlikely to increase as a result. For this reason, the County should not expect to experience higher costs for the public services beyond the direct service costs identified in Section 5.1 specifically for the proposed project.

The second set of potentially affected services is associated with decreased social welfare and public health services due to reduced unemployment and improved socioeconomic conditions, including higher income. While the relationships for the expenditures on the first set of services described above are well understood, the relationships for the expenditures on the second set of services are not. For example, the quantitative relationship between the number of unemployed and County health service expenditures has not been estimated and would require substantial analysis of the affected departments' budgets. For this reason, while the County should expect lower costs for social welfare and health services as a result of reduced unemployment, those savings cannot be estimated at this time.

CHANGES IN LOCAL GOVERNMENT REVENUE

Local government revenue sources can be categorized into seven general types:

- property tax and property-related taxes and fees,
- local sales and use tax,
- vehicle license fees,
- fines and forfeitures,
- fees for services,
- other local taxes (e.g., transient occupancy tax, utility users tax, business license tax), and
- intergovernmental transfers.

California's cities and counties vary in the extent to which they rely on the above taxes and fees to support their functions due to the differing nature of their relationship with the state government, their responsibilities, and their authority.

Further, developing the proposed solar project will impact the various taxes and fees in different ways. Due to the specificity of the taxes, changes in property and sales taxes can be estimated on an incremental basis with information about changes in property values, projected sales, and the appropriate tax rates. Certain special taxes, such as the transient occupancy tax, also can be estimated using an incremental approach focused on the added economic activity. Changes in other taxes are more readily estimated using the average revenue per County resident due to their less direct relationship to changes in population and business activity. Due to the complexity of the relationships between changes in economic activity and fiscal revenues, those changes have been estimated only where a direct relationship can be identified. For property and transfer taxes, and impact fees, these are derived solely from proposed project activities. For sales taxes, both the project construction costs and the indirect supply chain expenditures have been included in the calculation. Left out are the fines, licenses and special taxes such as transient occupancy, as well as the sales and property taxes from induced economic activity because those require a wider and detailed modeling of County economic activity.

Property Tax Impact

Although the active solar energy system portions of the proposed solar project would be excluded from the assessment of property taxes, pipes and ducts that are used to carry energy derived from solar are active solar energy system property only to the extent of 75 percent of their full cash value, and non-generating facilities would be assessed at their full value. For HHSEGS, the annual property tax avoided due to exemptions is roughly $13.6 million based on the cost estimates presented here. This translates to a total of $4 million that would have gone to the County services including the General Fund, libraries and roads. The land on which the project is located would be taxed at their newly assessed values, as well as the transmission interconnection facilities. The assumption is that the current "highest and best use" used for value assessment is agricultural, and that will change to an industrial activity definition with a new higher assessment upon transfer.

Changes in property taxes were estimated from the Deputy County Council's data on tax allocation, property assessments and sales; exemption details from BrightSource; and the appropriate tax rates for each area, as reported by the County. Property tax is assessed on project land and equipment. Current property tax on project land was estimated using the assessed value of BrightSource project area parcels (Deputy County Council, 2012b). The parcels are assessed 1.0 percent, resulting in the pre-project parcels generating approximately $62,000 in property taxes annually, $18,000 of which goes to county services. With the construction under the proposed solar project, the value of the parcels will be reassessed and property taxes will be assessed accordingly. In addition, the assessed value of the plant facilities would be $2.176 billion for the project. After the first year, staff applied the BOE's percent good factor to discount the assessed value of plant facilities over the life of the project (BOE, 2012a), resulting in a levelized assessed value over the life of the project of $1.63 billion per year. Approximately 45 percent of the project property will be taxable non-solar property, of which 38 percent will be dual-use and, thus, taxable at 25 percent of full value and 7 percent will be fully taxable (BrightSource Energy, Inc., 2012). Based on these values, the proposed solar project is estimated to generate approximately $2.63 million in property taxes annually, a net increase of about $2.56 million over the total fiscal year 2010 amounts. **Appendix Socio-1 Table 9** shows the increases in property tax revenues to the various agencies under current allocation rules after the land is leased and reassessed at the new purchase price. The County's revenues would increase by about $0.75 million annually.

APPENDIX SOCIO-1 Table 9
Changes in Annual Property Tax Revenues with the Project Completed

Property Tax Revenues	County Allocation	Added Revenues
School districts	62.5%	$1,600,000
County Services	29.43%	$760,000
Incorporated cities	1.16%	$30,000
Special districts	6.91%	$180,000
Total	100%	$2,560,000
Source: Deputy County Council County of Inyo, 2012.		

BSE has provided cost information regarding the non-generating facilities to be constructed as part of the project (BrightSource Energy, Inc., 2011a). The addition of new construction would also generate property tax revenue, although without the capital costs of the non-energy production components of the project, the additional revenue cannot be estimated. The structures subject to additional property tax not included here are listed in **Appendix Socio-1 Table 10**. These components would be taxed at their assessed value.

APPENDIX SOCIO-1 Table 10
Structures Subject to Additional Property Taxes

Structures	Square Feet
HHSEGS	
Visitor Center	23,637
Source: BrightSource Energy, Inc., 2011a	

Sales and Transaction Taxes Impacts

In fiscal year 2009-10, Inyo County received over $1.2 million in revenues from its share of the sales and use tax (California State Controller, 2012). **Appendix Socio-1 Table 11** shows the distribution of sales taxes collected within the County borders. The components sent to the County are shown in italics. The County receives 0.75 percentage point directly to its General Fund. Two other components of 0.5 percentage points each are directed to criminal justice activities and human and health services under state law. Finally, the County imposes a tax 0.5 percentage points for a Special Districts. 0.5 percentage points go to County transportation funds, but these revenues are controlled by the Inyo County Local Transportation Commission (ICLTC), which consists of representatives from the Inyo County Board of Supervisors and Bishop City Council, as opposed to being directly controlled by the county, so these are not considered, conservatively, as part of the local share. The County thus receives 2.25 percentage points of the 7.75 percentage point sales tax revenue from the proposed project. A second component equal to 1.06 percentage points is deposited into the Local Revenue Fund 2011 in the State Treasury; this is then reallocated back to the counties based on formulas specified in Assembly Bill 118 (2011). The amount that

Inyo County receives is independent of the sales and use tax revenues generated in the County.

APPENDIX SOCIO-1 Table 11
Distribution of Sales Tax

Purpose	Rate
State (General Fund)	3.94%
County Transportation Funds (ICLTC)	0.25%
State (Fiscal Recovery Fund)	0.25%
State (Local Public Safety Fund)	0.5%
State (Local Human and Health Services Fund)	0.5%
State (Local Revenue Fund 2011)	1.06%
City and County Operations	0.75%
County Special Districts Tax	0.5%
Total	**7.75%**
Source: BOE, 2012b.	

The proposed project is subject to sales and use taxes upon construction and operation, and the tax would be payable within the County per Board of Equalization Regulation 1826(b) (BOE, 2002). Sales tax revenues for the County are largely dependent on the final purchase price and designated “point of sale” for the proposed project, both of which are currently unknown. However, the applicant has made clear its desire to and intention of working with Inyo County to ensure that it maximizes the allocation of sales and use tax to the County (BrightSource Energy, Inc., 2012). In the past, BrightSource worked with the County of San Bernardino to maximize sales and use tax allocated to the unincorporated San Bernardino County stemming from construction of the Ivanpah SEGS project (07-AFC-05C). This indicates that it is reasonably foreseeable that BrightSource will follow through with its intentions and do the same for Inyo County. Furthermore, BrightSource noted that even if it designated the “point of sale” as nearby Pahrump, NV, it would still be subject to use tax in Inyo County.

Based on these assumptions presented by the proponents, the County government could receive $24.1 to $29.2 million, depending on the scenario, in its local share of sales and use tax over the 29-month construction period based on the assumptions presented in this report. The difference in sales tax revenues between the two scenarios is derived from the fact that mirror costs are not included in the sales tax base in Scenario 1. These amounts represent the maximum available assuming the County and state take the actions necessary to ensure compliance with tax collection.

During operation, however, sales tax revenues from the project will be negligible because non-payroll O&M expenditures spent in the County amount to only $27,000 annually. Of the amount collected, only $2,900 would go to the county. The sales tax revenue generated for the County during the construction period is far greater than the potential county expenditures estimated by the County and by Staff. Because of this, the net present value of the project net impact is positive in both cases.

Scenario 2 assumes that the project will generate additional sales tax revenues for the County because the newly employed local workers will be spending some of their additional disposable income locally on various goods, such as food, appliances and clothing. We generated a rough estimate of how much sales tax revenue employees of the direct and induced jobs created by the project will generate through local spending. Employees of the 50 direct and indirect jobs resulting from project construction will generate over $0.9 million during the 29-month construction period, and employees of the 18 direct and indirect jobs created by operations and maintenance spending will generate roughly $28,000 annually during the 25-year operation period. The County has expressed concern that increased employment during the O&M period could double the local population, which would place a financial burden on the County services that are population dependent. While a doubling of the local population would indicate roughly 100 additional employees in the O&M period, over five times the increase in jobs predicted by the model, we estimated the sales tax generated by employee spending if employment rose to 100 and found that this would generate nearly $156,000 annually for the County. This would offset most of the estimated County costs induced by increases in population.

In addition, an education impact fee would be assessed on the administration building at a rate of $0.47 per square foot. This would generate another $11,109. Staff did not include property transfer tax revenues in our analysis because there will likely be no transfer of property for the proposed project. Currently, the applicant has not acquired any property for the project but is under an option to lease and has obtained the right of land. If the lease is carried out, as anticipated, there will be no property transfer tax revenues.

One question is whether the project might be excluded from the sales and use tax by the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) under the authority granted by the recently enacted Senate Bill 71 (Public Resources Code Section 26003, et al). It appears questionable whether the project would qualify in any case given the criteria listed by the CAEATFA emphasizing the requirement that "the project develops manufacturing facilities, or purchases equipment for manufacturing facilities, located in California" (CAEATFA, 2010). Nevertheless, the project owners must (1) apply for the exclusion to the CAEATFA and (2) demonstrate that the project would not have been constructed without the exclusion. The County can object to that exclusion and present a case in opposition. It is doubtful that the project would qualify for an exclusion because (1) the project has a power purchase agreement with PG&E and (2) the project is prepared to begin construction as soon as the Energy Commission approves it (assuming it is approved). Currently, BrightSource has stated that it is not operating the facility, and the vendor has not applied for such an exemption for this project. The vendor is not expected to going forward because it has not done so at Ivanpah (CEC, 2012c)

The solar project will have two additional economic impacts on the County's sales and use tax revenues that are not quantified in this study due to the complexity of the analysis. A balanced presentation of the added sales tax revenues requires a full accounting of the added governmental costs as well. Such an analysis is beyond the scope of this study. These additional economic impacts to County sales tax revenue include:

- First, developing the solar project will have an indirect, but positive, effect on complementary services in the vicinity. Businesses en route to the project sites, such as convenience stores and gas stations, stand to benefit from increased traffic moving through the area. A higher sales volume for these entities will lead to higher tax revenues for the County's share of the sales tax as well as other taxes (e.g., gasoline taxes). The value of these additional revenues with the County is unknown, and would be substantially larger during the construction period than during the longer operational period. However, few businesses are located close to the site in Inyo County, so these added revenues are likely to be small.

- Second, the increased sales tax revenues from the additional "rounds" of spending by the businesses supplying the solar project, their employees, and the induced spending on the overall economy are excluded in this analysis. This would depend on the local share of expenditures on project supplies.

CONCLUSION

The proposed project is expected to cost in the range of $2.176 billion in total to construct with direct material costs of approximately $1.05 billion. Using conservative assumptions about where plant components are assembled, it was determined that about $71.4 million of the total $2.176 billion in construction costs would be spent locally over three years. However, only $0.23 million (0.3 percent) is projected by the applicant to be spent within Inyo County, and the remaining $71.2 million (99.7 percent) would be spent in neighboring counties. This spending is expected to directly produce about two jobs within Inyo County, and induce another 48 positions. Such spending would increase County economic output by $41.6 million and earnings by $2.8 million.

Local spending on annual operating costs would be about $27,000 based on the applicant's projections. This spending could directly produce 100 jobs, with about 5 of the 100 positions being filled by County residents and the remainder commuting from neighboring counties. It could indirectly generate another 13 jobs. Annual County economic output could rise by $2.2 million and earnings by $0.9 million.

Based on County Agency estimates, the County could incur gross costs of $11.4 million during construction and $1.7 per year during operation on public safety and other services in the local area (Scenario 1). Staff estimates are more conservative and predict that the county could incur costs of $2.8 million during construction and $0.39 per year during operation (Scenario 2).

Appendix Socio-1 Table 12 and **Table 13** summarize the net fiscal impacts during the construction and operational periods, and over the 28-year period of expected construction and operation for the two expenditures scenarios. These estimates represent the maximum available revenues presuming that the County and state take the actions necessary to ensure that taxes are appropriately collected at the project site. (San Bernardino County has taken such actions at Ivanpah SEGS which is also owned by BrightSource.) The net present value represents the discounted sum of the cash flow of revenues and expenditures. A 5.2 percent "real" discount rate was used based on the current yield on Inyo long-term debt and the inflation rate projected by prices on U.S. Treasury bonds (Big Pine Unified School District., 2010; FMS Bonds, Inc., 2012; Yahoo Finance, 2012; U.S. Department of the Treasury, 2012a; U.S. Department of the Treasury, 2012b).[5] During the three-year construction period, County agencies could receive between $12.6 and $27.3 million more than it expends. Once operational, the County could expend $940,000 annually more than it receives in Scenario 1 and receive $413,000 more than it expends in the first three years and $743,000 more thereafter in Scenario 2. Over the entire period, the County would effectively break even in Scenario 1 and gain $33.2 million net present value in Scenario 2. County gains would be positive even if the amount of materials subject to sales tax is cut in half in Scenario 2.

APPENDIX SOCIO-1 Table 12
Net Fiscal Impacts on Inyo County:
28 Years, Scenario 1

	Construction (3 Year Total)	Operation (Annual)	Net Present Value
Revenues	$24,069,000	$773,000	$31,471,000
Expenditures	$11,408,000	$1,714,000	$31,337,000
Net Impact	$12,661,000	($941,000)	$100,000

APPENDIX SOCIO-1 Table 13
Net Fiscal Impacts on Inyo County:
28 Years, Scenario 2

	Construction (29 Month Total)	Operation (Years 1-3)	Operation (Years 4 on)	Net Present Value
Revenues	$30,043,000	$801,000	$801,000	$37,289,000
Expenditures	$2,791,000	$388,000	$58,000	$4,054,000
Net Impact	$27,252,000	$413,000	$743,000	$33,200,000

Other County costs are not expected to change substantially. Population should remain unchanged as the local labor force, particularly for construction, is experiencing high unemployment and should be able to easily absorb the increased projected demand over the forecast period. Social welfare and public health expenditures may fall as unemployment decreases and socioeconomic conditions improve, but those have not been quantified. This report did not estimate induced changes in County revenues from the increased economic activity, which could be significant given the reported economic changes under a reasonably expected to occur scenario.

[5] The "real" discount rate is used for cashflows that are not adjusted for future inflation, as is the case here. The discount rate has the inflation rate subtracted out.

This analysis has several key caveats which could alter the results and conclusion significantly if the situation changes. The first is that the overall cost estimates are based on published sources and only partially reflect the actual costs that will be revealed once the project is constructed and assessed by the County Assessor and Board of Equalization. The proportion of the project costs subject to taxation also could vary as (1) the amount of material sales subject to local sales tax could vary, and (2) the County Assessor may determine that differing proportions of the plants qualify for the property tax exemption. Perhaps the largest caveat is that the manufacturing plant for the mirrors will not qualify for a sales tax exemption as well. If that portion did qualify, the project could have a net negative direct fiscal impact on the County departments. And finally, the calculations of the local shares of property and sales tax are complex and uncertain due to changing fiscal conditions at the state level.

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SOCIOECONOMICS

List of Comment Letters

		Socioeconomics Comments?
1	Inyo County	X
2	Bureau of Land Management	
3	National Park Service	
4	The Nature Conservancy	
5	Amargosa Conservancy	
6	Basin & Range Watch	X
7	Pahrump Paiute Tribe	
8	Richard Arnold, Pahrump Piahute Tribe	
9	Big Pine Tribe of Owens Valley	
10	Intervenor Cindy MacDonald	X
11	Intervenor Center for Biological Diversity	
12	Intervenor, Old Spanish Trail Association	
13	Applicant, BrightSource Energy, Inc.	X

Comment #	DATE	COMMENT TOPIC	RESPONSE
1	July 17, 2012	Inyo County	
1.8		County objects to use of private lands for mitigation purposes.	Objection noted. Appropriate mitigation lands within Inyo County are unlikely to have other useful economic purposes unless they have specific mineral rights.
1.9		Economic impacts of retired private lands not included in economic analysis.	The economic impacts of the lands used for mitigation are included in the analysis. Because such lands are currently of low valuation and any alternative valuation would be highly speculative given the extremely limited water supplies in the region and a lack of identified mineral rights, the county will experience a net positive impact from the inclusion of mitigation lands in proximity of the power plant site. This has been clarified in the revised report. This analysis complies with County Title 21, Section 21.20.010.
1.10		The Consultant's report has a false premise that 1,000 construction workers will commute to site from their homes.	Appendix Socio-1 assumes that the construction workforce will either be hired directly from the Las Vegas / Pahrump labor pool, or under a PLA California workers will find temporary housing in the Las Vegas or Pahrump area, similar to the practice at the Ivanpah SEGS site. Further rationale is discussed in the Consultant's report at p.4-12.6. This has been clarified in the revised report.

1.11a		Service demands for a commuting workforce will impose higher county costs.	The analysis includes most of the estimated county service costs. Specific changes are addressed to specific comments. This analysis complies with Inyo County Title 21, Section 21.20.010.
1.11b		Not unreasonable to anticipate a number of construction employees to dry camp or to reside in Tecopa or Shoshone.	The analysis currently assumes that 5% of the construction labor force will reside in Inyo County. Anyone dry camping will require an independent water supply which is problematic in the area. The number residing in Tecopa or Shoshone will be limited by available residential dwellings. The analysis does not include the positive fiscal impacts from increased employee populations and commensurate local spending.
1.12a		Clark County reports an increase of 30% in service calls in Primm during construction of Ivanpah.	According to Inyo County Sheriff William Lutze, the 30% increase in service calls is a comparison of stats from October 2009 to October 2010. The groundbreaking ceremony marking the start of construction at Ivanpah was on October 27th, 2010, therefore a 30% increase in calls to Las Vegas Municipal Police Department (LVMPD) in October 2009 to October 2010 would not be attributable to the construction at Ivanpah, which as of August 2012 is at the half-way point of completion. Staff requested more recent data from LVMPD which showed an increase in service calls in the Primm area of 6% from 2010 to 2011 and a decrease in felony crimes of 43% for the same period. Furthermore, as most of the HHSEGS construction labor force is likely to reside in the much larger community of Pahrump, or in Las Vegas, it is not likely that Inyo County would experience changes in service calls similar to Primm. This analysis complies with County Title 21, Section 21.20.010.
1.12b		The consultant did not visit the HHSEGS proposed project site to discover that camping on private land has been a problem.	See proposed Condition of Certification SOCIO-2.
1.13		Consultant did not question the applicant's estimate that 5% of construction costs would be spent in the county, and the Consultant substituted his judgement for that of the Sheriff.	At the July 27 workshop, the county pointed out that the 5% estimate probably was too high, not too low as implied by this comment. That 5% is too high implies that demand on the Sheriff's services will be lower than estimated in the report. Staff's report uses the Sheriff's estimates for needed staffing.
1.14		The absence of a CEC condition requiring a letter of credit or other financial assurance is nothing short of cavalier.	See proposed Condition of Certification SOCIO-3.

1.15		The Consultant expresses uncertainty whether the project owner might seek a sales and use tax exclusion under CAEFTA.	Only the mirror manufacturing plant is eligible to request such an exemption, not the entire plant. This has been clarified in the revised report. Staff's report states that it is not reasonable to expect that such an exemption will be requested or granted for the reasons expressed in the report. However, Scenario 1 assumes that the vendor receives a sales and use tax exclusion.
1.16		It is not inconceivable that BSE might apply for a CAEFTA sale and use tax exemption.	BSE does not own the mirror manufacturing plant, which is owned by a vendor. The vendor has not applied for an exempation at the Ivanpah SEGS. Without this precedent, such an application would not meet the criteria for the CAEFTA. Staff ran Scenario 1 excluding the sales tax revenue on the $446 million portion of the plant value could be eligible for such an exclusion.
Resolution 2012-29			
1.17a		Res. 2012-29 requires that the project be designated as a point of sale to the BOE.	See proposed Condition of Certification **SOCIO-3**.
1.17b		Res. 2012-29 requires project owner to establish financial assurances of $84.5 million.	County Title 21 Section 21.20.010 only requires that "the County and its citizens do not bear an undue financial burden from the project." This implies that any assurance be tied to the costs, not the revenues, projected for the project.
1.32		Res. 2012-29 requests a change in finding of fact that the socio economic impacts would be significant.	The report finds that it is reasonable to expect that the revenues generated for the county will exceed the reasonable expected costs by several fold, and thus there will not be significant socioeconomic impacts. This analysis complies with inyo County Title 21, Section 21.20.010.
1.33		Size and location of the project.	Noted. See page 4.12-24 of the FSA, Other Services.
1.34		Res. 2012-29 requests a change in finding of fact that less than 2% of county land is in private ownership, and every acre restricted for the purpose of compensatory mitigation results in a significant impact.	Mitigation lands are part and parcel of the overall project, and the net benefits that accrue to the county include the costs of providing mitigation lands. In addition, it is speculative to assume that the mitigation lands would have a higher economic value given the resource constraints on candidate lands.
1.35		Description of Charleston View.	Noted. See page 4.12-5 of the FSA, Socioeconomics Table 2.
1.36		Closest communities to site.	Noted
1.37		Size of closest communities.	Noted. See page 4.12-5 of the FSA, Socioeconomics Table 2.
1.38		Staffing of local services.	Noted. See revised page 4.12-24 of the FSA, Other Services.
1.39		Sheriff's staffing and patrol area.	Noted. See revised page 4.12-19 of the FSA, Affected Environment.
1.40		Additional services will be required during the construction period.	Noted and included in the assumptions in the report.

1.41		HHSEGS is anticipated to be constructed under the terms of a PLA with California Trade Councils. Majority of workers will commute from California to the project site.	A PLA has not yet been signed. The analysis assumes that regardless of whether a PLA is signed, the vast majority of construction workers will commute to the project site from temporary housing in Nevada. See page 4.12-3 of the FSA, Setting.
1.42		5% of the construction workforce will reside in Inyo, resulting in a 30% increase in the local population. The site is surrounded by vacant land on which "squatting" has occurred.	Noted. See page 4.12-15 of the FSA, Conclusion.
1.43		The temporary increase will lead to increased demand for County services.	See response 1.12a.
1.44		The County estimates that costs wll increase $11.1 million during construction and $1.7 million per year during operation.	Those cost estimates are included as Scenario 1 in the report.
1.45		Table of costs	See response 1.44
1.46		Increased costs will not be offset by increased property tax, nor will the County gain economic benefits due to the remote location.	As noted in the report, property taxes are only one component of the increased tax revenues reasonably expected to occur. Whether the property taxes are sufficient to cover ongoing costs depends on the cost scenario. This analysis complies with County Title 21, Section 21.20.010.
1.47		County Title 21 governs the siting, licensing and construction of the proposed project. The definition of "environment" exceeds that of CEQA, and requires mitigation of "undue financial burden."	The Commission must consider LORS, but has final authority over siting, licensing and construction of the proposed project under state law. The Commission will give due consideration to the County's concerns. This analysis complies with County Title 21, Section 21.20.010.
1.48		Designation of the HHSEGS jobsite for purposes of the sales and use tax would result in the County receiving revenues to offset economic impacts.	Consistent with the report.
1.49		A consultant with expertise in the area of sales & use tax should be funded by the project owner.	Comment Noted
1.50		The Consultant's report stated unequivocally that the County will receive $84.5 million in sales and use tax.	The report stated that it was reasonable to expect that the project will generate that amount of sales tax. However, the report notes that any forecast is uncertain within a potential range. In addition the sales and use tax forecast is revised as noted in response to specific comments, and an updated estimate provided by the applicant.
1.51		Requests COC SOCIO 2 that HHSEGS jobsite be designated as point of sale, and that the method be approved by the County.	Noted. Staff has proposed Condition of Certification SOCIO-3 to address this.
1.52		Requests that a consultant with expertise in the area of sales & use tax should be funded by the project owner.	Comment Noted

1.53		Requests that if BSE receives a sales tax exemption under CAEFTA, that BSE be required to pay the County $84.5 million.	Noted. Under County Title 21, the applicant is only required to mitigate "undue financial burden." The projected sales tax revenue is well in excess of the forecast of costs to the County.
1.54		Requests that BSE deliver a letter of credit for $84.5 million.	See response 1.53.
1.55		Request that the letter of credit be reduce annually by the amount of sales & use tax attributable to the project.	Comment Noted
1.56		Requests that 30 days after completing construction that BOE records be reviewed to audit sale & tax revenues.	Sales and use tax revenues attributable to the project will accrue to the county over a several year period, including after project completion because some of the increase comes from changes in relative statewide tax allocations. The report has been revised to clarify this.
1.57		Requests that the letter of credit will be returned upon full payment of the sales & tax revenues.	Comment Noted
1.58		Requests that the letter of credit be required as a mitigation under County Title 21.	Comment Noted
1.59		Requests COC SOCIO 3 that the CEC in coordination with the County investigate means to enhance degraded public lands rather than use private lands for compensatory mitigation.	Comment Noted
1.60		Requests that if private lands are used for mitigation that an economic study of lost opportunity costs be conducted.	See response 1.34.
1.72		Mitigation would result in net loss of County land. Mitigation should be met based on the County's COC.	See response 1.34.
1.73		It is unresolved how the project proposes to subsidize facilities…a large and temporary increase in population will require.	The report shows it is reasonable to expect that tax revenues will exceed expected costs by a substantial amount during the construction period. This analysis complies with County Title 21, Section 21.20.010.
1.74		The project will result in population increases that create a need for increases in services and infrastructure. Compliance should be met based on the County's COC.	See response 1.73.
1.75		The project will result in population increases that create a need for increases services and infrastructure. Compliance should be met based on the County's COC.	See response 1.73.
Gruen Gruen + Associates			

1.95		$2.9 billion total cost for construction ($2.5 billion in materials) vs. $2.18 billion assessed value confused Gruen Gruen + Assoc. consultants	The total construction costs are derived from the AFC Section 5-10, the assessed land value provided the County Assessor, an incremental cost increase reported in Data Response Set 2F 191, and an updated workforce estimate by the applicant. Of this amount, $2.58 billion is materials and equipment. In Data Response Set 2F 191, the applicant responded that the capital value for assessment purposes is $2.18 billion. The property tax amount has been revised in the report to reflect the corrected capital value reported by BSE.
1.96a		San Bernardino County "conversations" indicated $7.2 million in sales and use taxes for Ivanpah construction accruing to County due to BSE cooperating w/ a tax attorney	Staff contacted San Bernardino County's special consultant on sales & use tax. He confirmed that the approach in the Consultant's report is consistent with the method used by San Bernardino County. Tangible property subject to taxation is likely to exceed $2 billion.
1.96b		Only a portion of the sales & use tax goes to the County's General Fund.	The report states its reasonable to expect that $19 million would go to the General Fund. (p. 2) While the 1.0% of the sales and use tax allocations listed in Table 5.5 of the report have state-mandated purposes, those purposes have been identified by the county as significant added expenses created by the proposed project. In addition, the amount generated by just the portion going into the General Fund greatly exceeds the reasonably expected costs under Scenario 1 using the county's cost estimates. Finally, the sales tax excludes the transportation tax portion that would largely be spent at the discretion of County Supervisors through the Council of Governments.
1.96c		Property tax assumes that the base value remains constant into the future.	The tax base should be depreciated using the BOE's Percent Good Factor. A revised estimate has been included in the revised report.
1.97a		Inyo County will receive 30% of annual property tax based on assessment; school districts 62.5% and special districts 7%	This is consistent with Table 5.3 in the report that is the basis of the fiscal impacts assessment.
1.97b		Ivanpah has an estimated cost of $500 million and a tax basis of $250 million.	As noted in a recorded conversation, Mr. Endler did not give Mr. Gruen an estimated construction cost. In addition, Ivanpah was only 18% complete as of July 2012. Based on the Commission's ongoing review of power plant costs, the cost estimate of approximately $3 billion used in the report is consistent with costs reported publicly for Ivanpah, and for costs estimate for CSP technology projects. The assessment value of $2.2 billion provided by the applicant is consistent with this estimate.

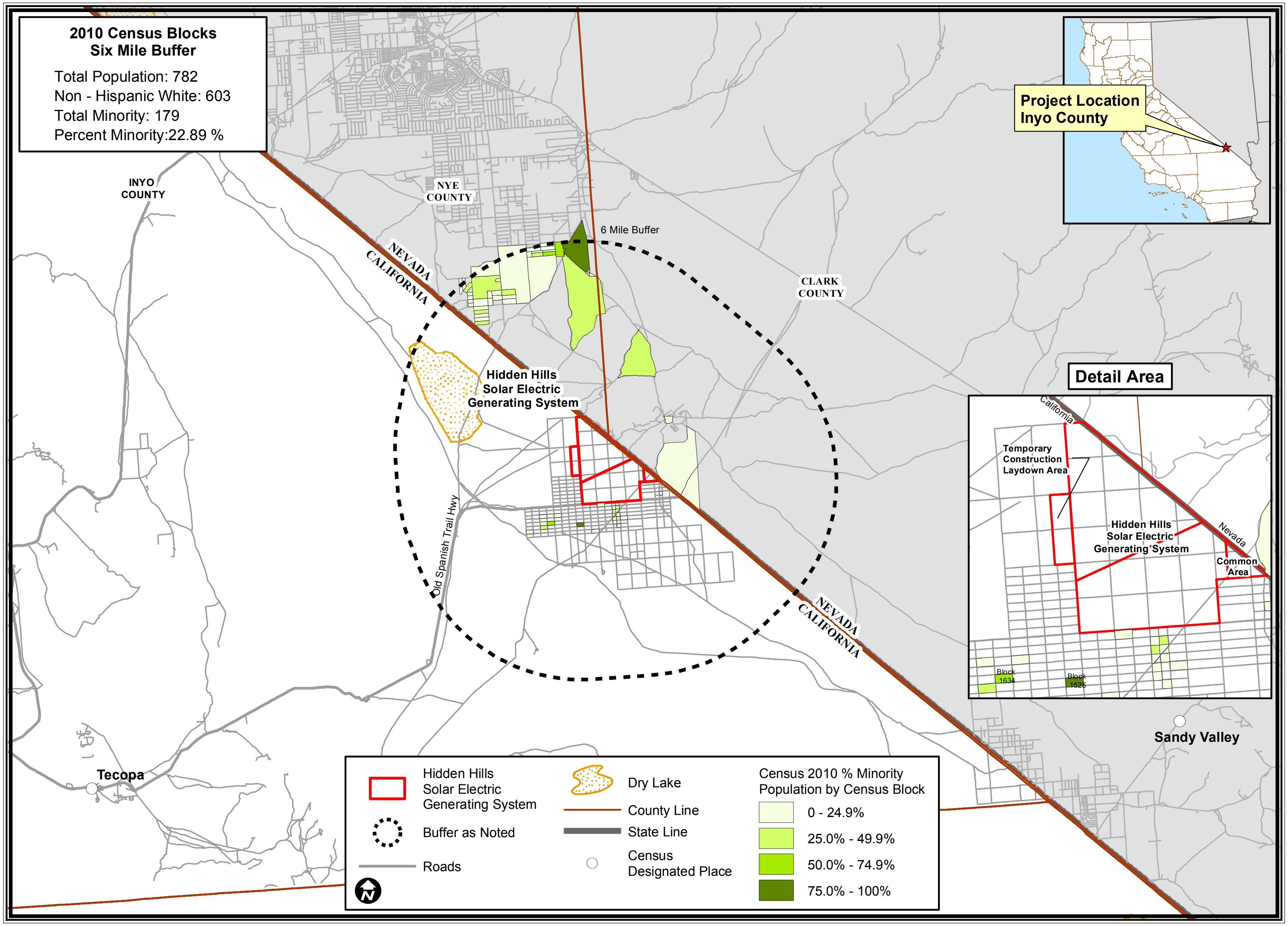
1.97c		Taxable spending and increases in property tax base from JEDI are unreliable.	While a University of California study recently confirmed the reliability of IMPLAN-based model estimates, the Consultant's report considered these additional fiscal benefits sufficiently uncertain and relatively trivial compared to the direct project fiscal contributions that these amounts are excluded from the reported total added fiscal revenues. Only additional sales tax revenues are included in Scenario 2.
1.98		"Opportunity costs" of project and mitigation lands	If the 170 residential lots were developed, based on the current average home sale price of $90,000, this total assessed value would increase to only $15 million, or less than 1% of the expected value of the proposed project. A large-scale residential development on this location would require 9,000 to 18,000 acre-feet of water, and no such water supply is available nearby in California. An interstate water project would be highly speculative. As such, no other economic activity appears viable in the locale. Mitigation lands are part of the project, and project and mitigation lands will pay property taxes, either on private or publlic lands (the latter as in-lieu.)
1.99		Attraction of tourists to project site	Creating a tourism attraction would be an additional benefit that accrues to the project and would further mitigate any potential socioeconomic impacts. This comment appears to contradict Comment 1.98 that the project will decrease opportunities for developing tourism in the region.
1.101		Contractors and Subcontractors obtain a Board of Equalization sub-permit and allocate eligible sales and use tax payments to Inyo County	See response 1.51.
1.102		Requests that a consultant with expertise in the area of sales & use tax should be funded by the project owner.	See response 1.52.
1.103		Interpretive Center (mitigation for Visual Resouces, Cultural Resources) be designed and operated to promote and take full advantage of potential for expanded tourism	Noted
1.105		Demand for human and health services shown in Table III.2	While Table III.2 shows trigger levels for added expenditures, it does not tie those triggers to increases in demand from the proposed project. Given that the entire population increase will be either project employees or their families, it appears unlikely that demand for all but a small portion of the listed services will increase. The report includes an estimate for added costs during the construction period in Scenario 2, and the county's original estimate in Scenario 1. Demand for these services is discussed at p. 4.12-15 of the report.

1.106		Cites conversation with San Bernardino Sheriff about increased incidents at solar power plants there.	See revised page 4.12-20, Affected Environment.
1.107		Cites conversations that law enforcement calls have increased 30% in Primm, NV due to Ivanpah project; concerns about "squatting" and illegal camping around HHSEGS site; concerns about increase in local population due to Project Labor Agreement	See responses 1.10, 1.12a, 1.12b, and 1.41. See proposed Condition of Certification SOCIO-2.
1.113		Motor Pool costs associated w/ County services increases due to project	Should additional trips to the project area outside of the Energy Comission's jurisdiction be deemed necessary by county staff, the projected sales tax revenue is in excess of the forecast of estimated costs to the County Motor Pool.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
6	**July 23, 2012**	**Basin and Range Watch**	
6.21		Nevada will get only a small portion of the economic benefits as only 10% of workers will come from Nevada.	Table 3-1 of the report shows that the applicant projects that 95% of the construction workforce will reside in Nevada, expending funds locally there. In addition, 95% of the ongoing workforce is expected to reside in Nevada, adding to ongoing employment opportunities.
6.22		Concerned that Nye County will be burdened with costs of potential emergencies.	Nye County's electricity cooperative, Valley Electric Association, has agreed to interconnect the power project. As a public corporation, the ratepayers of Nye County can weigh in on this decision.
6.44		Developers do not share benefits of large energy projects with local community.	The analysis finds that it is reasonable to expect that increased tax revenues will exceed expected additional costs for infrastructure and services as shown in Tables ES-1 and ES-2. Such a net increase in net revenues would constitute a net public benefit.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
10	**July 21, 2012**	**Intervenor Cindy MacDonald**	
10.1	**13-3 #1**	Where are complimentary services located in vicinty?	Such services are located in Tecopa and Shoshone.
10.2	**13-3 #2**	Where are businesses enroute to the project site?	5% of the construction workforce can be expected to reside in Tecopa or Shoshone. Such businesses are located in those communities.

10.3	13-3 #3	At what entities can Inyo County expect to receive higher sales volume?	Such businesses are located in Tecopa and Shoshone. However, those tax revenues were included in the estimated tax revenue increases reported in Tables ES-1 and ES-2, but have been excluded from the summary table, but are included as illustrative examples of reasonable to expect future conditions.
10.4	13-3 #4	How can Staff conclude that tax revenues will be substantially larger during construction than during the operational period?	The tax revenue increases in Tables ES-1 and ES-2 are dominated by the direct payments from proposed project and indirect and induced additional revenues from expenditures at local businesses are only a small portion of the total.
10.5	13-5 #1	Would Staff consider allocating the County money for tax assessment given stipulations about proceedings?	The report shows in Tables ES-1 and ES-2 that the county can reasonably expect to receive more than sufficient tax revenues to cover the expenses of recovering those revenues, as is typical and expected of all government agencies.
10.6	13-5 #2	In what sectors would the additional 77 jobs be created in?	The JEDI model used to estimate the job impacts does not provide a breakdown of the specific sectors in which those jobs have been created. Results are reported at p. 11 of the report. Note that input-output model upon which JEDI is based (IMPLAN) has been validated by a recent University of California study.
10.7	13-5 #3	How does Staff's recommended reductions, cuts and revised budgets serve the public interest of the County?	Other than the reference to discussion of the Assessor's expenses, the commentor has not provided other specific examples where the staff has recommended cuts and revised budgets, so a response is not possible.
10.8	13-6 #1	Why did Staff leave out analysis of potential adverse impacts to local residents?	The fines, licenses and special taxes left out would be paid by new construction and operational workers who come to the county, not by existing local residents. These would be added revenues to the county, and thus would be further benefits.
10.9	13-6 #2	Why did Staff report on the potential advantages but ignored potential disadvantages?	The fiscal impact reports both increased revenues and increased costs. Revenues are net of foregone revenues.
10.10	13-6 #6	If Staff recommends not funding infrastructure and services, where are the public benefits?	The analysis finds that it is reasonable to expect that increased tax revenues will exceed expected additional costs for infrastructure and services by several fold as shown in Tables ES-1 and ES-2. Such a net increase in net revenues would constitute a net public benefit.
Comment #	**DATE**	**COMMENT TOPIC**	**RESPONSE**
13	**July 23, 2012**	**Applicant, BrightSource Energy, Inc. -- p. 230**	
13.1		Environmental Justice	See revised page 4.12-5 of the FSA, Minority Populations
13.2		Environmental Justice	See revised page 4.12-5 of the FSA, Minority Populations
13.3		Federal LORS	Recommended federal LORS applies to agencies receiving federal funds, not applicable to list in this case.

13.4	Environmental Justice	See revised page 4.12-5 of the FSA, Minority Populations
13.5	Ommited word	See revised page 4.12-8 of the FSA, Induce Substanstial Population Growth
13.6	EPC Contractor	See revised page 4.12-3 of the FSA, Setting
13.7	Impacts to SIFPD	See revised page 4.12-18 of the FSA, Conclusion
13.8	Ommited word	See revised page 4.12-19 of the FSA, Affected Environment

SOCIOECONOMICS - FIGURE 1
Hidden Hills Solar Electric Generating System (HHSEGS) - Census 2010 Minority Population by Census Block - Six Mile Buffer



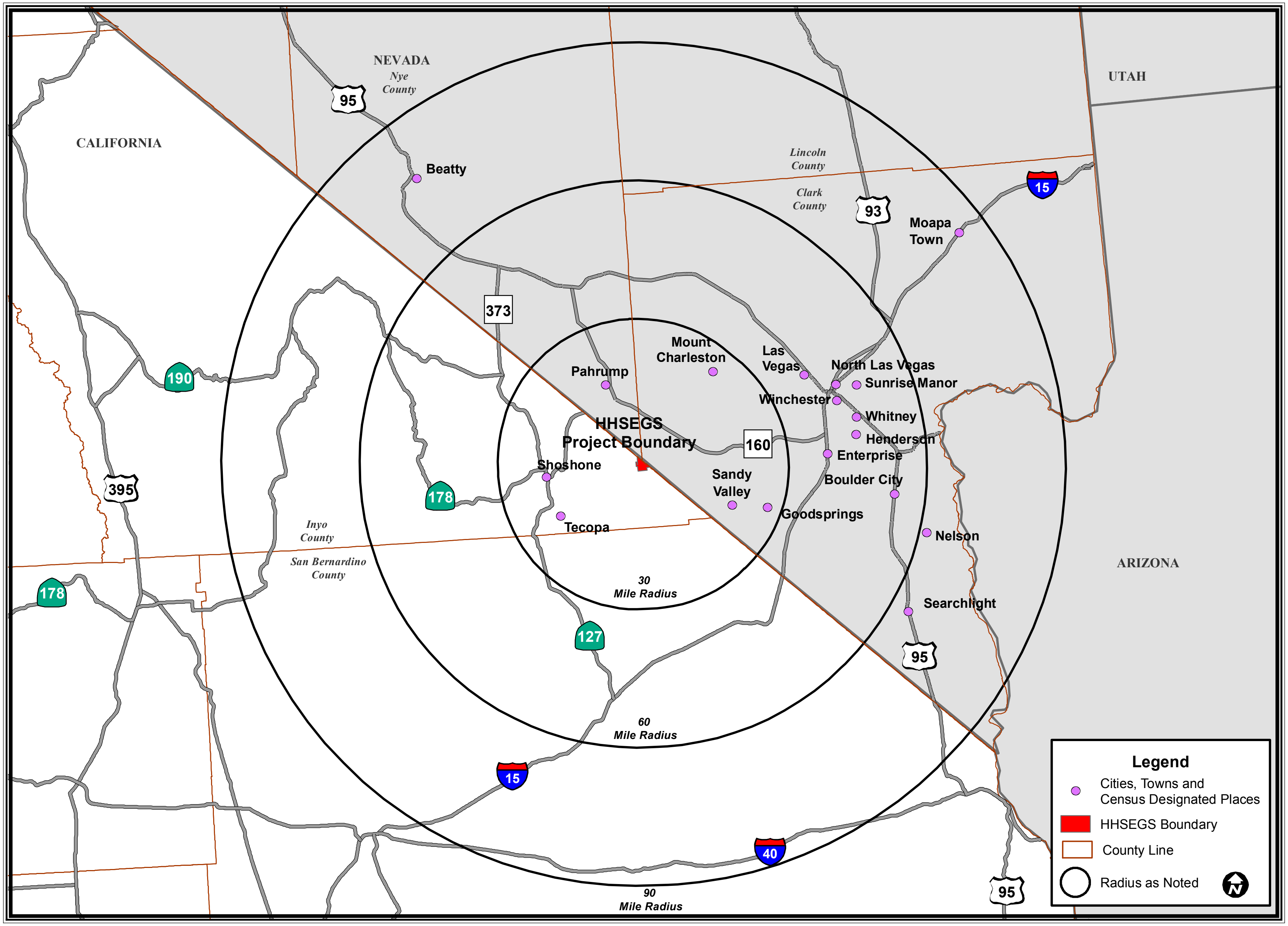
SOCIOECONOMICS

CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: CH2MHILL- Census 2010 PL 94-171 Data

SOCIOECONOMICS - FIGURE 2

Hidden Hills Solar Electric Generating System (HHSEGS) - Cities, Towns and Census Designated Places within 2 hour Commute

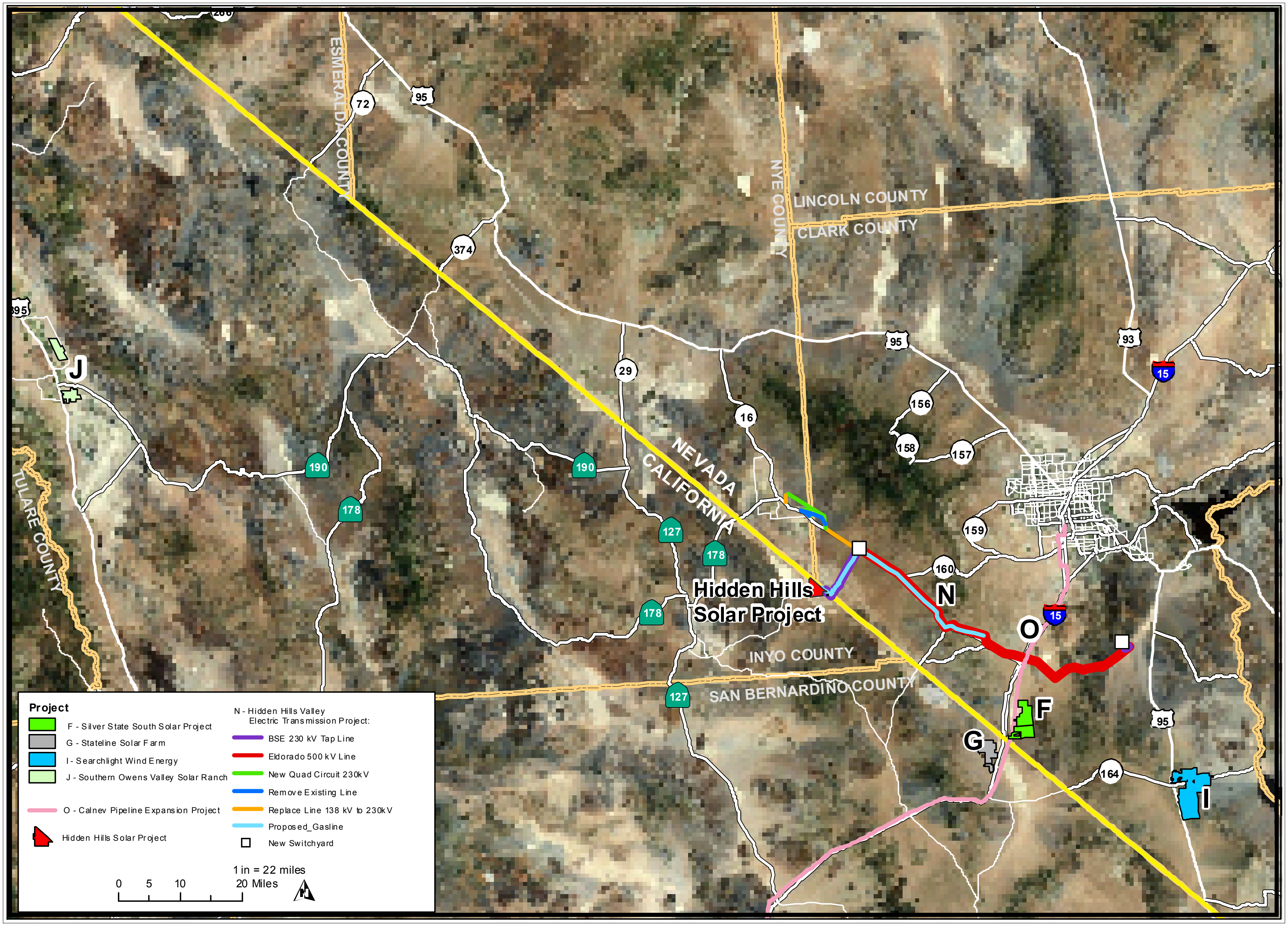


CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: ESRI

SOCIOECONOMICS - FIGURE 3

Hidden Hills Solar Electric Generating System (HHSEGS) - Cumulative Socioeconomic Projects



CALIFORNIA ENERGY COMMISSION, SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: BLM Southern Nevada District - Renewable Energy in Southern Nevada, BLM California - Renewable Energy Priority Projects, and Los Angeles Department of Water and Power.

SOILS & SURFACE WATER

Testimony of Marylou Taylor, P.E.

SUMMARY OF CONCLUSIONS

This assessment analyzes the potential impacts on soil and surface water resources by the proposed Hidden Hills Solar Electric Generating System (HHSEGS). Refer to the **WATER SUPPLY** section of this Final Staff Assessment for a detailed analysis of the potential impacts on groundwater supplies and groundwater quality.

California Energy Commission (Energy Commission) staff evaluated the potential impacts to: accelerated wind or water erosion and sedimentation; flood conditions in the vicinity of the project; surface water supplies; surface water quality; and compliance with all applicable laws, ordinances, regulations, standards (LORS) and state policies. Staff concludes that construction and operation of the proposed HHSEGS project would not result in any significant adverse impacts to soil and surface water resources, and would comply with applicable LORS and state policies, provided that the measures proposed in the Application for Certification (AFC) and staff's proposed conditions of certification are implemented.

The proposed HHSEGS project would not impede or significantly redirect flood flows of the designated 100-year floodplain. Compliance with staff proposed Conditions of Certification **SOILS-1** through **-9** would reduce or avoid impacts to less than significant of soil erosion, contact runoff, and discharge wastewater during construction and operations. Condition of Certification **SOILS-5** would reduce potential impacts from storm water damage. Condition of Certification **SOILS-6** would reduce potential offsite flooding impacts to Old Spanish Trail Highway/Tecopa Road.

Staff has not identified any significant impacts that would occur in Nevada regarding water quality and hydrology caused by the proposed HHSEGS project. The water quality and hydrology impacts from the linear facilities (transmission line and natural gas line portions) within the state of Nevada would be assessed by the Bureau of Land Management.

INTRODUCTION

This section of the Final Staff Assessment (**FSA**) analyzes the potential effects on soil and surface water resources by the proposed HHSEGS. This assessment specifically analyzes surface hydrology, surface water quality, and soil erosion by focusing on the potential for HHSEGS to:

- cause accelerated wind or water erosion and sedimentation;
- exacerbate flood conditions in the vicinity of the project;
- adversely affect surface water supplies;
- degrade surface water quality; and,

- comply with all applicable laws, ordinances, regulations and standards (LORS) and state policies.

Refer to the **WATER SUPPLY** section of this **FSA** for a detailed analysis of the potential effects on groundwater supplies and groundwater quality.

Where the potential for impacts is identified, staff proposes mitigation measures to reduce the significance of the impact and, as appropriate, recommends conditions of certification to ensure that any impacts are less than significant and the project complies with all applicable LORS.

LAWS, ORDINANCES, REGULATION, AND STANDARDS

Soils & Surface Water Table 1
Laws, Ordinances, Regulations, and Standards (LORS) and Policies

Federal LORS	
Clean Water Act (33 U.S.C. Section 1257 et seq.)	The Clean Water Act (CWA) (33 USC § 1257 et seq.) requires states to set standards to protect water quality, which includes regulation of storm water and wastewater discharges during construction and operation of a facility. California established its regulations to comply with the CWA under the Porter-Cologne Water Quality Control Act.
State LORS	
The Porter-Cologne Water Quality Control Act of 1967, California Water Code Section 13000 et seq.	Requires the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs) to adopt water quality criteria to protect state waters. Those regulations require that the RWQCBs issue waste discharge requirements (WDRs) specifying conditions for protection of water quality as applicable. Section 13000 also requires the state to be prepared to exercise its full power and jurisdiction to protect the quality of the waters of the state from degradation. Although Water Code 13000 et seq. is applicable in its entirety, the following specific sections are included as examples of applicable sections.
California Water Code Section 13240, 13241, 13242, 13243, & Water Quality Control Plan for the Lahontan Region (Basin Plan)	The Basin Plan establishes water quality objectives that protect the beneficial uses of surface water and groundwater in the region. The Basin Plan describes implementation measures and other controls designed to ensure compliance with statewide plans and policies and provides comprehensive water quality planning.
California Water Code Section 13260	This section requires filing, with the appropriate RWQCB, a report of waste discharge that could affect the water quality of the state unless the requirement is waived pursuant to Water Code section 13269.
California Code of Regulations, Title 20, Division 2, Chapter 3, Article 1	The regulations under Quarterly Fuel and Energy Reports (QFER) require power plant owners to periodically submit specific data to the California Energy Commission, including water supply and water discharge information.
SWRCB Order 2009-0009-DWQ	The SWRCB regulates storm water discharges associated with construction affecting areas greater than or equal to 1 acre to protect state waters. Under Order 2009-0009-DWQ, the SWRCB has issued a National Pollutant Discharge Elimination System (NPDES) General Permit for storm water discharges associated with construction activity. Projects can qualify under this permit if specific criteria are met and an acceptable Storm Water Pollution Prevention Plan (SWPPP) is prepared and implemented after notifying the SWRCB with a Notice of Intent.

SWRCB Order 2003-0003-DWQ	The SWRCB regulates storm water discharges to land that has a low threat to water quality. Categories of low threat discharges include piping hydrostatic test water.
SWRCB Order 97-03-DWQ	The SWRCB regulates storm water discharges associated with several types of facilities, including steam electric generating facilities. Under Order 97-03-DWQ, the SWRCB has issued a NPDES General Permit for storm water discharges associated with industrial activity. Projects can qualify under this permit if specific criteria are met and an acceptable SWPPP is prepared and implemented after notifying the SWRCB with a Notice of Intent.
Local LORS	
Inyo County General Plan	The General Plan includes water resources related goals and implementation measures to protect water resources from overutilization, degradation, and export.
Inyo County Code Title 21, Ordinance No. 1158 (Renewable Energy Ordinance)	Requires developers of solar thermal, photovoltaic, or wind energy power plants to obtain a renewable energy permit before the project moves forward. Facilities exempt from a renewable energy permit are required to obtain a "renewable energy impact determination" from the county to ensure that mitigation measures are addressed and, to the extent possible, incorporated into any approval of the facility granted by the applicable state or federal agency.
State Policies and Guidance	
SWRCB Res. 68-16	The "Antidegradation Policy" mandates that: 1) existing high quality waters of the state are maintained until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial uses, and will not result in waste quality less than adopted policies; and 2) requires that any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters, must meet WDRs which will result in the best practicable treatment or control of the discharge necessary to assure that: a) a pollution or nuisance will not occur and b) the highest water quality consistent with maximum benefit to the people of the state will be maintained.
SWRCB Res. 2008-0030	This SWRCB resolution requires sustainable water resources management, such as low impact development (LID) and climate change considerations, in all future policies, guidelines, and regulatory actions. It directs Regional Water Boards to "aggressively promote measures such as recycled water, conservation and LID Best Management Practices where appropriate and work with Dischargers to ensure proposed compliance documents include appropriate, sustainable water management strategies."

SETTING

REGIONAL SETTING – PAHRUMP VALLEY

The HHSEGS project would be located in the Pahrump Valley in the eastern Mojave Desert. Pahrump Valley, contained in both California and Nevada at an elevation of roughly 2,700 feet above mean sea level, is bordered by mountain ranges and adjoining valleys (see **Soils & Surface Water Figure 1**). The Nopah Range and Kingston Range border Pahrump Valley to the west and southwest, respectively. The Spring Mountains, which border Pahrump valley to the east in Nevada, reach 11,910 feet above mean sea level. Stewart Valley and Mesquite Valley border Pahrump Valley to the northwest and southeast, respectively.

The Pahrump Valley region is mostly very gently to moderately sloping alluvial fans, nearly level basin floor, and dry lakebeds with large playas. Major surface water features within the Pahrump Valley include Stewart (dry) Lake (approximately six square miles) located in California in the northwest portion of the valley, Pahrump (dry) Lake (approximately ten square miles) located in the central part of the valley in Nevada, and ephemeral washes located throughout the valley. The surrounding watershed has two main watercourses, Stump Springs and Lovell Wash. Both watercourses originate in Nevada and converge south of the site where they flow into Pahrump Valley. Average annual precipitation ranges from about four to six inches, and surface runoff within the Pahrump Valley drains towards Stewart (dry) Lake in California or towards Pahrump (dry) Lake in Nevada (DWR 2004).

Numerous small desert washes (ephemeral drainages) from the Spring Mountains cross the state border from Nevada and into California in the project area. The slope gradient diminishes from east to west. Surface waters that enter the proposed project site occur only during heavy rains and storm water runoff eventually drains into Stewart (dry) Lake located northwest of the proposed project.

The primary responsibility for the protection of water quality in California rests with the State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards. The portion of Pahrump Valley located within California falls under the jurisdiction of Lahontan Regional Water Quality Control Board (Lahontan RWQCB). Residents, visitors and nature rely on the region's water resources to provide beneficial uses, defined as "uses of water necessary for the survival or well being of people, plants and wildlife." The Water Quality Control Plan for the Lahontan Region (Basin Plan) designates beneficial uses for water bodies within the region, and establishes water quality objectives and implementation plans to protect those beneficial uses.

The Pahrump Valley watershed is contained in both California and Nevada. Lahontan RWQCB identifies the portion of Pahrump Valley watershed located within California as the Pahrump Hydrologic Unit, which does not contain any perennial surface water bodies. The Basin Plan does, however, recognize "all minor surface waters" in the Pahrump Hydrologic Unit as resources. The beneficial use designations for minor surface waters, both existing and potential, are listed in **Soils & Surface Water Table 2**. The Basin Plan does not identify receiving water for the Pahrump Hydrologic Unit.

Soils & Surface Water Table 2
Lahontan RWQCB Basin Plan Beneficial Use Designation for Minor Surface Waters in the Pahrump Valley

Existing or Potential Beneficial Uses	Description
Rare, Threatened, or Endangered Species	Supports habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered
Wildlife Habitat	Supports terrestrial ecosystems or wildlife water and food sources
Warm Freshwater Habitat	Supports warm water ecosystems
Commercial and Sportfishing	For fish or other organisms including, but not limited to, those intended for human consumption
Water Contact Recreation[1]	Activities involving body contact with water where ingestion of water is reasonably possible (i.e. swimming, wading, fishing)
Non-contact Water Recreation[1]	Activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible (i.e. picnicking, hiking, camping, boating)
Ground Water Recharge	Natural or artificial recharge for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion
Agricultural Supply	Farming, horticulture, or ranching
Municipal and Domestic Supply[1]	Used for community, military, or individual water supply systems including, but not limited to, drinking water supply

(Source: RWQCB 2005)
Note 1: The Basin Plan designates this beneficial use for all surface waters of the Lahontan Region, including all surface waters located in the Pahrump hydrologic unit.

LOCAL SETTING – CHARLESTON VIEW AREA

Soil Features

The project site is located on private land, which has already been partially disturbed as part of a previously approved residential development. Although the residential development was never completed, unpaved roads were installed in a grid pattern, which remains to the present date. The remainder of the site is mostly bare soil with sparse natural vegetation, similar to the surrounding area (HHSG 2011a § 5.11.3). The rural residential subdivision community known as Charleston View, established in the 1960s with a current population of about 70 people, is located just south of the project site (J&S 2001).

The project site is situated on the downstream edge or margin of alluvial fans that emanate from the Spring Mountains, as shown on **Soils & Surface Water Figure 2**. Alluvial fans form at the base of topographic features where there is a marked break in slope. Water-transported material (alluvium) carried by a mountain stream enters a broad flat valley and deposits sediment as its velocity decreases on entering the flatter valley. This creates fan-shaped deposits. Consequently, alluvial fans tend to be coarse-grained, especially at their mouths. At their edges, however, they can be relatively fine-grained.

Detailed Natural Resources Conservation Service (NRCS) soil survey data is not available for the project site; therefore the applicant used U.S. General Soil Map information to estimate soils properties. The U.S. General Soil Map consists of general soil association units, created by generalizing more detailed soil survey maps. In situations such as the HHSEGS proposed site where more detailed soil survey maps are not available, data on geology, topography, vegetation, and climate were assembled, together with satellite images. Soils of like areas are studied, and the probable classification and extent of the soils were determined. The U.S. General Soil Map shows the entire HHSEGS site within a much larger area labeled with Soil Unit S5740, which is a particular grouping of several separate soil types that would likely be found together in a landscape. Subcomponents of Soil Unit S5740 are presented in **Soils & Surface Water Table 3**. Descriptions of the four Hydrologic Soil Groups, which classifies a soil's infiltration characteristics, are listed in **Soils & Surface Water Table 4**.

Soils & Surface Water Table 3
U.S. General Soil Map: Soil Unit S5740 Sub-Components

Sub-Components	Composition percent	Hydrologic Group	Texture
Beshem	25	C	Clay / Clay loam
Nopah	15	C	Loam
Glencarb	10	C	Silt loam
Haymont	10	B	Very fine sandy loam
Rumpah	10	D	Clay
Tencee	10	D	Gravelly loam
Bluepoint	5	A	Loamy fine sand
Pahrump	5	C	Fine sandy loam
Tanazza	5	B	Fine sandy loam
Wodavar	5	D	Fine sandy loam

(Source: HHSG 2011b, Attach 5.15ER)

Note: This percent composition generally applies to the entire generalized soil association, which is extremely large. The HHSEGS site may contain only a few of these series.

Soils & Surface Water Table 4
Hydrologic Soil Groups

Hydrologic Soil Group	Description
A	Low runoff potential. Soils having high infiltration rates (greater than 0.30 inches per hour) even when thoroughly wetted and consisting chiefly of deep, well-drained sands or gravels.
B	Soils having moderate infiltration rates (0.15 – 0.30 inches per hour) when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well- to well-drained sandy loam soils with moderately fine to moderately coarse textures.

Hydrologic Soil Group	Description
C	Soils having slow infiltration rates (0.05 – 0.15 inches per hour) when thoroughly wetted and consisting chiefly of silty-loam soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture.
D	High runoff potential. Soils having very slow infiltration rates (0 – 0.05 inches per hour) when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material.

The applicant also completed onsite investigations to collect data on soil characteristics specific to the site. A Preliminary Geotechnical Evaluation was prepared following subsurface exploration performed in January 2011. Results from laboratory testing showed that the shallow surface deposits consist of a porous, sandy surface layer overlying a hardpan layer (HHSG 2011a, App 5.4A). An infiltration and drain time analysis was prepared following infiltration rate testing during July 2012 at onsite locations near the western border[1]. The composite infiltration rate was calculated at about 0.8 inches per hour (CH2 2012ii), which corresponds to Hydrologic Soil Group A. Although this value is based on soils located near the western project site border, it suggests that infiltration rates for the entire site could be higher than the infiltration characteristics suggested in **Soils & Surface Water Table 3**.

Surface Water Features

Numerous small desert washes (ephemeral drainages) from the Spring Mountains cross the state border from Nevada and into California in the project area. The slope gradient diminishes from east to west. Surface waters that enter the proposed project site occur only during heavy rains and dissipate quickly into the well-drained, sandy surface soils.

Features of the drainages include single, large channels with well-defined bed and banks, as well as broad, but sometimes weakly expressed, assemblages of shallow braided ephemeral channels. Many of the washes interconnect with other nearby washes either by natural forces or by following the grid of existing dirt roadways on the project area which interfere with the natural hydrology. Water runoff generally drains toward the west via sheet flow and these natural drainage channels, draining to the northwest and eventually into Stewart (dry) Lake located northwest of the project (HHSG 2011a, App 5.15C).

A total of 80 ephemeral washes were mapped in the project area by the applicant and identified as potential "Waters of the State" (CH2 2012k). The Lahontan RWQCB and California Department of Fish and Game (CDFG) are currently reviewing the project to determine whether any of the onsite washes are "Waters of the State". The Lahontan

[1] The purpose of the analysis was to develop representative infiltration rates for soils in the planned storm water retention area located at the western border of the site. For further information about the proposed retention area, see "Onsite Area Flooding" discussion below under "Direct Impacts".

RWQCB will verify the extent of jurisdictional Waters of the State on the site, and CDFG and the Energy Commission will verify which of these features will be subject to streambed alteration requirements under Section 1600 of the Fish and Game Code. Two of the ephemeral washes were determined to be “Waters of the U.S.” by the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act (CH2 2012k), as shown on **Soils & Surface Water Figure 2**. For further discussion on the jurisdictional determination, please refer to the **BIOLOGICAL RESOURCES** section of this **FSA**.

Area Flooding

The Federal Emergency Management Agency (FEMA) prepares 100-year flood maps for flood insurance purposes and for floodplain management use by local agencies to reduce the impact of flooding. FEMA map panels 06027C-4625D and 06027C-4175D cover the entire project site and show that the project site crosses into the Zone A[2] boundary in two areas: one located at the north tip of the site and the other located at the southwest corner of the site (see **Soils & Surface Water Figure 3**). Because FEMA does not indicate a value for expected flood depth for this floodplain boundary, the relative risk of flood damage (i.e. one foot of water versus three feet of water) is less predictable than floodplains where base flood elevation is determined.

The applicant completed a more detailed analysis of the project site and surrounding area. A Preconstruction Hydrology Analysis was submitted with the AFC that modeled offsite peak flows, runoff volumes, maximum velocities and maximum depths of potential floods (HHSG 2011a, App 5.15C). As shown on **Soils & Surface Water Figure 3**, the FEMA Zone A boundary (depicted by a heavy black outline) similarly matches areas where flooding of up to three feet deep were modeled (depicted by purple-colored cells). The exception occurs southeast of the project, where depths up to three feet appear just outside the Zone A boundary. This is runoff that originates as far away as the Spring Mountains in Nevada and flows through the Stump Springs area before dissipating at the valley floor (depicted by the fan shape). A portion of this flow is shown to enter the project site at its southeast corner, as well as a section of the southern boundary.

The fact that Old Spanish Trail Highway (also called Tecopa Road) borders the project site’s southern boundary implies that the roadway also experiences flooding caused by large storm events. Posted signs along the roadway caution motorists of potential flooding, and residents of Charleston View have indicated during workshops and PSA comments that flooding of the roadway occurs[3]. The extent, depths, or locations of the flooding is not well documented because Inyo County does not keep specific storm related data (CEC 2012ii). Inyo County’s Road Department records the days a flood event occurred and whether road repairs were made to fix flood damage, but logs do not indicate what portion of Tecopa Road was impacted by the noted event.

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[2] Zone A is defined by FEMA as special flood hazard area subject to inundation by the 1% annual chance flood also known as the 100-year flood (the flood that has a 1% chance of being equaled or exceeded in any given year). Because detailed analyses are not performed for Zone A, no depths or base flood elevations are shown within these zones. See www.fema.gov.

[3] Including but not limited to, PSA Workshop 1 (June 14, 2012 in Pahrump, Nevada) and Supplemental Comments & Analysis submitted by intervenor C.R. MacDonald (MAC 2012c).

Topographic maps show that the low point of Tecopa Road is located roughly 4,000 feet west of the HHSEGS site, which also falls within the published FEMA Zone A boundary.

The applicant's preconstruction hydrology study shows that the portion of Tecopa Road located directly adjacent to the project site is expected to flood from flows traveling northwest from the Stump Springs area and across the roadway. Floods of approximately one foot deep in spot locations are expected from rainfall equal to or larger than a 5-year, 24-hour storm, but no flooding is expected from a 2-year, 24-hour storm[4]. It is important to note that these rainfall recurrence intervals apply to rainfall that occurs in contributing sub-basins located upstream (primarily through the Stump Springs area), which eventually combine at Tecopa Road to cause flooding before they reach the southern and eastern site boundary. See **Soils & Surface Water Figure 4** for locations of the contributing sub-basins. Based on topographic maps, no storm water runoff from the proposed site location currently flows onto Tecopa Road.

Existing Project Site Flooding

The applicant's Preconstruction Hydrology Analysis (HHSG 2011a, App 5.15C) also modeled onsite peak flows, runoff volumes, maximum velocities, and maximum depths of potential floods. Results of the onsite flow modeling verify that storm water flows across the proposed site from the east toward the west. Estimated flows due to a 100-year storm show that the majority of runoff originating offsite would enter the site through the southern solar plant before leaving the site at its western boundary. **Soils & Surface Water Table 5** presents the estimated peak flows leaving the site calculated from cross-sections located along the west border (as shown in **Soils & Surface Water Figure 5**). Because cross sections are different widths, the table calculates the average flow per foot across each cross section.

Soils & Surface Water Table 5
Estimated Preconstruction Peak Discharge along Western Boundary

Floodplain Cross Section		Rain Event					
		100-year storm		25-year storm		10-year storm	
No.	Approx. Width	Peak Flow	Flow per foot	Peak Flow	Flow per foot	Peak Flow	Flow per foot
CS-4	2500 ft	778 cfs	0.31	516 cfs	0.21	314 cfs	0.13
CS-5	4700 ft	252 cfs	0.05	111 cfs	0.02	52 cfs	0.01
CS-6	4200 ft	5590 cfs	1.33	2578 cfs	0.61	1227 cfs	0.29
CS-7	3900 ft	5241 cfs	1.34	1977 cfs	0.51	941 cfs	0.24
Flows through the Stump Springs area (estimated, for comparison only):							
	900 ft	15900 cfs	17.67	7400 cfs	8.22	3800 cfs	4.22

(Source: HHSG 2011a, App 5.15C)
Notes: Refer to **Soils & Surface Water Figure 5** for locations of Floodplain Cross Sections.
cfs – cubic feet per second
Flow per foot units are cfs per foot.

[4] The "recurrence interval" is based on the probability that the given event will be equaled or exceeded in any given year. A 5-year storm has a 20 percent chance of occurring in any given year, and a 2-year storm has a 50 percent chance of occurring in any given year. Rainfall recurrence intervals are based on both the magnitude and the duration of a rainfall event. For example, a 5-year, 24-hour storm is the amount of rainfall with a 20 percent chance of occurring in a certain area in a 24-hour period during any given year. Generally speaking, a larger recurrence interval would result in a larger storm.

When comparing flows at different cross sections for the same rain event, rates across the bottom half of the site are much higher than the top half. Comparing cross sections for different rain events, the north end of the site experiences peak flows during the large 100-year storm at about the same rate (0.3 cfs per foot) as the southern portion of the site during a much smaller 10-year storm. Staff included rough flow estimates occurring through the Stump Springs area during each storm even to give perspective of scale. Estimates show the flow from the Stump Springs drainage area is about 3 times greater than any of the events for each of the flow segments on the site.

Groundwater Resources

For a detailed discussion of the regional and local groundwater resources, refer to the **WATER SUPPLY** section of this **FSA**.

PROJECT DESCRIPTION

Hidden Hills Solar I, LLC, and Hidden Hills Solar II, LLC (the applicant) proposes to construct the Hidden Hills Solar Electric Generating System (HHSEGS), located on approximately 3,097 acres in Inyo County, California, adjacent to the Nevada border. HHSEGS would comprise two solar fields with heliostat arrays and associated facilities: the northern solar plant (Solar Plant 1) and the southern solar plant (Solar Plant 2). Each solar plant would generate 270 megawatts (MW) gross (250 MW net), for a total net output of 500 MW.

Major items at each solar plant would include a steam turbine system, an air-cooled steam condenser system, and a 750-foot-tall solar power tower topped with a solar receiver steam generator (SRSG). A 103-acre common area located at the southeastern corner of the HHSEGS site would include an administration, warehouse, and maintenance complex; an onsite 138 kV substation; a natural gas metering station; and a parking area for visitors and employees. Temporary construction laydown and parking areas would be located in three locations, one on the west side of the site occupying approximately 180 acres and one within each solar field near the respective Solar Plant occupying approximately 8.5 acres each (HHSG 2011a, App 5.15A). The 180-acre temporary construction laydown area in addition to the entire HHSEGS site would total 3,277 acres. The perimeter of the site would be surrounded by desert tortoise fencing backed by a chain link security fence, There would also be landscaping such as trees and shrubs oriented parallel to and adjacent to the fencing.

Refer to the **PROJECT DESCRIPTION** section of this **FSA** for more information on HHSEGS major features including water use, wastewater discharge, and storm water handling. Additional information relevant to the soil and water resources analysis is summarized below. For a complete detailed description of the proposed project, refer to the HHSEGS Application for Certification ([AFC] HHSG 2011a) and the applicant's related supplemental material.

PROJECT CONSTRUCTION

Construction of HHSEGS is expected to take place from the second quarter of 2013 to the fourth quarter of 2015, for a total of 29 months.

Soil Erosion and Storm Water Control

During construction, portions of the project site would be graded, including portions along the ephemeral washes. Grading is not intended to level the site, but rather to prepare the site for installation of the heliostats and ease future maintenance activities. As such, the existing depressions for the drainages would remain, and natural drainage waters are expected to continue to flow in and through these ephemeral washes. Any grading required would be designed to promote sheet flow where possible (HHSG 2011a, App 5.15C).

Power Plant Sites

Major items at each solar plant would include a steam turbine system, an air-cooled steam condenser system, and a 750-foot-tall solar power tower topped with a SRSG. Other associated items include various raw water/wastewater treatment facilities with water storage tanks, auxiliary boilers, mirror washing related equipment, and a plant services building with parking. Heavy to medium grading would be performed within each plant's solar power tower and power block areas. The earthwork within the power blocks would be excavated and compacted to the recommendations of the final geotechnical report. The deepest excavations would occur for foundations and sumps (HHSG 2011a §§ 2.4.1.1, 5.11.4.6.2).

Prior to construction, the applicant would prepare a Storm Water Pollution Prevention Plan (SWPPP) to control storm water and soil erosion during the facility's construction using best management practices (BMPs)[5]. To redirect storm water flow around these facilities, diversion berms or drainage swales would be used. Stone filters and check dams would be placed strategically, as needed, throughout the project site to provide areas for sediment deposition and to promote the sheet flow of storm water prior to leaving the project site boundary. Native materials (rock and gravel) would be used where available for the construction of the stone filter and check dams. Stone filters and check dams are not intended to alter drainage patterns but to minimize soil erosion and promote sheet flow. To reduce erosion, storm drainage channels may be lined with a nonerodible material such as compacted riprap, geosynthetic matting, or engineered vegetation. The design would be developed for sheet flow for all storm events less than or equal to a 100-year, 24-hour storm event (HHSG 2011a, App 5.15A).

Permanent diversion channels would be built during the early stages of power plant construction to provide storm water management of the power block area during construction activities. Diversion channels placed around both Solar Plant 1 and Solar Plant 2 power blocks would comprise engineered earthen berms and adjacent swales with rock slope protection. These channels would be designed with a minimum ground surface slope of 0.5 percent to allow positive, puddle-free drainage (HHSG 2011a, App 5.15A).

[5] Storm water and soil erosion BMPs are methods that have been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources. BMPs can be classified as "structural" (i.e., devices installed or constructed on a site) or "non-structural" (procedures, such as modified landscaping practices). There are a variety of BMPs available, depending on pollutant removal capabilities. (See California Stormwater BMP Handbook at www.casqa.org.)

Solar Fields – Heliostats

Each solar field would consist of approximately 85,000 heliostats - elevated mirrors with a total reflecting surface of 204.7 square feet. Each heliostat assembly would be mounted on a single support pylon and guided by a computer-programmed aiming control system to track the movement of the sun (HHSG 2011a § 2.2.1.2).

The siting of pylons will be guided by global positioning system (GPS) technology. Installation of the heliostat assemblies would use vibratory technology to insert the pylons into the ground and a rough terrain crane able to mount heliostat assemblies on several pylons before moving to the next location. Vegetation clearing, grubbing[6], and contour smoothing in the heliostat fields would occur where necessary to allow for equipment access and storm water management. In areas where these activities are not required for access or construction, the vegetation would not be removed but would be mowed (if needed) to a height of approximately 12 to 18 inches (HHSG 2011a, App 5.15C).

Solar field development would maintain unobstructed sheet flow, with storm water mostly traveling in existing natural contours and flowpaths. Relatively small rock filters and local diversion berms through the heliostat fields may be installed as required to discourage water from concentrating and to maintain sheet flow. Mowing vegetation, rather than removal, would allow for clearance for heliostat function while leaving soil surface and root structures intact (HHSG 2011a, App 5.15C).

Solar Fields – Roads

The HHSEGS project would contain three types of roads (HHSG 2011b, Attach 5.15ER, CH2 2012u) as shown on **Soils & Surface Water Figure 6**:

- 20-ft wide internal perimeter asphaltic paved access roads – located between the power plants and along portions of the site boundary
- 12 to 20-ft wide dirt (aggregate base) access roads located along portions of the site boundary, as well as internally to the power plants
- 10-ft wide dirt heliostat maintenance paths[7] located concentrically around the power plants, placed approximately 152 feet apart

Most of the natural drainage features would be maintained and any grading required would be designed to promote sheet flow where possible. At some washes, limited grading may be required. Paved access roads would be protected from floods with ditches, culverts, and local fords with reinforced concrete shoulders (HHSG 2011a, App 5.15A).

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[6] Grubbing of vegetation includes the removal of any remaining roots or stumps after cutting vegetation to clear land.

[7] Multiple sections in the AFC describe these as “20-foot wide drive zones”. For purposes of this section’s analysis, staff assumes that the concentric maintenance paths/drive zones would be ten feet wide because the applicant’s post-construction calculations used this value. This analysis does not assess the proposed project using 20 foot wide concentric roads.

At the site's western boundary, the middle two-thirds of the western perimeter road would be elevated to prevent runoff flow from exiting the project site along existing natural contours and flowpaths (see **Soils & Surface Water Figure 8**). The berm created by the elevated roadway would result in an onsite retention area, designed to decrease post-construction peak flows by retaining runoff and allowing water to infiltrate and evaporate (HHSG 2011b, Attach 5.15ER). The applicant estimates that the maximum flooded area would be approximately 125 acres with a maximum depth of 3.8 feet at its deepest point (see **Soils & Surface Water Figure 9**). The retention area would be designed to drain within 24 hours using three drainage culverts, allowing water to flow under the roadway and into the adjacent area west of the project site. Runoff from large storms would fill the retention area then overtop the roadway, which would function as a broad-crested weir (CH2 2012ll, CH2 2012ii). Because construction of this road would occur early in the construction phase, it would provide storm water management of HHSEGS during construction activities.

Common Area

The common area located at the southeastern corner of the HHSEGS site would include an administration, warehouse, and maintenance complex; an onsite substation; and a parking area for visitors and employees. Construction of these common area facilities would require heavy to medium grading and would occur concurrently with the construction of Solar Plant 1 (HHSG 2011a, App 5.15A).

Similar to the power plant sites, storm water management for the administration complex would include a permanent diversion channel comprising an engineered earthen berm and adjacent swale with rock slope protection. The surface areas within the common area that are used for construction activities would be stabilized and dust suppression maximized with a layer of crushed stone in areas subject to heavy daily traffic (HHSG 2011a, App 5.15A).

Laydown Areas

Temporary construction laydown and parking areas would occupy approximately 180 acres on the west side of the site and approximately 8.5 acres on the solar fields at each power plant site. Temporary construction facilities at the large area to the west include office trailers, parking areas, material laydown areas, a concrete batch plant, and a heliostat assembly facility. The surface areas within the temporary construction areas used frequently would be stabilized and dust suppression maximized with a layer of crushed stone in areas subject to heavy daily traffic (HHSG 2011a, App 5.15A).

To redirect storm water flow around these facilities, diversion berms or drainage swales would be used. Stone filters and check dams would be placed strategically, as needed, throughout the project site to provide areas for sediment deposition and to promote the sheet flow of storm water prior to leaving the project site boundary. These areas would be restored to natural existing conditions[8] once all heliostats are installed onsite and the project is complete (HHSG 2011b, Attach 5.15ER).

[8] See "Restoration of Temporary Disturbance" in the Project Description section of the **FSA**.

Linear Facilities

Onsite

Onsite linear facilities would include underground natural gas pipelines (to supply the auxiliary boiler and nighttime preservation boiler) and underground gen-tie lines (electrical lines to connect generation facilities with the switchyard). These linear facilities as shown in **Soils & Surface Water Figure 7** are located along onsite 20-ft wide access roads (CH2 2012hh).

Offsite

The offsite transmission and natural gas pipeline alignments would be located in Nevada, primarily on federal land managed by the U.S. Bureau of Land Management (BLM), except for small segments of the transmission line in the vicinity of the Eldorado Substation, which is located within the city limits of Boulder City, Nevada.

This proposed “Hidden Hills Transmission Project” would be constructed and operated by Valley Electrical Association, a nonprofit electric utility based in Pahrump, Nevada that services more than 6,800 square miles of land located mainly along the California-Nevada border, but most of it in Nevada. The proposed Hidden Hills Transmission Project would consist of improvements on BLM land (CH2 2012ee) including:

- Approximately 10 miles of new generation tie-line from the HHSEGS project site to the proposed Crazy Eyes Tap Substation located immediately east of the Tecopa Road/SR 160 intersection. The Crazy Eyes Tap Substation would interconnect to the existing VEA Pahrump-Bob Tap 230-kV line.
- Construction and operation of new and existing access roads along each of the proposed transmission alignments

To supply natural gas to the proposed site, Kern River Gas Transmission Company (KRGT) proposes to construct a 12-inch pipeline from the HHSEGS meter station and extending 32.4 miles to KRGT’s existing mainline system just north of Goodsprings in Clark County, Nevada (CH2 2012ee).

Although the Hidden Hills Transmission Project and the KRGT natural gas pipeline are located entirely in Nevada (and therefore outside Energy Commission jurisdiction), these proposed projects are considered in this **FSA** as connected actions to the proposed HHSEGS project. Because the proposed linear facilities would be on BLM land, they are considered federal actions requiring review and compliance with the National Environmental Policy Act of 1969 (NEPA). A detailed environmental impact analysis will be prepared by BLM (BLM 2011). A separate construction storm water management program would be prepared for project features located in the State of Nevada and are not addressed in the AFC.

Total Soil Disturbance

Construction of the HHSEGS would affect the areas listed in **Soils & Surface Water Table 6**. Soil disturbance would occur as a result of grubbing, grading, and/or excavation activities. After construction, some of these areas would be covered with impervious material (i.e. concrete foundations, asphalt pavement, heliostat assemblies) and temporary construction areas would be restored to natural existing conditions.

Soils & Surface Water Table 6
Estimated Soil Disturbance and Impermeable Area of HHSEGS

Element	Total Area	Area of Land Grading and Excavation (construction activities)	Impervious Area (post-construction)
Solar Field – Heliostats	2,994 acres	negligible[1]	806 acres[2]
Solar Field – Roads Paved Roads Dirt Roads		 16 acres 189.2 acres	 16 acres 0
Solar Plant 1		19 acres[3]	10.5 acres[4]
Solar Plant 2		19 acres[3]	10.5 acres[4]
Common Area	103 acres	14.8 acres	8 acres
Laydown Area	180 acres	180 acres[5]	0
TOTAL	3,277 acres	438 acres	851 acres
Linear Facilities[6] (Nevada)		unknown	unknown

(Source: HHSG 2011b, Attach 5.15ER)

Note 1: No grading required. All-terrain vehicles would install pylons and mount heliostat assembles.

Note 2: Accounts for surface area of all mirrors in horizontal position. Assuming 170,000 heliostats total, each with a 206.4 square feet reflecting surface.

Note 3: Erosion control plans show each solar plant includes a temporary parking area (2.5 acres) and construction laydown area (6 acres).

Note 4: This area includes gravel surfacing, which helps permeability.

Note 5: The Post Construction Hydrologic & Hydraulic Analysis assumes the entire 180 acres would be graded.

Note 6: Onsite linear facilities would be located along paved or fully graded roads. Soil disturbance area of these linear facilities is considered concurrent with these roads.

Water Use

Six onsite groundwater supply wells would be drilled and developed to provide raw water for the HHSEGS project; two new wells per power block (primary and backup) and two wells at the administration complex (HHSG 2011a § 2.2.4). One temporary well would be installed for use at the large construction laydown area on the west, primarily for the onsite concrete batch plant. The estimated annual water requirement during construction is 288 acre-feet per year (CH2 2012p). During construction, water would be used daily for dust suppression and vehicle washing. Other uses include soil compaction, hydrostatic testing, and concrete mixing.

Wastewater Management

During construction, anticipated sources of wastewater would include sanitary wastes, wash water, concrete washout water, paint wash water, piping and vessel hydrostatic test water, and passivating[9] and chemical cleaning fluid waste. Sanitary waste would be contained in portable facilities and routinely disposed of at an offsite treatment/disposal facility by a sanitary service. Excess concrete and concrete washout slurries would be discharged to a temporary washout facility (HHSG 2011a, App 5.15A). Hydrostatic test water and passivating fluid waste, approximately 400,000 gallons and 300,000 gallons total for both solar plants, respectively, would be discharged to the surrounding area or used for dust control if test results meet regulatory standards. Otherwise, the hydrostatic test water would be trucked offsite for disposal at an approved facility (HHSG 2011a, Table 5.14-2).

PROJECT OPERATION

HHSEGS would be designed for an operating life of 25 to 30 years. It is anticipated that the facilities would normally operate at high average annual capacity factors during periods of sunlight (HHSG 2011a § 2.3.2.1). Commercial operation is estimated to begin in Third Quarter 2015 for Solar Plant 1 and Fourth Quarter 2015 for Solar Plant 2.

Soil Erosion

The applicant submitted a Preliminary Draft Construction Storm Water Pollution Prevention Plan/Drainage, Erosion, and Sediment Control Plan ([SWPPP/DESCP] HHSG 2011a, App 5.15A) that lists standard best management practices (BMPs). Disturbed areas would be stabilized with effective soil cover (such as aggregate, paving, or vegetation) as soon as feasible, but no later than 14 days after construction or disturbance is complete in that portion of the site. To reduce erosion potential, BMPs would be implemented in accordance with the approved SWPPP/DESCP. Vegetation would remain but would be cut (when necessary) to a height that would allow clearance for heliostat function while leaving the root structures intact. Occasional cutting of the vegetation would be performed as needed to permit unobstructed heliostat mirror movement.

Access roads to the heliostat arrays for bi-weekly washing of the mirrors would also be used for the occasional cutting of vegetation to reduce the risk of fire due to plant regrowth. To minimize soil erosion from maintenance operations, including travel of mirror washing vehicles on unpaved roads, a dust control plan would be prepared that includes fugitive dust control measures during operations such as use of soil stabilization techniques and limits on vehicle speed (HHSG 2011a, App 5.15A).

Storm Water Control

As discussed above, permanent diversion channels would be constructed around Solar Plant 1, Solar Plant 2, and the administration complex. In addition, an onsite retention area would be created at the site's west perimeter road. These would be maintained during the operational life of HHSEGS. Periodic maintenance would be conducted as

[9] Passivating fluid is used to treat or coat a metal pipe in order to reduce the chemical reactivity of its surface.

required after major storm events and when the volume of accumulated material behind the check dams exceeds 50 percent of the diversion channel's designed volume (HHSG 2011a, App 5.15A).

Areas compacted during construction activities would be restored, as appropriate, to approximate preconstruction compaction levels to minimize the opportunity for any increase in surface runoff (see "Restoration of Temporary Disturbance" in the **Project Description** section of the **FSA**). A majority of solar field development would maintain unobstructed sheet flow along existing natural contours and flowpaths. Relatively small rock filters and local diversion berms through the heliostat fields may be installed as required to discourage water from concentrating. Stone filters and check dams are not intended to alter drainage patterns but to minimize soil erosion and promote sheet flow (HHSG 2011a, App 5.15A).

Grading and mowing during construction could directly result in a permanent loss of a large portion of the ephemeral drainages that are present due to their shallow depths; however, affected drainages would be expected to reform naturally in this landscape where flow patterns are highly variable, both temporally and spatially (HHSG 2011a, App 5.15A).

Each HHSEGS Solar Plant would keep the potentially polluted contact[10] storm water from the power blocks and equipment areas, general facility drainage, process wastewater, and sanitary waste completely separated from non-contact storm water runoff, as described in the Wastewater Management discussion below.

Water Use

Six onsite groundwater supply wells would be drilled and developed to provide raw water for the HHSEGS project; two new wells per power block (primary and backup) and two wells at the administration complex. The water would be used for steam cycle make-up water, wet surface air cooler used in the auxiliary cooling system, condensate polishing to reduce contaminates in the steam/water cycle, power plant equipment wash down, mirror wash water, and domestic uses. The combined 500-MW net capacity of the solar plants would require an average of approximately 90 gpm. To provide adequate operating flexibility, the applicant's estimated annual water requirement is 140 acre-feet per year based on HHSEGS operating at full load (HHSG 2011a § 2.2.4.1).

Wastewater Management

Each HHSEGS Solar Plant would keep the potentially polluted waste water (contact runoff, general facility drainage, process wastewater, and sanitary waste) completely separated from non-contact storm water runoff (HHSG 2011a § 2.2.6.1).

General Facility Drainage

Each HHSEGS Solar Plant would collect contact runoff from the power block to prevent this potentially contaminated water from comingling with non-contact storm water runoff.

[10] Contact runoff refers to storm water in contact with exposed polluted or hazardous materials and/or surfaces that can potentially result in contaminated runoff (containing trace oil, chemicals, metals, toxic substances, or other materials).

The contact runoff would be collected along with wastewater from the plant's raw water use (such as sample drains, containment area washdown, and facility equipment wash water, if cleaning chemicals are not used) through a system of floor drains, hub drains, sumps, and piping and routed to the oil/water separator. From there, the water would flow to the waste collection tank then to a thermal evaporator system with the process wastewater (HHSG 2011a §§ 2.2.6.1, 5.14.4.3.2).

Process Wastewater

The primary wastewater collection system would collect process wastewater from all of the solar plant equipment, including blowdown[11] from the SRSG, natural-gas-fired boiler, demineralization, auxiliary cooling system, and water treatment equipment. Additional sources of wastewater include oil/water separator effluent from power block storm water runoff and general facility drainage. To the extent practical, process wastewater would be recycled and reused. A thermal evaporator system would process the wastewater for recycling back into the service water tank, returning approximately 90 percent of the wastewater for reuse. The reject from the thermal evaporator (approximately 1,360 gallons per day combined for both solar plants) would be trucked offsite for disposal at an approved facility. No reject streams from water treatment are planned to be generated onsite under the proposed treatment scheme (HHSG 2011a §§ 2.2.6.1, 5.14.4.1.2).

Sanitary Waste

The project would require a septic system and leach field at each of the two power blocks and the administration complex. Each of the systems would be designed to treat up to 700 gallons per day of wastewater discharged from toilets, sinks, and showers. Septic tanks would be pumped out as needed by a qualified sanitary service provider (HHSG 2011a, Table 5.14-3).

CONTAMINATED SOIL AND WATER

A Phase I Environmental Site Assessment for the project area concluded that no recognized environmental conditions were associated with the project site. Although the potential of encountering contaminated soil would be low, staff would require that an experienced and qualified Professional Engineer or Professional Geologist be available for consultation during site characterization, soil grading or soil excavation to determine appropriate actions to be taken in the event contaminated soil is encountered. (Refer to the **WASTE MANAGEMENT** section of this **FSA** for additional information related to contaminated soil).

ASSESSMENT OF IMPACTS AND DISCUSSION OF MITIGATION

This section provides an evaluation of the expected direct, indirect, and cumulative impacts to soil and surface water resources that could be caused by construction, operation, and maintenance of the HHSEGS. Staff's analysis consists of a description of the potentially "significant" impact, gathering data related to construction and operation

[11] Blowdown is the portion of water drained from a process to remove mineral build-up from concentrated recirculating water. These minerals would cause scaling on equipment surfaces and can damage the system.

of the project, then reaching a conclusion to determine whether or not the project presents a potentially “significant” impact. If staff determines there is a significant impact, then staff evaluates the applicants’ proposed mitigation for sufficiency and staff may or may not recommend additional or entirely different mitigation measures that are potentially more effective than those proposed by the applicant. Mitigation is designed to reduce the effects of potentially significant HHSEGS impacts to a level that is less than significant. The determination of significance for potential impacts to soil and surface water resources is discussed below.

Soil Resources

Staff evaluated the potential impacts to soil resources including the effects of construction and operation activities that could result in erosion and downstream transportation of soils and the potential for contamination to soils and surface water. There are extensive regulatory programs in effect that are designed to prevent or minimize these types of impacts. These programs are effective, and absent unusual circumstances, an applicant’s ability to identify and implement BMPs to prevent erosion or contamination is sufficient to ensure that these impacts would be less than significant.

The LORS and policies presented in **Soils & Surface Water Table 1** were used to determine the significance of HHSEGS impacts with respect to CEQA.

Water Quality

Staff evaluated the potential of HHSEGS to cause a significant depletion or degradation of surface water resources. (For a detailed analysis of the potential effects on groundwater supplies and groundwater quality, refer to the **WATER SUPPLY** section of this **FSA**).

To evaluate if significant CEQA impacts to water resources would occur, the following questions from CEQA Guidelines, Appendix G were addressed:

- Would the project violate any water quality standards or waste discharge requirements?
- Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?
- Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?
- Would the project create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?
- Would the project otherwise substantially degrade water quality?

- Would the project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?
- Would the project place within a 100-year flood hazard area structures which would impede or redirect flood flows?
- Would the project expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?
- Would the project be inundated by seiche or tsunami?
- Would the project result in substantial soil erosion or the loss of topsoil?
- Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?
- Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

Although the CEQA Guidelines provide a checklist of suggested issues that should be addressed in an environmental document, neither the CEQA statute nor the CEQA guidelines prescribe thresholds of significance or particular methodologies for performing an impact analysis. This is left to lead agency judgment and discretion, based on factual data and guidance from regulatory agencies and other sources where available and applicable. Staff considered compliance with the LORS and policies presented in **Soils & Surface Water Table 1** and whether there would be a significant impact under the CEQA. Where a potentially significant impact was identified, staff or the applicant proposed mitigation to ensure the impacts would be less than significant.

DIRECT IMPACTS

A discussion of the direct and indirect HHSEGS construction and operations impacts and mitigation is presented below. For each potential impact evaluation, staff describes the potential effect, summarizes the applicant's position, and then analyzes impacts for determining significance. If mitigation is warranted, staff provides a summary of the applicant's proposed mitigation and a discussion of the adequacy of the proposed mitigation. In the absence of applicant-proposed mitigation or if mitigation proposed by the applicant is inadequate, staff mitigation measures are recommended.

Soil Erosion Due to Water and Wind

Erosion during Construction

Construction of the project is scheduled to last 29 months. Soil losses would be created by construction and grading activities that would expose and disturb the soil and leave soil particles vulnerable to detachment by wind and water. Soil erosion results in the loss of topsoil and increases in sediment loading to nearby water resources. In the absence of proper BMPs, earthwork could cause significant fugitive dust and erosion.

The magnitude, extent, and duration of those impacts would depend on several factors, including weather patterns in the vicinity of the HHSEGS site, the types of soil that could be affected, and the method, duration, and time of year of construction activities. Prolonged periods of precipitation, or high intensity and short duration runoff events coupled with earth disturbance activities could result in accelerated onsite erosion. In addition, high winds during grading and excavation activities could cause wind borne erosion leading to increased particulate emissions that adversely impact air quality. The implementation of appropriate erosion control measures would help conserve soil resources, maintain water quality, prevent accelerated soil loss, and protect air quality.

Power Plant Sites, Common Area, and Laydown Area

The potential for erosion by water during construction is expected to increase as a result of loss of vegetative cover, removal of surface crust, and increased local sediment transport through creation of localized gullies and rills on newly graded areas. The applicant submitted a Preliminary Draft Construction DESCP/SWPPP (HHSG 2011a, Appendix 5.15A) that lists standard BMPs applicable to HHSEGS construction activities along with Water Pollution Control Drawings that show locations of specific BMPs at each power block, the common area, and the large temporary construction laydown area. In addition, the DESCP identifies specific measures to reduce water-related erosion including:

- Temporary erosion control measures would be implemented on active and non-active disturbed areas prior to and at regular intervals throughout the defined rainy season, and year-round prior to storm events.
- Erosion in concentrated flow paths would be controlled by lining channels with a non-erodible material such as compacted riprap, geosynthetic matting, or engineered vegetation.
- Diversion berms (for example, earth dikes) or drainage swales would be used, as needed, to redirect storm water run-on or onsite storm water flow around critical facilities or away from disturbed soil areas and stockpiles.
- Disturbed areas would be stabilized with effective soil cover (such as aggregate, paving, or vegetation) as soon as feasible after construction or disturbance is complete and no later than 14 days after construction or disturbance in that portion of the site has temporarily or permanently ceased.
- Sediment controls would be implemented at the draining perimeter of disturbed soil areas, at the toe of slopes, and at outfall areas.
- Stone filters and check dams would be strategically placed, as needed, throughout the project site to provide areas for sediment deposition and to promote the sheet flow of storm water prior to leaving the project site boundary. Where available, native materials (rock and gravel) would be used for the construction of the stone filter and check dams. Stone filters and check dams are not intended to alter drainage patterns but to minimize soil erosion and promote sheet flow.

The Preliminary Draft DESCP also includes a Monitoring and Reporting Program/Construction Site Monitoring Program to ensure performance standards and to monitor the effectiveness of BMPs.

Solar Fields – Heliostats and Roads

The Preliminary Draft DESCP states that each area of the HHSEGS project would be designed to provide the minimum requirements for access of installation equipment and materials. Most of the natural drainage features would be maintained and any grading required would be designed to promote sheet flow where possible. Areas disturbed by grading and other ground disturbance would be protected from erosion by implementation of appropriate BMPs. Some of the measures listed include:

- Existing vegetation would be preserved when feasible. Vegetation would be cut to a height that will not interfere with construction and operation of the heliostat fields, instead of clearing or grading the entire field.
- Clearing and grading activities would be restricted to areas where foundations, drainage facilities, and all-weather roads must be placed.
- Areas compacted during construction activities would be restored, as appropriate, to approximate preconstruction compaction levels to minimize the opportunity for any increase in surface runoff.
- Effective sediment perimeter controls would be established and maintained at locations where runoff discharges offsite.

Wind Erosion

The Preliminary Draft DESCP also includes standard BMPs for Wind Erosion Control. The following practices were listed to minimize the loss of wind-blown soil from the site:

- Disturbed soil areas of the project site would be watered regularly to control dust and to maintain optimum moisture levels for compaction as needed, but to avoid runoff, the areas would not be watered excessively. Sediment controls may be used at the edges of these areas as necessary to minimize sediment discharge.
- Areas of high erosion may require application of an approved palliative to reduce dust and prevent excess moisture on the road which may attract tortoises.
- At each structure site, the disturbed soil would be watered to form a crust following completion of construction in that location.
- The construction site would post visible speed limit signs to prevent vehicles from traveling at excessive speeds.

Linear Facilities

Although the amount of excavation required to install the onsite underground transmission lines and natural gas pipelines would be relatively minor, soil disturbance associated with buried linear facilities could total to a considerable amount of soil disturbance. Activities such as clearing vegetation, excavation, and vehicle travel would present the highest potential for erosion. However, for the HHSEGS project the onsite linear facilities would be located along proposed paved internal roads. The Preliminary Draft DESCP does not specifically mention measures to implement for onsite facilities.

The applicant does not include measures for the offsite linear facilities located in Nevada. A separate construction storm water management program would be prepared for the Hidden Hills Valley Electrical Transmission Project and KRGT natural gas pipeline activities in Nevada.

Staff Evaluation of Erosion during Construction

Staff reviewed the Preliminary Draft DESCP and agrees that BMPs during construction would reduce or avoid impacts to soil from erosion. To protect surface waters, standardized storm water and soil erosion Best Management Practices (BMPs)[12] have been determined by the SWRCB and RWQCBs to be the most effective, practical means of preventing or reducing pollution from nonpoint sources. The conceptual plans for erosion control during construction appear reasonable, but there are additional elements that should be incorporated into the final DESCP that would be developed as required in Condition of Certification **SOILS-1**.

- The Preliminary Draft DESCP currently does not include BMPs that would be implemented for the onsite linear facilities. Although the proposed BMPs for the linear facilities may be similar to those already proposed for other construction activities, a discussion should be included in the BMP narrative section of the document.
- The DESCP should reflect the most recent design plans of the proposed HHSEGS project. Since the initial filing of the original AFC, some changes to the project have occurred such as removal of two boilers from each power block, relocation of various elements within the power blocks, undergrounding of onsite linear facilities, and modifications to the west perimeter retention area (CH2 2012p, CH2 2012ii). Any adjustments that would alter Water Pollution Control Drawings, change the BMP strategy, or result in revised hydrology or hydraulic calculations should be reflected and addressed in an updated DESCP.

Staff believes that compliance with an approved DESCP accordance with Condition of Certification **SOILS-1** would reduce the impacts of soil erosion during construction. In addition, the project activities require that it be covered under the federal General Construction Permit (SWRCB Order No. 2009-0009-DWQ). To ensure compliance with this order, staff proposes Condition of Certification **SOILS-2** which requires a construction SWPPP. Also, conditions of certification in the **AIR QUALITY** section of this **FSA** require a construction mitigation plan to prevent significant impacts from fugitive dust and wind erosion during construction. With implementation of BMPs and associated monitoring activities included in the approved DESCP and SWPPP, impacts on soil would be expected to be less than significant during construction of the proposed HHSEGS project.

Erosion During Operations

Soil losses would be ongoing after the construction of the HHSEGS project. Areas disturbed during the construction phase are subject to potential erosion during the operational life of the proposed project. HHSEGS would be designed for an operating life of 25 to 30 years.

[12] BMPs can be classified as "structural" (i.e., devices installed or constructed on a site) or "non-structural" (procedures, such as modified landscaping practices). There are a variety of BMPs available, depending on pollutant removal capabilities.

Onsite Erosion

The estimated total area of land grading and excavation during construction of the HHSEGS project would be about 438 acres, as shown in **Soils & Surface Water Table 6**. After project completion, the temporary parking and construction laydown areas would be restored to natural existing conditions and about 45 acres would become impervious due to the addition of concrete foundations and asphalt paving. The balance of the previously disturbed area, roughly 200 acres, would be susceptible to potential erosion during the operational life of the proposed project. Furthermore, the addition of impervious surfaces to an area previously undeveloped would increase velocities of storm water runoff (see “Flooding” discussion below), which would increase the erosion potential of open soil areas.

The applicant submitted a Preliminary Draft DESCP/SWPPP (HHSG 2011a, App 5.15A) that states permanent erosion control measures would reduce potential soil related impacts, including gravel, landscaping, and engineering drainage channels. These would be stabilized areas with very little or essentially no risk of erosion. In addition, relatively small rock filters and local diversion berms through the heliostat fields may be installed as required to discourage water from concentrating and to maintain sheet flow. These all would serve to prevent wind and water erosion and maintain some water infiltration capacity of the soil.

Staff agrees that implementation and maintenance of permanent BMPs during operations would reduce or avoid impacts to onsite soil from erosion. The Preliminary Draft DESCP is reasonable in concept, however it does not sufficiently discuss post construction measures for erosion and sediment control. The document should address exposed soil treatments proposed during operation of the project for both road and non-road surfaces. A maintenance schedule should include post construction maintenance of BMPs applied to disturbed areas following construction. Staff believes that compliance with Condition of Certification **SOILS-1** which would require the applicant to develop and implement an approved DESCP would reduce the impacts of soil erosion during operation of the proposed project.

Although modeling and calculations can be used to estimate post-construction flows and provide a basis for structural design parameters, alluvial flows are very complex. Flood flows from the mountains are initially confined in incised channels, but at the site the flood flows are broadly distributed (known as sheet flow) and less confined and can take random paths across the fan. Predicted flow depths and velocities have a potential uncertainty because they do not account for the dynamics of erosion and sedimentation which carry and deposit sediments at various locations along the margin of the alluvial fan where the site is located. Where obstructions such as heliostats and fences are encountered, flows can have erosive effects which could undermine their stability. The consequences of flash flood damage or modified sedimentation and erosion rates may be significant. Staff proposes Condition of Certification **SOILS-5** requiring a Storm Water Damage Monitoring and Response Plan to reduce these potential impacts.

Offsite Erosion

The project’s addition of impervious surfaces could also increase velocities of storm water runoff leaving its boundaries, possibly increasing the potential to erode offsite areas downstream of the project. The applicant proposes an onsite retention area to address the increase in peak flows from project development by controlling the rate that storm water runoff leaves the site (HHSG 2011b, Attach 5.15ER). The area would retain storm water through use of a berm created along the western site boundary by elevating the middle two-thirds of the western perimeter roadway above existing grade. Runoff collected at the berm would slow down flows and allow water to infiltrate and evaporate. The retention area would be designed to drain within 24 hours using three drainage culverts, conveying flow under the roadway and into the adjacent area west of the project site. Runoff from large storms would fill the retention area then overtop the roadway, which would function as a broad-crested weir (CH2 2012ll), as shown on **Soils & Surface Water Figure 9**.

While the retention area would reduce potentially damaging post-construction peak flows, elements of this strategy could potentially still cause offsite erosion.

- By draining the retention area through three 18-inch pipes, water collected from a large area would be concentrated into three points. Flow velocities at the pipe outlets could scour and erode the soil offsite.
- The 180-acre temporary construction area, located offsite and downstream of the retention area, would be more susceptible to erosion compared to surrounding areas not disturbed by construction activities. Although the applicant proposes to restore this area to natural existing conditions, vegetation for soil stability would take time to establish.
- The fill material used in the construction of a typical roadway embankment would not be a sufficient barrier against water. The typical roadway embankment construction does include the same level of geotechnical engineering analysis required for flood control structures (such as a levee). Therefore, a typical roadway embankment would be subject to damage caused by piping, seepage, and erosion from overtopping.

The applicant submitted a Preliminary Draft DESCP/SWPPP (HHSG 2011a, App 5.15A) that states permanent erosion control measures would reduce potential soil related impacts. Although Velocity Dissipation Devices[13] were listed in the suite of erosion control measures, their importance in reducing offsite erosion warrants a more detailed discussion in the DESCP including specifics such as locations, installation, and ongoing maintenance during operations. In addition, the DESCP should also include a more detailed discussion on the proposed strategy to restore any disturbed areas, while at the same time meeting requirements of relevant conditions of certification in the **BIOLOGICAL RESOURCES** section of the **FSA**[14].

To address the potential significant offsite erosion from storm damage to the retention area berm (west perimeter road), staff proposes Condition of Certification **SOILS-5**

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[13] Approved BMPs under Fact Sheet EC-10 of California Stormwater BMP Handbook (www.casqa.org)

[14] Including but not limited to Conditions of Certification: **BIO-8** (General Impact Avoidance and Minimization Measures), **BIO-18** (Weed Management Plan), and **BIO-19** (Special-Status Plant Impact Avoidance and Minimization Measures).

requiring a Storm Water Damage Monitoring and Response Plan to reduce these potential impacts in four ways:

1. Establish design criteria for berm construction based on site specific studies and reports to withstand storm water flows of a 100-year storm event.

2. Establish an ongoing maintenance plan to ensure all storm water management measures are functioning properly, through periodic inspection before the first seasonal storms and after each storm event throughout the year.

3. Establish and implement a response plan after every occurrence of damage (from a storm event or other cause) to clean up and repair damage to the berm.

4. Develop and implement a process to monitor incidents and propose modifications and/or improvements to address ongoing issues.

Staff believes that compliance with an approved DESCP in accordance with Condition of Certification **SOILS-1** and an approved Storm Water Monitoring and Response Plan in accordance with Condition of Certification **SOILS-5** would reduce the impacts of soil offsite erosion during operation of the proposed project.

Water Quality of Surface Waters

HHSEGS could have an adverse effect on water quality if discharges create pollution, contamination, or nuisance. Construction and operation of an industrial facility can impact the quality of surface waters by any of the following activities:

- Grading or clearing of land so that sediment is discharged into a water resource. Sediment is considered a pollutant with potential to cause or contribute to the degradation of a water resource's beneficial uses.
- Increasing impervious surface areas resulting in increased amount of storm water runoff volume and rate. This can cause substantial flooding, erosion, and/or siltation, which could impact water resources.
- Placing development in, or discharging sediment into, a river, stream, lake, wetland or water of the US and/or water of the state[15], or into a buffer area for one of these water bodies. Impacts or losses to these special aquatic resources may require specific mitigation measures.
- Storing equipment, raw materials, finished products, or waste products in a manner that exposes them to precipitation and/or storm water runoff. Contact runoff[16] could concentrate various pollutants that would then discharge to a water resource.
- Discharging wastewater from an industrial or commercial process. Because of the high concentrations of total dissolved solids and the further concentration through

[15] Refer to the **BIOLOGICAL RESOURCES** section of this **FSA** for further discussion on jurisdictional determination of wetlands or watercourses as a Water of the US or a Water of the State.

[16] Contact runoff refers to storm water in contact with exposed polluted or hazardous materials and/or surfaces can potentially result in contaminated runoff (containing trace oil, chemicals, metals, toxic substances, or other materials).

evaporation, the liquids could be considered “designated wastes” with regulated disposal requirements.

The following discussion analyzes project information to determine whether HHSEGS would sufficiently avoid or reduce the potential impacts listed above. Where appropriate, staff recommends conditions of certification to ensure that any impacts are less than significant and the project complies with applicable LORS.

Sediment Increase

To prevent the discharge of sediment, the HHSEGS would implement temporary BMPs during construction and permanent BMPs during operation to prevent or reduce soil erosion, as discussed in “Soil Erosion Due to Water and Wind” above. The SWRCB and RWQCBs have determined that standardized storm water and soil erosion BMPs are the most effective, practical means to protect surface waters by preventing or reducing pollution from nonpoint sources. Staff agrees that carefully chosen BMPs for both construction and operation activities could effectively prevent or reduce sediment discharge into water resources. Staff believes compliance with the conditions of certification relating to soil erosion (identified in the “Soil Erosion Due to Water and Wind” discussion above) would ensure that the impact of sediment to surface water quality would be less than significant.

Impervious Surface Area

To prevent an increase in storm water flows discharged offsite as a result of the increase of impervious area, HHSEGS proposes an onsite retention area located along the west perimeter road, as discussed in “Onsite Area Flooding” below. The retention area, located within the project boundary (see **Soils & Surface Water Figure 8**), would control the flow of water offsite to match the flow rate of pre-construction conditions. This “collection and treatment” approach creates a point-source discharge that could increase the volume and possible amounts of pollutants, even when peak discharge rates of post construction are matched to rates of preconstruction. Because this point-source discharge is not upstream of an impaired water body and provided the applicant addresses potential erosion caused by the retention area through Conditions of Certification **SOILS-1** and **SOILS-5** (see “Offsite Erosion” discussion above), staff does not identify any significant impacts to water quality as a result of added impervious surfaces or the retention area.

Aquatic Resources

To avoid impacts or losses to special aquatic resources, HHSEGS proposes to implement a Biological Resources Mitigation Implementation and Monitoring Plan during construction activities (refer to the **BIOLOGICAL RESOURCES** section of this **FSA**) in addition to implementing standardized storm water and soil erosion BMPs. Because details of such a plan are still unknown pending the identification of specific mitigation and monitoring requirements, the applicant submitted a plan outline as a suggested framework.

The applicant stated in its AFC that the U.S. Army Corp of Engineers (USACE) is not anticipated to assert jurisdiction over the ephemeral washes and, therefore, a CWA Section 404 Permit and Section 401 Water Quality Certification would not be needed.

Because compliance with these two permits would likely require additional mitigation measures, the applicant did not propose additional measures. The USACE has since reviewed and assessed the HHSEGS site and identified two drainages as “Waters of the US” (CH2 2012k). As a result, a Section 404 Permit would be required from USACE, which in turn would result in the requirement of a Section 401 Water Quality Certification from Lahontan RWQCB. Section 401 of the CWA gives the Regional Boards the authority to consider the impacts of the entire project and require mitigation for volume, velocity, and pollutant load of the discharge from new outfalls to surface waters designated as “Waters of the State”.

USACE has not yet finalized their analysis and Lahontan RWQCB is currently reviewing the project for compliance with state water quality standards. If USACE and Lahontan RWQCB determine that additional mitigation measures would be necessary under CWA Sections 404 and/or 401, staff anticipates that compliance with those measures would address impacts to special aquatic resources and water quality. In the **BIOLOGICAL RESOURCES** section , staff recommends the applicant be required to provide a copy of the 404 and/or 401 Certifications, in accordance to Condition of Certification **BIO-7** (Biological Resources Mitigation Implementation & Monitoring Plan). See the **BIOLOGICAL RESOURCES** section of the **FSA** for a discussion of potential impacts and mitigation.

Polluted Runoff

To prevent contact runoff from discharging offsite during construction activities, the applicant has identified a combination of standard BMPs within the Preliminary Draft Construction DESCP/SWPPP for pollution control measures to be implemented during construction. The BMPs would limit or reduce potential pollutants at their source before they come into contact with storm water. These BMPs also involve daily activities of the construction site, are under the control of the construction contractor, and are additional “good housekeeping practices,” which involve maintaining a clean and orderly construction site.

Staff agrees that implementation and maintenance of the identified BMPs during construction would reduce or avoid impacts of contact runoff and recommends Conditions of Certification **SOILS-1** and **-2** requiring an approved DESCP and Construction SWPPP. Furthermore, to reduce the potential impacts from operation of a temporary concrete batch plant during construction, Condition of Certification **SOILS-3** requires an industrial Storm Water Pollution Prevention Plan (Industrial SWPPP) to ensure proper control and use of equipment, materials, and waste products from temporary batch plant facilities. With implementation of these conditions of certification, impacts from polluted runoff would be avoided or reduced to less than significant during construction of the proposed HHSEGS project.

To prevent contact runoff from discharging offsite during operations, HHSEGS would collect contact runoff from power block and equipment washing in an oil/water separator. The effluent would be mixed with and processed as industrial wastewater (see “Operations Wastewater” discussion below). Staff also recommends Condition of Certification **SOILS-4** requiring that each operating solar plant comply with all requirements of the General NPDES Permit for Discharges of Storm Water Associated with Industrial Activity, including the development of an Industrial SWPPP, unless otherwise documented that this permit is not required by the SWRCB[17]. Similar to the Industrial SWPPP, **SOILS-1** requires that the DESCP address appropriate methods and actions for the protection of water quality and soil resources for both the construction and operation phases of the project. Also, **SOILS-5** would reduce the potential of pollutants caused by storm damage from leaving the site.

Furthermore, Condition of Certification **WORKER SAFETY-2** would require a Hazardous Materials Management Program, and Condition of Certification **WASTE-4** would require an Operation Waste Management Plan. Both documents would be developed by the applicant to address handling, transportation, tracking, usage, storage, emergency response, spill control and prevention, training, record keeping, and reporting of hazardous wastes on the site. Other conditions of certification in the **WASTE MANAGEMENT** section of this **FSA** address wastes, including cleanup of all spills of hazardous substances. With implementation of these conditions of certification, impacts from polluted runoff would be avoided or reduced to less than significant during operation of the proposed project.

Operation Wastewater

To prevent the discharge of untreated industrial wastewater or untreated sanitary wastewater from entering nearby water resources, each HHSEGS Solar Plant would keep the potentially polluted waste water (contact runoff, general facility drainage, process wastewater, and sanitary waste) completely separated from non-contact storm water runoff, Sanitary waste would remain contained within the septic system. Industrial wastewater would remain within the power block and processed through the thermal evaporator system. Hazardous liquids would be meticulously handled to prevent spills and accidental release. Wastewater produced from the energy generation process would be processed through the thermal evaporator system. Potentially contaminated storm water (rain that falls onto industrial equipment or other surfaces that might contaminate the storm water) would be collected and processed through the thermal evaporator system. HHSEGS would transport the reject from the thermal evaporator and the sanitary waste from the septic tanks to approved facilities for offsite disposal. (See “Operations Wastewater” and “Sanitary Wastewater” discussions below.) Non-contact storm water would be directed away from the power blocks and allowed to flow toward the west. All BMPs and conditions of certification would strive to prevent any chemical or hazardous pollutants from mixing with the "clean" storm water. With implementation of these measures, impacts from sanitary or industrial wastewater would be avoided or reduced to less than significant during operation of the proposed project.

Flooding

Flooding is usually defined as the inundation of dry land adjacent to a channel when excess flow exceeds its banks. Because ephemeral streams like those at the site do not have permanent flow, their banks are formed in response to rainfall events which are

[17] For electric generating facilities, industrial storm water permits are required if fuel is burned to generate steam that is used to turn a generator. Concentrating solar power facilities are not one of the regulated industrial categories because solar energy replaces the need for fuel.

infrequent and vary in intensity. The extreme changes in flow conditions causes flooding, erosion, and sedimentation that can drastically alter the channel's shape and alignment. Consequently, desert washes can be transient and may vary in course from one storm event to another (resulting in heavy braiding of shallow channels). For purposes of this analysis, impacts of flooding will consider the natural behavior of ephemeral streams.

Onsite Area Flooding

Proposed construction of the HHSEGS project would alter existing onsite drainage patterns which could potentially cause or increase onsite flooding. For the majority of the project site, existing drainage patterns would generally remain the same. However, changes to a number of areas such as grading, adding impervious surfaces, diverting flows, and impeding flows can increase the amount of storm water runoff volume and rate. An analysis of each impact and the applicant's proposal to address impacts follows below.

Grading and Increase of Impervious Area

Heavy to medium grading would be performed within each solar plant's power block area and the common area complex, necessary to prepare the sites for construction of the various facilities. Grading would also be needed to create a system of roadways for access to each facility and maintenance of the heliostats, although grading in the solar fields would match natural contours and promote sheet flow where possible. Three areas of temporary grading would occur for construction laydown and parking: one within the large 180 acre area located adjacent to the site's west boundary, and one near each solar plant's power block area. Estimated amount of total grading (both temporary and permanent) would be about 438 acres, as shown in **Soils & Surface Water Table 6**. After project completion, the temporary parking and construction laydown areas would be restored to natural existing conditions, resulting in approximately 241 acres of land permanently altered by graded access roads and constructed facilities.

While most of the permanently graded area would remain "dirt" surface, the addition of concrete foundations and asphalt paving would create approximately 45 acres of impervious surface. Because water is not able to infiltrate into impervious surfaces, storm water runoff quickly concentrates and flows downstream, increasing both the volume and velocity of accumulated water. In addition, the heliostat assemblies would essentially function as thousands of rooftops and create approximately 806 acres of impervious surfaces, covering about 26 percent of the project site (see **Soils & Surface Water Table 6**). However, because the heliostats would be installed such that surface runoff flows to the pervious dirt areas of the solar field, impacts are considerably less severe than a contiguous stretch of impervious area.

Diversion Channels

In three areas (Solar Plant 1, Solar Plant 2, and the administration building), permanent diversion channels would be constructed to redirect storm runoff around these structures and prevent damage from flooding that occurs naturally due to existing topography. Solar Plant 2, in particular, is located in an area that experiences existing flood flows during storm events (see **Soils & Surface Water Figure 5**). The

Preconstruction Hydrology Analysis shows that a 100-year, 24-hour storm event[18] would likely result in flood flows approximately two feet deep, and approximately one foot deep from the more frequent 10-year, 24-hour storm event. The diversion channels around the administration building and each solar block would protect these structures from natural ephemeral flooding. Similarly, additional temporary diversion channels would also redirect flows around construction laydown and temporary parking areas during the construction activities of the project. Because of the general flow-through design of the solar fields, the diversion channels would not redirect runoff flows in a way that would adversely flood other areas either onsite or offsite. Also, **SOILS-5** (Storm Water Damage Monitoring and Response Plan) would require maintenance and monitoring of diversion channels during operations for added protection against storm damage.

Retention Basin

The applicant submitted an Existing Condition Hydrologic & Hydraulic Analysis (HHSG 2011a, App 5.15C) and a Final Post Construction Hydrologic & Hydraulic Analysis (HHSG 2011b, Attach 5.15ER) to compare the differences in peak flow, hydraulic depths, and velocities between the existing condition and the post construction conditions. Staff reviewed both reports and found the methodology and assumptions for both analyses appropriate and reasonable[19]. Because the applicant anticipates an increase in the project's post construction peak flows due to proposed changes such as grading, impervious surfaces, and diversion channels, the post construction analysis includes an onsite retention area along the west perimeter road (see **Soils & Surface Water Figure 8**).

The retention area would be created via a berm, constructed by elevating the west perimeter road above existing grade to a constant elevation of 2588.8 feet for a portion of the road's length[20]. The applicant estimates that the berm would decrease post construction runoff to better match preconstruction runoff. For smaller, more frequent rain events such as the 2-year, 24-hour storm, the road would stop runoff from flowing across that portion of the western project boundary, allowing the retained water to infiltrate and evaporate. Three 18-inch discharge pipes would be installed at the low point of the retention area to ensure it would drain within a 24-hour period after a storm event (CH2 2012ii). For larger storms, the retained water would build up to above the road elevation and weir over it (**see Soils & Surface Water Figure 9**). For the 100-year, 24-hour storm, the applicant calculates that post construction peak flow[21] would be

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[18] A design storm event is a hypothetical storm event, of a given frequency interval and duration, used to estimate how often storms of a given magnitude will occur, based on historical rainfall information. A 100-year, 24-hour design storm event corresponds to a major storm (the probability of occurrence in any given year is one in 100, or a one percent chance) and is used to represent flows with the potential to cause property damage and other impacts.

[19] Staff verified that a preapproved hydrologic analysis methodology and appropriate protocols (HEC-1 and FLO-2D) were used to generate calculated values for the preliminary analysis.

[20] The north and south ends of the west perimeter road would match existing elevations. The elevated portion would be about 1500 feet in length, beginning approximately 3000 feet north of TecopaRoad and would return back to existing elevation approximately 2100 feet prior to the north end of the road.

[21] This peak flow was calculated at a point located downstream of the 180-acre temporary laydown area to account for its contribution to runoff. The analysis assumed this laydown area would be entirely graded.

10,783 cfs compared to the preconstruction peak flow of 10,790 cfs (HHSG 2011b, Attach 5.15ER).

The elevated west perimeter road (berm) would decrease post construction runoff to better match preconstruction runoff, but this retention area would also clearly cause substantial onsite flooding. For the 100-year, 24-hour storm, the berm would retain 195.4 acre-feet of water across approximately 125 acres of land, with depths ranging from about four feet deep (at the base of the road) to about half a foot deep (toward the east). Because the berm would function as a weir, the estimated onsite flooding would occur at the western site border, as shown on **Soils & Surface Water Figure 10**. Because drainage pipes would sufficiently ensure drainage of the retention area within a 24-hour period (thus reducing the risk of closely spaced storms exacerbating flood depths), this onsite flooding would not be expected to encroach into either of the Solar Power Plants or into the common area. Therefore, staff does not identify any significant impacts to these structures as a result of onsite flooding.

However, staff notes that long-term sediment transport to this retention area could alter the expected storage capacity at the base of the road and could over time affect flow velocities that weir over the berm. Also, the berm may experience potential damage from the weir flow over time (see the discussion under “Offsite Erosion” above). Permanent erosion control measures and sediment management for the berm should be identified and discussed in an updated DESCP.

Although the retention area would not impact the proposed structures, repeated flooding would occur among the heliostats in the solar fields, especially those located on the west side of the proposed site. Staff acknowledges the applicant has completed a thorough hydrologic analysis, but notes that predicted flow depths and velocities on undeveloped alluvial fans have potential uncertainty. The consequences of flash flood damage or modified sedimentation and erosion rates may be significant. Staff proposes Condition of Certification **SOILS-5** (Storm Water Damage Monitoring and Response Plan) to reduce potential impacts caused by large storm event in four ways:

1. Establish specifications for heliostat installation and west perimeter road (berm) construction based on site specific studies and reports (e.g. Pylon Insertion Depth and Heliostat Stability Report). This ensures that heliostats and the west perimeter road (berm) are designed to withstand storm water scour of a 100-year storm event.

2. Establish an ongoing maintenance plan to ensure all storm water management measures are functioning properly, though periodic inspection before the first seasonal storms and after each storm event throughout the year.

3. Establish and implement a response plan to clean up damage and prevent release of sediment or pollutants after every occurrence of damage from a storm event or other cause.

4. Develop and implement a process to monitor incidents and propose modifications and/or improvements to address ongoing issues.

Furthermore, as the proposed project plans evolve from the conceptual and preliminary phases, any changes affecting hydrology or hydraulics would require an updated comprehensive analysis for purposes of **SOILS-5**. Examples include: the use of certain commercial dust suppressants applied onto dirt roads that would increase the total impervious area of the site, and structural changes to the proposed west perimeter road (berm) that would increase or decrease retention time.

In addition, standing water onsite might have impacts to biological resources given the scarcity of water in the desert. For example, standing water has the potential to attract nuisance predators such as ravens to the site. See the **BIOLOGICAL RESOURCES** section of this **FSA** for further discussion on the potential impacts of standing water to biological resources and possible mitigation required.

Offsite Area Flooding

Grading and Increase of Impervious Area

Numerous ephemeral drainages flow through the proposed HHSEGS site, originating from the east and discharging to the west toward the dry lake bed. Due to the episodic rainfall of the region and transient nature of the drainages, offsite flows can easily exceed these shallow channels and result in flooding. Modeling of the site in its present undeveloped state results in offsite flows to areas downstream (property west of the site) as indicated in **Soils & Surface Water Table 5**. As discussed above, proposed grading and construction of HHSEGS would increase the amount of impervious area onsite. This would increase the amount of storm water peak discharge leaving the site and could exacerbate the naturally occurring floods downstream of the site.

The applicant proposes to create a retention area that would decrease post construction runoff rates. Because the peak discharge of the 100-year, 24-hour storm event leaving the site during post construction conditions would be very close to discharge of preconstruction conditions, the impacts of offsite downstream flooding (to areas located west of the project site) would be reduced. Staff agrees that the proposed project would not exacerbate existing flooding conditions to the areas located west of the project site, and impacts would be less than significant.

Retention Area

Although the retention area would cause substantial onsite flooding, the inundated area (as shown in **Soils & Surface Water Figures 8**, **9**, and **10**) would not extend past the proposed site's borders to flood offsite areas. However, staff notes that long-term sediment transport to this retention area could alter the expected storage capacity at the base of the road and could affect flow velocities that weir over the berm. Also, the berm may experience potential damage from the weir flow over time (see the discussion under "Offsite Erosion" above). Permanent erosion control measures and sediment management for the retention area should be identified and discussed in an updated Drainage, Erosion, and Sediment Control Plan (DESCP). With this effective sediment management control, staff believes that offsite flooding due to the proposed retention area could be prevented.

Staff acknowledges the applicant has completed a thorough hydrologic analysis, but notes that predicted flow depths and velocities on undeveloped alluvial fans have potential uncertainty. The consequences of flash flood damage or modified sedimentation and erosion rates may be significant. Staff proposes Condition of Certification **SOILS-5** (Storm Water Damage Monitoring and Response Plan) to reduce potential impacts to the retention area caused by large storm events.

Impediments to Existing Flow Conditions

Tecopa Road, a county road that borders the south side of the project site, has historically experienced flooding due to storm events (see the "Area Flooding" discussion above under "Local Setting – Charleston View"). The applicant's pre- and post-construction analysis do not show a significant difference in Tecopa Road flood depths between the existing condition (shown on **Soils & Surface Water Figure 5**) and the post construction conditions (shown on **Soils & Surface Water Figure 10**), but estimated post construction Tecopa Road flooding may not be accurate. The applicant's analysis represented post-construction site conditions by incorporating the following proposed elements: impervious surfaces (heliostats, buildings, asphalt roadways and parking lots), graded dirt roads, protective diversion berms around power blocks and administration complex, and elevated west perimeter road. The analysis did not incorporate the perimeter fence (with desert tortoise exclusion fencing) or the landscape screening[22] proposed along the perimeter of the project site. The tortoise fencing in particular has the potential to trap vegetation and debris which could block or slow the flow of water to the site (see **Soils & Surface Water Figure 11**). These two elements would impede existing flows and could exacerbate flood events at Tecopa Road.

As shown on **Soils & Surface Water Figure 12**, flows from the Stump Springs area cross Tecopa Road before encountering the HHSEGS property boundary. The perimeter fencing and landscape screen would impede these flows, causing a portion of the flow to be diverted west along Tecopa Road while the rest would flow onto the HHSEGS site. Staff identified the following potential impacts:

- increased depths and frequency of flooding along the roadway adjacent to the site, and
- increased flow along the roadway shoulder.

The following discussion analyzes project information to determine whether HHSEGS would sufficiently reduce the potential impacts listed above. Where appropriate, staff recommends conditions of certification to reduce impacts.

<u>Adjacent Roadway Flooding</u>

To estimate the potential increased flood depths caused by the proposed perimeter elements (fencing and landscaping), staff used Manning's equation for open channel flow. Manning's equation can be simplified for sheet flooding because water depth is much smaller than floodplain width (i.e. a foot deep compared to a mile wide), which results in the hydraulic radius approximately equal to the depth.

[22] See Condition of Certification **BIO-9** (Desert Tortoise Clearance Survey and Exclusion Fencing) in the **BIOLOGICAL RESOURCES** section of this **FSA** for requirements to minimize impacts to desert tortoise. See Condition of Certification **VIS-2** (Landscape Improvements, Permanent Fencing and Screening) in the **VISUAL RESOURCES** section for requirements to reduce the visual impacts to viewers from Tecopa Road and the Charleston View residential area.

Manning's equation	Simplified equation
$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$	$$D = \left[\frac{Q\,n}{1.49\,W\,S^{1/2}}\right]^{3/5}$$
where Q = flow rate (cfs) n = roughness coefficient of the channel A = cross-sectional area of the channel (square feet) R = hydraulic radius = A/P (feet) P = wetted perimeter, the amount in contact with water (feet) S = slope of the channel energy gradient	where D = water depth (feet) Q = flow rate (cfs) n = roughness coefficient of the floodplain W = floodplain width (feet) S = slope of the floodplain energy gradient

The simplified equation was used to make a direct relationship between the increase in flood depth and effects of the proposed perimeter elements by making the following assumptions:

- The roughness coefficient 'n' represents physical characteristics of the floodplain at the site perimeter. For preconstruction conditions, staff used an 'n' value of 0.03 to represent undisturbed desert terrain. To represent the change in floodplain characteristics due to the perimeter fence and landscape screening, an 'n' value of 0.16 was used[23].
- Because the perimeter fence only affects a portion of the floodplain rather than the entire area, staff represented the post-development flood depths by calculating the average of flood depths without the fence (n=0.03) and with the fence (n=0.16). Staff used the average of the two values, or n = 0.10, to represent the overall post-development 'n' for the area at and around the project site perimeter.
- The flow rate 'Q' represents the portion of flows from Stump Springs that encounters the site. Because the floodplain width and slope are assumed not to change from pre- to post-construction, the value of 'Q' would also stay constant. Therefore, the only component that would change in the simplified Manning's equation is the roughness coefficient 'n', which would result in a change in water depth (flooding).

Given these assumptions, the simplified equation above can be used to compare average flood depths before and after project development as follows:

$$\frac{D_{post}}{D_{pre}} = \left[\frac{n_2}{n_1}\right]^{3/5}$$

where: n_2 is the average post-development n = 0.10
n_1 is the pre-development n = 0.03

[23] Staff estimated the post-construction n using the USGS method (USGS1989). The base value for the flood plain's natural surface (n=0.03) is the same as preconstruction. Corrections were added for obstructions (perimeter fencing = 0.03) and vegetation (landscape screening = 0.10).

Therefore, the ratio of flood depth for post-development and pre-development conditions is 2.1. In other words, the elements proposed for the project's perimeter could potentially double existing flood depths at Tecopa Road.

Soils & Surface Water Table 7 shows estimated flood depths, assuming the site encounters half the flows from the Stump Springs area. Smaller storms could see an increase in flow depth of a few inches, while the larger storms could increase by more than a foot. Since depths of floods would increase for all storms, frequency of flooding would increase during smaller storms.

Soils & Surface Water Table 7
Estimated Flood Depths at Tecopa Road

Storm Event	Stump Springs flows	Flows to Site **Q**	Pre-Develop Flooding	Post-Develop Flooding	Pre vs. Post Increase
100 yr	15900 cfs	7950 cfs	2.1 ft	4.3 ft	2.2 ft
25 yr	7400 cfs	3700 cfs	1.3 ft	2.7 ft	1.4 ft
10 yr	3800 cfs	1900 cfs	0.9 ft	1.8 ft	0.9 ft
5 yr	2100 cfs	1050 cfs	0.6 ft	1.3 ft	0.7 ft
2 yr	300 cfs	150 cfs	0.2 ft	0.4 ft	0.2 ft

Notes:

- Values of Stump Springs flow rates for different storm events are from the applicant's calculated flows (HHSG 2011a, App 5.15C).
- Assumes the site crosses half the width of the floodplain created by flows from Stump Springs.
- Pre-Development n = 0.03 and Post-Development n = 0.10

The estimated flood depths presented above are rough averages taken across the area at and around the project site perimeter. Although flood depths at localized areas along the perimeter would be more accurately calculated using two-dimensional modeling computer software specifically designed for this purpose, staff concludes these estimates are sufficient to show that flooding impacts to Tecopa Road would be potentially significant.

Inyo County's requirement for Flood Damage Prevention (Title 14, Chapter 14.29) identifies areas of special flood hazard as the same identified by FEMA. While the project would comply with this section of Inyo County Code because it is located outside the FEMA Zone A boundary, staff used these requirements as guidance for determining significance with respect to flooding of Tecopa Road and proposing mitigation to reduce impacts to less than significant. Inyo County Code defines adverse affects as cumulative effects that would increase water surface elevation of the base flood (the 100-year flood) more than one foot at any point. Therefore, staff considers a depth increase of up to one foot to be a less than significant impact for the 100-year storm. This in turn would result in less than one foot depth increase for all storms less than the 100-year event as shown in **Soils & Surface Water Table 7.**

Staff proposes Condition of Certification **SOILS-6** to reduce incremental flooding for storms up to the 100-year, 24-hour storm, to less than one foot. Condition of Certification **SOILS-6** (Perimeter Drainage Management Plan) requires the project to reduce flooding impacts by increasing the amount of flows crossing the perimeter at Tecopa Road. This can be accomplished with appropriate storm water control structures, such as a drop inlet for large storm events, staggered landscape planting that allows better flow around the vegetation, or dry wells to increase infiltration.

It is important to note that estimates shown in **Soils & Surface Water Table 7** assume the proposed tortoise fence contains debris occupying 50 percent of the cross-sectional area. Further blockage of flows (as shown in **Soils & Surface Water Figure 11**) would result in the fence becoming more of a barrier rather than an impedance, which would further increase the flooding impacts to Tecopa Road. **SOILS-5** (Storm Water Damage Monitoring and Response Plan) would require maintenance and aggressive fence cleaning to reduce the amount of trapped vegetation and debris.

<u>Increased Roadway Flows</u>

The perimeter fencing and landscape screen would impede the naturally occurring floodplain flows from the Stump Springs area, causing a portion of the flow to concentrate at the perimeter and be diverted west along Tecopa Road. With an increase of flow volumes and velocities, the diverted runoff would impact the roadway shoulder and adjacent property west of the site (as depicted by the solid black arrows on **Soils & Surface Water Figure 11**).

The concentrated flows could potentially undercut the asphalt pavement edges and cause pavement damage at the roadway shoulder. Staff could not determine the project's incremental contribution to roadway shoulder damage because a baseline could not be established. Tecopa Road was constructed in the early 1970s and does not comply with current Inyo County geometric roadway design standards[24]. Inyo County's Road Department records the days a flood event occurred and whether road repairs were made to fix flood damage, but logs do not indicate what portion of Tecopa Road was impacted by the noted event (CEC 2012ii). Staff recognizes that flood damage occurs on Tecopa Road, but the extent of damage to the section of road adjacent to the proposed site cannot be determined. The concentrated flows could also erode the soil as it continues along the fence, then erode the adjacent property west of the site as it spreads at the west end of the site.

Staff proposes Condition of Certification **SOILS-6** (Perimeter Drainage Management Plan) that requires the project to increase the amount of flows crossing the perimeter which would, in turn, reduce the amount of redirected concentrated flow along the shoulder of Tecopa Road. Condition of Certification **SOILS-6** also requires the project to implement erosion control measures to protect the area adjacent to Tecopa Road and the area west of the site from erosion due to these concentrated flows. Also **SOILS-5** (Storm Water Damage Monitoring and Response Plan) would require maintenance of erosion control features and repair of damage from a storm event or other cause. Condition of Certification **TRANS-3** (Restoration of All Public Roads, Easements, and Rights-of-Way) would require the project to restore the public roads after project construction to compliance with the applicable jurisdiction's specifications (see the

[24] For further discussion on the structural integrity of Old Spanish Trail Highway/Tecopa Road, see "Total Construction Traffic" in the **TRAFFIC AND TRANSPORTATION** section of this **FSA**.

TRAFFIC AND TRANSPORTATION section of this **FSA**). This roadway restoration to current design standards would be an improvement above existing (baseline) Tecopa Road features and would help reduce damage from concentrated shoulder flows.

Offsite Linear Facilities

The proposed offsite linear facilities east of the proposed HHSEGS project would not alter existing offsite drainage patterns. The gas pipeline would be constructed underground, and the pole structures for the overhead power transmission lines would not impede or adversely redirect existing flows. Staff believes that offsite flooding impacts of the proposed Hidden Hills Transmission Project and proposed KRGT natural gas pipeline would be less than significant.

Vicinity Flood Hazards

Flood hazards include direct flooding due to overtopping of nearby rivers or streams resulting from severe rainstorms, or secondary flooding due to seismic activity creating tsunamis (tidal waves) or seiches (waves in inland bodies of water).

To identify the different types of flood risks for a given location, flood hazard maps were developed by the Federal Emergency Management Agency (FEMA) to identify areas prone to flooding[25]. Comparing the HHSEGS site location to these maps (see **Soils & Surface Water Figure 3**) and considering the site's elevation (2600 feet above mean sea level (msl)), staff found that:

- Although the north tip and southwest corner of the project footprint are located in areas designated at Zone A (100-year flood hazard area), neither of the power blocks or the administration complex are within these zones. Only heliostat poles and at-grade access roads would be placed in the designated 100-year flood zone, and neither would impede nor significantly redirect Zone A flood flows[26].
- HHSEGS site is located roughly 200 miles inland with no dams in the region. In addition, no levees or inland bodies of water are located in the area.

The proposed project would not impede or significantly redirect flood flows of the FEMA designated 100-year floodplain. In addition, the project would not be affected by dam failure, tsunami, or seiche. Staff agrees with the applicant that HHSEGS would not have significant impacts pertaining to these identified flood hazard areas. (For discussion on additional potential hazards that could be caused by soil failure such as mudflow, landslide and liquefaction, see the **GEOLOGY and PALEONTOLOGY** section of this **FSA**.)

<u>Water Supply</u>

Refer to the **WATER SUPPLY** section of this **FSA** for a detailed analysis of the potential effects on groundwater supplies and groundwater quality.

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[25] For further discussion of FEMA and potential flooding, see Area Flooding under Local Setting heading above.

[26] The elevated portion of the west perimeter road is located between two Zone A boundaries, separated by more than 200 feet to the north and more than 2000 feet to the south.

Wastewater

Construction Wastewater

Improper handling or containment of construction wastewater could cause a broad dispersion of contaminants to soil, surface waters, or groundwater. For example, hydrostatic testing[27] of a new pipeline can result in discharge of super-chlorinated water often used for the initial disinfection. Other constituents of concern include total dissolved solids (TDS) and total suspended solids (TSS). Discharge of any non-hazardous construction-generated wastewater would require compliance with discharge regulations.

Anticipated sources of wastewater, also referred as non-storm water discharges, would be sanitary wastes, wash water, concrete washout water, paint wash water, and piping hydrostatic test water. Clean water used for dust control and soil compaction would not be considered wastewater because flows would not discharge offsite.

The applicant submitted a Preliminary Draft Construction DESCP/SWPPP (HHSG 2011a, App 5.15A) identifying a combination of standard BMPs for non-storm water management measures to be implemented during construction as well as corresponding Construction Phase BMP Plans showing their locations. Sanitary waste would be contained in portable facilities and routinely disposed of at an offsite treatment/disposal facility by a licensed sanitary service. Concrete washout slurries would be discharged to a temporary washout facility and allowed to dry prior to disposal offsite. The DESCP/SWPPP states that non-storm water discharges would be eliminated, controlled, or treated in accordance with the Construction General NPDES Permit requirements to minimize or eliminate the release of pollutants in storm water.

Staff agrees that implementation and maintenance of BMPs during construction would reduce or avoid impacts from concrete washouts and sanitary waste. Although compliance with Conditions of Certification **SOILS-1** and **-2** (DESCP and Construction SWPPP) would implement these and other standard BMPs, the BMP's planned for treatment of wash water are not specifically addressed in the DESCP/SWPPP. The Final DESCP and SWPPP must be revised to specifically include the appropriate BMPs for proposed management and ensure disposal of wash water during construction would not result in significant impacts.

The applicant stated in the AFC that hydrostatic test water (approximately 400,000 gallons total from both solar plants) would be discharged to the surrounding area or used for dust control if test results meet regulatory standards (HHSG 2011a, Table 5.14-3) Otherwise, the hydrostatic test water would be trucked offsite for disposal at an approved facility. In addition, the AFC states the same approach would occur for the passivating[28] and chemical cleaning fluid wastes (estimated to range from 200,000 to 400,000 gallons total from both solar plants) produced from pipe cleaning and flushing.

[27] A hydrostatic test is a way in which leaks can be found in pressure vessels such as pipelines and plumbing. The test involves placing water, which is often dyed for visibility, in the pipe or vessel at the required pressure to ensure that it will not leak or be damaged.

[28] Passivating fluid is used to treat or coat a metal pipe in order to reduce the chemical reactivity of its surface.

Discharge of hydrostatic test water to land is regulated under SWRCB Order No. 2003-003-DWQ which specifically prohibits the discharge of hydrostatic test water unless all residual pollutant concentrations comply with groundwater quality objectives. Discharge of hydrostatic test water to surface waters would be subject to provisions of Lahontan Regional Board Order No. R6T-2008-0023 (Revised Waste Discharge Requirements and NPDES General Permit for Limited Threat Discharges to Surface Waters).

In addition, potential contaminants in the discharge of other wastewater streams (anticipated wash water and passivating/chemical cleaning fluid wastes) may also be subject to other Lahontan RWQCB regulations to protect water quality. Because more information is needed describing the management and disposal methods of wash water and pipe water discharges not meeting SWRCB and/or Lahontan RWQCB requirements, staff cannot determine whether these wastewater streams would result in significant impacts during construction. To ensure HHSEGS would sufficiently address these wastes, staff recommends Condition of Certification **SOILS-7** (Construction Wastewater Discharge) requiring the project owner to obtain the appropriate permit(s) from Lahontan RWQCB and/or the SWRCB for reuse onsite as dust control. If the wastewater discharge does not meet the requirements for reuse, then the project owner must submit proof of proper wastewater disposal, in accordance with waste discharge requirements of the Clean Water Act (CWA). Adoption of Condition of Certification **SOILS-7**, in addition to a complete and approved DESCP and Construction SWPPP as required in Conditions of Certification **SOILS-1** and **-2**, would reduce potential impacts from proposed management and disposal of wastewater during construction to a less than significant level.

Operations Wastewater

A thermal evaporator system would process the wastewater. Generally speaking, heat is applied to recirculating wastewater causing water to vaporize, producing a high quality distillate for reuse, and leaves behind virtually all the unwanted contaminants in a concentrated solute for disposal. HHSEGS would return approximately 90 percent of the operations wastewater for reuse back into the service water tank. The applicant states in the AFC that reject from the thermal evaporator would be trucked offsite for treatment or disposal at an approved facility.

To ensure protection of water quality from waste disposal, the SWRCB establishes specific requirements including a system to classify waste, according to the risk of impairment to water quality, as well as standards and regulations for proper disposal. For example, “hazardous waste” disposal is only accepted at a Class I disposal site and a “designated waste” at a Class II disposal site, while wastewater discharge would typically occur at a wastewater treatment facility.

Staff proposes Condition of Certification **SOILS-8** (Wastewater Collection System) requiring the project owner to submit proof of proper wastewater disposal, in accordance with waste discharge requirements of the Clean Water Act (CWA). Adoption of Condition of Certification **SOILS-8** would reduce potential impacts from proposed management and disposal of process wastewater during operations to a less than significant level.

Sanitary Wastewater

As noted previously, the HHSEGS project would require a septic system and leach field at each of the two power blocks and the administration complex. Each of the systems would be designed to treat up to 700 gallons per day of wastewater discharged from toilets, sinks, and showers. Septic tanks would be pumped out as needed by a qualified sanitary service provider.

The use of septic tanks and leach fields for onsite treatment and disposal of domestic wastes is an established practice. However, improper construction and operation of these systems may adversely impact nearby surface and ground waters. To ensure protection of human health and the environment from improper disposal of sewage, California Plumbing Code and Lahontan RWQCB establishes specific requirements for the discharge of sewage. Included in the requirements are soil percolation standards; minimum separation/set back distances to prevent impacts to groundwater and nearby water wells; and septic tank and leach field design, sizing and construction standards to ensure adequate capacity and proper treatment and disposal of the wastewaters. The Inyo County Environmental Health Services Department (ICEHSD) is responsible for permitting and requires persons constructing septic systems to apply for a permit for the construction and operation of the system.

Consistent with the Energy Commission's in-lieu permit provisions, staff proposes adoption of Condition of Certification **SOILS-9** (Septic System and Leach Field Requirements) requiring compliance with the requirements of the Inyo County Code (Title 7, Section 7.52.060), the California Plumbing Code (California Code of Regulations Title 24, Part 5), and the Lahontan RWQCB Basin Plan for all project sanitary waste disposal facilities, such as septic systems and leach fields. Adoption of Condition of Certification **SOILS-9** would both ensure compliance with LORS and, through the protectiveness provided by the County regulatory standards, reduce potential impacts from project septic systems to a less than significant level.

INDIRECT IMPACTS

Indirect impacts are effects caused by the project and occurring later in time or farther removed in distance, but still reasonably foreseeable. Indirect impacts usually result from a chain of events caused by the project, intended or not.

Soil Erosion and Surface Water Quality

With any new project, possible indirect impacts affecting soil and water resources would be in response to additional construction activities. For example, additional housing could be needed to accommodate workers for construction and operation of a proposed project, or additional industrial facilities may be attracted to an area containing an established solar facility. These in turn can further result in additional roads or other infrastructure. Potential impacts of these various resultant activities would be similar to the potential direct impacts of the project itself such as: potential erosion due to construction activities, potential flooding impacts due to structures within a 100-year flood zone or increase of impervious surfaces, potential contamination from industrial activities, and potential impacts from wastewater.

The **SOCIOECONOMICS** section of this **FSA** discusses growth-inducing impacts, and concludes that the project's construction and operation workforces would not induce a substantial population growth or displacement of population, or induce substantial increases in demand for housing. The **GROWTH INDUCING IMPACTS** section of this **FSA** concludes that neither the project's gas pipeline nor the electricity generated by the HHSEGS would induce any additional growth in the project area. The scarcity of local groundwater resources and the existing land use designations are serious constraints to any significant economic development in the project area. Based on this information, staff believes the HHSEGS project would not indirectly result in significant impacts to soil resources or surface water quality.

Water Supply and Groundwater Quality

Refer to the **WATER SUPPLY** section of this **FSA** for a detailed analysis of the potential effects on groundwater supplies and groundwater quality.

CUMULATIVE IMPACTS AND MITIGATION

A project may result in a significant adverse cumulative impact where its effects are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of reasonably foreseeable future projects (California Code of Regulations, Title 14, section 15130). The construction and operation activities of the various projects could potentially overlap and result in cumulative impacts to the same resource(s).

Soil Erosion and Surface Water Quality

The project site is in Inyo County, along the California and Nevada border. **Soils & Surface Water Table 8** lists the projects in the vicinity of the proposed HHSEGS site that have been approved or are under review. These specific projects were considered for the HHSEGS cumulative impacts to water quality and hydrology because of their location within the Pahrump Valley. **Soils & Surface Water Figure 13** (also see **Cumulative Effects Figure 2**) displays the project locations on a map in relation to the proposed HHSEGS site.

Soils & Surface Water Table 8
Projects Reviewed for Cumulative Impacts

Map ID	Project Name (Agency ID#)	Location	Ownership	Status	Project Description
A	St. Therese Mission	Tecopa Road near Charleston View	Magnificat Ventures Corp, Las Vegas NV	Inyo County approved project June 2011	17.5 acre environmental park, memorial and internment center
B	Pahrump Valley General Aviation Airport	Pahrump, NV (~ 10 miles northwest of HHSEGS site)	Nye County	Environmental review phase (const may overlap with HHSEGS const)	Public-use general aviation airport on 650 acres of BLM land
C	Element Solar (NVN 089655)	Pahrump Valley (6.5 miles northeast of HHSEGS site)	First Solar Development	POD submitted[1]	100 MW photovoltaic project with 2,560 acres of BLM land requested

Map ID	Project Name (Agency ID#)	Location	Ownership	Status	Project Description
H	Sandy Valley (NVN 090476)	Clark County, NV (~8 miles southeast of HHSEGS site)	BrightSource Energy Solar Partners	POD submitted[1]	750 MW renewable energy project with 15,190 acres of BLM land requested
N	Hidden Hills Valley Electric Transmission Project (NVN 089669)	Mainly in Clark County, NV (direct service to HHSEGS site)	Valley Electric Association	Environmental review phase (DEIS expected late December, 2012)	Transmission and natural gas pipeline alignments. This is a “connected action” to the proposed HHSEGS project.

Note 1: The Plan of Development (POD) includes basic project information needed to initiate the environmental analysis and review process with the Bureau of Land Management (BLM). This step occurs prior to publication of a Notice of Intent to prepare an Environmental Impact Statement.

These projects have the potential to increase local soil erosion and storm water runoff. Without the use of storm water BMPs and erosion control BMPs, these changes could incrementally increase local soil erosion and storm water runoff leading to significant impacts to the quality of Pahrump Valley’s surface waters. By complying with all applicable erosion and storm water management LORS, including the Water Quality Control Plan for the Lahontan Region (Basin Plan) in California and applicable requirements of the Nevada Division of Environmental Protection’s regulatory agencies, the proposed HHSEGS project would not contribute to a potentially significant cumulative impact[29].

Offsite Flooding

Staff considered the effects of the St. Therese Mission project to analyze cumulative offsite flooding because it is located on the same alluvial fan area as the HHSEGS site and is also bordered by Tecopa Road (as shown on **Soils & Surface Water Figure 13**). In addition, St. Therese Mission includes a perimeter fence and landscaping along its border adjacent to Tecopa Road similar to HHSEGS. As discussed in Direct Impacts above (Offsite Area Flooding: Impediments to Existing Flow Conditions), the fencing and landscaping could potentially flood Tecopa Road and increase storm water flows along the roadway shoulder. The relatively close proximity of the two projects has the potential of combining impacts to further exacerbate flooding and erosive flows.

Staff found that St. Therese Mission is located on a portion of the alluvial fan that avoids floodplain flows from the Stump Springs area (see **Soils & Surface Water Figure 3**). Therefore, its perimeter fence and landscaping do not encounter the large flows that would result in significant flooding to Tecopa Road as would the HHSEGS site. Based on this information, staff does not believe that the effects of the two projects would combine to cumulatively result in Tecopa Road flooding worse than potential flooding caused by the HHSEGS project alone. In other words, mitigated impacts from Condition

[29] CEQA also allows the lead agency to determine that a project’s contribution to a cumulative impact is not significant “if the project will comply with the requirements in a previously approved plan or mitigation program which provides specific requirements that will avoid or substantially lessen the cumulative problem … within the geographic area in which the project is located.” (California Code of Regulations, Title 14, section 15064(h)(3)).

of Certification **SOILS-6** (intended to reduce potential Tecopa Road flooding) would not contribute to a significantly cumulative impact.

Water Supply and Groundwater Quality

Refer to the **WATER SUPPLY** section of this **FSA** for a detailed analysis of the potential cumulative effects on groundwater supplies and groundwater quality.

COMPLIANCE WITH LORS AND STATE POLICY

CLEAN WATER ACT, ANTIDEGRADATION POLICY, PORTER-COLOGNE WATER QUALITY CONTROL ACT, AND SWRCB ORDERS 2009-0009-DWQ, 2003-003-DWQ, AND 97-03-DWQ

The Clean Water Act (CWA) (33 USC, section 1257 et seq.) requires states to set standards to protect water quality, which include regulations of storm water and wastewater discharge during construction and operation of a facility. California established its regulations to comply with the CWA under the Porter-Cologne Water Quality Control Act. The SWRCB regulates storm water discharges associated with construction of projects affecting areas greater than or equal to 1 acre. Under Order 2009-0009-DWQ, the SWRCB has issued a National Pollutant Discharge Elimination System (NPDES) General Permit for storm water discharges associated with construction activity, Order 2003-03-DWQ is for water discharges to land that has a low threat to water quality (includes water from hydrostatic testing of pipes), and Order 97-03-DWQ is for storm water discharges associated with industrial activity. Projects qualify under these permits if specific criteria are met and an acceptable Storm Water Pollution Prevention Plan (SWPPP) is prepared and implemented after notifying the SWRCB with a Notice of Intent.

The HHSEGS would satisfy these requirements of the SWRCB and Lahontan RWQCB with the development of a DESCP in accordance with Condition of Certification **SOILS-1**, the development of construction SWPPPs in accordance with Condition of Certification **SOILS-2**, compliance with requirements for hydrostatic test water discharge in accordance with Condition of Certification **SOILS-7**, and the development of industrial SWPPPs in accordance with Conditions of Certification **SOILS-3** and **-4**. In addition, proposed Condition of Certification **SOILS-5** would reduce potential impacts from damaging storm events.

CALIFORNIA CODE OF REGULATIONS TITLE 20, DIVISION 2, CHAPTER 3, ARTICLE 1

These data collection regulations known as Quarterly Fuel and Energy Reports (QFER) are to obtain necessary information in order for the California Energy Commission to develop policy reports and analyses related to energy. Power plant owners are required to periodically report specific operational data to the California Energy Commission, including water supply and water discharge information. Through compliance with Condition of Certification **SOILS-8** (Wastewater Collection System), HHSEGS would provide the required data for wastewater disposal.

INYO COUNTY GENERAL PLAN AND RENEWABLE ENERGY ORDINANCE

The Inyo County General Plan lists Water Resources goals and policies, which include Policy WR-1.4 that new industrial developments reducing polluted runoff from entering surface waters by complying with the Clean Water Act, reducing direct-source pollution into surface waters, and implementing appropriate mechanisms to reduce wastewater discharge. The General Plan also identifies goals for Public Services and Utilities, including Wastewater goals (PSU-4) which ensure adequate wastewater collection, treatment, and disposal; and Stormwater Drainage goals (PSU-5) which include polices that new project design and maintenance activities improve runoff quality and encourage use of natural stormwater drainage systems.

Title 21 of the Inyo County Code (Renewable Energy Ordinance) encourages and regulates the development of renewable energy resources within Inyo County. The ordinance requires developers of solar thermal, photovoltaic, and wind energy power plants to protect the health, safety, and welfare of the County's citizens, the County's environment, and to ensure the County and its citizens do not bear an undue financial burden from the project. Under this ordinance, a proposed project must implement necessary mitigation measures by obtaining a renewable energy permit, a renewable energy development agreement, or a renewable energy impact determination. Furthermore, this ordinance requires compliance with the Inyo County General Plan.

Although compliance with **SOILS-1** through **-9** would reduce polluted runoff from entering surface waters, staff believes that HHSEGS does not specifically reduce direct-source discharge. As discussed in "Onsite Area Flooding" above, an onsite retention area would accumulate runoff from a majority of the HHSEGS site along the west perimeter road before discharge offsite. However as discussed in "Water Quality of Surface Waters" above, staff does not identify any significant impacts to water quality as a result of the retention area provided staff recommended mitigation measures are implemented.

SWRCB RES. 2008-0030 (LOW IMPACT DEVELOPMENT)

SWRCB and Lahontan RWQCB encourage a low-impact planning approach for new development projects. Low Impact Development (LID) is an alternative management approach to the traditional "end-of-pipe" centralized collection and treatment approach of simply collecting onsite runoff flows in order to control offsite discharge through a single discharge point. Although the post construction peak discharge rate matches the preconstruction rate, the post construction flows are typically sustained for a longer period of time which increases the volume of runoff during a given rain event. This can increase the amount of pollutants and the erosive energy of discharge.

LID focuses on an integrated system of decentralized, small-scale control measures spread throughout the site. By distributing storm water rather than concentrating it, the erosive forces of this runoff can be avoided. LID features often take advantage of soil infiltration, vegetation, and evaporation to mimic the natural hydrologic regime. Examples of measures include:

- Reducing imperviousness, conserving natural resources and ecosystems, maintaining natural drainage courses, reducing use of pipes, and minimizing clearing and grading.
- Providing runoff storage measures dispersed uniformly throughout a site's landscape with the use of a variety of detention, retention, and runoff practices.
- Maintaining predevelopment time of concentration[30] by strategically routing flows, increasing surface roughness, and disconnecting[31] impervious surfaces to maintain travel time and control the discharge.

However, LID measures may not be suitable for all sites, with considerations made to expected rainfall intensities, climate (i.e., relative humidity, solar radiation, air temperature, wind speed) and, in particular, soil permeability. Also, LID by itself may not completely replace the need for conventional storm water controls to mitigate excess flow rates or to provide enhanced storm water treatment.

The proposed HHSEGS site appears suitable for implementation of LID measures, based on the dry hot climate and sandy native soils. The applicant submitted a Preliminary Draft DESCP which contains the following measures:

- Vegetation would not be removed but would be mowed (if needed) in areas where grading is not required for access or construction.
- Most of the natural drainage features would be maintained and any grading required would be designed to promote sheet flow where possible.
- Relatively small rock filters and local diversion berms through the heliostat fields to discourage water from concentrating.
- Areas compacted during construction activities would be restored, as appropriate, to approximate preconstruction compaction levels.
- Heliostat assemblies, which contribute to the project's total impervious area, would be installed such that their surface runoff flows to the pervious dirt areas of the solar field.

Staff believes that implementation of the above measures, which would be approved by staff in accordance with Condition of Certification **SOILS-1**, sufficiently complies with this SWRCB policy. Although the applicant does not specifically demonstrate that all components of LID are met, namely the objective of maintaining preconstruction runoff volume, the above measures would help reduce the increase in volume. Furthermore, neither Inyo County nor Lahontan RWQCB requires minimum standards for use of LID practices for this area.

[30] The time of concentration refers to the amount of time it takes for water to travel from a watershed's most distant point to the watershed's outlet. Maintaining storm water's natural time of concentration allows the water to slowly permeate into the ground.

[31] The impacts of disconnected impervious surfaces are considerably less severe than a contiguous stretch of impervious area.

FACILITY CLOSURE

HHSEGS is designed for an operating life of 25 to 30 years (HHSG 2011a, § 2.3.2.1). Facility closure can be either temporary or permanent, and closure options range from "unplanned temporary closure," with the intent of a restart at some time, to the removal of all equipment and facilities. Closure can result from two circumstances: (1) the facility is closed suddenly and/or unexpectedly because of unplanned events, such as a natural disaster or economic forces or (2) the facility is closed in a planned, orderly manner, such as at the end of its useful economic or mechanical life or due to gradual obsolescence.

In the event of a temporary or unplanned closure, HHSEGS would be required to comply with all applicable conditions of certification, including an emergency Risk Management Plan to manage the possible release of hazardous substances present onsite (see the **HAZARDOUS MATERIALS** section of this **FSA**). Depending on the expected duration of the shutdown, other appropriate measures would be taken such as removing chemicals from storage tanks or equipment.

Permanent closure (decommissioning) requires a Facility Closure Plan, as discussed in the **FACILITY DESIGN** and **GENERAL CONDITIONS** sections of this **FSA***,* which would be submitted to the Energy Commission for approval prior to decommissioning. Future conditions that could affect decommissioning are largely unknown at this time, however compliance with all applicable LORS, and any local and/or regional plans would be required. The plan would address all concerns in regard to potential erosion and impacts on water quality. Refer to the **FACILITY DESIGN** section of this **FSA** for further discussion on temporary and permanent facility closure.

RESPONSE TO AGENCY AND PUBLIC COMMENTS

Staff published the Preliminary Staff Assessment ([PSA], CEC 2012u) on May 24, 2012. The table below contains staff's responses to comments received pertinent to topics addressed in this section. The comments were submitted by:

- Agency - Inyo County (INYO 2012j)
- Agency - Bureau of Land Management (BLM 2012b)
- Intervenor - Cindy MacDonald (MAC 2012c)
- Applicant – Hidden Hills Solar I, LLC; and Hidden Hills Solar II, LLC (CH2 2012ee)

Comment #	COMMENT and RESPONSE
1	**Inyo County**
1.79 Pg 12: Consistency with General Plan	COMMENT: Goal PSU-4/Wastewater: To ensure adequate wastewater collection, treatment, and disposal. Consistency: Compliant. The project proposes adequate wastewater management for the project site. Identified by PSA as LORS?: No.

Comment #	COMMENT and RESPONSE
	Goal PSU-5/Stormwater Drainage: To collect and dispose of stormwater in a manner that minimized inconvenience to the public, minimizes potential water-related damage, and enhances the environment Consistency: Compliant. The project proposes adequate stormwater drainage for the project site. Identified by PSA as LORS?: No. RESPONSE: Text added identifying PSU-4 and PSU-5 in the Inyo County LORS. See page 45.
2	**Bureau of Land Management**
2.3 Pg. 2: Soils & Surface Water	COMMENT: An assumption is made in Table 6 (page 4.10-12) of the PSA that there will be negligible soil disturbance throughout the heliostat field. Soil disturbance is a direct result of the installation of solar cells or mirrors and, to date, all technologies require some level of disturbance. Ground disturbance can occur even in relatively level areas. RESPONSE: In the construction industry, disturbed area or soil disturbance area typically means an area that is altered as a result of clearing, grading, and/or excavation. Staff use of "negligible" in describing heliostat installation in the field (vehicle driving, vegetation mowing, and foot traffic) reflected that no grading would be required. Staff changed the description to "Area of Land Grading and Excavation" to avoid confusion. See Total Soil Disturbance discussion in the **Soils & Surface Water** section on page 15.
2.4 Pg. 2: Soils & Surface Water	COMMENT: Neither the applicant's plan of development nor the PSA's proposed SOILS-5 condition of certification address the possibility that flow across the roadway may cause this berm to fail, nor do they address any potential impacts of the resulting offsite flooding and scour. SOILS-5 does not require the berm to be stabilized with riprap, gunite, or similar material that would prevent piping around the 18-inch culvert that would be the sole drainage point. Armoring the key points in this berm will be necessary to minimize risk to offsite soil resources. Alternatively, the applicant may choose not to install a berm along the western perimeter and simply allow floodwaters to pass through the heliostat field unimpaired, although this may result in heliostat being damaged or washed away. RESPONSE:

Comment #	COMMENT and RESPONSE
	Included language in **SOILS-5** on page 88 about protection and damage to the west perimeter road. See discussion on page 32.
10	**Intervenor - Cindy MacDonald** **SOILS & SURFACE WATERS**
10.1	COMMENT: (p.14-1 #1) Why should the public believe the CEC and applicant would "*ensure all appropriate environmental review has been completed*" at any other stage of the proposed project if they won't even do it now? <u>RESPONSE:</u> The entire sentence reads as follows: "For activities outside of the project boundaries the owner shall ensure all appropriate environmental review and approval has been completed before field activities begin." Activities outside the project boundaries do not fall within Energy Commission jurisdiction. Compliance staff would enforce Energy Commission conditions of certification as well as work with local agencies should an issue develop outside the project boundaries.
10.2 10.3 10.4	COMMENT 10.2: (p.14-1 #2) How does it serve the public interest to develop and analyze data regarding potentially significant impacts of the proposed project only after the proposed project is approved? COMMENT 10.3: (p.14-2 #3) How are "mitigation measures" reducing the project's impacts and meeting CEQA requirements if those impacts aren't even disclosed, analyzed or vetted until after the proposed project is approved? COMMENT 10.4: (p.14-2 #4) If only general and superficial data and/or analysis are substituted for site-specific data and critical analysis, how can the proposed project site be credibly deemed "suitable" or "feasible"? <u>RESPONSE TO ALL:</u> The proposed project is defined in the AFC and during Discovery. Staff analyzes the project, identifies impacts and evaluates feasible mitigation measures in the PSA and FSA, to provide an independent recommendation to the Commissioners. The Commissioners use the evidentiary record, augmented by analyses from the applicant and interveners, and hearings, to render a decision on the proposed project.
10.5	COMMENT 10.5: (p.14-6 #1) Why didn't the CEC Staff address the issues associated with potential soil unsuitability at the proposed project site in the Preliminary Staff

Comment #	COMMENT and RESPONSE
	Assessment as outlined in the Preliminary Geotechnical Report?
10.6	COMMENT 10.6: (p.14-6 #2) Given the potential gravity of the lack of site suitability or the possibility that the proposed project may be infeasible based on the findings of the Preliminary Geotechnical Report, why wouldn't the applicant INSIST on obtaining a Final Geotechnical Report before moving forward with the AFC process or at any time since? <u>RESPONSE TO ALL:</u> Staff does not agree with the commenter's statement about "the lack of site suitability or the possibility that the proposed project may be infeasible based on the findings of the Preliminary Geotechnical Report". The Preliminary Geotechnical Report concluded that "there are no known geotechnical or geologic conditions that would preclude development of the proposed project at the subject site". After further analysis, staff made a similar determination concluding that the project (as mitigated) would not result in significant geologic impacts. (See the **Geology and Paleontology** section of this **FSA**.)
10.7	COMMENT 10.7: (p.14-6 #3) Since heliostat assembly's are structures and the Preliminary Geotechnical Report warned that "surface runoff should…..not [be] permitted to flow or infiltrate….beneath structures", what is going to happen to the thousands of heliostats that will be positioned in the South, Southwest and Western portions of the project site that are in an acknowledged flood zone and subjected to high intensity stormwater and surface runoff?
10.8	COMMENT 10.8: (p.14-6 #4) Since the Preliminary Geotechnical Report warned of soils with "high collapse potential" as is clearly illustrated by the photo of the van, what is going to be the reality behind the applicant's "fool proof" highly advanced computer controlled "Glint and Glare Heliostat Positioning Plan" when the heliostat's shift and sink just as the van did due to water infiltration causing soil collapse? <u>RESPONSE TO ALL:</u> The "structures" discussed in the geotechnical report are those with elements of horizontal construction, such as concrete slabs-on-grade, exterior concrete flatwork, and pavement sections (like roads and parking lots). The heliostat foundations are 6 inch diameter rods (pylons) driven at least 10 feet into the ground. The design of the heliostat foundation will not allow flow or infiltration of runoff beneath the pylon. The AFC states that earthwork within the power blocks and common

Comment #	COMMENT and RESPONSE
	area would be "excavated and compacted to the recommendations of the associated geotechnical report" (AFC Section 2.4.1.1). This would remove the unsuitable soil and replace with suitable soil to create a stable layer, per California Building Code requirements and proposed conditions of certification **GEN-1**, **GEN-5** and **CIVIL-**1 discussed in the **Facility Design** section of this **FSA**. Expansive soils do not present the same challenges for pylons because amount of material exposed to the swelling/shrinking soils at the surface is much smaller than a concrete building. The bigger risks to heliostats are above ground forces from water and wind. **SOILS-5** requires heliostat stability and includes a monitoring plan that inspects for heliostat and mirror damage. Staff included in **SOILS-5** (page 87) a requirement to also test pylon stabilization with saturated soil and standing water.
10.9	COMMENT: (p.14-6 #5) If heliostat assemblies shift, sink and/or collapse due to a rain event, how will this impact the heliostat's ability to transfer energy/heat to the power towers and the "renewable" portion of the proposed projects energy production? <u>RESPONSE:</u> **SOILS-5** would implement a plan to reduce storm water impacts by establishing specifications for heliostat installation based on site specific studies and reports. This ensures that heliostats are designed to withstand a 100-year storm event.
10.10	COMMENT: (p.14-9 #1) Given the fact that the CEC Staff has already identified that the location of the proposed project site near the bottom of an alluvial fan system may result in “significant” impacts, why have they not pursued developing modeling of impacts during the CEQA equivalency process to determine site suitability and project feasibility? <u>RESPONSE:</u> Site suitability and project feasibility was address in the **Geology and Paleontology** section of this **FSA**. Assessment of geologic hazards include faulting and seismicity, liquefaction, dynamic compaction, hydrocompaction, subsidence, expansive soils, landslides, tsunamis, seiches, and others as may be dictated by site-specific conditions. The Preliminary Geotechnical Report concluded that "there are no known geotechnical or geologic conditions that would preclude development of the proposed project at the subject site". After further analysis, staff made a similar determination concluding that the project (as mitigated) would not result in significant geologic impacts. (See the **Geology and Paleontology** section of this **FSA**.)

Comment #	COMMENT and RESPONSE
10.11 10.12	COMMENT 10.11: (p.14-9 #2) How is the modeling of potential storm water impacts to the proposed project site *after* the project's approval considered a mitigation measure that reduces project impacts? COMMENT 10.12: (p.14-9 #3) How can the current approach taken by the CEC Staff to determine potential impacts and develop mitigation measures to protect the environment from storm water impacts only *after* project approval be defined as "conservative" or meet CEQA equivalency standards? <u>RESPONSE TO ALL:</u> The Post Construction Hydrologic & Hydraulic Analysis (modeling) submitted with the AFC was needed for evaluation and review of potential environmental impacts that may result from implementation of the proposed project. The analysis was based on a preliminary design of the project, which is sufficient for staff to determine if potential impacts are mitigable. Should the project be approved, a revised analysis must be submitted to reflect the project final design, including mitigation measures.
10.13	COMMENT: (p.14-9 #4) Could modeling of site-specific storm water impacts also yield a potential "catastrophic" conclusion such as the Ivanpah site modeling results did? Could impacts be even greater at the Hidden Hills site? <u>RESPONSE:</u> Staff reviewed the applicant's pre- and post-construction hydrology analyses (modeling) and then compared the results to Ivanpah's hydrology analysis. The Ivanpah project site contains significantly steeper terrain: some channels are more than five feet deep with many more that are one to two feet deep, and modeled post-construction flow velocities reached over 5 feet/second across large areas of braided flow zones. The Hidden Hills site contains one channel that measured 1.6 feet deep with the remaining measured 0.6 foot or less. When post-construction flow velocities were modeled, highest velocities (over 5 feet/second) occurred in the largest channel for approximately 200 feet length. Braided flow zones reached up to 3 feet/second.
10.14	COMMENT 10.14: (p.14-9 #5) What if the site-specific storm water modeling impacts reveals the HHSEGS project site is unsuitable for the proposed project but it has already been approved? COMMENT 10.15: (p.14-9 #6)

Comment #	COMMENT and RESPONSE
10.15	Does it matter if site-specific storm water modeling reveals the HHSEGS project site is not suitable or feasible and cannot be reasonably mitigated because project approval is already a foregone conclusion, regardless of its impacts to the environment? <u>RESPONSE TO ALL:</u> Staff did not find that the site is unsuitable for the proposed project, based on the pre- and post-construction hydrology analyses (modeling) as well as the preliminary geotechnical report. Staff believes the preliminary studies are adequate to identify whether there are any potentially significant impacts from storm water flows in accordance with CEQA requirements. Through the proposed conditions of certification staff will ensure the final designs incorporate the measures necessary to ensure there are no significant impacts.
10.16	COMMENT: (p.14-12 #1) Despite Staff acknowledging the potentially significant environmental impacts of the heliostats/mirrors in relation to generally known site-specific issues, why hasn't Staff or the applicant developed any of the aforementioned reports to insure project site suitability, feasibility and reasonably foreseeable environmental impacts, degradation and/or damage? <u>RESPONSE:</u> The Pre- and Post-Construction Hydrologic & Hydraulic Analyses (modeling) submitted with the AFC were adequate for evaluation and review of potential environmental impacts that may result from implementation of the proposed project. Staff believes the preliminary studies are adequate to identify whether there are any potentially significant impacts from storm water flows in accordance with CEQA requirements. Through the proposed conditions of certification staff will ensure the final designs incorporate the measures necessary to ensure there are no significant impacts.
10.17 10.18 10.19	COMMENT 10.17: (p.14-12 #2) Specifically, how many heliostats/mirrors structures would have to be impacted by storm water inundation, flooding and/or standing water to be considered potentially significant? Significant? 100? 1,000? 10,000? 100,000? COMMENT 10.18: (p.14-12 #3) What is number of heliostats/mirror structures impacted by storm water inundation, flooding and/or standing water that would render a determination of unmitigatable impacts to the proposed project site? COMMENT 10.19: (p.14-13 #4) How many heliostat/mirrors could be potentially carried offsite due to

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	a significant storm event before they were deemed a significant adverse impact to the environment and surrounding property owners?
10.20	COMMENT 10.20: (p.14-13 #5) How much broken glass could be littered around the site before those impacts would be deemed potentially significant or significant? 100 lbs? 1,000 lbs? 10,000 lbs? 100,000 lbs?
10.21	COMMENT 10.21: (p.14-13 #6) How much broken mirror glass could potentially be carried offsite before it would be deemed a significant adverse impact to the environment and surrounding property owners? 100 lbs? 1,000 lbs? 10,000 lbs? 100,000 lbs? RESPONSE TO ALL: Impacts from storm water inundation, flooding, and/or standing water is typically in terms of the potential to cause injuries to people or property damage to buildings. If heliostats are not damaged from standing water, then no heliostats are impacted. A CEQA impact would occur if a damaged heliostat releases a contaminant into the standing water. No numerical threshold is established for specific number of heliostats for determining significance. The Lahontan Basin plan establishes water quality objectives that protect the beneficial uses of surface water and groundwater in the Region. (The following have been identified for the Pahrump Valley: Ammonia; Bacteria, Coliform; Biostimulatory Substances; Chemical Constituents; Total Residual Chlorine ; Color; Dissolved Oxygen; Floating Materials; Oil and Grease; Non-degradation of Aquatic Communities and Populations; Pesticides; pH; Radioactivity; Sediment; Settleable Materials; Suspended Materials; Taste and Odor; Temperature; Toxicity; Turbidity.) **SOILS-5** would implement a plan to reduce storm water impacts from damaged heliostats in four ways: 1. Establish specifications for heliostat installation based on site specific studies and reports. This ensures that heliostats are designed to withstand storm water scour of a 100-year storm event. 2. Establish an ongoing maintenance plan to ensure all storm water management measures are functioning properly, though periodic inspection before the first seasonal storms and after each storm event throughout the year. 3. Establish and implement a response plan to implement after every occurrence of damage (from a storm event or other cause) to clean up damage and prevent release of sediment or pollutants. 4. Develop and implement a process to monitor incidents and propose modifications and/or improvements to address ongoing issues.

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	See **SOILS-5** language on page 88 and discussion on page 32.
10.22	COMMENT: (p.14-13 #7) Given the fact that Staff already projects broken mirrors and mirror shards will be an inseparable part of the proposed project, who has analyzed the potential glint and glare impacts of this debris - either in the heliostat assemblies or dispersed throughout the landscape - in relation to motorists, recreational viewers, and local residents? <u>RESPONSE:</u> Staff does not consider mirror shards to be an inseparable part of the proposed project. Instead, the goal of **SOILS-5** is to prevent mirror shards as much as possible. Should mirror damage occur, **SOILS-5** requires clean up. The perimeter screening/fencing in **VIS-2** would also reduce impacts to motorists, recreational viewers, and local residents. For additional discussion on Glint and Glare, please refer to the **Traffic and Transportation** section of this **FSA**.
10.23	COMMENT: (p.14-17 #1) Did Staff make an error in estimating impervious surfaces from heliostat/mirror assemblies or have design changes increased the number of heliostat/mirror assemblies on the proposed site? <u>RESPONSE:</u> The discrepancy in amount of impervious area from heliostats (806 acres vs. 851 acres) was a typo. The correct amount is 806 acres, as shown in Table 6. The estimate of 851 acres includes all impervious areas, not just the heliostats. See page 30. The commenter is incorrect in stating that the project site is currently 25 percent impervious simply because the native soil composition contains 25 percent high runoff potential components (Hydrologic Soil Group D). Impervious surfaces prevent the infiltration of water into the soil. These areas are mainly artificial structures such as pavements (roads, sidewalks, driveways and parking lots) and rooftops. Existing conditions on the proposed project site contain zero percent impervious area.
10.24	COMMENT: (p.14-17 #2) Based on historical experience in the area, it is probable that the highest concentration of clay and clay like soils will most likely be located in the South, Southwest and West end of the proposed project site. If this turns out to be the case as a result of the Final Geotechnical Report, what differences will this make (if any) to offsite flooding in this area? <u>RESPONSE:</u>

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	Using a preapproved hydrologic analysis methodology, the applicant analyzed storm water runoff of the site for both pre-construction and post-construction scenarios. Although soil type at the site is a definite factor, the flooding is largely contributed to increasing impervious area and modifications to the naturally occurring drainage patterns.
10.25	COMMENT: (p.14-17 #3) What evidence and/or data is available that supports the estimated soil disturbance acreage, impervious surface acreage and where is it located in the AFC files or subsequent documents? <u>RESPONSE:</u> Soil disturbance acreage information is found in Appendix C of Post Construction Hydrologic & Hydraulic Analysis (Road construction, large laydown construction area) and Attachment I of Construction DESCP/SWPPP (laydown areas at each solar plant site). Staff use of "negligible" soil disturbance in describing heliostat installation in the field (vehicle driving, vegetation mowing, and foot traffic) reflected that no grading would be required. Staff changed the description from “Soil Disturbance Area” to “Area of Land Grading and Excavation” to avoid confusion. Please see **Soils & Surface Water Table 6** on page 15. Impervious surface acreage information from: Appendix C of Post Construction Hydrologic & Hydraulic Analysis (heliostats, paved roads, buildings, powerblocks)
10.26 10.27	COMMENT 10.26: (p.14-18 #4) What is the accurate design element for the roads that will circle the power towers; the 20 ft. drive zones or the 10 ft. maintenance paths? COMMENT 10.27: (p.14-18 #5) What is the difference in total affected acreage between these two design elements for the drive zones versus the maintenance paths? <u>RESPONSE TO ALL:</u> Because the applicant's post-construction calculations used 10-foot wide concentric drive zones around each solar tower, staff considers this to be the intended design. Staff did not assess the project using 20-foot wide concentric drive zones because the post-construction calculations indicated 10-foot wide roads and not 20-foot wide roads. Paved roads: 16 acres Fully graded dirt roads (12' & 20'): 18.2 acres Partially graded dirt roads (10'): 171 acres

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10.28	COMMENT: (p.14-18 #6) If chemical dust suppressants are used to control fugitive dust over the life of the project, shouldn't the impervious surfaces they create be included in the impervious surface evaluations? RESPONSE: Yes. The Post Construction Hydrologic and Hydraulic Analysis used the assumption that the 10' partially graded dirt roads are compacted, rather than impervious. If the chemical dust suppressant used for these road results in impervious areas, then an updated report is required for **SOILS-5**. See discussion on page 33.
10.29	COMMENT: (p.14-18 #7) If the applicant and/or CEC CPM approve the use of Pennz-Suppress D for dust suppression over the life of the project, what potential impacts will this product have to water, water quality and biological resources in and around the proposed project site? RESPONSE: Should the proposed project be approved, the CPM would consult with technical staff (air, water, and biological resources) prior to approving a particular dust suppression product. This verification is included in Air Quality section Conditions of Certification **AQ-SC3** (Construction Fugitive Dust Control) and **AQ-SC7** (Operation Dust Control Plan).
10.30	COMMENT: (p.14-18 #8) Gravel surfaces and roads in the area have proven to be reasonably effective in slowing storm water runoff, ponding and structure collapse. Given its advantages in the area, would the CEC Staff recommend the drive zone/maintenance paths be surfaced with gravel to reduce impervious surfaces between the heliostat fields as well as reducing potential impacts for onsite and offsite flooding? RESPONSE: Staff recognizes gravel as an effective means of erosion control of disturbed soil. It is an approved BMP under "Non-Vegetative Stabilization" (Fact Sheet EC-16 of California Stormwater BMP Handbook, www.casqa.org). Depending on the final designs for drainage management staff may require use of this BMP.
10.31	COMMENT: (p.14-18 #9) In the Applicants Supplemental Response to Data Adequacy Review, a reference was made to Appendix 5.15R containing revisions to previous errors. However, this Appendix has not been posted on the CEC website and still remains unavailable for public review. Will the CEC finally post this document?

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	RESPONSE: See Docket TN#62125, 09/07/2011, CH2MHill / J. Carrier, Supplement to the Application for Certification, 325 pages
10.32	COMMENT: (p.14-18 #10) Given the fact that the heliostat/mirror assemblies alone will increase the impervious surface area by 26%, wouldn't this be considered a significant unmitigatable change to the existing landscape? Wouldn't this fact require stricter onsite controls to reduce these unmitigatable impacts from adversely affecting the environment? RESPONSE: The increase of impervious area due to the heliostats would be a significant impact, but staff has determined the impact to be mitigable. Compliance with the proposed conditions of certification would ensure potential impacts are reduced to less than significant.
10.33	COMMENT: (p.14-18 #11) In a CEC sponsored workshop on July 2, 2012, regarding Alternatives, a chart was shown comparing the impacts of the HHSEGS to other renewable technologies. Here, it determined the impacts of the HHSEGS to onsite and offsite flooding and other storm water related events as "less than significant". Given the number of issues raised, such as increasing the currently existing impervious surfaces by 26% due to the heliostat/mirror assemblies alone or potential catastrophic impacts to heliostat/mirror assemblies from storm water velocities associated with alluvial fans, would Staff revisit this determination and more fully explore the adverse environmental impacts in the Final Staff Assessment? RESPONSE: The increase of impervious area due to the heliostats would be a significant impact, but staff has determined the impact to be mitigable. Compliance with the proposed conditions of certification would ensure potential impacts are reduced to less than significant.
10.34	COMMENT 10.34: (p.14-19 #1) How can review, analysis and appropriate mitigation measures be developed during the AFC CEQA equivalency process if key information and data is out of date and potentially irrelevant? RESPONSE: Staff does not agree that key information is out of date or irrelevant. The data is better described as general and estimated, primarily because the area has not been developed. The applicant submitted in the AFC a pre- and post-construction hydrology studies based on the

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	best available data as well as preliminary studies (such as the preliminary geotechnical analysis) based on present-day site-specific data. Subsequently through responses to data requests, additional information was collected and submitted (such as the soil infiltration analysis). CEQA allows lead agencies to identify performance standards that will govern the development of specific mitigation measures, provided that sufficient information is known in order to evaluate whether the project as designed can achieve the identified mitigation. Depending on the project, a conceptual design or a preliminary design of facilities would meet CEQA's requirement that mitigation measures are feasible and enforceable.
10.35	COMMENT 10.35: (p.14-19 #2) Since the CEC Staff is aware of the potential problems associated with an out of date DESCP, will they require an updated version be made available for review during the AFC CEQA equivalency process? RESPONSE: The proposed design submitted in the AFC is preliminary. This allows for the analysis of potential environmental impacts with the possibility of implementing reasonable design changes to reduce or avoid impacts. During this process, the applicant has proposed changes to the original AFC including: removal of two boilers from each power block (reducing air emissions), undergrounding some onsite linear facilities (reducing visual impacts), and modifications to the west perimeter retention area (in the process of finalizing its preliminary design). Staff is requiring the applicant to update the DESCP to reflect and address these changes and other changes that would result from the environmental review (such as additional mitigation measures required from other technical sections of this **FSA**). Staff has not identified significant issues in the proposed changes because activities can be addressed with existing approved BMPs (California Stormwater BMP Handbook, www.casqa.org).
10.36	COMMENT: (p.14-23 #1) Will Staff please provide a clear definition of what a Zone A flood zone definition is? RESPONSE: Flood zones are geographic areas that the FEMA has defined according to varying levels of flood risk. Each zone reflects the severity or type of flooding in the area. Zone A is defined as a special flood hazard area subject to inundation by the 1 percent annual chance flood also known as the 100-year flood (the flood that has a 1

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	percent chance of being equaled or exceeded in any given year). Because detailed analyses are not performed for Zone A, no depths or base flood elevations are shown within these zones. This can be rephrased as: a flood hazard area in which the flood zone has no base flood level.
10.37	COMMENT: (p.14-23 #2) While Staff has determined that heliostat pylons and maintenance roads located in the southern portion of the proposed project site will not significantly impede or redirect current flood flows, what impacts would increasing the impervious surfaces have on this area with respect to volume, velocity and rates of flooding? <u>RESPONSE:</u> The applicant's computer model of existing flow conditions uses site specific data with 1-foot contour topography. To model the amount of flooding within the retention area, the applicant made the following adjustments to represent post-construction site conditions: impervious surfaces (heliostats, buildings, asphalt roadways and parking lots), graded dirt roads, protective diversion berms around power blocks, and the elevated west perimeter road. The post-construction model shows exacerbated flooding in the retention area due to the increase of impervious surfaces, but flooding did not significantly increase at the site's south perimeter or north perimeter. Similar results were shown when velocities were modeled.
10.38	COMMENT: (p.14-23 #3) Since one of the definitions for a Zone A flood classification is, its area is “approximate”, why has Staff deemed that merely 200 or 2,000 ft. is fully capable of separating the two zones when definitive data is not available? <u>RESPONSE:</u> FEMA prepares these maps to identify flood-prone areas for programs such as the National Flood Insurance Program (NFIP) that provide federal flood insurance to home and business owners and renters exposed to flood hazards. Staff’s use of the word “approximate” in describing the FEMA Zone A boundaries was because their maps of this area do not include base flood elevations. The 200 foot separation is between to the FEMA Zone A boundary (where water depth is undetermined) and the south end of the proposed berm. The applicant's computer model is a more detailed analysis using1-foot contour topography to calculate flood depths. The post-construction model shows exacerbated flooding between 2-feet and 4-feet deep in the retention area caused by the elevated west

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	perimeter road. This more detailed analysis shows that onsite flooding does not spread into the FEMA designated Zone A areas located north or south of the retention area. Based on the computer modeling, the exacerbated onsite flooding would not redirect Zone A boundaries to housing or buildings.
10.39	COMMENT: (p.14-23 #4) Why did Staff confine the majority of their analysis regarding storm water flows and potential flood impacts to; a) onsite evaluations, b) non-residential areas located near the proposed project boundaries, and c) the east/west axis versus the north/south axis? <u>RESPONSE:</u> Staff assessed the potential for the proposed project to exacerbate flood conditions in the vicinity of the project, both onsite and offsite. Specifically, it addresses the question listed in CEQA Guidelines (Appendix G, VIII. Hydrology and Water Quality): Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site? Staff's analysis focused on the "east/west axis" because the natural terrain of the area directs flows from east to west, as shown on topographic maps of the vicinity. Grading or other modifications to the terrain can increase velocities of naturally occurring flows across the site, which increases the potential for flooding downstream (west of the site). Obstructions that impede naturally occurring flows (such buildings, power plant structures, elevated roads, fences, and vegetation) can increase the potential for flooding onsite as well as upstream (east of the obstruction). The community of Charleston View is roughly the same elevation as the proposed project. In other words, it is neither upstream nor downstream of the project site. Staff recognizes the confusion caused by the sentence (in Surface Water Features): “The majority of runoff flows through the southern portion of the site due to offsite flows originating from the east.” Throughout the site, natural flow direction is from east to west. The modeling of a 100-year storm shows that the majority of sheetflow flooding occurs through Solar Field 2, which is the southern HALF of the project site. Staff has corrected this on page 9.
10.40	COMMENT: (p.14-23 #5) What are the projected impacts to the Old Spanish Trail Highway during a 100-year, 24- hour storm event if the proposed project is approved?

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	RESPONSE: Staff added a discussion on the potential flooding to Old Spanish Trail Highway (also called Tecopa Road). See “Offsite Area Flooding: Impediments to Existing Flow Conditions” on page 34.
10.41	COMMENT: (p.14-24 #6) Can the retention area result in excessive flooding and inundation by following the western perimeter road to join up with other flood flows coming from the south that match the FEMA floodplain maps? RESPONSE: The applicant's computer model of existing flow conditions uses site specific data with 1-foot contour topography. To model the amount of flooding within the retention area, the applicant made adjustments to represent post-construction site conditions: impervious surfaces (heliostats, buildings, asphalt roadways and parking lots), graded dirt roads, protective diversion berms around power blocks, and elevated west perimeter road. The post construction model shows exacerbated flooding in the retention area, but flooding did not spread into the FEMA designated Zone A areas located north or south of the retention area. Flooding would not "match" and meet up with the FEMA delineation for Zone A.
10.42	COMMENT: (p.14-24 #7) Did the CEC Staff check the applicant’s figures for accuracy in the “Estimated Peak Discharge Along Western Boundary” located in Table 5? RESPONSE: The applicant analyzed storm water runoff of the site for both pre-construction and post-construction scenarios. - Staff verified that a pre-approved hydrologic analysis methodology was used. - Staff used in-house software for an independent analysis to compare pre-construction peak flows, and results were similar to those of the applicant. - Staff studied the post-construction analysis and found its approach and assumptions reasonable. Appropriate protocols (HEC-1 and FLO-2D) were used to generate calculated values for the preliminary analysis. The applicant's analysis was based on a preliminary design of the project, which is sufficient for staff to determine if potential impacts are mitigable. Should the project be approved, a revised analysis must be submitted to reflect the project final design, including mitigation measures.

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10.43 10.44	COMMENT 10.43: (p.14-24 #1) What does “help reduce the increase in volume” translate to in terms of degree of actual impact reductions? 1%? 10? 50? Please explain. COMMENT 10.44: (p.14-24 #2) After the measures referred to that would help reduce the increase in volume are implemented, would the remaining impacts still be potentially significant, significant or unmitigatable? <u>RESPONSE TO ALL:</u> Compliance with LID policy is one approach to reducing CEQA impacts related to water quality and flooding. Several counties in California have aggressively promoted the SWRCB's LID policy by implementing new county standards and ordinances. Neither Inyo County nor Lahontan RWQCB requires minimum standards for use of LID practices applicable to the proposed project, so the applicant is not obligated to follow all components of LID. The applicant is proposing several BMPs, and along with staff proposed conditions of certification, CEQA impacts would be less than significant (see discussions under Water Quality and Flooding). Because the applicant isn't required to follow any LID ordinances, they are not required to calculate the increase in volume of storm water runoff caused by the proposed project.
10.45	COMMENT: (p.14-25 #1 (a)) Would Staff recommend as a Condition of Certification, the allowance of onsite septic tanks but eliminate the connected leach fields to ensure the applicant would have to dispose of all wastes offsite versus allowing wastes to seep into local groundwater over the life of the project? <u>RESPONSE:</u> Based on information submitted to date, staff does not identify a reason to restrict the project to the exclusive use of septic tanks and prohibiting the use of leach fields. **SOILS-9** requires that septic systems meet ICEHSD permit requirements.
10.46	COMMENT: (p.14-25 #1 (b)) Would Staff please clearly explain what this means, what the applicant would be exempt from, what the differences between operating with and without the permit are, why the applicant would qualify for a NONA, and how onsite waste disposal generated from the cement batch plant may differ between the two options? <u>RESPONSE:</u>

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	The NPDES Industrial General Permit is a federal permit issued by the California SWRCB, and therefore outside the jurisdiction of the California Energy Commission. Staff was informed by the SWRCB that this permit would be required for concrete batch plant activities. Based on this information, Staff developed **SOILS-3** to ensure that copies of permit-related documents were forwarded to the Compliance Project Manager (Energy Commission Staff). Because this is a federal permit, Staff recognizes that the applicant has the option of requesting an exemption from the issuing agency who has the discretion of either allowing or denying the request. This is also the reason staff developed **SOILS-4**.
10.47	COMMENT 10.47: (p.14-27 #1) Where is the discussion and analysis of impacts to water and soil quality resulting from the HHSEGS's introduction of chemical and hazardous materials to the environment during construction and operations?
10.48	COMMENT 10.48: (p.14-27 #2) When Staff refers to "*could increase the volume*" of pollutants, what is this based on and what degree of volume are they discussing?
10.49	COMMENT 10.49: (p.14-27 #3) When Staff refers to increasing "*possible amounts of pollutants*", what is this based on, what kind of pollutants are they referring to, and what is the possible amount of increases they are referencing?
10.50	COMMENT 10.50: (p.14-28 #4) Since storm water runoff from the entire proposed project site will predominately be directed toward the single point retention area, what are the kinds and volume of both individual and cumulative chemical and hazardous material pollutant impacts if combined with storm water and deposited in this singular area?
10.51	COMMENT 10.51: (p.14-28 #5) What protection will be provided in the retention area to prevent storm water runoff that has combined with onsite chemicals and hazardous materials (i.e., diesel, oil, etc.)? For example, will the retention area be lined with a non-permeable non-toxic substance to prevent saturation of soils and eventual seepage into local groundwater resources?
10.52	COMMENT 10.52: (p.14-28 #6) If the retention area is protected through the installation of a non-permeable, non-toxic liner that prevents soil/water contamination, how will this prevent pollutants from eventually discharging into the environment through the drainage culvert?

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10.53	COMMENT 10.53: (p.14-28 #7) Where has Staff analyzed, discussed and determined impacts of the construction and operations of the HHSEGS with respect to possible adverse impacts to soil resources? <u>RESPONSE TO ALL:</u> All streams of wastewater would be kept completely separated from each other. Sanitary waste would remain contained within the septic system. Industrial wastewater would remain within the power block and processed through the thermal evaporator system. Hazardous liquids would be meticulously handled to prevent spills and accidental release. Wastewater produced from the energy generation process would be processed through the thermal evaporator system. Potentially contaminated storm water (rain that falls onto industrial equipment or other surfaces that might contaminate the storm water) would be collected and processed through the thermal evaporator system. "Clean" storm water would be directed away from the power blocks and allowed to flow toward the west. All BMPs and conditions of certification would strive to prevent any chemical or hazardous pollutants from mixing with the "clean" storm water. The commenter's statement that "all the onsite hazardous materials, emissions, and chemical introductions... just disappear from the equation" is not an accurate description of staff's assessment. The installation of a liner at the proposed retention area is not necessary because this runoff is separated from all other wastewater streams. Staff used the phrase "could increase the volume (of water) and possible amounts of pollutants" to describe a POTENTIAL impact of the proposed retention area, <u>absent</u> any BMPs or conditions of certification. No calculations were made to estimate individual or cumulative volumes of chemical or hazardous pollutants because no amount is allowed. See discussion on page 29.
10.54 10.55	COMMENT 10.54: (p.14-28 #8) The applicant intends to use lead-acid batteries to power the heliostat/mirror assemblies. These batteries may number up well over one hundred thousand. What impacts will storm water runoff have if it contacts these batteries and/or sweeps them into the retention area? COMMENT 10.55: (p.14-28 #9) If a 100-year 24-hour storm event is capable of dislodging 18,000 heliostat/mirror assemblies (or more) from the proposed project site such as was modeled by the BLM for the Ivanpah site, wouldn't this indicate that 18,000 lead-acid batteries (or more) would also be dislodged during this same storm event? What would be the impacts to water and soil quality if this happened?

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10.56	COMMENT 10.56: (p.14-28 #10) How many lead-acid batteries being dislodged and swept into the retention area and/or surrounding environment would it take to become a "significant adverse impact" to the environment? To water quality? To soil resources? <u>RESPONSE TO ALL:</u> The battery to operate a heliostat's pointing motor would be mounted to each heliostat above the ground. The battery is roughly the same size as a car battery with the same construction; each containing lead plates and one to two quarts of sulfuric acid. Like a car battery, it is sealed in a strong case and chances are extremely low that it would leak if dropped from that height. However, should a spill occur, the acid can be neutralized and it would not generate any significant toxic gases. Lead-acid batteries are more fully discussed in the **Hazardous Materials Management** section of this **FSA**. Additionally, Lead-acid batteries would have to be disposed of properly as hazardous waste, as required in the **Waste Management** section of this **FSA**.
10.57	COMMENT 10.57: (p.14-28 #11) What site-specific data does Staff rely upon to reach their determination that the construction and operation of the HHSEGS will not result in significant degradation of water quality or soil resources over the proposed project's life span? <u>REPONSE:</u> Staff reviewed publically available information and information submitted by the applicant in the AFC and related supplemental material such as subsequent data responses. Staff also consulted with various local and State agencies in addition to applying professional analysis and judgment.
10.58	COMMENT 10.58: (p.14-28 #12) How far into the project's lifetime did Staff analyze or model site-specific cumulative impacts of listed chemicals, hazardous materials and substances that will be utilized over the proposed project's lifetime that resulted in Staff's "*not identifying any significant impacts to water quality as a result of the retention area"*? <u>RESPONSE:</u> The AFC states that HHSEGS would be designed for an operating life of 25 to 30 years. Staff's analysis covers the entire operating life in addition to decommission and closure activities after the proposed project discontinues operations.
10	**Intervenor - Cindy MacDonald**

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	Other Technical Sections (as indicated)
AIR RESOURCES 10.23	COMMENT 10.23: (p.3-9, #1) If the applicant chooses to directly wire the heliostats, how many feet/yards/miles of trenching will be required and what does this translate to in terms of acreage disturbance at the project site? <u>RESPONSE:</u> Based on the Ivanpah project (that uses BrightSource technology and is currently under construction), wires would connect a group of heliostats together with the wire fastened down at the ground surface. Several groups are connected to an above ground electrical box. Multiple electrical boxes would be located throughout the solar field. Underground cables would connect the electrical boxes to the service building of the respective solar power plant. Much of the trenching (roughly 2 feet deep) would occur along the footprint of the spur roads that cut across the solar fields, so no additional soil disturbance would occur in these areas. However, trenching would likely occur between spur roads also, which would be additional soil disturbance. The applicant has not provided the amount of additional trenching this would require. Staff will have the applicant address potential impacts in the final DESCP required in **SOILS -1**.
AIR RESOURCES 10.26	COMMENT 10.26: (p.3-10, #1) How many roads circle the power towers for each plant under each design element (20-ft versus 10 ft)? <u>RESPONSE:</u> Because the applicant's post-construction calculations used 10-foot wide concentric drive zones around each solar tower, staff considers this to be the intended design. Staff did not assess the project using 20-foot wide concentric drive zones because the post construction calculations indicated 10-foot wide roads and not 20-foot wide roads. Because the circular layout of each solar field is contained within two irregular shapes, the number of roads surrounding each tower varies depending on direction from the solar tower. The "Civil Overall Site Plan" (AFC, Appendix 5.15A, Pg. 897, www.energy.ca.gov\\sitingcases\\hiddenhills\\documents\\applicant\\afc\\Volume-2-Appendixes) shows the layout of 10-foot wide dirt roads. Solar Plant 1 would have 13 complete circles, but as many as 41 roads. Solar Plant 2 would have 8 complete circles, but as many as 33 roads. The applicant has not submitted site plans showing 20-foot wide dirt roads within the solar fields.
AIR RESOURCES 10.27	COMMENT 10.27: (p.3-10, #2) What is the projected total surface in acreage values for each of these maintenance road design elements and what is the difference in

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	values between them? Example, 20-ft roads result in 500 acres of disturbance, 10-ft roads result in 1,000 acres of disturbance. <u>RESPONSE:</u> Because the applicant's post-construction calculations used 10-foot wide concentric drive zones around each solar tower, staff considers this to be the intended design. Staff did not assess the project using 20-foot wide concentric drive zones because the post-construction calculations indicated 10-foot wide roads and not 20-foot wide roads. Paved roads: 16 acres Fully graded dirt roads (12' & 20'): 18.2 acres Partially graded dirt roads (10'): 171 acres
AIR RESOURCES 10.28	COMMENT 10.28: (p.3-10, #3) How many miles of roads for each kind of road (paved, fully graded, partially graded) is the completed proposed project projected to have? <u>RESPONSE:</u> When assessing amount of soil disturbance, staff is concerned with area of roadway rather than number of miles.
AIR RESOURCES 10.29	COMMENT 10.29: (p.3-10, #4) What is the total number of square feet for each kind of road (paved, fully graded, partially graded) that will be incorporated into the proposed project sites operational design? <u>RESPONSE:</u> 1 acre = 43,560 square feet Paved roads: 16 acres = 696,960 square feet Fully graded dirt roads (12' & 20'): 18.2 acres = 792,792 square feet Partially graded dirt roads (10'): 171 acres = 7,448,760 square feet
AIR RESOURCES 10.64	COMMENT 10.64: (p.3-17, #4) How can the 200,000 to 400,000 gallons of recycled water be counted on for dust control if its discharge depends on the fluid sample levels of contamination? <u>RESPONSE:</u> The reuse of this wastewater (hydrostatic test water or passivating/cleaning fluid) was accounted for in the applicant's calculation when requesting the use of 288 AFY of water for construction activities.
AIR RESOURCES 10.65	COMMENT 10.65: (p.3-17, #5) What happens to this recycled water if it fails to register as “clean”? How will it be disposed of?

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	<u>RESPONSE:</u> Water discharge (hydrostatic test water or passivating/cleaning fluid) that does not meet requirements for reuse onsite would be trucked offsite for disposal at an approved facility. **SOILS-7** (Construction Wastewater Discharge) requires disposal offsite at an appropriately licensed facility.
AIR RESOURCES 10.66 AIR RESOURCES 10.67	COMMENT 10.66: (p.3-17, #6) Will the applicant just dilute the recycled water until it registers as “clean”? If so, how much additional water would this require? COMMENT 10.67: (p.3-17, #7) If the fluid samples fail to register as “clean” and the applicant dilutes it with additional water until it can register as clean enough for discharge, isn’t the same amount of “nonclean” chemicals being discharged into the environment? If so, what is the cumulative affect of this discharge to soil, water and biological resources over the life of the proposed project? <u>RESPONSE TO ALL:</u> The NPDES General Permit relating to this wastewater is a federal permit issued by the California SWRCB, and therefore outside the jurisdiction of the California Energy Commission. Staff was informed by the Water Board that this permit would be required. Based on this information, Staff developed **SOILS-7** (Construction Wastewater Discharge) to ensure that copies of permit-related documents were forwarded to the Compliance Project Manager (Energy Commission Staff). Because this is a federal permit, Water Board staff administers and enforces its requirements. This permit program is designed to ensure there are no discharges from project operations that would result in water quality impacts.
AIR RESOURCES 10.108	COMMENT 10.108: (p.3-32, #2) How can the soil disturbance of installing 170,000 heliostat/mirror assemblies be considered “negligible”? <u>RESPONSE:</u> In the construction industry, disturbed area or soil disturbance area typically means an area that is altered as a result of clearing, grading, and/or excavation. Staff use of "negligible" in describing heliostat installation in the field (vehicle driving, vegetation mowing, and foot traffic) reflected that no grading would be required. Staff changed the description from “Soil Disturbance Area” to “Area of Land Grading and Excavation” to avoid confusion. Please see the Total Soil Disturbance discussion and **Soils & Surface Water Table 6.**

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AIR RESOURCES 10.109	COMMENT 10.109: (p.3-32, #3) Where is the site-specific data located that describes how the heliostat/mirror assemblies will be installed, how many will be installed per day per ATV and how long this process is expected take? RESPONSE: The general installation procedure for heliostats is found in the **Project Description** section of this **FSA**. Information about the number of heliostats installed per day is not included, and staff does not need to know that in order to complete its analysis. The applicant may be able to answer this question for the commenter.
LAND USE 10.12 LAND USE 10.13 LAND USE 10.14 LAND USE 10.15 LAND USE 10.16	COMMENT 10.12: (p. 10-4, #1) What will be the affected acreage of "temporary housing" and where will it be located? COMMENT 10.13: (p. 10-4, #2) How many temporary housing units would be installed, when would they be installed and for how long would they remain active? COMMENT 10.14: (p. 10-4, #3) What will be the affected resources and impacts of temporary housing if the CPM authorizes it? Topics should include construction worker traffic analysis, additional roadways if required, additional septic tanks//leach fields if required, additional water requirements, impacts to biological, cultural/historic and visual resources, etc. COMMENT 10.15: (p. 10-4, #4) What will happen to the area that lodged the temporary housing once it is no longer needed? How will it be developed, maintained and/or reclaimed? COMMENT 10.16: (p. 10-4, #5) What is the projected amount of revenue the "transient tax" would generate for Inyo County and/or the State of California based on this temporary housing? RESPONSE TO ALL: The text "from temporary worker housing" was a typo in **SOILS-8** (Septic System and Leach Field Requirements). The text was unintentional and is no longer included in the condition (renumbered **SOILS-9**). The analysis in the **Socioeconomics** section of this **FSA** shows that no additional housing, temporary or otherwise, would need to be constructed as a result of project construction and operations. There is enough available housing in the area to accommodate those workers who may temporarily relocate closer to the project site during

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	construction.
OPERATIONS 10.10	COMMENT: (p. 12.-3, #8) What is the reason(s) for the differing design elements description and discrepancy? RESPONSE: **Traffic and Transportation** (pg. 622 of PSA) took information from AFC, Project Description, Section 2.1.2.4. **Soils and Surface Water** (pg. 571 of PSA) took information from the Preliminary Construction SWPPP-DESCP (Appendix 5.15A of AFC) in two locations: Post-construction Hydrology Calculations (Attachment H, pg 706) and Grading and Drainage (Attachment I, pg 897).
OPERATIONS 10.11	COMMENT: (p. 12.-3, #9) Which one of these design descriptions is currently accurate? RESPONSE: Because the applicant's post-construction calculations used 10-foot wide concentric drive zones around each solar tower and not 20-foot wide, staff considers this to be the intended design.
OPERATIONS 10.12	COMMENT: (p. 12.-3, #10) Which one of these design elements is incorporated in the AFC files and where is it located? RESPONSE: **Traffic and Transportation** (pg. 622 of PSA) took information from AFC, Project Description, Section 2.1.2.4. **Soils and Surface Water** (pg. 571 of PSA) took information from the Preliminary Construction SWPPP-DESCP (Appendix 5.15A of AFC) in two locations: Post-construction Hydrology Calculations (Attachment H, pg 706) and Grading and Drainage (Attachment I, pg 897).
OPERATIONS 10.13	COMMENT: (p. 12.-4, #11) How many roads circle the power towers for each plant under *each* design element? RESPONSE: Because the circular layout of each solar field is contained within two irregular shapes, the number of roads surrounding each tower varies depending on direction from the solar tower. The "Civil Overall Site Plan" (AFC, Appendix 5.15A, Pg. 897,

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	www.energy.ca.gov/sitingcases/hiddenhills/documents/applicant/afc/Volume-2-Appendixes) shows the layout of 10-foot wide dirt roads. Solar Plant 1 would have 13 complete circles, but as many as 41 roads. Solar Plant 2 would have 8 complete circles, but as many as 33 roads. The applicant has not submitted site plans showing 12-foot wide dirt roads within the solar fields.
OPERATIONS 10.14	COMMENT 10.14: (p. 12.-4, #12) What is the projected total surface in acreage values for *each* of these maintenance road design elements and what is the difference in values between them? Example, 20-ft roads result in 500 acres of disturbance, 10-ft roads result in 1,000 acres of disturbance.
OPERATIONS 10.15	COMMENT 10.15: (p. 12.-4, #13) Do changes in acreage values for maintenance paths/drive zones result in changes to the number of installed heliostats/mirrors? If so, by how many?
OPERATIONS 10.16	COMMENT 10.16: (p. 12.-4, #14) What are the differences in impacts to the Low Impact Design element of the proposed project if the 20-ft drive zones are utilized versus the 10-ft maintenance paths?
OPERATIONS 10.17	COMMENT 10.17: (p. 12.-4, #15) What are the differences between sheet flow, drainage and surface run off between these two design elements?
OPERATIONS 10.18	COMMENT 10.18: (p. 12.-4, #16) Which of the two designs provide the highest level of environmental protection and/or the least amount of environmental impacts and by what degree? <u>RESPONSE TO ALL:</u> Because the applicant's post-construction calculations used 10-foot wide concentric drive zones around each solar tower, staff considers this to be the intended design. Staff did not assess the project using 20-foot wide concentric drive zones. 1 acre = 43,560 square feet Paved roads: 16 acres = 696,960 square feet Fully graded dirt roads (12' & 20'): 18.2 acres = 792,792 square feet Partially graded dirt roads (10'): 171 acres = 7,448,760 square feet
WASTE MGMT 10.2	COMMENT: (p. 18-1, #2) Do California and/or Inyo County allow industrial facilities to discharge waste that could potentially seep into underground water tables residing below the proposed project site?

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	RESPONSE: The Clean Water Act and California Water Code do not allow direct discharge of industrial waste that would degrade groundwater or surface waters. Inyo County and the Regional Water Quality Control Board allow industrial facilities to dispose sanitary and domestic wastewater to an onsite wastewater treatment system (typically consisting of a septic tank, distribution piping, and leach field) provided specific standards are met and a permit is approved.
WASTE MGMT 10.3	COMMENT: (p. 18-1, #3) If so, are there any restriction on what can be discharged into leach fields and under what authority (LORS) are these restrictions established? RESPONSE: California currently does not have statewide rules and regulations regarding onsite wastewater treatment, but the State Water Resource Control Board is in the process of preparing uniform regulations for California. Until then, new septic systems in Inyo County must comply with the Uniform Plumbing Code (Section 107(d), Chapter 1 Part 1) and the Lahontan Basin Plan (Section 4.4, Individual Wastewater Treatment Systems). HHSEGS would be required to comply with the adopted LORS in effect at the time any new onsite septic system would be constructed. Inyo County Environmental Health Services Department (ICEHSD) is responsible for permitting and inspecting the installation septic systems to ensure LORS are met. ICEHSD has published an onsite sewage treatment and disposal guide which includes information on site evaluation and system design. http://www.inyocounty.us/EnvironmentalHealth/residential_septic_systems.html
WASTE MGMT 10.4	COMMENT: (p. 18-2, #1) What waste disposal system is going to be utilized for the proposed HHSEGS, septic tanks with leach fields or septic tanks without leach fields that require sanitary wastes to be disposed of offsite? RESPONSE: The use of a septic tank and the use of a leach field are not mutually exclusive. The proposed septic system basically consists of a septic tank, distribution piping, and leach field. Waste water enters tank, allowing solids to settle and scum to float. The settled solids are anaerobically digested, reducing the volume of solids. The excess liquid drains in a relatively clear condition from the tank outlet to a piping network, often lain in a stone-filled trench, that distributes

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	wastewater throughout the leach field. Waste collected in the septic tank that is not decomposed by the anaerobic digestion eventually has to be removed, or else the septic tank fills up and undecomposed wastewater discharges directly to the leach field.
WASTE MGMT 10.5	COMMENT: (p. 18-2, #2) If the septic tank/leach field system is utilized, what are the impacts of discharging this waste into the surrounding environment such as soils and above local water tables? <u>RESPONSE:</u> Improper construction and operation of the septic system could release bacteria and other contaminants into the surrounding area. Regulations are in place to protect groundwater. New septic systems in Inyo County must comply with the Uniform Plumbing Code (Section 107(d), Chapter 1 Part 1) and the Lahontan Basin Plan (Section 4.4, Individual Wastewater Treatment Systems). Included in the requirements are soil percolation standards; minimum separation/set back distances to prevent impacts to groundwater and nearby water wells; and septic tank and leach field design, sizing and construction standards to ensure adequate capacity and proper treatment and disposal of the wastewaters. Inyo County Environmental Health Services Department (ICEHSD) is responsible for permitting and inspecting the installation septic systems to ensure LORS are met. ICEHSD has published an onsite sewage treatment and disposal guide which includes information on site evaluation and system design. http://www.inyocounty.us/EnvironmentalHealth/residential_septic_systems.html
WASTE MGMT 10.6 WASTE MGMT 10.7	COMMENT: (p. 18-2, #3) Since no detailed description or critical analysis has yet to occur regarding the engineering and design element of the pipe and drainage systems in relation to the septic tank/leach field waste disposal systems, how can the CEC Staff and/or public know if hazardous wastes and semi-hazardous wastes can potentially be disposed of and discharged into the surrounding environment via the septic tank/leach field system? COMMENT: (p. 18-3, #4) What data is available that can confirm no hazardous or semi-hazardous materials will be disposed of via the septic tank/leach field system? <u>RESPONSE TO ALL:</u> The disposal of hazardous wastes or semi-hazardous waste into the

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	septic system is simply illegal. A number of LORS are in place to regulate the generation, transportation, treatment, storage, and disposal of hazardous waste (see Table 1 in the **Waste Management** section of this **FSA**). In addition, condition of certification **WASTE-4** requires an Operation Waste Management Plan for all wastes generated, including hazardous waste. The plan must cover the management methods to be used for each waste stream, including temporary on-site storage, housekeeping and best management practices to be employed, and disposal requirements and sites. As discussed in the **Waste Management** section of this **FSA**, staff concludes that the proposed project would comply with all applicable LORS regulating the management of hazardous and non-hazardous wastes during both facility construction and operation.
WASTE MGMT 10.8	COMMENT: (p. 18-3, #5) Where is the engineering design description in the AFC project data (or subsequent documents) that clearly depicts the septic tank/leach field systems will only be connected to toilets, showers, and sinks associated exclusively with domestic type waste disposal? <u>RESPONSE:</u> The AFC states in the Project Description (Section 2.2.6.1) and the Water Resources section (5.15.3.3.3) that the septic system would collect wastewater discharges from toilets, sinks, and showers. Staff does not require engineering design drawings to verify this during the licensing process, because **SOILS-9** requires that septic systems meet ICEHSD permit requirements. Septic system design would need approval and installation would be inspected to ensure that only domestic type wastewater would connect to the system.
WASTE MGMT 10.9	COMMENT: (p. 18-3, #6) If the septic tank/leach field system is utilized, what mitigation measures can be used to prevent potential soils and underground water systems from being effected by cumulative waste discharges over the life of the proposed project? <u>RESPONSE:</u> **SOILS-9** (Septic System and Leach Field Requirements) would ensure compliance with LORS and, through the protectiveness provided by the County regulatory standards, would reduce potential impacts from the septic systems.
WASTE MGMT 10.10	COMMENT: (p. 18-3, #7) Would Staff recommend as a Condition of Certification, the allowance of onsite septic tanks but eliminate the connected leach fields to ensure the applicant would have to dispose of all wastes offsite

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	versus allowing wastes to seep into local soils and groundwater over the life of the project? RESPONSE: Based on information submitted to date, staff does not identify a reason to restrict the project to the exclusive use of septic tanks and prohibiting the use of leach fields. **SOILS-9** requires that septic systems meet ICEHSD permit requirements.
WASTE MGMT 10.23 WASTE MGMT 10.24	COMMENT: (p. 18-9, #1) Can the CEC know about the potential inclusion of temporary worker housing at or near the proposed project site -not include any data, analysis, potential impact discussions or proposed mitigation measures under CEQA equivalency requirements – and still approve the siting of the proposed project? COMMENT: (p. 18-9, #2) Should temporary worker housing be utilized on or near the proposed project site, what is the maximum number of units that would be authorized and what would be their corresponding waste disposal needs? RESPONSE TO ALL: The text "from temporary worker housing" was a typo in **SOILS-8** (Septic System and Leach Field Requirements). The text was unintentional and is no longer included in the condition (renumbered **SOILS-9** on page 92). The analysis in the **Socioeconomics** section of this **FSA** shows that no additional housing, temporary or otherwise, would need to be constructed as a result of project construction and operations. There is enough available housing in the area to accommodate those workers who may temporarily relocate closer to the project site during construction.
WASTE MGMT 10.26	COMMENT: (p. 18-10, #8) How can the 200,000 to 400,000 gallons of recycled water be counted on for dust control if its discharge depends on the fluid sample levels of contamination? RESPONSE: The reuse of this wastewater (hydrostatic test water or passivating/cleaning fluid) was accounted for in the applicant's calculation when requesting the use of 288 AFY of water for construction activities.
WASTE MGMT 10.27	COMMENT: (p. 18-10, #9) What happens to this recycle water if fails to register as clean? How will it be disposed of?

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	RESPONSE: Water discharge (hydrostatic test water or passivating/cleaning fluid) that does not meet requirements for reuse onsite would be trucked offsite for disposal at an approved facility. **SOILS-7** (Construction Wastewater Discharge) requires disposal offsite at an appropriately licensed facility. See discussion on page 40.
WASTE MGMT 10.28 WASTE MGMT 10.29	COMMENT: (p. 18-10, #10) Will the applicant just dilute the recycled water until it registers as clean? If so how much additional water would this require? COMMENT: (p. 18-10, #11) If the fluid samples fail to register as clean and the applicant dilutes it with additional water until it can register as clean enough for discharge, isn't the same amount of non-clean chemicals being discharged into the environment? If so, what is the cumulative affect of this discharge to soil, water and biological resources over the life of the proposed project? RESPONSE: The NPDES General Permit relating to this wastewater is a federal permit issued by the California SWRCB, and therefore outside the jurisdiction of the California Energy Commission. Staff was informed by the Water Board that this permit would be required. Based on this information, Staff developed **SOILS-7** (Construction Wastewater Discharge) to ensure that copies of permit-related documents were forwarded to the Compliance Project Manager (Energy Commission Staff). Because this is a federal permit, Water Board staff administers and enforces its requirements. This permit program is designed to ensure there are no discharges from project operations that would result in water quality impacts.
13	**Applicant – Hidden Hills Solar I, LLC and Hidden Hills Solar II, LLC**
13.1 (p.233 #1)	COMMENT: Page 4.10 4, Table 2, Title: Please consider revising the title of the table as follows: "Lahontan RWQCB Basin Plan Beneficial Use Designation for Minor Surface Waters in the Pahrump Valley" RESPONSE: Agreed. Change made on page 5.
13.2 (p.233 #2)	COMMENT: Page 4.10 6, Table 3: The following notes should be added to Table 3: (1) The percent composition cannot be applied to the HHSEGS site. This percent composition generally applies to the entire

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	generalized soil association, which is extremely large. For example, within the HHSEGS site there may be only a few of these series present. (2) At least one of these series is expected to contain a petrocalcic horizon. (3) Here are many areas with cryptobiotic crusts and desert pavement; wind and water erosion could potentially be problematic once these are disturbed. RESPONSE: Staff agrees the first note should be added, but the second and third notes are too site-specific for Table 3 on page 6. Mention of the soil's hardpan layer and presence of surface crusts are found elsewhere in the analysis.
13.3 (p.233 #3)	COMMENT: Page 4.10 7, Surface Water Features, 3rd paragraph, 3rd sentence: "Waters of the State" are defined by the State Water Resources Control Board, not the Department of Fish and Game; therefore please revise the sentence as follows: The Lahontan RWQCB and California Department of Fish and Game is are currently reviewing the project; to determine whether any of the onsite washes are "Waters of the State".the RWQCB will verify the extent of jurisdictional waters of the State on the site, and CDFG will verify which of these features will be subject to streambed alteration requirements under Section 1600 of the Fish and Game Code. RESPONSE: Agreed. Change made on page 8 with modification.
13.4 (p.233 #4)	COMMENT: Page 4.10 7, 5th paragraph, last sentence: "The majority of runoff flows through the southern portion of the site due to offsite flows originating from the east." This sentence is not clear. Does it mean that offsite runoff is mostly on the southern boundary? Seems that it would mostly be on the western boundary. RESPONSE: Staff recognizes the confusion caused by the sentence (in Surface Water Features). Throughout the site, natural flow direction is from east to west. The modeling of a 100-year storm shows that the majority of sheetflow flooding occurs THROUGH Solar Field 2, which is the southern HALF of the project site. Staff has corrected this on page 9.
13.5 (p.233 #5)	COMMENT: Page 4.10 11, Linear Facilities, Offsite: The description of the electric transmission line and the natural gas pipeline have been modified. The revised description contained previously in the Applicant's

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	General Document Comments should be used. <u>RESPONSE:</u> The description on page 14 now matches the language in the Project Description section of the **FSA**.
13.6 (p.234 #6)	COMMENT: Page 4.10 11, Linear Facilities, Offsite, last paragraph, 1st sentence: CEQA does not have connected actions. Therefore, delete the sentence "~~Although the Hidden Hills Transmission Project is located entirely in Nevada (and therefore outside Energy Commission jurisdiction), this proposed transmission project is considered in this PSA as a connected action to the proposed HHSEGS project.~~" <u>RESPONSE:</u> Staff does not agree with this comment. See discussion under "Project Impacts Outside the State Border" in the **Executive Summary** of this **FSA**.
13.7 (p.234 #7)	COMMENT: Page 4.10 13, Soil Erosion, 1st paragraph: Please modify the first paragraph since it is vague and replace it with the following from the AFC: Disturbed areas would be stabilized with effective soil cover (such as aggregate, paving, or vegetation) as soon as feasible but no later than 14 days after construction or disturbance is complete in that portion of the site. <u>To reduce erosion potential, best management practices (BMPs) will be implemented in accordance with the SWPPP/DESCP.</u> Vegetation will remain but will be cut (when necessary) to a height that will allow clearance for heliostat function while leaving the root structures intact. Occasional cutting of the vegetation will be performed as needed to permit unobstructed heliostat mirror movement. <u>RESPONSE:</u> Agreed. Change made on page 16 with modification.
13.8 (p.234 #8)	COMMENT: Page 4.10 15, Contaminated Soil and Water, 2nd sentence: This sentence reads, in part: "It is recommended that near surface soils be tested for the potential presence of *these compounds to assess* if there are any potential for unacceptable exposure risks…" (Emphasis added). Please clarify what compounds are being referred to. <u>RESPONSE:</u> This was a typo. Text was updated on page 18 to reflect information in **Waste** section.

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13.9 (p.234 #9)	COMMENT: Page 4.10 20, 2nd bullet, 2nd sentence: Please revise the sentence as follows: "Since the initial filing of the original AFC, ~~several~~ some changes to the project have occurred such as the removal of two boilers from each power block ~~facility layout and basic shape of each power block, the new alignment of onsite linear facilities, relocation of the project switchyard~~ and modifications to the west perimeter retention area. RESPONSE: Changes made with modification. Staff is aware that the proposed switchyard is back at the original location, but the facility layout and basic shape of the powerblock has changed. Original powerblock layout in the AFC (HHSG 2011a, Figure 2.2-1) is different from updated layout from Supplemental Data Response, Set 2 (CH2 2012p, Figure 2.2-1 R1).
13.10 (p.234 #10)	COMMENT: Page 4.10 21, 3rd paragraph, 1st sentence: The proposed project does not constitute an "unusual circumstance." These best management practices (BMPs) are effective and have been proven in other desert projects. RESPONSE: Staff does not intend to imply that BMPs are not effective in desert projects. The unusual circumstance refers to the complex flows characteristic of undeveloped alluvial fans, compared to the more predictable flows of a traditional, continuously flowing stream. The paragraph on page 24 was re-written to explain the need for a Storm Water Damage Monitoring and Response Plan (**SOILS-5**).
13.11 (p.234 #11)	COMMENT: Page 4.10 21, 3rd bullet, Footnote 6: Determination of "Waters of the State" is the job of the SWRCB (or the Lahontan RWQCB), not the California Department of Fish and Game (CDFG). Therefore, please revise: "(~~by California Department of Fish and Game and~~ Lahontan RWQCB)" in the footnote. RESPONSE: Change made on page 26 with modification.
13.12 (p.234 #12)	COMMENT: Page 4.10 26, 3rd paragraph: Regarding the 2nd sentence, VTN performs hydrologic modeling in all sorts of desert environments. Please provide some reasoning for stating "…modeling is imprecise and untested in this desert environment."

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	RESPONSE: Staff agrees that VTN followed preapproved hydrologic analysis methodology and appropriate protocols (HEC-1 and FLO-2D) for the preliminary analysis. The intent of that sentence was to say that alluvial flows are very complex. This area does not have the benefit of historical flood data to compare to the estimated flow calculations. The paragraph on page 24 was re-written to explain the need for a Storm Water Damage Monitoring and Response Plan (**SOILS-5**).
13.13 (p.234 #13)	COMMENT: Page 4.10 30, last paragraph, 2nd sentence: Please delete the portion of the following sentence. It is inconsistent with the Socioeconomics PSA section concludes that "there is sufficient existing labor force in the region and the workforce would reside in existing, available housing" (CEC PSA Socioeconomics, page 4.9 15). The portion of the sentence which should be deleted reads: "For example, ~~additional housing may be needed to accommodate workers for construction and operation of the project, or~~ …" RESPONSE: This sentence was intended to be a general statement applicable to any new project. Staff made edits on page 41 removing implications that this statement is specific to the project.
13.14 (p.235 #14)	COMMENT: SOILS-1: Changes to condition. RESPONSE: Staff does not agree with relocation of the "Verification" heading. Other changes made on page 83 with modification.
13.15 (p.237 #15)	COMMENT: SOILS-2: Changes to condition. RESPONSE: Changes made on page 85 with modification.
13.16 (p.237 #16)	COMMENT: SOILS-4: No comments RESPONSE: N/A
13.17 (p.237 #17)	COMMENT: SOILS-5: Changes to condition. RESPONSE: Staff does not agree with relocation of the "Verification" heading. Other changes made on page 89 with modification.

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13.18 (p.240 #18)	COMMENT: SOILS-6 (Construction Wastewater Discharge, renumbered SOILS-7): No comments RESPONSE: N/A
13.19 (p.240 #19)	COMMENT: SOILS-7 (Wastewater Collection System, renumbered SOILS-8): No comments RESPONSE: N/A
13.20 (p.240 #20)	COMMENT: SOILS-8 (Septic System and Leach Field Requirement, renumbered SOILS-9): Changes to condition. RESPONSE: Changes made on page 92 with modification.

STAFF CONCLUSIONS AND PROPOSED FINDINGS

Based on the assessment of the proposed Hidden Hills Solar Electric Generating System (HHSEGS), California Energy Commission (Energy Commission) staff proposes the following findings:

- Compliance with an approved DESCP in accordance with Condition of Certification **SOILS-1** would reduce the impacts of soil erosion during construction and operations.
- Condition of Certification **SOILS-5** would reduce impacts of potential storm water damage to heliostat assemblies.
- Conditions of Certification **SOILS -1**, **-2**, and **-3** would reduce or avoid impacts of contact runoff during construction activities. Conditions of Certification **SOILS -1** and **-4** would reduce or avoid impacts of contact runoff during operations.
- Condition of Certification **SOILS-6** would reduce potential offsite flooding impacts to Old Spanish Trail Highway/Tecopa Road. The proposed HHSEGS project would not impede or significantly redirect flood flows of the designated 100-year floodplain. In addition, the project would not be affected by dam failure, tsunami, or seiche.
- The discharge of construction wastewater would be in compliance with LORS and would have no adverse environmental impact provided the requirements of Conditions of Certification **SOILS-1** and **-7** are met.
- The discharge of sanitary waste and industrial wastewater would be in compliance with LORS and would have no adverse environmental impact provided the requirements of Conditions of Certification **SOILS-8** and **-9** are met.
- Compliance with Conditions of Certification **SOILS-2** through **-9**, the HHSEGS project would conform with applicable federal, state, and local LORS and state policy related to water quality and hydrology.

- Staff has not identified any significant impacts that would occur in Nevada regarding water quality and hydrology caused by the proposed HHSGES project. The water quality and hydrology impacts from the linear facilities (transmission line and natural gas line portions) within the state of Nevada would be assessed by BLM under the requirements of the National Environmental Policy Act (NEPA) of 1969.

PROPOSED CONDITIONS OF CERTIFICATION

DRAINAGE, EROSION, AND SEDIMENTATION CONTROL PLAN (DESCP)

SOILS-1 Prior to site mobilization, the project owner shall obtain the CPM's approval for a site specific DESCP that ensures protection of water quality and soil resources of the project site and all onsite linear facilities for both the construction and operation phases of the project. This plan shall address appropriate methods and actions, both temporary and permanent, for the protection of water quality and soil resources, demonstrate no increase in off-site flooding potential, and identify all monitoring and maintenance activities. The project owner shall complete all engineering plans, reports, and documents necessary for the CMP to conduct a review of the proposed project and provide a written evaluation as to whether the proposed grading, drainage improvements, and flood management activities comply with all requirements presented herein. The DESCP may be combined with Condition of Certification SOILS-2 (Construction SWPPP). The plan shall be consistent with the grading and drainage plan as required by Condition of Certification **CIVIL-1** and shall contain the following elements:

Vicinity Map: A map shall be provided indicating the location of all project elements with depictions of all major geographic features to include watercourses, washes, irrigation and drainage canals, major utilities, and sensitive areas.

Site Delineation: The site and all project elements shall be delineated showing boundary lines of all construction areas and the location of all existing and proposed structures, underground utilities, roads, and drainage facilities. With legend, indicate types and locations of storm water control measures built to permanently control storm water pollution. Distinguish between pollution prevention, treatment, and containment devices. Identify sanitary waste facilities. Adjacent property owners shall be identified on the plan maps. All maps shall be presented at a legible scale

Drainage: The DESCP shall include the following elements:

a. Topography. Topography for offsite areas are required to define the existing upstream tributary areas to the site and downstream to provide enough definition to map the existing storm water flow and flood hazard. Spot elevations shall be required where relatively flat conditions exist.

b. Proposed Grade. Proposed grade contours shall be shown at a scale appropriate for delineation of onsite ephemeral washes, drainage ditches, and tie-ins to the existing topography.

c. Hydrology. Existing and proposed hydrologic calculations for onsite areas and offsite areas that drain to the site; include maps showing the drainage area boundaries and sizes in acres, topography and typical overland flow directions, and show all existing, interim, and proposed drainage infrastructure and their intended direction of flow. Show each discharge location from the site.

d. Hydraulics. Provide hydraulic calculations to support the selection and sizing of the onsite drainage network, diversion facilities and BMPs.

Watercourses and Critical Areas: The DESCP shall show the location of all onsite and nearby watercourses including washes, irrigation and drainage canals, and drainage ditches, and shall indicate the proximity of those features to the construction site. Maps shall identify high hazard flood prone areas. Maps shall show with legend locations of expected sources of pollution generation (i.e. outdoor work and storage areas, delivery areas, trash enclosures, fueling areas) during construction activities and separate maps for operational activities.

Clearing and Grading: The plan shall provide a delineation of all areas to be cleared of vegetation, areas to be preserved, and areas where vegetation would be cut to allow clear movement of the heliostats. The plan shall provide elevations, slopes, locations, and extent of all proposed grading as shown by contours, cross-sections, cut/fill depths or other means. The locations of any disposal areas, fills, or other special features shall also be shown. Existing and proposed topography tying in proposed contours with existing topography shall be illustrated. The DESCP shall include a statement of the quantities of material excavated at the site, whether such excavations or fill is temporary or permanent, and the amount of such material to be imported or exported or a statement explaining that there would be no clearing and/or grading conducted for each element of the project. Areas of no disturbance shall be properly identified and delineated on the plan maps.

Soil Wind and Water Erosion Control: The plan shall address exposed soil treatments to be used during construction and operation of the proposed project for both road and non-road surfaces including specifically identifying all chemical based dust palliatives, soil bonding, and weighting agents appropriate for use at the proposed project site that would not cause adverse effects to vegetation; BMPs shall include measures designed to prevent wind and water erosion including application of chemical dust palliatives after rough grading to limit water use. All dust palliatives, soil binders, and weighting agents shall be approved by the CPM prior to use.

Project Schedule: The DESCP shall identify on the topographic site map the location of the site-specific BMPs to be employed during each phase of construction (initial grading, project element construction, and final grading/stabilization). BMP implementation schedules shall be provided for each project element for each phase of construction.

Best Management Practices: The DESCP shall show the location, timing, and maintenance schedule of all erosion- and sediment-control BMPs to be used prior to initial grading, during project element excavation and construction, during final grading/stabilization, and after construction. BMPs shall include measures designed to control dust and stabilize construction access roads and entrances. The maintenance schedule shall include post-construction maintenance of treatment-control BMPs applied to disturbed areas following construction.

Erosion Control Drawings: The erosion-control drawings and narrative shall be designed, stamped and sealed by a professional engineer or erosion-control specialist.

Agency Comments: The DESCP shall include copies of recommendations from the County of Inyo and the California Department of Fish and Game (CDFG). If the DESCP is combined with the Construction SWPPP, the document shall include copies of recommendations from the Lahontan Regional Water Quality Control Board (RWQCB).

Monitoring Plan: Monitoring activities shall include routine measurement and photographs of the volume of accumulated sediment in the onsite drainage ditches, and storm water diversions.

<u>Verification:</u> The DESCP shall be consistent with the grading and drainage plan as required by Condition of Certification **CIVIL-1**, and relevant portions of the DESCP shall be submitted to the chief building official (CBO) for review and approval. In addition, the project owner shall do all of the following:

- No later than ninety (90) days prior to start of site mobilization, the project owner shall submit a copy of the DESCP to Inyo County for review and comment. If the DESCP is combined with the Construction SWPPP, the project owner shall submit a copy of the document to the Lahontan RWQCB for review and comment. The CPM shall consider comments received.
- During construction, the project owner shall provide an analysis in the monthly compliance report on the effectiveness of the drainage-, erosion- and sediment control measures and the results of monitoring and maintenance activities.
- Once operational, the project owner shall provide in the annual compliance report information on the results of storm water BMP monitoring and maintenance activities.

CONSTRUCTION - NPDES GENERAL PERMIT (SOLAR PLANT 1 & 2)

SOILS-2 The project owner shall fulfill the requirements contained in State Water Resources Control Board's *National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities Order No. 2009-0009-DWG, NPDES No. CAS000002* and all subsequent revisions and amendments. The project owner shall develop and implement a construction Storm Water Pollution Prevention Plan (SWPPP) for the construction of the project.

Verification: At least thirty (30) days prior to site mobilization, the project owner shall submit the construction SWPPP to the CBO and CPM and a copy shall be kept accessible onsite at all times. Within ten (10) days of its mailing or receipt, the project owner shall submit to the CPM any correspondence between the project owner and the Lahontan RWQCB about the general NPDES permit for discharge of storm water associated with this activity. This information shall include any updates to the construction SWPPP, a copy of the notice of intent sent by the project owner to the State Water Resources Control Board and the notice of termination.

INDUSTRIAL - NPDES GENERAL PERMIT (CONCRETE BATCH PLANT)

SOILS-3 For the operation of the temporary concrete batch plant, the project owner shall comply with the requirements of the State Water Resources Control Board's NPDES General Permit for Discharges of Storm Water Associated with Industrial Activities (Order No. 97-03-DWQ, NPDES No. CAS000001) and all subsequent revisions and amendments. The project owner shall develop and implement a Storm Water Pollution Prevention Plan (SWPPP) for the operation of the temporary concrete batch plant. The project owner may also submit a Notice of Non- Applicability (NONA) to the RWQCB to apply for an exemption to the general NPDES permit.

Verification: At least thirty (30) days prior to operation of the temporary concrete batch plant, the project owner shall submit copies to the CPM of the operational SWPPP and shall retain a copy on site. Within 10 days of its mailing or receipt, the project owner shall submit to the CPM any correspondence between the project owner and the Lahontan RWQCB about the general NPDES permit for discharge of storm water associated with this activity. This information shall include a copy of the notice of intent sent by the project owner to the State Water Resources Control Board and the notice of termination. A letter from the RWQCB indicating that there is no requirement for a general NPDES permit for discharges of storm water associated with industrial activity would satisfy this condition.

INDUSTRIAL - NPDES GENERAL PERMIT (SOLAR PLANT 1 & 2)

SOILS-4 For the operation of Solar Plant 1 and 2, the project owner shall comply with the requirements of the State Water Resources Control Board's NPDES General Permit for Discharges of Storm Water Associated with Industrial Activities (Order No. 97-03-DWQ, NPDES No. CAS000001) and all subsequent revisions and amendments. The project owner shall develop and implement a Storm Water Pollution Prevention Plan (SWPPP) for the operation of each solar plant. The project owner may also submit a Notice of Non- Applicability (NONA) to the RWQCB to apply for an exemption to the general NPDES permit.

Verification: At least thirty (30) days prior to operation of each solar plant, the project owner shall submit copies to the CPM of the operational SWPPP and shall retain a copy on site. Within 10 days of its mailing or receipt, the project owner shall submit to the CPM any correspondence between the project owner and the Lahontan RWQCB about the general NPDES permit for discharge of storm water associated with this activity. This information shall include a copy of the notice of intent sent by the project owner to the State Water Resources Control Board and the notice of termination. A letter from the RWQCB indicating that there is no requirement for a general NPDES permit for discharges of storm water associated with industrial activity would satisfy this condition.

STORM WATER DAMAGE MONITORING AND RESPONSE PLAN

SOILS-5: The project owner shall reduce impacts caused by large storms by ensuring heliostats and the west perimeter road (berm) withstand the 100-year storm event, establishing ongoing maintenance and inspection of storm water controls, and implementing a response plan to clean up damage and address ongoing issues.

The project owner shall ensure that the heliostats and west perimeter road (berm) are designed and installed to withstand storm water scour that may occur as a result of a 100-year, 24-hour storm event. The analysis of the storm event and resulting heliostat stability will be provided within a Pylon Insertion Depth and Heliostat Stability Report to be completed by the project owner. This analysis will incorporate results from site-specific geotechnical stability testing, as well as hydrologic and hydraulic storm water modeling performed by the project owner. The modeling will be completed using methodology and assumptions approved by the CPM.

The project owner shall also develop a Storm Water Damage Monitoring and Response Plan to evaluate potential impacts from storm water, including damage to west perimeter road (berm) and heliostats that fail due to storm water flow or otherwise break and scatter mirror debris or other potential pollutants on to the ground surface.

The basis for determination of pylon embedment depths and berm design shall employ a step-by-step process as identified below and approved by the CPM:

A. Determination of peak storm water flow within each sub-watershed from a 100-year event:

- Use of San Bernardino County (SBC) Hydrology Manual to specify hydrologic parameters to use in calculations; and
- HEC -1 and Flo-2D models will be developed to calculate storm flows from the mountain watersheds upstream of the project site, and flood flows at the project site, based upon hydrologic parameters from SBC.

- The use of dry wells or injection wells shall be considered for management of storm water flows that may affect the west perimeter road (berm). These infiltration devices shall be designed and operated in accordance with USEPA Class V Injection Well requirements. The groundwater recharge that may be achieved by these wells can be considered as credit for mitigation in accordance with **WATER SUPPLY-1**.

B. Determination of potential total pylon scour depth:

   - Potential channel erosion depths will be determined using the calculated design flows, as determined in A above, combined with Flo-2D to model onsite sediment transport.
   - Potential local scour will be determined using the calculated design flows, as determined in A above, combined with the Federal Highway Administration (FHWA) equation for local bridge pier scour from the FHWA 2001 report, "Evaluating Scour at Bridges."

C. The results of the scour depth calculations and pylon stability testing will be used to determine the minimum necessary pylon embedment depth within the active channels. In the inactive portions of the alluvial fans that are not subject to channel erosion and local scour, the minimum pylon embedment depths will be based on the results of the pylon stability testing. Minimum pylon embedment depth within the retention area will be based on additional site-specific testing for pylon stability under conditions of saturated soil and standing water.

D. The results of the calculated peak storm water flows and channel erosion and heliostat scour analysis together with the recommended heliostat installation depths shall be submitted to the CPM for review and approval sixty (60) days before the start of heliostat installation.

The Storm Water Damage Monitoring and Response Plan shall be submitted to the CPM for review and approval and shall include the following:

- Detailed maps showing the installed location of all heliostats within each project phase;
- Description of the method of removing all soil spoils should any be generated;
- Each heliostat should be identified by a unique ID number marked to show initial ground surface at its base, and the depth of the pylon below ground;
- Minimum Depth Stability Threshold to be maintained of pylons to meet long-term stability for applicable wind, water (flowing and static), and debris loading effects;
- Above and below ground construction details of a typical installed heliostat;
- BMPs to be employed to minimize the potential impact of broken mirrors to soil resources;
- Construction plans and details of the western perimeter road (berm), including erosion control measures; Include an appendix showing analysis of the berm's function as discharge control (weir) and retention area (area and duration of standing water)

- Methods and response time of mirror cleanup and measures that may be used to mitigate further impact to soil resources from broken mirror fragments; and
- Monitoring, documenting, and restoring the adjacent offsite downstream property when impacted by sedimentation, berm damage, or broken mirror shards.

A plan to monitor and inspect periodically, before first seasonal and after every storm event:

- Security and Tortoise Exclusion Fence: Inspect for damage and buildup of sediment or debris
- Heliostats within drainages or subject to drainage overflow or flooding: Inspect for tilting, mirror damage, depth of scour compared to pylon depth below ground and the Minimum Depth Stability Threshold, collapse, and downstream transport.
- Drainage channels: Inspect for substantial migration or changes in depth, and transport of broken glass.
- Constructed diversion channels: Inspect for scour and structural integrity issues caused by erosion, and for sediment and debris buildup.
- Adjacent offsite downstream property: Inspect for changes in the surface texture and quality from sediment buildup, erosion, or broken glass.

Short-Term Incident-Based Response:

- Security and Tortoise Exclusion Fence: repair damage, and remove built-up sediment and debris.
- Heliostats: Remove broken glass, damaged structure, and damaged wiring from the ground, and for pylons no longer meeting the Minimum Depth Stability Threshold, either replace/reinforce or remove the mirrors to avoid exposure for broken glass.
- Drainage channels: no short-term response necessary unless changes indicate risk to facility structures.
- West perimeter road (berm) and constructed diversion channels: repair damage, maintain erosion control measures and remove built-up sediment and debris.

Long-Term Design-Based Response:

- Propose operation/BMP modifications to address ongoing issues. Include proposed changes to monitoring and response procedures, frequency, or standards.
- Replace/reinforce pylons no longer meeting the Minimum Depth Stability Threshold or remove the mirrors to avoid exposure for broken glass.

- Propose design modifications to address ongoing issues. This may include construction of active storm water management diversion channels and/or detention ponds.

Inspection, short-term incident response, and long-term design based response may include activities both inside and outside of the project boundaries. For activities outside of the project boundaries the owner shall ensure all appropriate environmental review and approval has been completed before field activities begin.

Verification: At least sixty (60) days prior to installation of the first pylon, the project owner shall submit to the CPM a copy of the Pylon Insertion Depth and Heliostat Stability Report for review and approval prior to construction. At least sixty (60) days prior to commercial operation, the project owner shall submit to the CPM a copy of the Storm Water Damage Monitoring and Response Plan for review and approval prior to commercial operation. The project owner shall retain a copy of this plan onsite at the power plant at all times. The project owner shall prepare an annual summary of the number of heliostats failed due to damage, cause and extent of the damage, and cleanup and mitigation performed for each damaged heliostat. The annual summary shall also report on the effectiveness of the berm against storms, including information on the damage and repair work or associated erosion control elements of the berm. The project owner shall submit proposed changes or revisions to the Storm Water Damage Monitoring and Response Plan to the CPM for review and approval.

PERIMETER DRAINAGE MANAGEMENT PLAN

SOILS-6: The project owner shall develop and implement a Perimeter Drainage Management Plan to reduce flooding and erosion damage to the section of Old Spanish Trail Highway/Tecopa Road adjacent to the project site. The post-development flood depth calculated for the 100-year, 24-hour storm shall not increase more than one foot at any point on Tecopa Road adjacent to the project site.

The project owner shall provide a detailed hydraulic analysis utilizing FLO-2D which models pre- and post-development flood conditions for the 2-, 5-, 10-, 25-, and 100-year storm events. Boundaries of the analysis shall include the floodplain area from where Stump Springs area runoff flows cross the Nevada border to one mile west of the HHSEGS west property line. The methodology and assumptions for the modeling shall be reviewed and approved by the CPM.

The Perimeter Drainage Management Plan shall be submitted to the CPM for review and approval and shall incorporate the following:

- Vegetation shall be placed to promote infiltration and flow into the solar field. Vegetation planting and establishment shall comply with Condition of Certification **VIS-2**. Vegetation management shall include control of invasive vegetation as prescribed in Condition of Certification **BIO-18**. Fencing shall comply with VIS-2 and **BIO-9**.

- Landscape area between the roadway and perimeter fence shall implement erosion protection from flow velocity of two feet per second along the roadway and discharge from these flows to adjacent property west of the project site.
- Storm water control and conveyance structures (i.e. drop inlets, culverts) shall be designed to prevent desert tortoise from entering the structure or entering the project site. Localized ponding shall not remain longer than 24 hours.
- The use of dry wells or injection wells shall be considered for management of flood flows and artificial recharge of the groundwater aquifer in the project area. These infiltration devices shall be designed and operated in accordance with USEPA Class V Injection Well requirements. The groundwater recharge that may be achieved by these wells can be considered as credit for mitigation in accordance with **WATER SUPPLY-1**.
- Maintenance methods and scheduling shall be identified in the Plan to ensure proper operation of storm water control and conveyance structures and other Best Management Practices (BMPs)
- Elements of monitoring, inspection, and damage response (short-term and long-term) prescribed in Condition of Certification **SOILS-5** shall be implemented in maintenance of storm water conveyance and erosion control features identified in the Perimeter Drainage Management Plan.

Verification: At least sixty (60) days prior to perimeter fence installation, the project owner shall submit to the CPM a copy of the preliminary Perimeter Drainage Management Plan for review.

In combination with Condition of Certification **CIVIL-1**, at least fifteen (15) days (or project owner- and CBO-approved alternative time frame) prior to the start of site grading the project owner shall submit the documents described above to the CBO for design review and approval. In the next monthly compliance report following the CBO's approval, the project owner shall submit a written statement certifying that the documents have been approved by the CBO.

Any proposed changes or revisions to the approved Storm Water Damage Monitoring and Response Plan must be reviewed and approved by the CPM.

CONSTRUCTION WASTEWATER DISCHARGE

SOILS-7 Prior to hydrostatic test water discharge to land, the project owner shall fulfill the requirements contained in State Water Resources Control Board (SWRCB) *Order No. 2003-003-DWQ Statewide General Waste Discharge Requirements (WDRs) for Discharges to Land with a Low Threat to Water Quality (General WDRs)* and all subsequent revisions and amendments.

Prior to hydrostatic test water discharge to surface waters or designated Waters of the State, the project owner shall fulfill the requirements contained in Lahontan RWQCB *Order No. R6T-2008-0023 (Revised Waste Discharge*

Requirements and NPDES General Permit for Limited Threat Discharges to Surface Waters) and all subsequent revisions and amendments.

Prior to transport and disposal of any facility construction-related wastewaters offsite, the project owner shall test and classify the stored wastewater to determine proper management and disposal requirements. The project owner shall provide evidence that wastewater is disposed of at an appropriately licensed facility. The project manager shall ensure that the wastewater is transported and disposed of in accordance with the wastewater's characteristics and classification and all applicable LORS (including any CCR Title 22 Hazardous Waste and Title 23 Waste Discharges to Land requirements).

Verification: The project owner shall submit to the CPM copies of all relevant correspondence between the project owner and the SWRCB or Lahontan RWQCB about the hydrostatic test water discharge requirements within 10 days of its receipt or submittal. This information shall include copies of the Notice of Intent and Notice of Termination for the project. A letter from the SWRCB or Lahontan RWQCB indicating that there is no requirement for the discharge of hydrostatic test water would satisfy the corresponding portion of this condition.

Prior to transport and disposal of any facility construction-related wastewaters offsite, the project owner shall test and classify the stored wastewater to determine proper management and disposal requirements. The project manager shall ensure that the wastewater is transported and disposed of in accordance with the wastewater's characteristics and classification and all applicable LORS (including any CCR Title 22 Hazardous Waste and Title 23 Waste Discharges to Land requirements). The project owner shall provide evidence to the CPM of proper wastewater disposal, via a licensed hauler to an appropriately licensed facility, in the monthly compliance report.

WASTEWATER COLLECTION SYSTEM

SOILS-8 The project owner shall recycle and reuse all process wastewater streams to the extent practicable. Prior to transport and disposal of any facility operation wastewaters that are not suitable for treatment and reuse onsite, the project owner shall test and classify the stored wastewater to determine proper management and disposal requirements. The project owner shall provide evidence that industrial wastewater and contact storm water are being disposed of at an appropriately licensed facility. The project owner shall ensure that the wastewater is transported and disposed of in accordance with the wastewater's characteristics and classification and all applicable LORS (including any CCR Title 22 Hazardous Waste and Title 23 Waste Discharges to Land requirements). An annual summary of industrial wastewater discharge shall be submitted to the CPM in the annual compliance report.

Verification: Prior to transport and disposal of any facility operation wastewaters that are not suitable for treatment and reuse onsite, the project owner shall test and classify the stored wastewater to determine proper management and disposal requirements. The project manager shall ensure that the wastewater is transported and disposed of in accordance with the wastewater's characteristics and classification and all applicable LORS (including any CCR Title 22 Hazardous Waste and Title 23 Waste

Discharges to Land requirements). The project owner shall provide evidence to the CPM of proper industrial wastewater disposal, via a licensed hauler to an appropriately licensed facility, in the annual compliance report.

The project owner shall submit an industrial wastewater discharge summary report to the CPM in the annual compliance report for the life of the project operation. The report shall include the results of chemical analysis for proper disposal offsite, average TDS concentration, monthly range, monthly average, daily maximum within each month, and annual discharge volume by the project. After the first year and for subsequent years, this information shall also include the yearly range and yearly average discharge volume by the project.

SEPTIC SYSTEM AND LEACH FIELD REQUIREMENTS

SOILS-9 The project owner shall comply with the requirements and all subsequent revisions and amendments of the Inyo County Environmental Health Services Department (Inyo County Codes 7.52.020 and 7.52.060), the California Plumbing Code (California Code of Regulations Title 24, Part 5), and the Lahontan RWQCB Basin Plan while designing, constructing, and operating the HHSEGS sanitary waste disposal facilities such as septic systems and leach fields. Compliance shall include an engineering report on the septic system and leach field design, operation, maintenance, and loading impact to groundwater.

The project owner shall submit all necessary information and the appropriate fee to the Inyo County Environmental Health Services Department to ensure that the project has complied with county sanitary waste disposal facilities requirements. Written assessments prepared by Inyo County regarding the project's compliance with these requirements must be submitted to the CPM for review and approval.

Verification: At least thirty (30) days prior to use of the septic systems, the project owner shall submit to the CPM for review and approval a written assessment prepared by Inyo County regarding the project's compliance with the requirements above.

REFERENCES

BLM 2011 – Bureau of Land Management. Project Fact Sheet: Hidden Hills Transmission Project. November 2011.

BLM 2012b – BLM/A. Lueders and J. Kenna (tn: 66238) BLM Comment Letter Regarding PSA. 7/16/2012

CEC 2012u – California Energy Commission/M. Monasmith (tn: 65442) Preliminary Staff Assessment. 5/24/2012

CEC 2012ii – California Energy Commission/M. Monasmith (tn: 67868) Record of Conversation with Candace Hill and D. Crom re flooding on Tecopa Road. 8/31/2012

CH2 2012k – CH2MHill/J. Carrier (tn: 64364) Applicant's Data Response Set 1C-2. 3/23/2012

CH2 2012p – CH2MHill/J. Carrier (tn: 64558) Supplemental Data Response, Set 2, Boiler Optimization Plan and Design Change. 4/2/2012

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CH2 2012y – CH2MHill/J. Carrier (tn: 65092) Applicant's Data Response, Set 2E 5/04/2012

CH2 2012ee– CH2MHill/J. Carrier (tn: 66319) Applicant's PSA Comments, Set 2. 7/23/2012

CH2 2012hh– CH2MHill/J. Carrier (tn: 66549) Applicant's Letter Confirming Relocation of the Switchyard and Gas Metering Station. 8/10/2012

CH2 2012ii– CH2MHill/J. Carrier (tn: 67060) Applicant's Supplemental Data Response, Set 4B. 9/10/2012

CH2 2012ll– CH2MHill/J. Carrier (tn: 65209) Applicant's Supplemental Data Response Set 4. 5/11/2012

DWR 2004 – California Department of Water Resources. California's Groundwater – Bulletin 118, Update 2004, Pahrump Valley Groundwater Basin. Website publication: http://www.water.ca.gov/pubs/groundwater/bulletin_118/

HHSG 2011a – BrightSource Energy/J. Woolard (tn: 61756) Application for Certification, Volume 1 & 2. 08/5/2011

HHSG 2011b – BrightSource Energy/C. Jensen (tn: 62125) Supplement to AFC for HHSEGS. 09/07/2011

INYO 2012j – Inyo County/M. Fortney (tn: 66310) Inyo County Comments on PSA. 7/17/2012

J&S 2001 – Jones & Stokes. Goals and Policies Report for the Inyo County General Plan, prepared for Inyo County. December 2001.

MAC 2012c - Cindy MacDonald (tn: 66291) Cindy McDonald's Supplemental Comments and Analysis. 07/23/2012

RWQCB 2005 – California Regional Water Quality Control Board, Lahontan Region. Water Quality Control Plan for the Lahontan Region (Basin Plan) amended 2005.

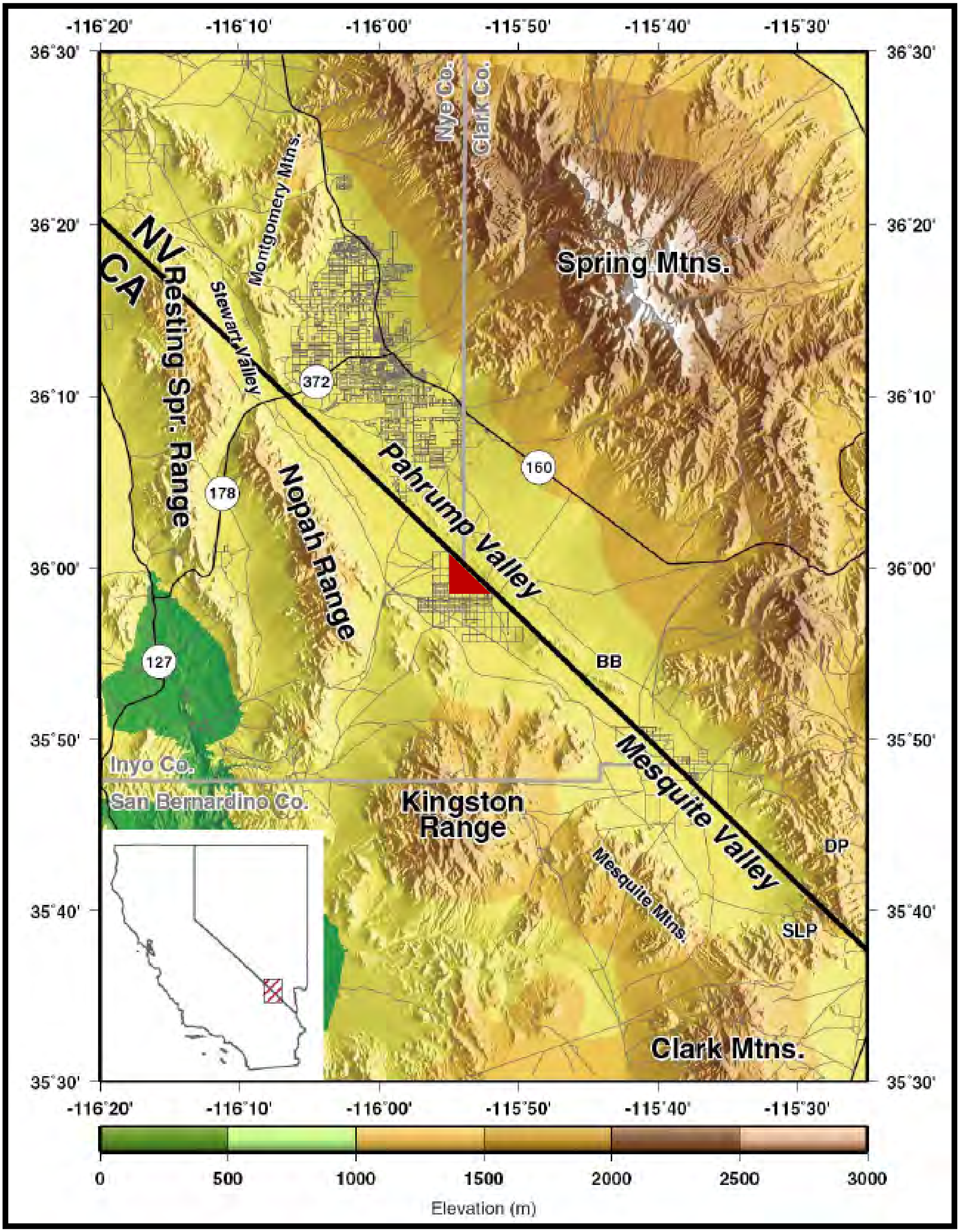
USGS 1989 - U.S. Geological Survey/Arcement and Schneider. "Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains", U.S. Geological Survey Water-Supply Paper 2339, Denver, Colorado. 1989.

ACRONYMS

Acronyms Used in the Soils & Surface Water Section

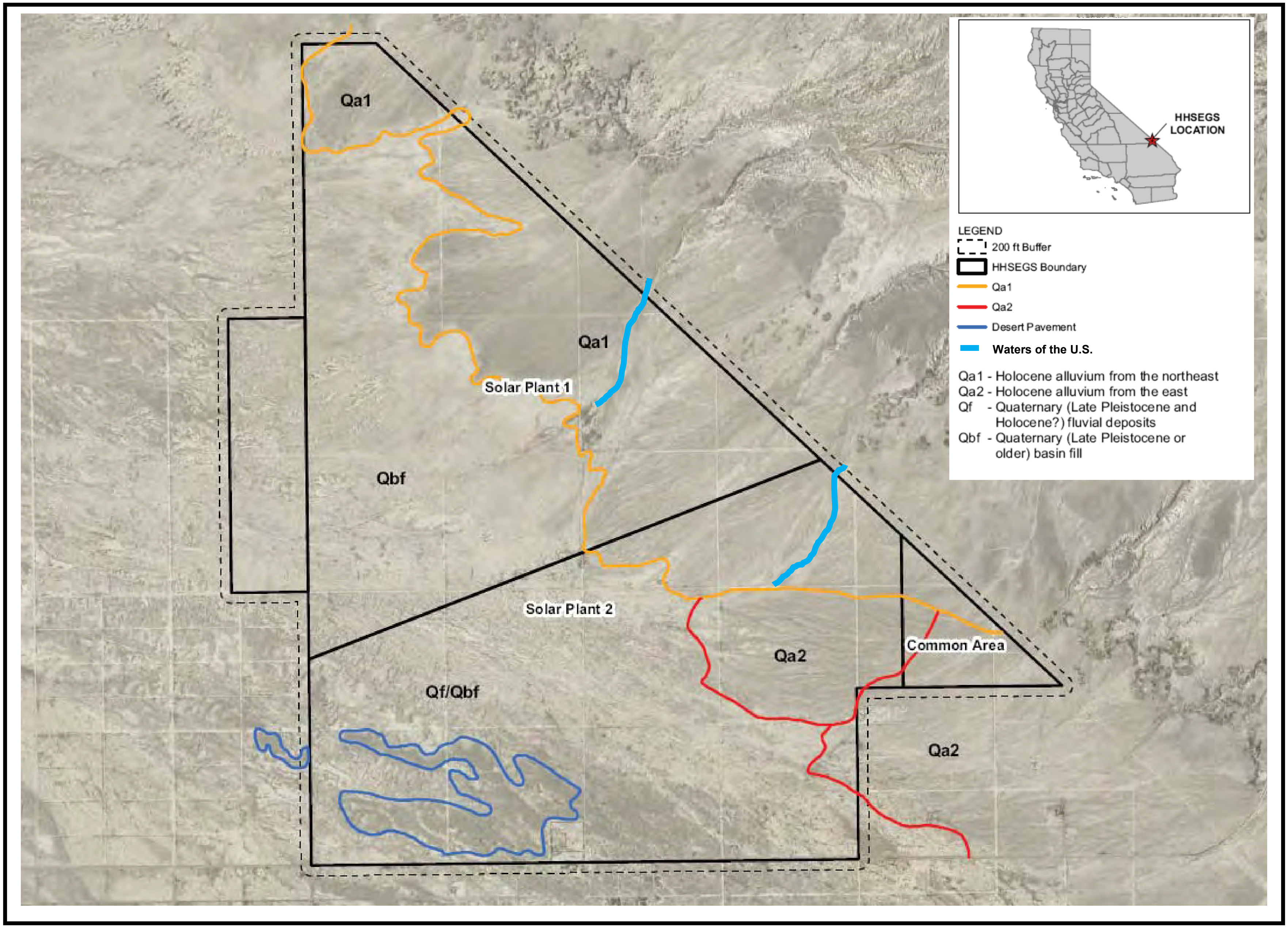
AFC	Application for Certification
BLM	U.S. Bureau of Land Management
BMP	Best Management Practice
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CWA	Clean Water Act
DESCP	Drainage, Erosion, and Sediment Control Plan
FEMA	Federal Emergency Management Agency
FSA	Final Staff Assessment
GPS	global positioning system
HHSEGS	Hidden Hills Solar Electrical Generating System
ICEHSD	Inyo County Environmental Health Services Department
kV	kilovolt
LID	Low Impact Development
LORS	Laws, Ordinances, Regulations and Standards
msl	mean sea level
MW	megawatts
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PSA	Preliminary Staff Assessment
QFER	Quarterly Fuel and Energy Reports
RWQCB	Regional Water Quality Control Board
SRSG	solar receiver steam generator
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TSS	total suspended solids
USACE	U.S. Army Corp of Engineers
WDR	Waste Discharge Requirements

Hidden Hills Solar Electric Generating System (HHSEGS) – Vicinity Map



SOURCE: Geosphere, April 2010, Figure 1, Page 94

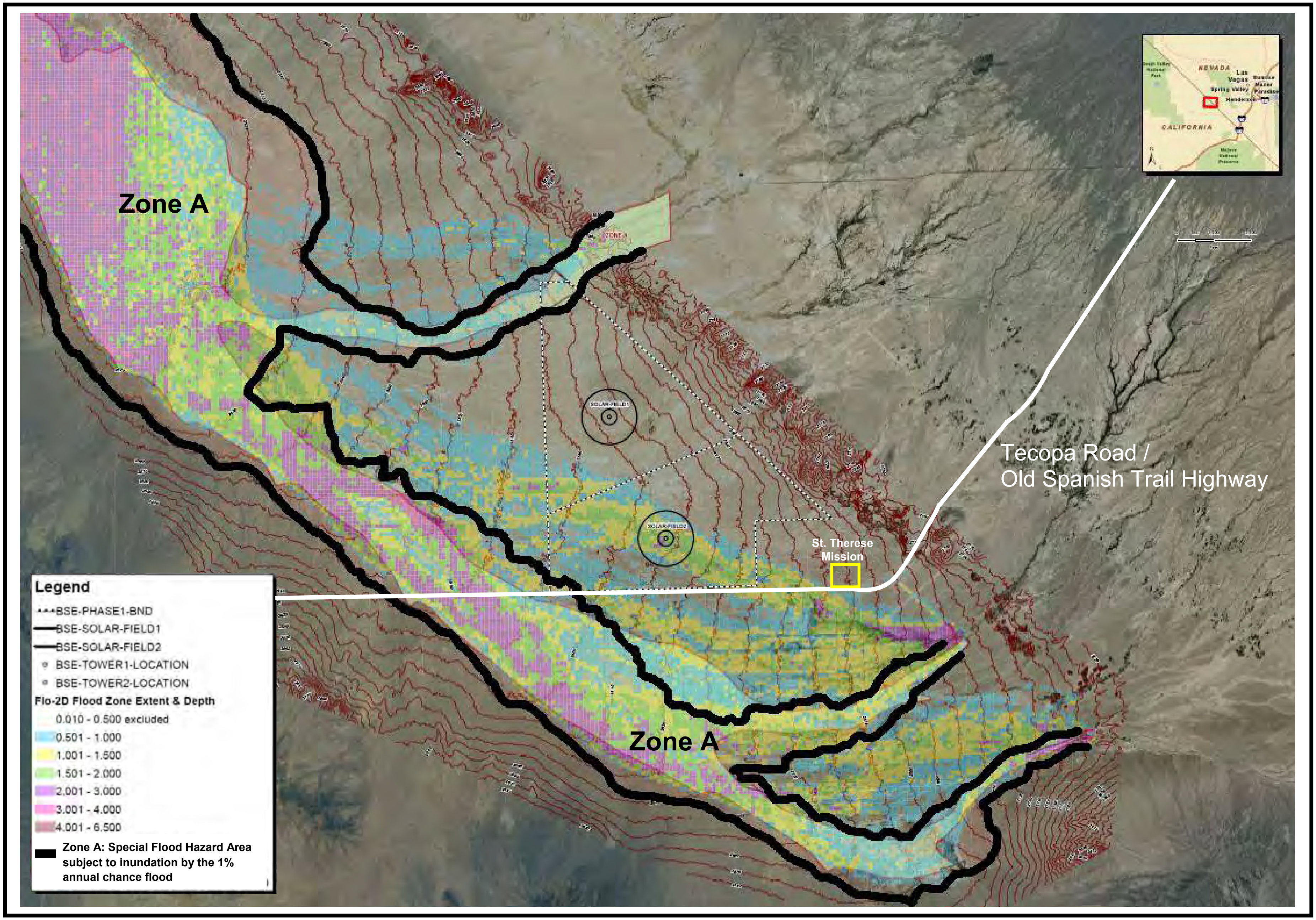
SOILS & SURFACE WATER - FIGURE 2
Hidden Hills Solar Electric Generating System (HHSEGS) – Alluvial Fans and Waters of the U.S.



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: Figure DR 101-1, Land Surface Units; CH2MHill, Fig 1, URS and BrightSource Energy

SOILS & SURFACE WATER - FIGURE 3

Hidden Hills Solar Electric Generating System (HHSEGS) – Federal Emergency Management Agency – Flood Insurance Rate Map



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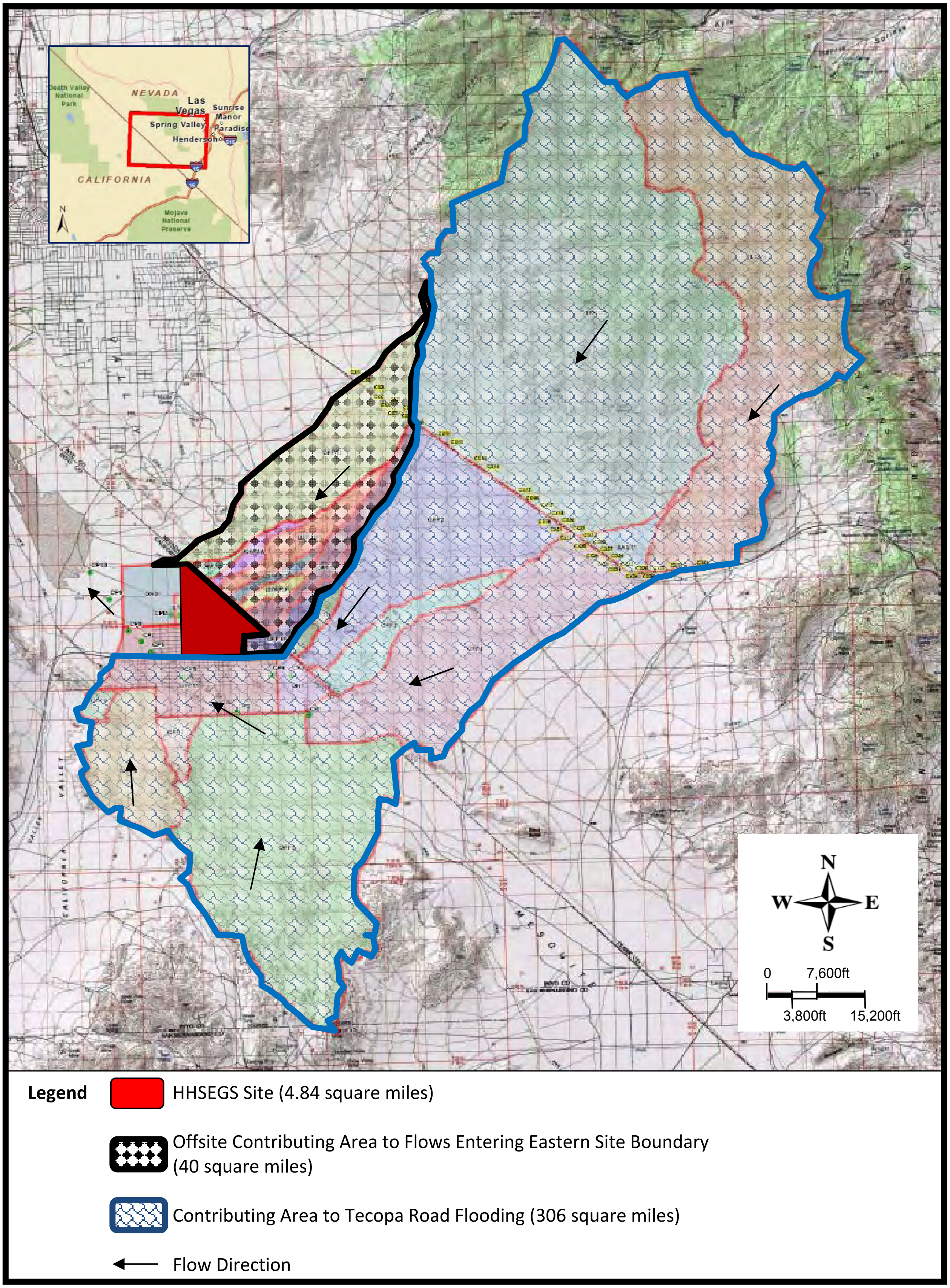
SOURCE: 3/28/2011, VTN Consulting and BrightSource Energy

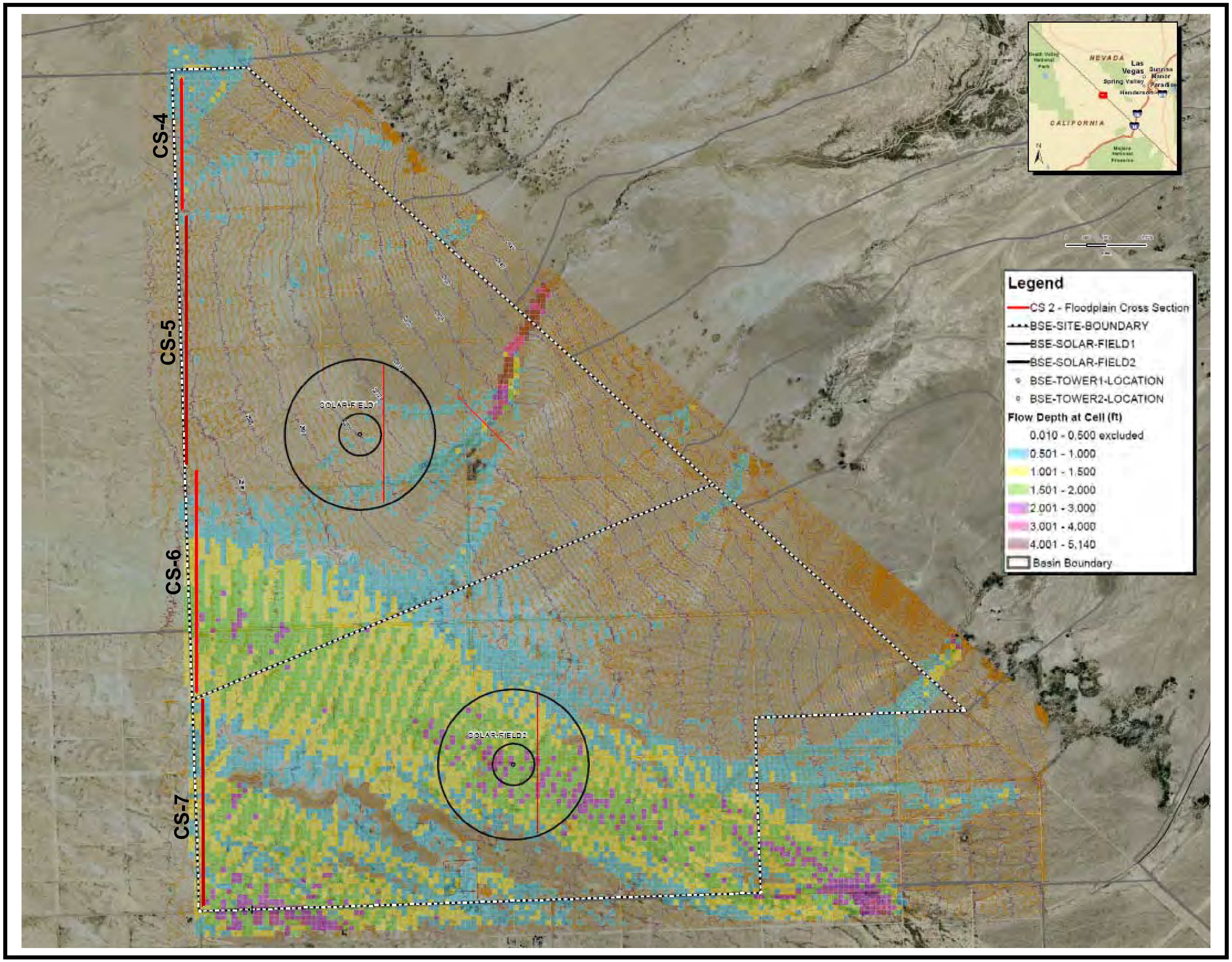
SOILS & SURFACE WATER - FIGURE 4
Hidden Hills Solar Electric Generating System (HHSEGS) -
Watershed Areas Contributing to Runoff



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: 5/16/2011, VTN Consulting and BrightSource Energy

SOILS & SURFACE WATER - FIGURE 5

Hidden Hills Solar Electric Generating System (HHSEGS) – Preconstruction Depth Map (24 hour – 100 year Rain Event)

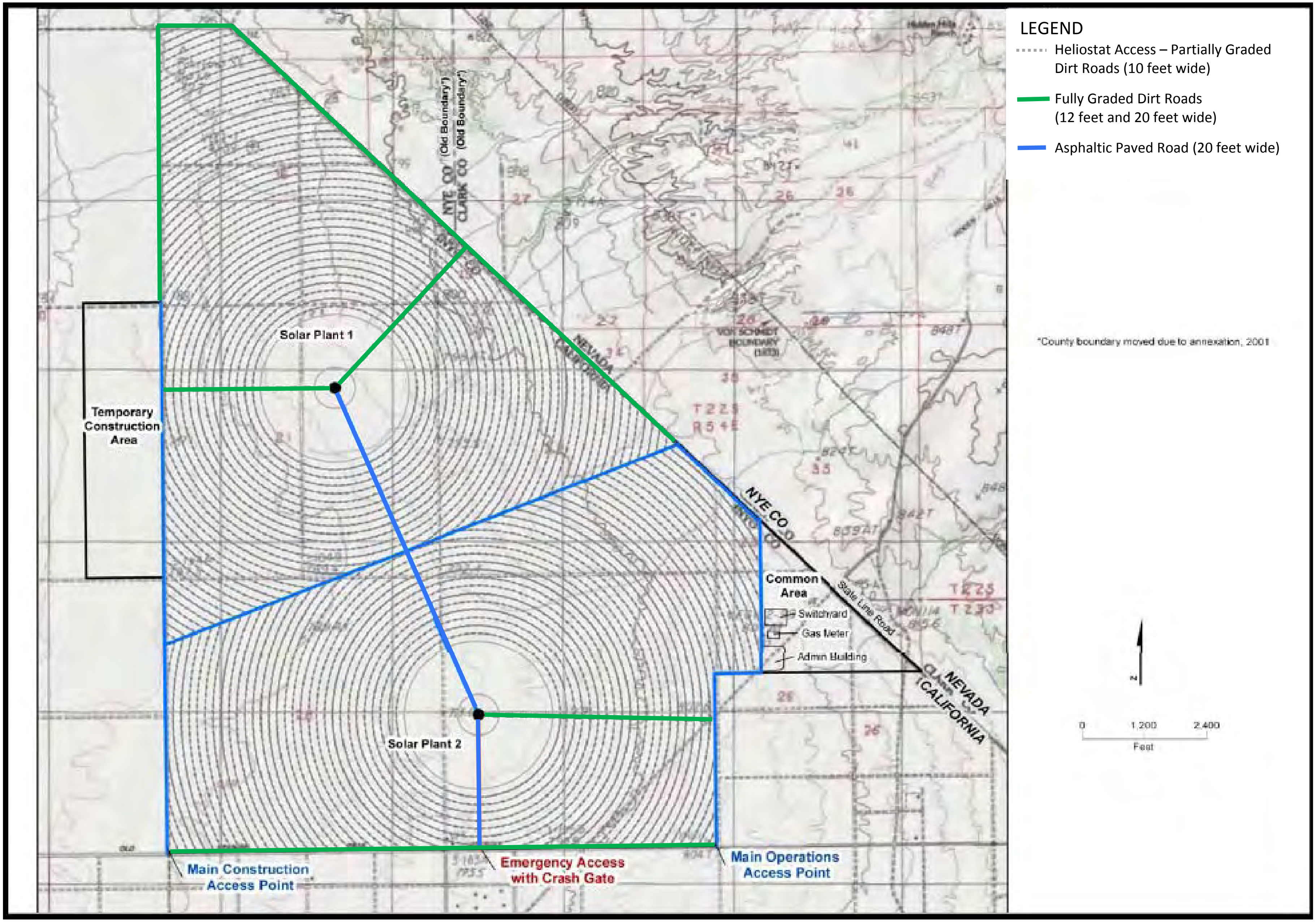


CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION

SOURCE: 4/4/2011, VTN Consulting and BrightSource Energy

SOILS & SURFACE WATER - FIGURE 6

Hidden Hills Solar Electric Generating System (HHSEGS) – Road Types



SOILS & SURFACE WATER

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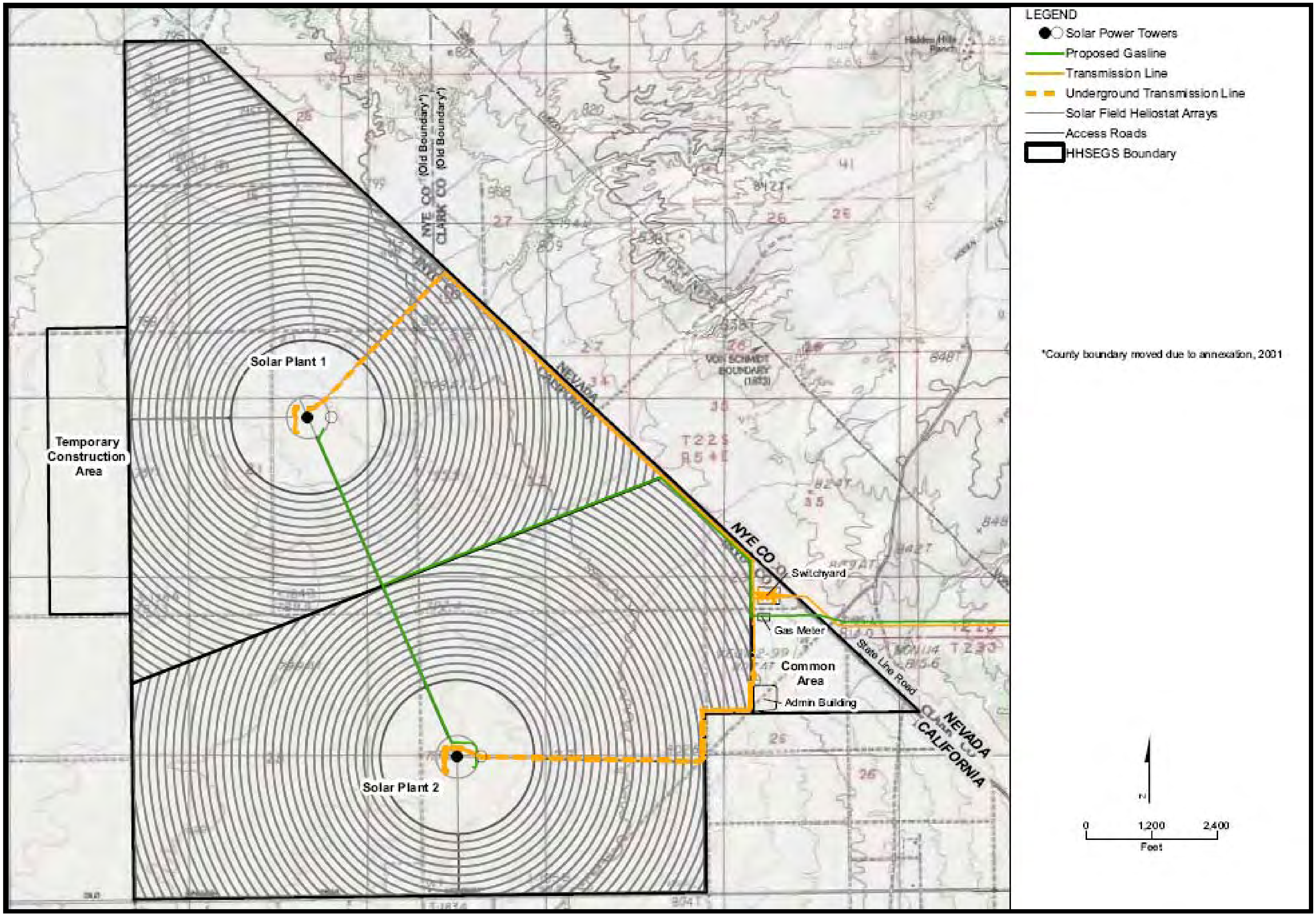
SOURCE: 4/22/2011, Dwg No. C-1000, CH2MHill and BrightSource Energy

SOILS & SURFACE WATER - FIGURE 7

Hidden Hills Solar Electric Generating System (HHSEGS) – Linear Facilities



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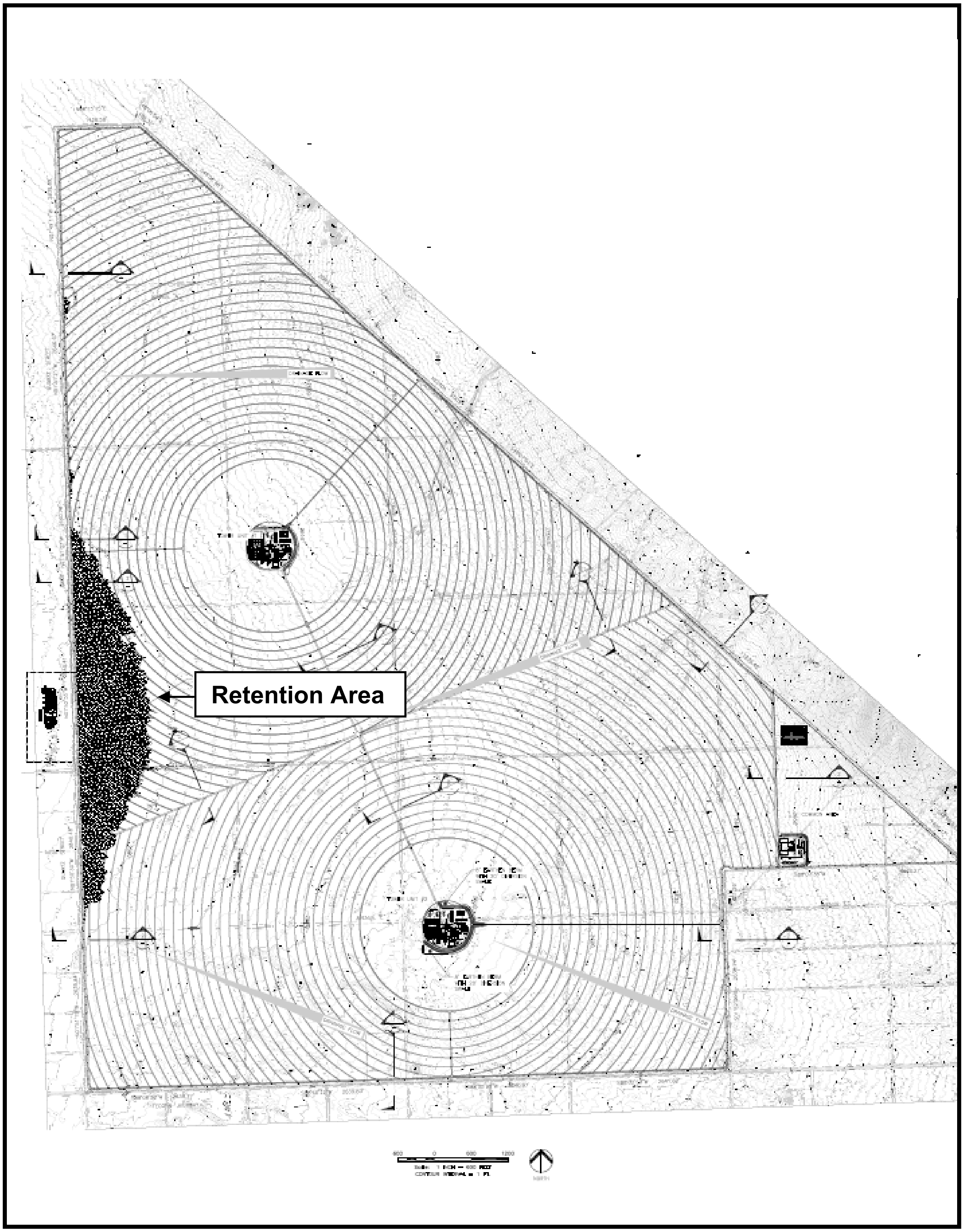
SOURCE: Figure 2.1-2R1, CH2MHill

SOILS & SURFACE WATER - FIGURE 8
Hidden Hills Solar Electric Generating System (HHSEGS) – Retention Area



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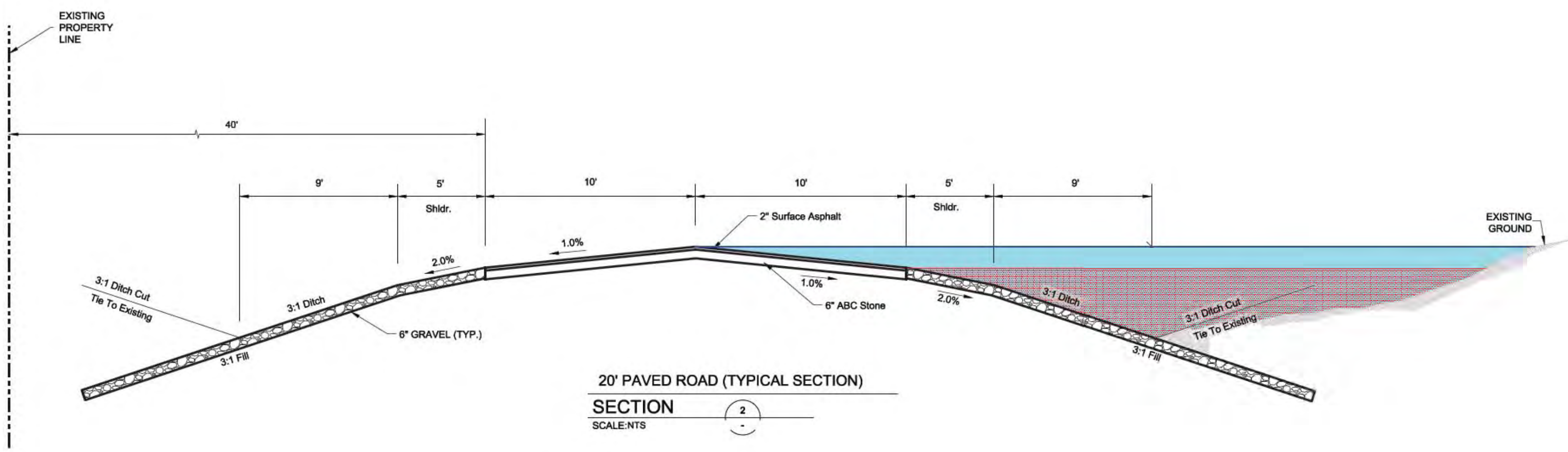
SOURCE: 4/22/2011, Dwg No. C-2000, BrightSource Energy and CH2MHill

Hidden Hills Solar Electric Generating System (HHSEGS) – Retention Area Cross-Section



LEGEND

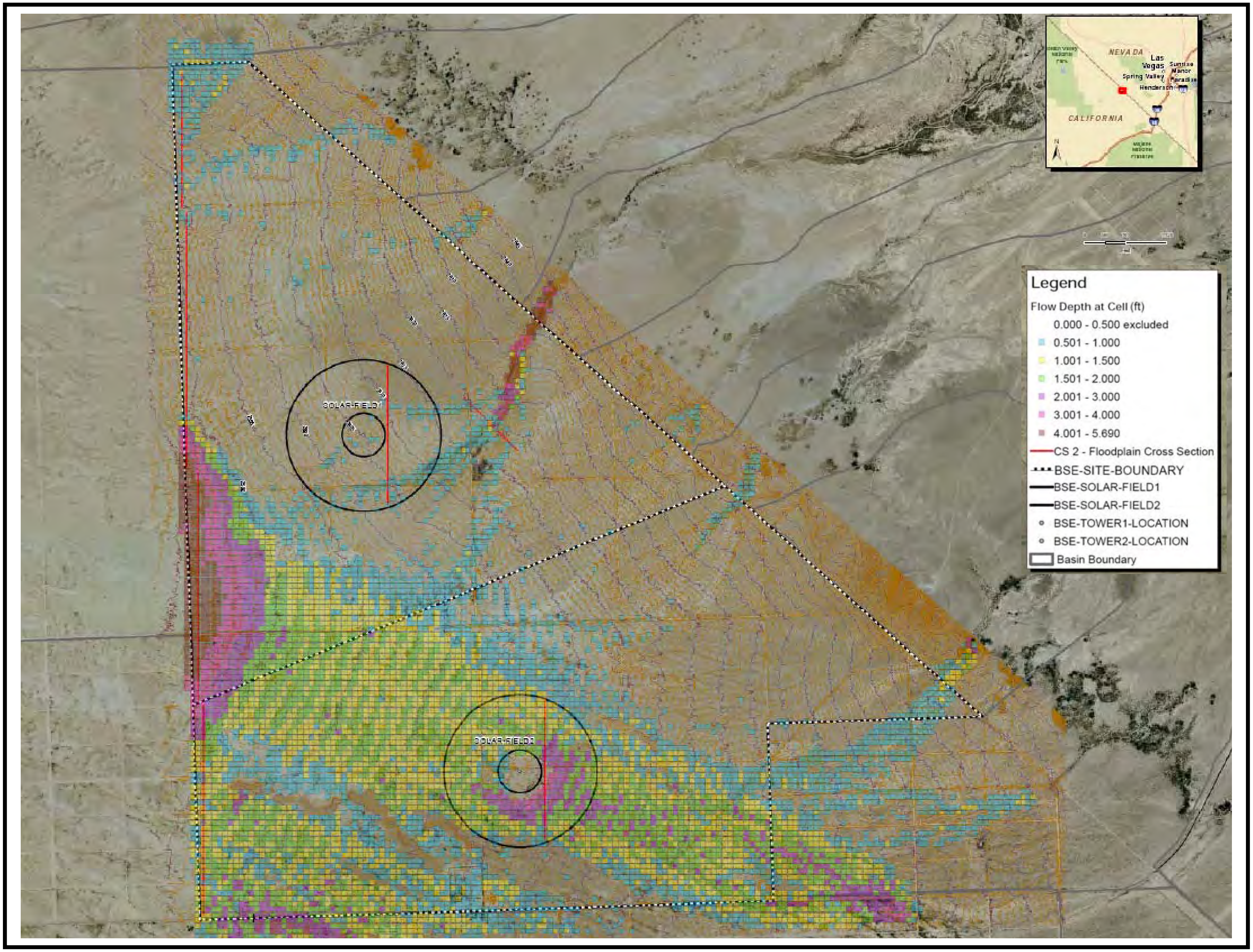
5, 10, 25, & 100-YEAR STORM EVENT INITIAL PONDING (3.80 FEET MAX DEPTH)

2-YEAR STORM EVENT INITIAL PONDING (2.79 FEET MAX DEPTH)

SOURCE: 5/11/2012, VTN Consulting and BrightSource Energy

SOILS & SURFACE WATER - FIGURE 10

Hidden Hills Solar Electric Generating System (HHSEGS) – Post-construction Depth Map (100 year – 24 hour Rain Event)



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SOURCE: 5/25/2011, VTN Consulting and BrightSource Energy

Hidden Hills Solar Electric Generating System (HHSEGS) -

Example of Tortoise Fence Blocked with Debris

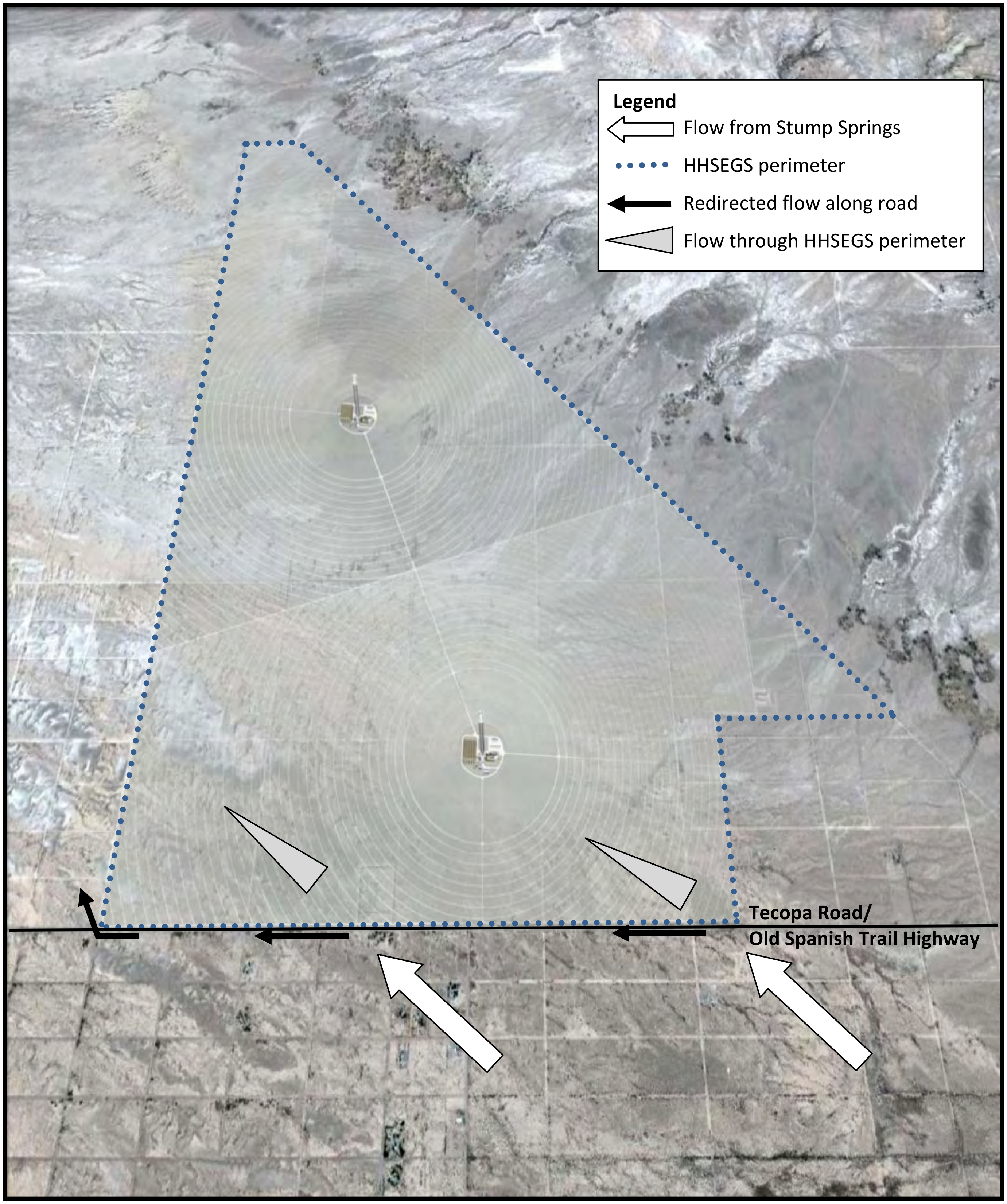
Above: Matted Vegetation.
This is an example of the vegetation mat that formed on the tortoise fencing. The fencing was installed parallel to the ground slope.

Right: Bowed Tortoise Fence.
The trapped sediment and debris caused the tortoise fence to bow out. The stream channel slopes down towards the right.

Ivanpah SEGS Construction Site

SOURCE: August 2011, California Energy Commission

SOILS & SURFACE WATER - FIGURE 12
Hidden Hills Solar Electric Generating System (HHSEGS) –
Post-Construction Storm Water Flow Patterns at Tecopa Road/Old Spanish Trail Highway



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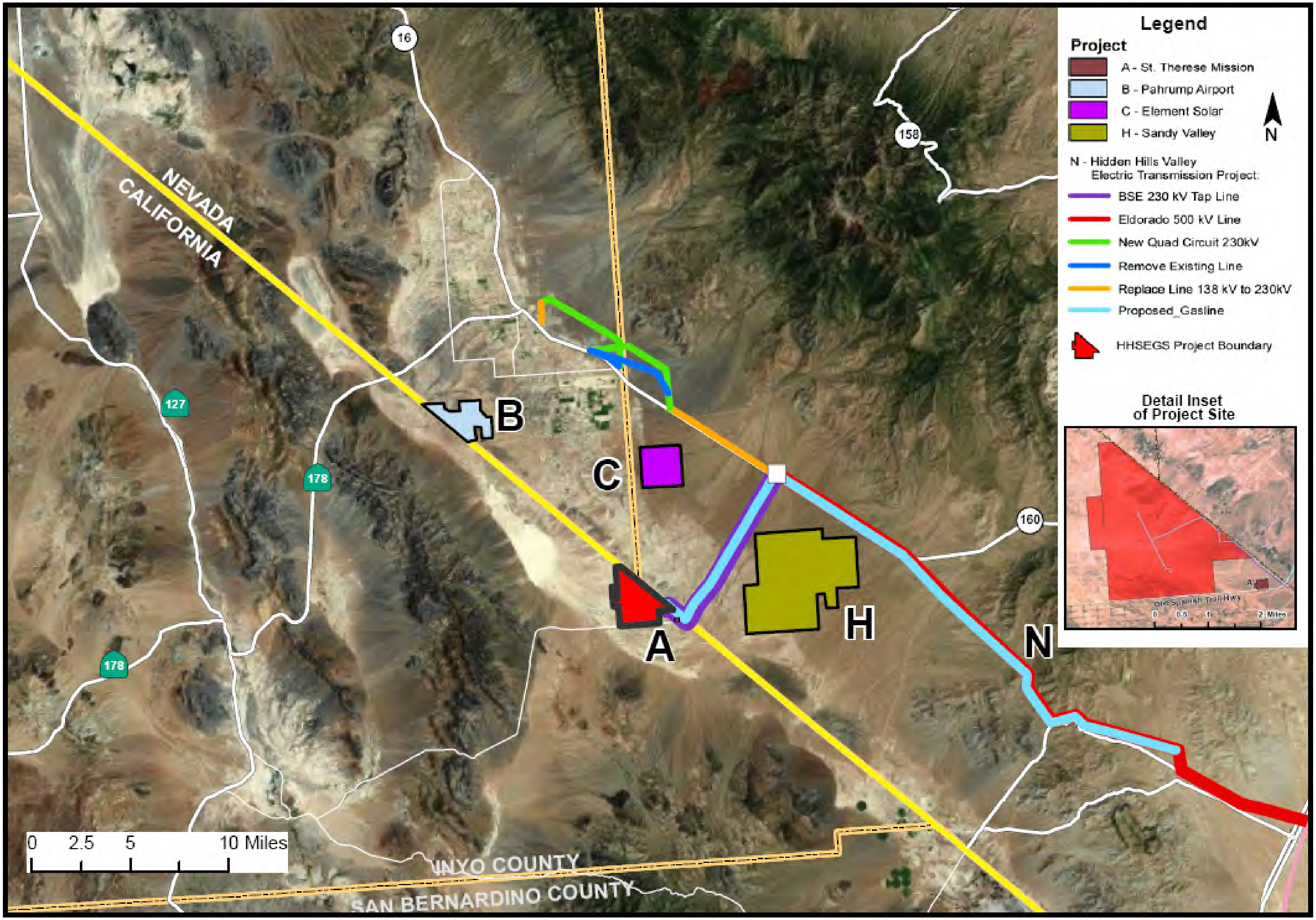
SOURCE: August 2011, BrightSource Energy and CH2MHill

SOILS & SURFACE WATER - FIGURE 13
Hidden Hills Solar Electric Generating System (HHSEGS) – Cumulative Impacts Map



CALIFORNIA ENERGY COMMISSION - SITING, TRANSMISSION AND ENVIRONMENTAL PROTECTION DIVISION
SOURCE: BLM Southern Nevada District – Renewable Energy in Southern Nevada, BLM California – Renewable Energy Priority Projects