5.11 Soils

5.11.1 Introduction

The Hidden Hills Solar Electric Generating System (HHSEGS) will be located on privately owned land 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 administration, warehouse, and maintenance complex, and an onsite switchyard. A temporary construction laydown and parking area on the west side of the site will occupy approximately 180 acres.

Each solar plant 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. The solar power tower technology for the HHSEGS project design incorporates an important technology advancement, the 750-foot-tall solar power tower. One principle advantage of the HHSEGS solar power tower design is that it results in more efficient land use and greater power generation. The new, higher, 750-foot solar power tower allows the heliostat rows to be placed closer together, with the mirrors at a steeper angle. This substantially reduces mirror shading and allows more heliostats to be placed per acre. More megawatts can be generated per acre and the design is more efficient overall.

In each solar 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, unless augmented, will shut down when insolation drops below the level required to keep the turbine online. Each Plant will include a natural gas fired auxiliary boiler, used to augment the solar operation when solar energy diminishes or during transient cloudy conditions, as well as a startup boiler, used during the morning startup cycle, and a nighttime preservation boiler, used to maintain system temperatures overnight. On an annual basis heat input from natural gas will be limited by fuel use and other conditions to less than 10 percent of the heat input from the sun.

To save water in the site's desert environment, each solar plant will use a dry-cooling condenser. Cooling will be provided by air-cooled condensers, supplemented by a partial dry-cooling system for auxiliary equipment cooling. Raw water will be drawn daily from onsite wells located in each power block and at the administration complex. Groundwater will be treated in an onsite treatment system for use as boiler make-up water and to wash the heliostats.

Two distinct transmission options are being considered because of a unique situation concerning Valley Electric Association (VEA). Under the first option, the project would interconnect via a 230-kilovolt (kV) transmission line to a new VEA-owned substation (Tap Substation) at the intersection of Tecopa Road[1] and Nevada State Route (SR) 160

[1] The road is also called Tecopa Highway and Old Spanish Trail Highway. The names are generally used interchangeably.

(the Tecopa/SR 160 Option). The other option is a 500-kV transmission line that interconnects to the electric grid at the Eldorado Substation (the Eldorado Option), in Boulder City, Nevada.

A 12- to 16-inch-diameter natural gas pipeline will be required for the project. It will exit the HHSEGS site at the California-Nevada border and travel on the Nevada side southeast along the state line, then northeast along Tecopa Road until it crosses under SR 160. From this location a 36-inch line will turn southeast and continue approximately 26 miles, following the proposed Eldorado Option transmission line corridor, to intersect with the Kern River Gas Transmission (KRGT) pipeline. A tap station will be constructed at that point to connect it to the KRGT line. The total length of the natural gas pipeline will be approximately 35.3 miles.

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), except for small segments of the transmission line (both options) in the vicinity of the Eldorado Substation, which is located within the city limits of Boulder City, Nevada. A detailed environmental impact analysis of the transmission and natural gas pipeline alignments will be prepared by BLM.

This section is organized as follows: Section 5.11.2 describes the laws, ordinances, regulations, and standards (LORS) that may apply to soils and their land use. A discussion of the existing environment, including soil types in the project area (affected environment), is included in Section 5.11.3. The environmental analysis to determine potential impacts and potential cumulative impacts to soil resources due to construction and operation of the project are provided in Sections 5.11.4 and 5.11.5, respectively. Mitigation measures proposed for the project are provided in Section 5.11.6. Agencies and agency contacts are included in Section 5.11.7, and applicable permits and permit schedule are listed in Section 5.11.8. Section 5.11-9 provides the references cited in the preparation of this section.

5.11.2 Laws, Ordinances, Regulations, and Standards

Federal, state, and county LORS applicable to soils are summarized in Table 5.11-1 and are discussed below.

TABLE 5.11-1
Laws, Ordinances, Regulations, and Standards Applicable to Soils

LORS	Requirements/ Applicability	Administering Agency	AFC Section Explaining Conformance
Federal			
Federal Water Pollution Control Act of 1972: Clean Water Act of 1977 (including 1987 amendments)	Regulates stormwater discharge from construction and industrial activities	Lahontan RWQCB	Sections 5.11.2.1 and 5.11.4.2.
Natural Resources Conservation Service (1983), National Engineering Handbook, Sections 2 and 3	Standards for soil conservation	Natural Resources Conservation Commission	Sections 5.11.2.1 and 5.11.5.

TABLE 5.11-1
Laws, Ordinances, Regulations, and Standards Applicable to Soils

LORS	Requirements/ Applicability	Administering Agency	AFC Section Explaining Conformance
State			
Porter-Cologne Water Quality Control Act of 1972; Cal. Water Code 13260-13269: 23 CCR Chapter 9	Regulates stormwater discharge	Lahontan RWQCB	Sections 5.11.2.2 and 5.11.4.2
Local			
Inyo County, CA Code	Describes ordinances for grading and soil erosion control	Inyo County, CA	Section 5.11.1.3.1
Inyo County, CA General Plan	Describes ordinances for preventing wind and water erosion	Inyo County, CA - Public Works Building and Safety	Section 5.11.1.3.2

5.11.2.1 Federal LORS

5.11.2.1.1 Federal Water Pollution Control Act of 1972 and the Clean Water Act of 1977

The Federal Water Pollution Control Act of 1972, commonly referred to as the Clean Water Act following amendment in 1977, establishes requirements for discharges of stormwater or wastewater from any point source that would affect the beneficial uses of waters of the United States. The State Water Resources Control Board (SWRCB) has adopted statewide National Pollution Discharge Elimination System (NPDES) general permits that apply to stormwater discharges associated with construction, industrial, and municipal activities. The Regional Water Quality Control Board (RWQCB) is the administering agency for the NPDES permit program. The project will comply with the Clean Water Act through the preparation and implementation of both a Construction and an Industrial Stormwater Pollution Prevention Plan (SWPPP).

5.11.2.1.2 USDA Engineering Standards

The U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS), *National Engineering Handbook*, 1983, Sections 2 and 3 provide standards for soil conservation during planning, design, and construction activities. The project will comply with these standards during grading and construction to limit soil erosion.

5.11.2.2 State LORS

5.11.2.2.1 California Porter-Cologne Water Quality Control Act

The California Water Code requires protection of water quality by appropriate design, sizing, and construction of erosion and sediment controls. The discharge of soil into surface waters resulting from land disturbance may require filing a report of waste discharge (see Water Code Section 13260a). No discharges of soil into surface waters are anticipated, and thus, no waste discharge permit is anticipated.

5.11.2.3 Local LORS

5.11.2.3.1 Inyo County Code

Inyo County has established ordinances for grading and soil erosion control. These ordinances apply to the HHSEGS project area. The Inyo County ordinances provide the means for controlling soil erosion, sedimentation, and increased rates of water runoff and related environmental damage by establishing minimum standards. Permits may be required if the project area is deemed to be within a flood-related erosion-prone area (14.29.240). Grading permits may be required if more than 5 acres of land will be graded; if more than 5 acres will be graded the project may not be exempt from CEQA Guidelines (15.24.030). The county code also outlines the reclamation/revegetation plan that may be required for renewable energy developments, which includes consideration of soil type (21.20.030). The project will comply with these ordinances during grading and construction to control soil erosion.

5.11.2.3.2 Inyo County General Plan

The Inyo County General Plan includes goals and policies for the protection of soil and air resources by preventing wind and water erosion. The Conservation/Open Space Element outlines goals for minimizing soil erosion due to wind and water related to new development, and the Public Safety Element outlines goals and implementation measures to prevent dust while construction grading. Air Quality Implementation Measure 4.0 requires contractors to implement dust suppression measures during excavation, grading, and site preparation activities. The project will comply with the General Plan goals and policies to prevent wind and water erosion and protect soil and air resources.

5.11.3 Affected Environment

The HHSEGS site is located in Inyo County, California, on private land that has been partially disturbed as part of a previously approved residential development. Although the residential development was never completed, gravel roads were installed in a grid pattern that remains to the present date. The remainder of the site is mostly bare soil with sparse natural vegetation that is similar to the surrounding area.

In addition to the road grid, a few lots outside of the project site have been developed. In total, there are fewer than 50 houses and trailers in this area. The nearest residence to the HHSEGS property boundary is approximately 300 feet west of the fenceline. 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.

5.11.3.1 Soil Types within the Study Area

Detailed NRCS soil survey data were not available for the project site; therefore the U.S. General Soil Map (STATSGO2; NRCS, 2006) was used to estimate soils properties. Soil units at the project site and within a 1-mile buffer surrounding the project boundary are shown in Figure 5.11-1. The U.S. General Soil Map shows general soil units that are groupings of soil types that would likely be found together in a landscape. Table 5.11-2 summarizes potential characteristics of the soils identified by the U.S. General Soil Map as likely to be found at the project site.

Because of the general nature of this information, it is recommended that an onsite investigation be completed to verify soil types and characteristics at the project site. A preliminary geotechnical investigation has been completed for the site, and is included as Appendix 5.4A (Ninyo and Moore, 2011).

TABLE 5.11-2
Soil Mapping Unit Descriptions and Characteristics

Map Unit	Description	
S5740	**Tencee-Rumpah-Nopah-Haymont-Glencarb-Besherm**	
	The project site and portions of both transmission line options cross this soil unit. STATSGO map units include soils that are geographically located together in the landscape, but include several types of parent materials, landforms, typical profiles, slopes, etc.	
	The following information is from the series ("soil type") specific OSDs (NRCS, 2011), and is included to give the reader a general idea of the soil characteristics that may be found on-site.	
	Tencee Series	
	Parent material:	Gravelly alluvium derived from mixed sources
	Landforms:	Terrace remnants and sides of ridges
	Typical profile:	Very gravelly sandy loam over indurated material over extremely gravelly sandy clay loam
	Slope:	0 to 40 percent
	Depth and drainage:	Shallow to petrocalcic; well drained
	Permeability:	Moderate over very slowly permeable petrocalcic
	Runoff:	Very high
	Taxonomic class:	Loamy-skeletal, carbonatic, thermic, shallow Calcic Petrocalcids
S5740	**Rumpah Series**	
	Parent material:	Alluvium from mixed sources
	Landforms:	Old lake plains
	Typical profile:	Clay throughout
	Slope:	0 to 2 percent
	Depth and drainage:	Very deep; well drained
	Permeability:	Very slow
	Runoff:	Slow
	Taxonomic class:	Fine, smectitic, thermic Sodic Haplotorrerts
S5740	**Nopah Series**	
	Parent material:	Alluvium from mixed rock sources
	Landforms:	Inset fans, fan skirts, and alluvial flats
	Typical profile:	Loam over silt loam and silty clay loam
	Slope:	0 to 8 percent slope
	Depth and drainage:	Very deep; well drained
	Permeability:	Slow
	Runoff:	Slow
	Taxonomic class:	Fine-silty, carbonatic, thermic Typic Torriortherts
S5740	**Haymont Series**	
	Parent material:	Mixed rock sources
	Landforms:	Fan skirts, alluvial flats, axial stream floodplains, and lake plains
	Typical profile:	Very fine sandy loam over silt loam and very fine sandy loam
	Slope:	0 to 4 percent slope
	Depth and drainage:	Very deep; well drained
	Permeability:	Moderate
	Runoff:	Slow
	Taxonomic class:	Coarse-silty, mixed, superactive, calcareous, thermic Typic

TABLE 5.11-2
Soil Mapping Unit Descriptions and Characteristics

Map Unit	Description	
S5740	**Glencarb Series**	
	Parent material:	Mixed alluvium with a large component of calcareous materials
	Landforms:	Flood plains, low stream terraces, and basin floors
	Typical profile:	Silt loam over silty clay loam
	Slope:	0 to 2 percent slopes
	Depth and drainage:	Very deep; well drained
	Permeability:	Moderately slow
	Runoff:	Low
	Taxonomic class:	Fine-silty, carbonatic, thermic Typic Torrifluvents
S5740	**Besherm Series**	
	Parent material:	Alluvium from mixed rock sources
	Landforms:	Old lake plains
	Typical profile:	Clay loam over clay
	Slope:	0 to 8 percent slopes
	Depth and drainage:	Very deep; well drained
	Permeability:	Slow
	Runoff:	Slow
	Taxonomic class:	Fine, carbonatic, thermic Typic Haplocalcids

Note: Soil characteristics are based on soil mapping provided in the published online soil survey (NRCS, 2006) and a review of corresponding OSDs (NRCS, 2011). Soil map units described above are limited to those mapped in the vicinity of the HHSEGS project site.

Soils in the project area have a variety of characteristics depending on landform and location. Land uses for these soils are generally limited to pasture, range, or wildlife habitat. Natural vegetation is expected to be sparse and dominated by salt- and drought-tolerant species. As such, the revegetation potential of disturbed areas not covered by permanent facilities will likely be challenging and will require suitable plants and establishment techniques.

5.11.3.2 Agricultural Use On and Around the HHSEGS Site

The HHSEGS site is not located in an area that is used for agricultural production. A small, abandoned orchard was formerly located in the south-central portion of the project site (Appendix 5.4A; Ninyo and Moore, 2011). It is unknown how long the orchard functioned or when it was abandoned. None of the potentially affected areas are designated as Important Farmlands by the NRCS.

5.11.4 Environmental Analysis

5.11.4.1 Soil Loss and Erosion

Construction activities may affect soil resources by increasing soil erosion and compaction. Soil erosion primarily removes topsoil and can increase the sediment load in surface receiving waters downstream of the construction site. The magnitude, extent, and duration of construction-related impacts depends on the erodibility of the soil; the proximity of the construction activity to the receiving water; and the construction methods, duration, and season.

Conditions that favor excessive soil erosion are present at the HHSEGS site; this creates a potential for significant soil erosion during the construction period. To reduce this erosion potential, best management practices (BMPs) will be implemented in accordance with the SWPPP that is required for all construction projects over 1 acre by the RWQCB.

The California Energy Commission (CEC) also requires that project owners develop and implement a drainage, erosion, and sediment control plan (DESCP) to reduce the impact of runoff from the construction site. Monitoring will involve periodic inspections to ensure that the BMPs described in the SWPPP/DESCP are being properly implemented and are effective. Implementation of these erosion prevention and control plans is expected to significantly reduce soil erosion; however, the overall anticipated soil loss from the project during construction may still be considerable given of the size of the disturbed area. Estimates of erosion by water and wind are provided in the following sections.

5.11.4.2 Water Erosion

An estimate of soil loss at the project site during construction by water erosion is provided in Table 5.11-3. This estimate was developed using the Revised Universal Soil Loss Equation (RUSLE2) program using the following assumptions. Detailed calculations and assumptions for the soil loss estimates are found in Appendix 5.11A.

Assumptions:

- Active grading at the HHSEGS site will occur over a 6-month period. The soil in this area will then be exposed for an additional 23 months during the construction period, after which the majority of the site will either be paved or covered with HHSEGS facilities. It is assumed that around one-tenth of the project site will have bare soil exposure during the construction period.
- Estimates of soil loss (in tons) were made for the site-specific soil mapping unit characteristics that were available within the RUSLE2 database.
- RUSLE2 rainfall erosivity conditions were estimated for the HHSEGS site coordinates using site-specific rainfall estimates from online National Oceanic and Atmospheric Administration data (NOAA Atlas 2) online at http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html (verified April 17, 2011). A 100-foot slope length was assumed for all soil units. The median of each soil unit slope class was used for the RUSLE calculations.

Soil losses for the project site were estimated using the following RUSLE2 conditions:

- **Construction** soil losses were approximated using Management as “bare ground, smooth surface;” Contouring: None, rows up and down hill; Diversion/terracing: None; and Strips and Barriers: None.
- **Grading** soil losses were approximated using Management as “bare ground, rough surface” soil conditions; Contouring: None, rows up and down hill; Diversion/terracing: None; and Strips and Barriers: None.

- **Construction** soil losses **with implementation of construction BMPs** was approximated using Management as "Silt fence;" Contouring: Perfect, no row grade; Diversion/terracing: None; and Strips and Barriers: two silt fences, one at end of RUSLE2 slope.
- A **"No Project"** soil loss estimate was also approximated using Management as "Dense grass – not harvested;" Contouring: Rows up and down hill; Diversion/terracing: None; and Strips and Barriers: None.

The estimated soil loss at the project site by water erosion is 562 tons without the use of construction BMPs. With the implementation of construction BMPs, (examples described in Section 5.11.6.1 and 5.11.6.2), the total estimated soil loss from the project site is significantly reduced to approximately 12.1 tons over the same period.

It should be recognized that these estimates of accelerated soil loss by water are very conservative (i.e., will tend to overestimate of soil loss) because they assume a single BMP (i.e., straw wattles); whereas, an actual SWPPP will require the implementation of multiple soil erosion control measures.

TABLE 5.11-3
Estimate of Soil Loss by Water Erosion from Project Site Using Revised Universal Soil Loss Equation (RUSLE2)

			Estimates Using Revised Universal Soil Loss Equation*		
Feature (acreage)	**Activity**	**Duration (months)**	**Soil Loss (tons) without BMPs**	**Soil Loss (tons) with BMPs**	**Soil Loss (tons/year) No Project**
Project Site (3,097 acres total; 389 acres to be graded)	Grading	6	195	2.3	0.43
	Constr.	23	328	8.9	—
Temporary Construction Area (180 acres total; 29 acres to be graded)	Grading	6	14.5	0.17	0.03
	Constr.	23	24.5	0.67	—
Project Soil Loss Estimate	**TOTAL**	29	**532**	**12.1**	**0.5**

Notes:
*Soil losses (tons/acre/year) are estimated using RUSLE2 software available online at http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm

The soil characteristics were estimated using RUSLE2 soil profiles corresponding to the mapped soil unit.
- Soil loss (R-factors) were estimated using 2-year, 6-hour point precipitation frequency amount for the nearest National Weather Service station to the HHSEGS site (online at http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html
- Estimates of actual soil losses use the RUSLE2 soil loss times the duration and the affected area. The No Project Alternative estimate does not have a specific duration so loss is given as tons/year

Other Project Assumptions:
- It is assumed that grading for the project site will take 6 months and construction will take 23 months.
- It is assumed that grading of the temporary construction area will also take 6 months, and then the site will be covered with temporary buildings and material so that soil loss will be negligible during the remaining 23 months of the construction period

5.11.4.3 Wind Erosion

The potential for wind erosion of surface material was estimated by calculating the total suspended particulates (TSP) or "fugitive dust" that could be emitted as a result of wind erosion of exposed soil, active excavation of exposed soil, and construction vehicle travel on exposed soil. TSP emissions were estimated from the calculations of construction emissions of particulate matter with a diameter of less than ten microns (PM_{10}). A conversion factor of 3.3 was used to convert PM_{10} to TSP, which is the ratio of particle size constants listed in AP-42, Table 13.2.2-2 (U.S. Environmental Protection Agency, 1995; also in Table 11.9-4 in Bay Area Air Quality Management District, 2005).

Fugitive dust emissions from wind erosion of exposed soil were calculated using the emission factor contained in the report entitled, "Improvement of Specific Emissions Factors (BACM Project No. 1), Final Report" (MRI, 1996), using the expected maximum exposed soil areas during scraping and grading activities.

Fugitive dust from the active excavation of exposed soil (site grading and scraping) was calculated using the emission factors contained in AP-42, Section 11.9, Table 11.9.1, and the expected duration of scraping and grading activities.

Fugitive dust from construction vehicle travel on exposed soil was calculated using the equations in AP-42, Section 13.2.2, using the expected construction equipment operating schedule.

Mitigation measures, such as watering exposed surfaces, will be used to reduce fugitive dust emissions during construction activities. The reduction efficiency of these measures was derived according to the method described in "Control of Open Fugitive Dust" (EPA, 1988) and reflects the effectiveness of two mitigation measures. Table 5.11-4 summarizes the mitigation measures and expected efficiencies that were applied to the emission calculations.

TABLE 5.11-4
Mitigation Measures for Fugitive Dust Emissions

Mitigation Measure	Fugitive Dust Emission Reduction Efficiency	Efficiency Applied
Water active sites at least four times daily	61%	
Enclose, cover, water three times daily, or apply non-toxic soil binders, according to manufacturer's specifications, to exposed piles (i.e., gravel, sand, dirt) with 5 percent or greater silt content	84%	
Combination of above	85%	85%

Source: SCAQMD, 1993: Table 11-4.

Table 5.11-5 summarizes the fugitive dust predicted to be emitted from the site from grading and the wind erosion of exposed soil, after the application of the above mitigation. Without mitigation, the maximum predicted wind erosion of material from the site is estimated to be 194.7 tons over the course of the project construction cycle. This estimate is greatly reduced to approximately 29 tons by implementing a single, basic mitigation measure, such as water and soil stabilizer application. These estimates are conservative

because they make use of emission rates for a generalized soil rather than site-specific soil properties, and assume the worst-case for blowing conditions.

TABLE 5.11-5
Estimate of Total Suspended Particulates Emitted from Grading and Wind Erosion at Project Site

Emission Source	Affected Acreage	Unmitigated TSP (tons)	Mitigated TSP (tons)
Grading and Construction Vehicle Dust			
Project Site	412	125.6	18.7
Temporary Construction Area	180	69.1	10.3
Estimated Total		**194.7**	**29.0**

Project Assumptions:

Grading for the project site is estimated to involve 2,528 acre-months of disturbance.

Sources: PM10 Emission Factor Source: Midwest Research Institute, South Coast AQMD Project No. 95040, Level 2 Analysis Procedure, March 1996; EPA, AP-42 Sections 11.9 and 13.2.2 and EPA, "Control of Open Fugitive Dust Sources", September 1988.

It is expected that the same BMPs that will be instituted to prevent erosion and sedimentation from exposed soil areas during precipitation events will also reduce offsite soil movement by wind. These BMPs are described in the preliminary DESCP/SWPPP (Appendix 5.15A) and will be finalized during final project design prior to construction. Even with the implementation of proposed mitigation measures, the potential for wind-related impacts on soil erosion are considerable.

5.11.4.4 Other Notable Soil Characteristics

One characteristic of the project site soils is their expected low suitability to support revegetation. These soils will likely have severe limitations for cultivation and have soil limitations in the rooting zone, limitations due to climate, or have limitations due to their risk for erosion. For this reason, the Applicant will implement mitigation measures to minimize soil disturbance and accelerate revegetation, as described in Section 5.11.4.6.

To minimize adverse effects on soil, it will be necessary to segregate and stockpile surface soils and organic matter during construction and excavation. These soils will be used to reconstitute areas that will be revegetated after construction. In addition to the proper choice of plants and establishment techniques, soil amendments (i.e., fertilizers) could be considered to favor revegetation success.

The Phase I Environmental Site Assessment (Appendix 5.14A; Ninyo and Moore, 2011) concluded that there were no recognized environmental conditions associated the project site. However, given the historical use of a portion of the site as an orchard prior to 2005, there is a potential for soils within this area to contain residual levels of persistent agricultural pesticides, such as organochlorine or metal-base (i.e., lead arsenate) pesticides. 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 to construction or site workers.

Cut and fill for grading will occur from within the site. There will be no borrow sites outside of the project site.

5.11.4.5 Impacts on Jurisdictional Wetlands

Ephemeral drainages, which transmit water in response to infrequent (and potentially high intensity) rainfall events, cross state lines between Nevada and California and, for the most part, terminate on the eastern portion of the project site. These drainages are isolated with no hydrologic connectivity to a downstream traditional navigable Water of the U.S. (TNW); additionally, the onsite drainages would not have any effect on the biological, chemical, or physical integrity of a downstream TNW. Therefore, the ephemeral drainages on the project site are not likely to be regulated by the U.S. Army Corps of Engineers under the Clean Water Act; however, these features could be considered jurisdictional by the RWQCB and California Department of Fish and Game (CDFG) as a waters of the State. The jurisdictional status of onsite washes, as well as potential permitting requirements, are addressed in Section 5.2, Biological Resources.

5.11.4.6 Construction

The technology proposed for this project allows for several strategies to reduce environmental impacts and take advantage of the site's natural attributes, as follows:

- Cutting vegetation to a height that will not interfere with construction and operation of the heliostat fields but not clearing or grading the entire field
- Restricting clearing and grading activities to areas where foundations, drainage facilities, and all-weather roads must be placed
- Taking advantage of the natural permeability of the soils at the site by minimizing compaction and decompacting soils where necessary
- Implementing a revegetation and rehabilitation program to accelerate the return of areas that have been temporarily disturbed to a vegetated state
- Implementing a stormwater control design that promotes sheet flow and greater infiltration

5.11.4.6.1 Vegetation Clearing and Cutting

To construct the heliostat array fields located within these sites, some vegetation clearing will occur but only where necessary to allow for equipment access and stormwater management. In areas where general site grading is not required, vegetation clearing will not occur, except for the drive zones, which will be grubbed, bladed, and smoothed.

An approximate 8- to 12-foot-wide linear swath of vegetation along the entire outer edge of the area to be developed will be cleared and grubbed (but not graded except as required for safe passage of vehicles) to create an internal perimeter path for installation of the tortoise exclusion and security fencing. Vegetation clearing, with leveling or grading limited to arroyo walls will be performed throughout the site beneath the heliostats where the existing vegetative cover will not permit access of installation equipment and materials.

Other than areas required for access roads and drive zones, if vegetation is taller than 18 inches, it will be cut to a height of approximately 12 to 18 inches to allow clearance for heliostat function and, at the same time, leave the soil surface and root structures intact. The vegetation will be cut with a mower. Occasional trimming of the vegetation may be required

during the operational phase of the project to control plant regrowth that could affect heliostat mirror movement.

Clearing and grubbing (where shrubs including roots are removed) will be performed in different portions of the project site, as follows: maintenance roads for each facility; drive zone paths; the power blocks; in the common area or temporary construction area where the existing topography must be modified to make suitable parking; building pads, and laydown areas; in the graded portions of Solar Plants 1 and 2; and to provide access for installation equipment and materials during construction (areas requiring leveling by grading). For all other areas, existing vegetation (and root systems) will be maintained to anchor the soil and reduce the potential for erosion. Where existing site topography is favorable, the natural drainage features will be maintained.

5.11.4.6.2 General Grading and Leveling

On the project site, grading will be required in some areas to construct safe roadways for equipment and vehicles. In addition, heavy to medium grading will be performed in the following areas: within the solar project's power blocks; for the switchyard; within the administration complex; and for the heliostat assembly buildings.

The deepest excavations will be restricted to foundations and sumps. Within each of these areas, earthwork cuts and fills will be balanced to the extent possible. The earthwork within the power blocks and common area will be excavated and compacted to the recommendations of the associated geotechnical report.

The surface soil grade of each facility will be designed to provide the minimum requirements for access of installation equipment and materials during site construction and operations. Most of the natural drainage features will be maintained and any grading required will be designed to promote sheet flow where possible. Areas disturbed by grading and other ground disturbance will be protected from erosion by implementation of appropriate BMPs that will be identified in the project's Construction SWPPP.

5.11.4.6.3 Storm Drainage System

The majority of the project site will 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, and administration complex, the stormwater management system will include diversion channels, bypass channels, and/or swales to direct run-on flow from up-slope areas and run-off flow through and around each facility.

Diversion channels will be designed so that a minimum ground surface slope of 0.5 percent will be provided to allow positive, puddle-free drainage. To reduce erosion, storm drainage channels may be lined with a nonerodible material such as compacted rip-rap, geo-synthetic matting, or engineered vegetation. The design will 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 will be controlled in accordance with the requirements of the DESCP/SWPPP, and all other applicable LORS.

5.11.4.6.4 Erosion and Sediment Control Measures

Protection of soil resources will be an important factor in the design of the erosion and sedimentation controls. To minimize wind and water erosion, open spaces will be preserved

and left undisturbed maintaining existing vegetation (to the extent possible with consideration of site topography and access requirements). To minimize the potential for an increase in surface runoff, areas compacted during construction activities will be restored, as appropriate, to approximate preconstruction compaction levels.

If needed, stone filters and check dams will be strategically placed throughout the project site to provide areas for sediment deposition and to promote the sheet flow of stormwater prior to leaving the project site boundary. Where available, native materials (rock and gravel) will be used for the construction of the stone filter and check dams. Diversion berms will be used to redirect stormwater around critical facilities, as required.

Periodic maintenance will be conducted as required after major storm events and when the volume of material behind the check dams exceeds 50 percent 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.

5.11.4.7 Operation

Project operation will not result in impacts to the soil from erosion or compaction. Routine vehicle traffic during project operation will be limited to existing roads. Access to the heliostat arrays to permit bi-weekly washing of the mirrors is described in Section 5.1, Air Quality. These same routes will be used for the occasional cutting of vegetation to reduce the risk of fire due to plant regrowth.

When linear facilities need to be inspected or maintained, vehicle traffic near these areas will be limited to the extent necessary to perform the inspection or maintenance activity. Impacts to soil from project operations will be less than significant.

5.11.4.8 Effects of Generating Facility Emissions on Soil-Vegetation Systems

HHSEGS will rely on energy from the sun to produce steam-generated power. However, during times of low solar energy, natural gas may be used as a temporary back up for thermal stability of the equipment. Emissions, principally nitrogen oxides (NO_x), from the auxiliary boilers could have a potential adverse effect on soil-vegetation systems where environments, such as serpentine habitats, that are highly sensitive to nutrients (e.g., from nitrogen deposition) are downwind of the project.

However, because there are no serpentine habitats in or surrounding the project area and because the amount of additional nitrogen to the area will be very small, the expected impact of operation of HHSEGS on soil-vegetation systems is expected to be less than significant.

5.11.5 Cumulative Effects

Potential cumulative impacts on soils from the project are primarily related to increased soils disturbance that could lead to increased soil erosion. Impacts from soil disturbance are expected to occur primarily during construction. After construction is complete and erosion control BMPs are implemented, soil erosion on the site is expected to be less than current, natural conditions.

It is expected that other projects that could contribute to a cumulative impacts analysis will also be required to employ construction and operational BMPs and to comply with applicable federal, state, and local LORS. Therefore, it is unlikely that HHSEGS will have combined cumulative impacts on soils with other closely related past, present, and reasonably foreseeable future projects.

5.11.6 Mitigation Measures

Erosion control measures will be required during construction to prevent accelerated soil erosion or dust generation that could reduce soil productivity and to maintain water quality. Temporary erosion control measures will be implemented before construction begins and will be maintained and evaluated throughout the construction period. These temporary measures will be removed from the site after the completion of construction and, where needed, replaced by permanent control measures.

5.11.6.1 Temporary Erosion Control Measures

Prior to the start of construction, the Applicant will finalize the DESCP/SWPPP and implement the temporary erosion control measures and BMPs designed to minimize soil erosion and sediment transport during construction. The DESCP/SWPPP will require the implementation of construction BMPs to minimize and control soil erosion and minimize its transport offsite.

Examples of temporary erosion control measures that could be included in the final DESCP/SWPPP typically include revegetation, dust suppression, and sediment barriers. Potential temporary erosion control measures are described below.

- **Revegetation**—Vegetation is the most efficient form of erosion control because it keeps the soil in place and maintains the landscape over the long term. Vegetation reduces erosion by absorbing raindrop impact energy and holding soil in place with fibrous roots. It also reduces runoff volume by decreasing erosive velocities and increasing infiltration into the soil. Due to the dry and sandy conditions of the soil, drought-tolerant species and establishment procedures that are suited to this environment will be required for revegetation.

- **Dust Suppression**—During construction of the project, dust erosion control measures will be implemented to minimize the wind-blown erosion of soil from the site. Local well water will be sprayed on the soil in construction areas to control dust and during revegetation.

- **Sediment Barriers**—Sediment barriers, such as straw bales, sand bags, mulched vegetation, berms, and ditches, slow runoff and trap sediment. Sediment barriers are generally placed below disturbed areas or at the base of exposed slopes. Sediment barriers are most often placed around sensitive areas, such as wetlands or washes, to prevent contamination by sediment-laden water. Some barriers will be placed in locations where offsite drainage will occur to prevent sediments from leaving the site. However, due to the presence of desert tortoise, use of silt fences will be minimized.

If used, straw bales will be properly installed (staked and keyed), then removed or used as mulch after construction. Runoff infiltration/evaporation areas, drainage diversions, and

other large-scale sediment traps will be considered due to the level of grading and excavation that will occur at the power block areas. Any soil stockpiles will be stabilized and covered, if left onsite for long periods of time. This could include the placement of sediment barriers around the base of the stockpiles, a method that can be employed during trenching operations for the transmission lines.

5.11.6.2 Permanent Erosion Control Measures

Permanent onsite erosion control measures could include drainage, infiltration/evaporation systems, slope stabilization, check dams, stone filter rings, and long-term revegetation. If soil conditions permit, revegetation will follow from planting for short-term erosion control. Revegetation of the area disturbed by construction will be accomplished using locally prevalent, non-invasive, fast-growing plant species compatible with adjacent existing plant species.

As described in Section 5.15, Water Resources, the Applicant will finalize and implement an Industrial SWPPP to avoid or mitigate water quality impacts that could result from project operations. Under the Industrial SWPPP, operations at the solar plant site will be conducted in accordance with the statewide General Industrial Permit. The Industrial SWPPP will include a suite of BMPs that will include steps to identify and mitigate pollutants and conditions of concern, as well as inspections, monitoring, and sampling per the permit requirements.

Compliance with the Industrial SWPPP will ensure that operation-related soils impacts are less than significant. See Section 5.1, Air Quality, for information on fugitive dust control measures and mitigation.

5.11.7 Involved Agencies and Agency Contacts

Agency contacts are shown in Table 5.11-6.

TABLE 5.11-6
Agency Contacts for Soils

Issue	Agency	Contact
Approval of Grading Plan and Issuance of Grading Permit	Inyo County Public Works	Paul Hancock, Engineer Assistant Inyo County Public Works P.O. Box Q Independence, CA 93526 (760) 878-0208 (office) (760) 937-6072 (cell)

5.11.8 Permits Required and Permit Schedule

A grading permit will generally be required from Inyo County because of the large total affected area for the HHSEGS project site. However, the CEC licensing process supersedes the need to obtain local permits. Table 5.11-7 lists the applicable land use permits and permit schedule.

TABLE 5.11-7
Permits Required and Permit Schedule for Soils

Permit	Agency Contact	Schedule
County Grading Permit	Paul Hancock, Engineer Assistant Inyo County Public Works PO Box Q Independence, CA 93526 (760) 878-0208 (office) (760) 937-6072 (cell)	Estimated 6 months from submittal of complete application
Construction Requirements Pertaining to Soil	Kathleen O'Connell, Realty Specialist, Lands Department, BLM 101 W. Spikes Road Needles, CA 92363 (760) 326-7000 email: koconnel@ca.blm.gov	Estimated 12 months from approval of the right-of-way application

5.11.9 References

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National Oceanic and Atmospheric Administration. 2011. Precipitation Data. Hydrometeorological Design Studies Center, Precipitation Frequency Data Server. Available at: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html (verified April 4, 2011).

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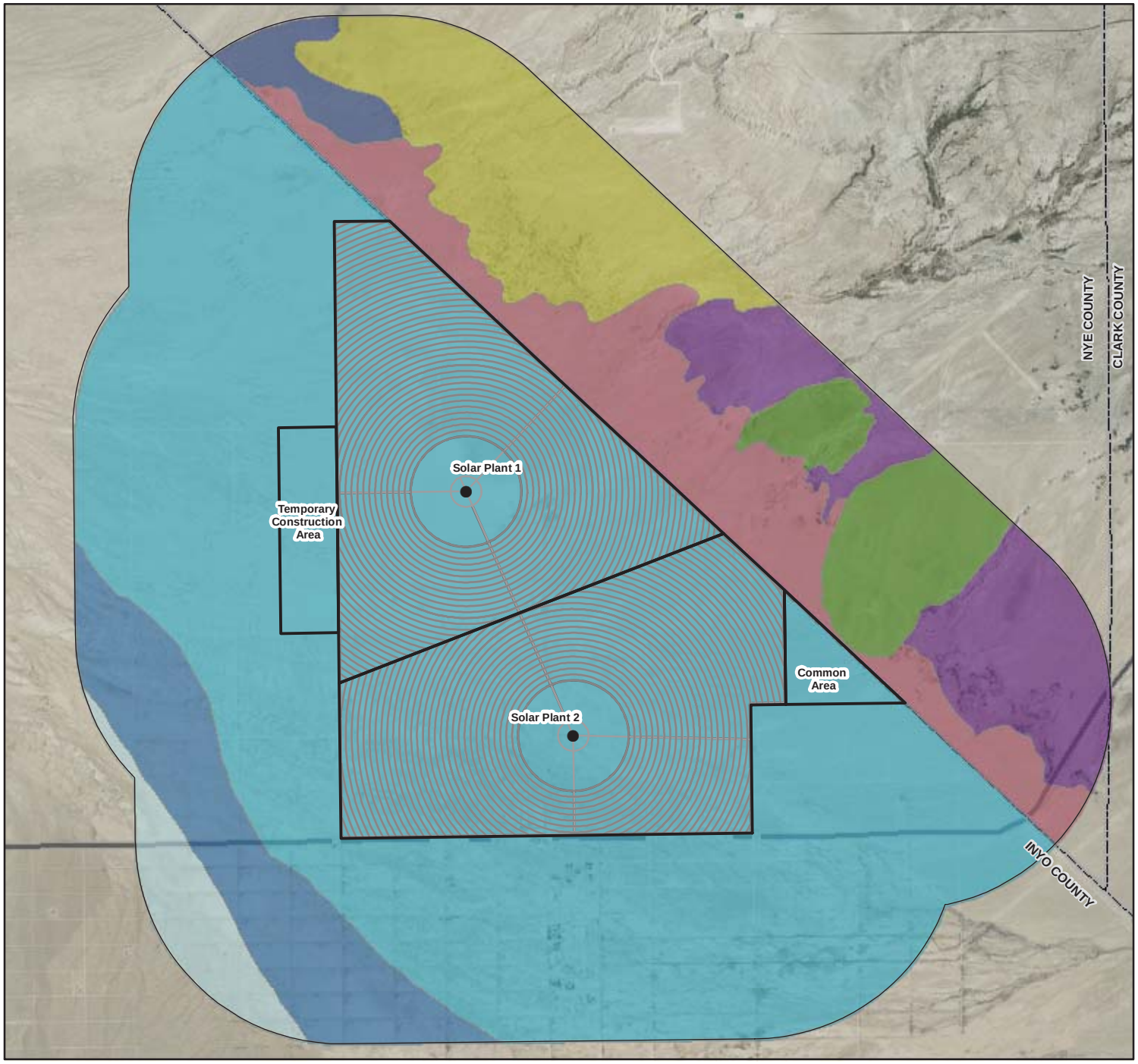

LEGEND

- Solar Power Tower

Roads and Trails

- Major Road

Project Site Data

- HHSEGS Boundary
- HHSEGS Buffer (1 mile)

Soil Units Within 1 mile

- Corbilt gravelly loamy fine sand, 0 to 4 percent slopes
- Crosgrain-Vace association
- Pahrump-Wodavar-Vegastorm association
- Tanazza-Wechech-Wodavar association
- Wechech-Nopah-Yermo association

Nye and Inyo County Soils (STATSGO)

- Bluepoint-Arizo (s1123)
- Playas (s1038)
- Tencee-Rumpah-Nopah-Haymont-Glencarb-Besherm (s5740)

N

0 2,000 4,000
Feet

FIGURE 5.11-1
Soils Within 1-mile of HHSEGS
Hidden Hills Solar Electric Generating System

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