

8.11 SOILS AND AGRICULTURE

This section presents an evaluation of the potential environmental effects from construction and operation of the proposed Russell City Energy Center (RCEC), Advanced Wastewater Treatment (AWT) Plant, and linear facilities on soils and agriculture. The RCEC will be located near San Francisco Bay in Hayward, California. Hayward is located in the western part of Alameda County. The impact assessment includes the approximate 14.7-acre site for the RCEC and AWT plant as well as the corridor for the 16-inch natural gas pipeline, the 230-kV electric transmission line, and the water supply and wastewater return pipelines.

Section 8.11.1 describes the existing environment that the project may affect. Section 8.11.2 identifies potential environmental impacts resulting from construction and operation of the RCEC and AWT plant. Section 8.11.3 discusses potential cumulative impacts, and Section 8.11.4 describes proposed mitigation measures. Section 8.11.5 addresses laws, ordinances, regulations, and standards (LORS) applicable to geological resources and hazards. Section 8.4.6 describes the agencies involved and provides agency contacts, and Section 8.4.7 describes the permits required and a schedule for obtaining such permits. Section 8.11.8 contains a list of references cited.

8.11.1 Affected Environment

The RCEC and AWT plant will be located on a 14.7-acre site at 3590 and 3636 Enterprise Avenue in the City of Hayward. The site consists of artificially drained soils formed from alluvium. This land is naturally high in salts, and is not designated by the California Department of Conservation as Prime Farmland or Farmland of Statewide Importance. Land along the electric transmission line, natural gas pipeline, and water supply and discharge pipeline routes is very similar to the RCEC and AWT plant site in soil type. The project site does not include publicly owned lands for which there is an adopted policy preventing non-agricultural use (California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program 1994).

8.11.1.1 Soil Resources

Identification of soil types and their distribution was accomplished primarily through a review of maps provided by the U.S. Soil Conservation Service (now called the Natural Resources Conservation Service [NRCS]). Figure 8.11-1 is a detailed map of the surficial soils in the project area. The soil map units associated with the RCEC facility, AWT plant, electric transmission line, water supply and wastewater discharge pipelines, and natural gas pipeline route are listed in Table 8-11-1. Table 8.11-2 provides a detailed summary of the physical and chemical characteristics of each soil type identified from the project site. This information was obtained from the Soil Survey of Alameda County, California, Western Part (SCS 1981).

RCEC Plant Site

The power plant site is entirely situated within the Reyes clay, drained soil type series (Figure 8.11-1). These soils tend to be very deep, exhibit level to nearly level topography, and are poorly to very poorly drained clays formed in tidal flats. Reyes clay soils have a high potential for shrinking and swelling.

Electrical Transmission Line and Eastshore Substation—The new overhead transmission lines will run east on Enterprise Avenue from the RCEC plant switchyard to the existing 115-kV transmission corridor, then 1.1 miles south to PG&E's existing Eastshore Substation. The line is situated within the

Table 8.11-1. Soil mapping unit identified by project component.

Project Component	Soil Mapping Unit
RCEC and AWT plant	139 - Reyes clay, drained
Electric Transmission Line	111 - Danville silty clay loam, 0 to 2 percent slopes 139 - Reyes clay, drained 143 - Sycamore silt loam, drained 154 - Willows clay, drained
Natural Gas Pipeline Route	107 - Clear Lake clay, 0 to 2 percent slopes 111 - Danville silty clay loam, 0 to 2 percent slopes 139 - Reyes clay, drained 154 - Willows clay, drained
Water Supply Pipeline	139 - Reyes clay, drained
Construction Laydown and Worker Parking	107 - Clear Lake clay, 0 to 2 percent slopes 111 - Danville silty clay loam, 0 to 2 percent slopes 139 - Reyes clay, drained 154 - Willows clay, drained

Danville, Reyes, Sycamore, and Willows series (Figure 8.11-1). These soils are usually very deep, well to very poorly drained clays, silty clays, silt loams, and silty clay loams formed on nearly level to sloping (less than 9 percent) ground in low alluvial terraces, tidal flats, flood plains, and basin rims. These soils exhibit a moderate-to-high potential for shrink-swell behavior.

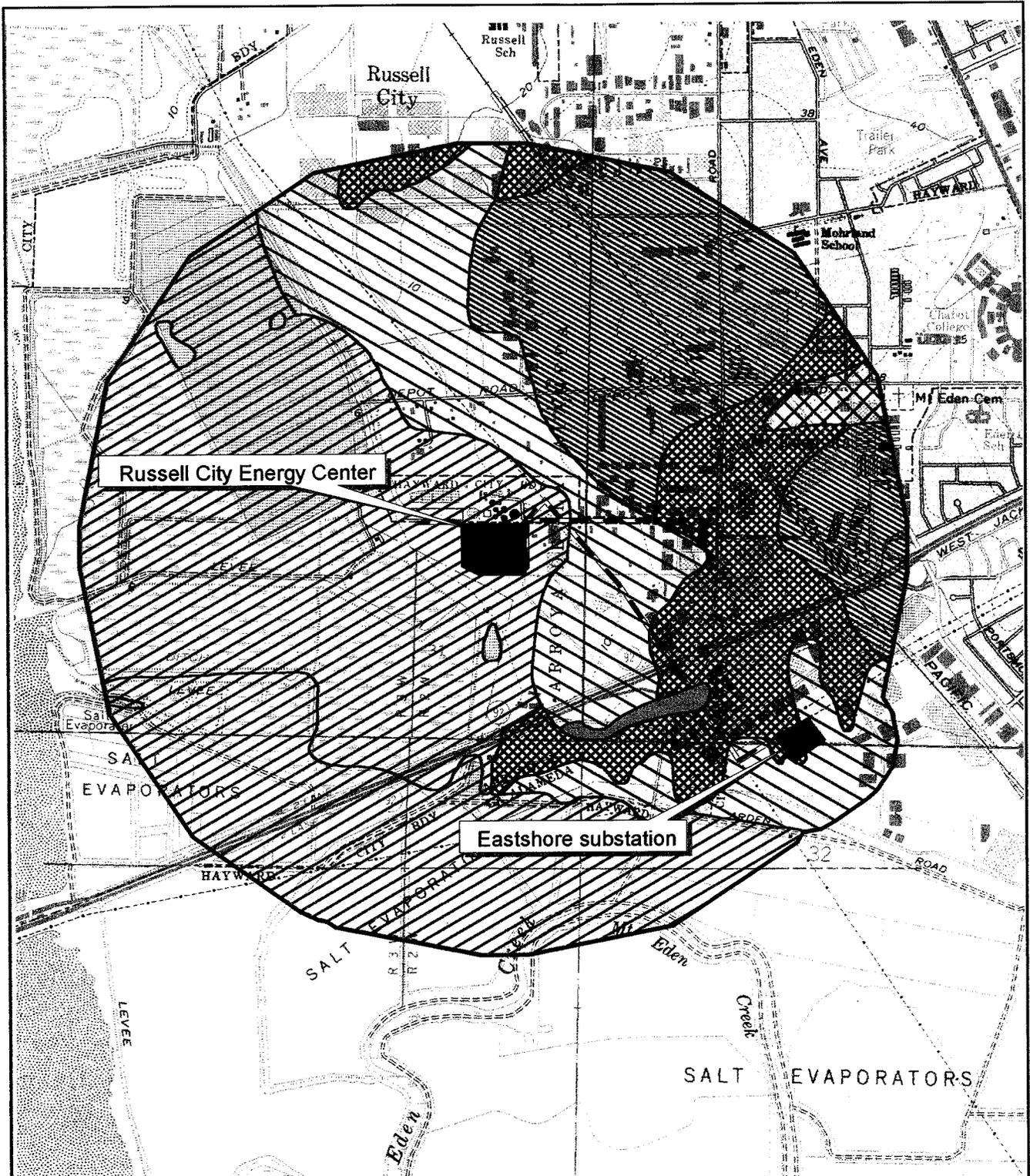
Natural Gas Pipeline—The proposed natural gas pipeline route crosses several soil series, including the Clear Lake, Danville, Reyes, and Willows (Figure 8.11-1). These soils are usually very deep, well to very poorly drained clays, silty clays, clay loams, silt loams, and silty clay loams formed on nearly level to sloping (less than 9 percent) ground in low alluvial terraces, tidal flats, flood plains and basin rims. These soils exhibit a moderate-to-high potential for shrink-swell behavior. Construction of the gas pipeline would only temporarily affect these soils.

Wastewater Return Pipeline—The wastewater return route runs through the Reyes soil series (Figure 8.11-1). These soils tend to be very deep and very poorly drained, and exhibit nearly level topography in tidal flats. Their shrink-swell potential is high. These soils tend to be finely textured (i.e., clayey) formed from alluvium derived from mixed sources.

Construction Laydown and Worker Parking Areas—The construction laydown and worker parking areas cross soils of the Danville, Clear Lake, Reyes, and Willow soil series. These soils are the same as those located along the natural gas pipeline. There would be little disturbance of these soils for laydown and construction parking.

AWT Plant

The AWT plant is entirely situated within the Reyes clay, drained-soil type series (Figure 8.11-1). These soils tend to be very deep, exhibit level to nearly level topography, and are poorly to very poorly drained clays formed in tidal flats. Reyes clay soils have a high potential for shrinking and swelling.



Legend

	BOTELLA		REYES
	CLEAR LAKE		SYCAMORE
	DANVILLE		WILLOWS

0.5 0 0.5 Miles

Scale = 1:24,000

Source: USGS Quad DRGs - GIS Data Depot
USDA Soil Conservation Service

Figure 8.11-1
Affected Soil Types
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Russell City Energy Center AFC

May 2001

Table 8.11-2. Soil mapping unit descriptions.

Map ^{1/}	Soil Series Name	Depth (inches)	USDA texture	USCS ^{2/} Classification	Permeability (in/hr)	Drainage	Erosion Hazard	Erosion Factors ^{3/}		Land Capability ⁴	pH	Salinity (mmhos/cm)
								K	T			
107	Clear Lake	0-26 26-60	Clay Clay, silty clay	CH, CL CH, CL	0.06-0.2 0.06-0.2	Poorly drained	None	0.24 0.24	5	IIIs-5 Nonirrigated IIs-5 Irrigated	6.1-8.4 7.4-8.4	<2 <4
111	Danville	0-21 21-53 53-80	Silty clay loam Clay, silty clay, silty clay loam Clay loam, silty clay loam	CL CL, CH CL	0.2-0.6 0.06-0.2 0.2-0.6	Well drained	None	0.32 0.24 0.28	5	IIIs-3 Nonirrigated IIs-3 Irrigated	6.1-7.3 6.1-7.3 6.6-8.4	<2 <2 <2
139	Reyes	0-6 6-72	Clay Clay, silty clay, silty clay loam	MH ML, MH	<0.06 <0.06	Very poorly drained	None	0.15 0.28	5	Ivw-9 Nonirrigated	6.1-8.4 3.6-6.0	4-8 >16
143	Sycamore	0-18 18-60	Silt loam Silt loam, loam	ML ML	0.6-2.0 0.6-2.0	Poorly drained	Slight	0.49 0.49	5	IIIc-1 Nonirrigated	6.6-8.4 6.6-8.4	<2 <2
154	Willows	0-19 19-72	Clay Clay, silty clay	CH CH	<0.06 <0.06	Poorly drained	None	0.28 0.28	2	IIIs-5 Nonirrigated IIs-5 Irrigated	7.4-9.0 8.5-9.0	2-8 >4

1/ Soil numbers refer to numbers shown on Figure 5.6-2 (Soil Map of Project Area).

2/ Unified Soil Classification System.

3/ K is a measurement of relative susceptibility to sheet and rill erosion by water. It ranges from 0.10 to 0.64, with lower values representing a lower susceptibility to erosion. T represents soil-loss tolerance, which is defined as the maximum rate of soil erosion (wind and water) without reducing crop production or environmental quality. Values range from 1 to 5 tons of soil loss per acre per year with 5 representing soils less sensitive to erosion.

4/ An indication of the suitability of soils for most kinds of field crops. Land capability classes are I through VIII. Subclasses are designated by letters e, w, s, or c. The land capability units are 0 through 9. See Soil Survey of Alameda County, California, Western Part, p. 31-32.

NA: Not Applicable

Source: U.S. Soil Conservation Service 1981.

8.11.1.2 Agricultural Resources

The City of Hayward does not have agriculture land uses. Local agricultural uses in the Tri-City area (Union City, Newark, Fremont) to the south include livestock grazing, and cultivation of pumpkins, squash, and cold weather crops (broccoli, lettuce, and cauliflower). None of these agricultural areas are located near the project or its appurtenant facilities. Livestock grazing occurs mainly in the hilly areas to the east of Fremont and Union City. Crop cultivation takes place in a few areas within the city limits of Fremont and Newark. Some project area soils (types 107, 111, 154) are considered prime farmland soils when found in open field or agricultural areas, but none of the project facilities cross these soils in any other context than land that is zoned and used as urban, industrial land.

RCEC Plant Site

There are no agricultural crops on or near the RCEC power plant site.

Electrical Transmission Line and Eastshore Substation—There are no agricultural land uses along the proposed route for the transmission line, which runs from the RCEC east to the existing 115-kV transmission line, then south to the existing PG&E Eastshore Substation. Construction of the transmission line will occur in an existing transmission line right-of-way. There are no agricultural uses along this route.

Natural Gas Pipeline—Construction of the natural gas pipeline would not displace or disrupt agricultural operations, as it will be placed entirely in city streets and on industrial facility property.

Wastewater Return Pipeline—The wastewater discharge pipeline will cross Enterprise Avenue to the Hayward Water Pollution Control Facility, directly across the street from the RCEC site. It will not displace or disrupt any agricultural operations.

AWT plant

There are no agricultural crops on or near the AWT plant site.

Construction Laydown and Worker Parking Areas

There are no agricultural uses near the construction laydown and worker parking areas.

8.11.2 Environmental Consequences

The following subsections describe the probable environmental effects on agricultural production and soils during the construction and operational phases of the project.

The 14.7-acre proposed RCEC and AWT plant site is presently an open field occupied by the KFOX radio broadcasting towers and transmitter shed and the Rummels Industries metal sand blasting and painting operations. After the power plant site has been graded, compacted, covered with concrete or gravel, and the constructor has installed drainage systems, there will be little remaining potential for natural erosion.

8.11.2.1 Soil Resources

The Universal Soil Loss Equation is typically used to quantify water-induced soil loss in agricultural areas. Since there will be no conversion of agricultural land during construction, estimates of soil loss have not been determined. Erosion characteristics of individual soil series have been included in Table 8.11-2. The soil series affected by this project have erosion hazards of none to slight (SCS 1981). Also, the erosion factors for these soils indicate low to moderate susceptibilities of erosion and high tolerances

of soil loss without compromising either crop production or environmental quality. Anticipated soil erosion during and after construction will, however, be minimized through implementation of the erosion control measures. Routine vehicle traffic during operation of the project will be limited to existing roads, most of which are paved, and standard operational activities will not disrupt soils.

The proposed transmission line and pipeline routes generally follow existing utility corridors or roadways, which will facilitate access and reduce project-related disturbances. Disturbed areas along linear facility routes will be allowed to revegetate following construction activities.

Significance Criteria

The project could cause a significant environmental impact in relation to soil resources by causing:

- Accelerated wind or water-induced soil erosion resulting from project construction or operation
- Increased sedimentation in stream channels and stream crossings

Impacts to soil resources would be significant if construction activities were to occur in areas of high erosion susceptibility and the disturbed areas were left exposed and not properly stabilized.

Construction Impacts

Potential construction effects on soil resources include increased soil erosion, soil compaction, loss of soil productivity, and disturbance of saturated soils. Soil erosion results in the loss of topsoil and increased sedimentation of surface waters downstream of the construction site. The magnitude, extent, and duration of this construction-related impact would depend on several factors, including the proximity of the construction to water; the soils affected; and the method, duration, and time of year of construction.

RCEC Plant Site

Construction of the 12.55-acre power plant site will require minimal grading and earthwork. Graded areas will be smooth, compact, free from irregular surface changes, and sloped to drain toward the natural drainage system. Any cut-and-fill slopes for permanent embankments will be designed to withstand horizontal ground accelerations for Seismic Zone 4. Geogrid reinforcement for fill slopes and soil nailing for cut slopes will be provided, if necessary, for slopes requiring soil reinforcement to resist seismic loading. Slopes for embankments will be no steeper than 2:1 (horizontal:vertical).

Any areas to be backfilled (if needed) will be prepared by removing unsuitable material and rocks. The bottom of an excavation will be examined for loose or soft areas. Such areas will be fully excavated and backfilled with compacted fill in layers of uniform, specified thickness. Structural fill supporting foundations, roads, parking areas, etc., will be compacted in accordance with ASTM standards. Final grading will include aggregate surfacing of the entire site to control erosion except for paved roadways or landscaped areas.

The surficial soils at the RCEC site are predominantly clay (Reyes clay, drained). The cut-and-fill operations at the site will result in alteration of the existing soil profiles. Alteration of the existing soil profiles, including mixing of soils and rock, will alter the physical, chemical, and biological characteristics of the native soils. Clearing of the protective vegetative cover and the subsequent soil disturbance will likely result in short-term increases in water and wind erosion rates. The proposed project design will include measures to stabilize fill areas and cut slopes and to control drainage and erosion. These design measures are expected to minimize erosion and sedimentation to acceptable levels.

Following construction, wind and water erosion on the plant site will be reduced, because the site will be leveled, compacted, covered with concrete and/or aggregate, and drainage will be controlled through a storm drain system. Implementation of the mitigation measures discussed in Section 8.11.4 will limit impacts to the soil resources at the power plant site to acceptable levels. There would likewise be no significant impacts from air emissions to the surrounding soil-vegetation system.

Electrical Transmission Line and Eastshore Substation Expansion—A new 1.1-mile electrical transmission line will be constructed from the RCEC switchyard and extend a short distance across Enterprise Avenue to an existing Pacific Gas and Electric 115-kV transmission line. From that point, the existing transmission line, running about 1 mile south to the Eastshore Substation, will be upgraded for the RCEC project. This upgrading will consist of new conductors and replacement towers. Construction of the new transmission line will result in soil disturbance and compaction by construction vehicles and activities at transmission tower structure locations (including foundation excavations), at equipment staging areas, and at pull and tension sites. Construction of the proposed transmission line support bases will temporarily disturb land at the existing support bases. Soil disturbance, however, will be very slight, because the majority of these support bases are currently located in parking lots. One new tower will be constructed on a vacant parcel of City land immediately east of the City of Hayward Water Pollution Control Facility. One tower is located in the State Route 92 interchange to Clawiter Road/Industrial Boulevard. Clearing of vegetation at these two locations, and associated soil disturbance and compaction by construction vehicles and activities will result in short-term increased water and wind erosion rates until disturbed areas are stabilized. Increased soil compaction may decrease the ability of vegetation to reestablish following disturbance, which may result in increased erosion.

Implementation of the mitigation measures specified in Section 8.11.3 will limit impacts to the soil resources associated with construction of the transmission system to acceptable levels. Overall, the construction impacts to soils along the transmission line route will not be significant.

Natural Gas Pipeline—The construction right-of-way disturbances along the natural gas pipeline route are expected to be approximately 3 to 7 feet wide. Effects on soils and prospects for soil erosion are very slight because the pipeline will be constructed only along improved areas, including paved city streets and parking lots.

Wastewater Return Pipeline—The construction right-of-way disturbances along the wastewater discharge pipeline route are expected to be approximately 3 to 7 feet wide. Effects on soils and prospects for soil erosion are very slight because the pipeline will be constructed only over a very short distance, across Enterprise Avenue to the City of Hayward Water Pollution Control Facility.

AWT Plant

Potential impacts resulting from construction of the AWT plant will be substantially similar to those expected for construction of the RCEC plant site. Following construction, wind and water erosion on the plant site will be reduced because the site will be leveled, compacted, covered with concrete and/or aggregate, and drainage will be controlled through a storm drain system. Implementation of the mitigation measures discussed in Section 8.11.4 will limit impacts to the soil resources at the AWT plant to acceptable levels.

Construction Laydown and Worker Parking Areas

Large power plant and AWT plant components will be stored at the construction laydown and worker parking areas. Activities during the construction phase, including vehicular travel on graded access roads (at the Eastshore Substation), may temporarily disturb the existing ruderal vegetation, compact soil, and potentially increase wind and water erosion. Appropriate erosion and dust control techniques will be implemented during construction. No significant erosional impacts will result.

Operational Impacts

Operation of the RCEC, AWT plant, electric transmission lines, natural gas pipeline, and water supply and wastewater return pipelines, are not expected to result in significant impacts to soil from either erosion or compaction. Routine vehicular access to the individual project components during operation of the project will be limited to existing roads, most of which are paved. Standard operational activities will not involve disruption of soil.

RCEC Plant Site

Operation of the project will have little or no effect on soils.

Natural Gas Pipeline—Operation of the natural gas line will have little or no effect on soils; the natural gas line will be underground.

Electrical Transmission Line and Eastshore Substation Expansion—Operation of the electrical transmission system will have little or no effect on soils.

Wastewater Return Pipeline—Operation of the wastewater discharge pipeline will have little or no effect on soils.

AWT Plant

Operation of the AWT plant will have little or no effect on soils.

Construction Laydown and Worker Parking Areas

The construction laydown and worker parking areas will be returned to their pre-project uses after construction is completed.

8.11.2.2 Agricultural Resources

The following significance criteria were used in evaluating potential impacts to agricultural resources:

- Substantial displacement or curtailment of agricultural land uses
- Degradation of agricultural land productivity
- Impacts to Prime Farmland, agricultural areas of statewide importance, or unique farmland

Impacts could be significant if the project were to alter land with special designations (e.g., Prime Farmland) to the point that the disturbed area would no longer exhibit the inherent characteristics of the special designation.

Construction Impacts

Since the project will not cause a substantial displacement or curtailment of agricultural land use, or a degradation of agricultural productivity, the construction phase of the project will not cause a significant impact to agricultural resources.

Operational Impacts

Operation of the power plant and advanced wastewater treatment plant, electric transmission line, natural gas pipeline, and water supply and discharge pipelines, will not cause any impacts to agricultural resources because they will not affect agricultural land in any way.

8.11.3 Cumulative Impacts

Since the construction and operation of the project and its appurtenant facilities will not have other than minor and temporary effects on soil resources and will have no effects on agricultural lands, they will cause no cumulative impacts.

8.11.4 Proposed Mitigation Measures

This section discusses mitigation measures that will be implemented to reduce project-related effects on soil resources. The project will not affect any agricultural lands or resources.

Appropriate erosion control measures will help maintain soil resources and water quality, protect property from erosion damage, and prevent accelerated soil loss (which destroys soil productivity and its capacity to support and maintain vegetation). Temporary erosion control measures will be installed before construction begins and will be removed from the construction site after construction activities are completed.

The following mitigation measures can be implemented to reduce potentially significant soil impacts. An acceptable level of soil erosion, as used herein, is defined as that amount of soil loss that would not affect (i.e., limit) the potential long-term beneficial uses of the soil as a growth medium or adversely affect water resources due to accelerated erosion and subsequent sedimentation.

- Prepare an Erosion Control Plan prior to construction and implement the plan during and following construction. Erosion and sediment control measures may include, but are not limited to, use of sand bags, mulches, protective coverings (e.g., jute netting and rip-rap), installation of culverts under roadways at drainage crossings, installation of sediment detention basins, construction of water diversions along roads, and water bars along pipeline rights-of-way. The plan will conform to the Alameda County Hydrology Manual and local ordinances.
- Conduct grading operations in compliance with the Alameda County Grading Ordinance.
- Perform construction activities in accordance with the Stormwater Pollution Prevention Plan (SWPPP) and associated Monitoring Program. These items will be required for the project in accordance with California's General Industrial Stormwater Permit for Construction Sites under the United States Environmental Protection Agency (US EPA) National Pollutant Discharge Elimination System (NPDES) Program. The SWPPP will include erosion control measures, including Best Management Practices to reduce erosion and sedimentation.
- Stabilize disturbed areas that will not be covered with surface structures (e.g., buildings) or pavement following grading and/or cut-and-fill operations. In areas to be disturbed or excavated along pipeline routes and where vegetation is present prior to construction, topsoil will be selectively salvaged and replaced. No seeding or irrigation is proposed.
- Limit soil erosion/dust generation by wetting active construction areas with water (including roads) or by applying commercial dust palliatives (soil binders).

- Conduct visual post-construction monitoring of areas that were disturbed during the construction phase, particularly noting steep slope areas or other erosion prone areas.
- Implement corrective measures in areas that do not respond adequately to initial stabilization techniques or in areas where accelerated erosion is occurring.

8.11.5 Applicable Laws, Ordinances, Regulations, and Standards

Federal, and state laws, ordinances, regulations, and standards (LORS) applicable to Agriculture and Soils are discussed below. The LORS are summarized in Table 8.11-3.

Table 8.11-3. LORS Applicable to agriculture and soils

LORS	Applicability	Conformance (Section)
Federal:		
Clean Water Act	Controls erosion of soil and disruption or displacement of surface soil	Section 8.11.3
California:		
None directly applicable	N/A	N/A
Alameda County:		
None directly applicable	N/A	N/A
City of Hayward:		
None directly applicable	N/A	N/A

8.11.5.1 Federal

The Clean Water Act (CWA) authorizes the USEPA to regulate discharges of wastewater and stormwater into surface waters by using NPDES permits and pretreatment standards. These permits are implemented at the state level by the State Water Resources Control Board (SWRCB), but the USEPA may retain jurisdiction at its discretion. The primary interest of the CWA in the current project concerns soil erosion control during construction, and the need to prepare and execute site-specific erosion control measures for construction of each element of the project that will entail physical disruption or displacement of surface soil.

8.11.5.2 State

There are no State of California LORS that are directly applicable to agriculture and soils. The SWRCB, which controls surface water discharge, may become involved indirectly through a discharge National Pollution Discharge Elimination System permit if a surface discharge during construction were to cause soil erosion (see Section 8.15, Water Resources).

8.11.5.3 Local

Neither Alameda County nor the City of Hayward has any laws or ordinances that directly control soil resources or the removal of farmland from active production. The county does prohibit discharge of drainage onto county roadways, in order to prevent roadway erosion.

8.11.6 Involved Agencies and Agency Contacts

There are a number of agencies involved with agriculture, land use, and soil erosion. The NRCS, Alameda County Department of Agriculture/Weights and Measures, and the City of Hayward Planning

Department will be involved on the RCEC project. The agencies and persons to contact for each of these agencies are shown in Table 8.11-4.

Table 8.11-4. Agency contacts.

Topic	Agency	Contact	Title	Telephone
Soil erosion	NRCS 430 G Street #4164 Davis, CA 95616-4164	Eric N. Vinson	State Soil Scientist	(530) 792-5640
Agriculture	Alameda County Dept. of Agriculture/Weights and Measures 224 W. Winton Ave., Room 184 Hayward, CA 94544	Earl Whitaker	Agriculture Commissioner	(510) 670-5232
Land use	City of Hayward Community and Economic Development Department	Gary Calame	Sr. Planner	(510) 583-4226

8.11.7 Permits Required and Schedule

The City of Hayward will require a grading and erosion control permit prior to the start of construction. The State Water Resources Control Board will require a NPDES General Permit for Stormwater Discharges prior to the start of construction. The schedule for acquiring these permits is summarized in Table 8.11-5. Information required to obtain each permit is also included.

Table 8.11-5. Permits required and schedule.

Permit/Approval Required	Schedule
Grading/Drainage/Erosion Control Permit: <ul style="list-style-type: none"> • Engineered Grading Plan • Topographic Plan • Drainage controls • Surface Hydrology Report • Geotechnical/Geological Hazard Evaluation • Identify material source or disposal location and haul route • Erosion and Dust Control Plan • Traffic Control Plan 	30 days prior to start of construction activities, or as agreed with the CEC CPM.
NPDES General Permit for Stormwater Discharges Associated with Construction Activities: <ul style="list-style-type: none"> • Submit Notice of Intent (NOI), including facility information, receiving water information, implementation requirements, site map, and certification • Prepare a Stormwater Pollution Prevention Plan (SWPPP) • Prepare a Stormwater Monitoring Plan (SMP) 	Submit application 120 days prior to start of construction, or as agreed with the CEC CPM.

8.11.8 References

California Department of Conservation. 1994. *A guide to the farmland mapping and monitoring program*. Appendix B: Mapping categories and soil taxonomy terms. Division of Land Resource Protection.

U.S. Soil Conservation Service (SCS). 1981. *Soil survey of Alameda County, California, Western Part*.