3.6 Geology, Soils, and Seismicity

3.6.1 Existing Conditions

3.6.1.1 Regulatory Setting

Federal

There are no federal laws, regulations, or standards related to geology and soils that are applicable to the Proposed Project.

State

Alquist-Priolo Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. Under the Alquist-Priolo Act, the California state geologist identifies areas in the state that are at risk from surface fault rupture. The primary purpose of the Alquist-Priolo Act is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. The act addresses only the hazard of surface fault rupture and is not directed toward other earthquake hazards. The law requires the state geologist to establish regulatory zones (known as Earthquake Fault Zones or Alquist-Priolo Zones) around the surface traces of active faults and issue appropriate maps. The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling construction. Local agencies must regulate most development projects within the zones. Projects include all land divisions and most structures for human occupancy. Local agencies can be more restrictive than state law requires (California Geological Survey 2005a.).

Before a project may be permitted, a geologic investigation is required to demonstrate that proposed buildings would not be constructed across active faults. An evaluation and written report of a specific site must be prepared by a licensed geologist. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back from the fault (generally 50 feet) (California Geological Survey 2005a).

Seismic Hazards Mapping Act of 1990

The California State Seismic Hazards Mapping Act of 1990 addresses earthquake hazards other than surface fault rupture, including liquefaction and seismically induced landslides. Through the act, the state establishes city, county, and state agency responsibilities for identifying and mapping seismic hazard zones and mitigating seismic hazards to protect public health and safety. The act requires the California Department of Conservation, Division of Mines and Geology, to map seismic hazards and establishes specific criteria for project approval that apply within seismic hazard zones, including the requirement for a geological technical report.

California Building Code

The California Code of Regulations, Title 24 (California Building Code) applies to all applications for building permits. The California Building Code (also called the California Building Standards Code) has incorporated the Uniform Building Code (UBC), which was first enacted by the International Conference of Building Officials in 1927 and which has been updated approximately every 3 years since that time. The current version of the California Building Code became effective in 2007.

Local agencies must ensure that development in their jurisdictions comply with guidelines contained in the California Building Code. Cities and counties can, however, adopt building standards beyond those provided in the code.

Local

City and County of San Francisco General Plan Community Safety Element

The Community Safety Element contains the following policies relevant to the proposed Project (City and County of San Francisco 2012).

> **Objective 1 Policy 1.5:** Support development and amendments to building code requirements that meet city seismic performance goals.

> **Objective 1 Policy 1.6:** Consider site soil conditions when reviewing projects in areas subject to liquefaction or slope instability.

> **Objective 1 Policy 1.7:** Consider information about geologic hazards whenever city decisions are made that will influence land use, building density, building configurations or infrastructure.

San Francisco Construction Site Runoff Pollution Prevention Procedures

The San Francisco Construction Site Runoff Pollution Prevention Procedures is a program intended to reduce the discharge of pollution to the local storm drain system (San Francisco Public Utilities Commission 2013). The requirements vary under different conditions, but can include the development of a stormwater pollution prevention plan (SWPPP), plan review, stormwater treatment measures, runoff monitoring, and increased site inspections. In addition to a SWPPP, the program calls for implementation of an Erosion and Sediment Control plan at the project site.

San Mateo County Seismic and Safety Element

The Seismic and Safety Element, adopted in 1976, contains policies that generally propose strategies for the reduction of the risk of geotechnical hazards to acceptable levels; and support the integration of data on geotechnical hazards into the development review process. The element was prepared as an inter-jurisdictional effort, evaluating seismic and safety issues for 14 of the county's cities and the unincorporated area. Most of the cities adopted the element as their own, with policy variations dependent on local conditions (San Mateo County 1985).

San Mateo County Conservation and Open Space Element General Plan Policy

The Conservation and Open Space Element, adopted in 1973, contains policies for the protection and enhancement of the County's natural resources. This document contains maps of hazard areas and designates much of the rural area for open space due to identified hazards of steep slopes and landslide susceptibility. The Conservation and Open Space Element also contains policies requiring the preparation of detailed geotechnical reports during preparation of environmental review for public and private projects to consider soil capabilities and potential erosion impacts (San Mateo County 1985).

San Mateo County Grading Ordinance

The San Mateo County Grading Ordinance includes regulatory provisions to reduce the adverse effects of grading, cut and fill operations, land clearing, water runoff, and soil erosion in an effort to conserve natural resources (such as topography and vegetation), as well as to protect health and safety, through the reduction or elimination of the hazards of earth slides, mud flows, rock falls, undue settlement, erosion, siltation, and flooding.

Santa Clara County Geologic Ordinance

This ordinance establishes requirements for geologic evaluation of projects based on proposed land use and adopted official County Geologic Hazard Maps. The ordinance establishes requirements, rules, and regulations for the development of land that is on or adjacent to known potentially hazardous areas. The geologic investigation would be reviewed and approved by the county geologist prior to any project approval (Santa Clara County 1994).

Santa Clara County Grading Ordinance

This ordinance establishes minimum standards for grading projects in order to control erosion and the production of sediment, as well as to control other related environmental damage such as de-stabilization and/or scarring of hillsides.

3.6.1.2 Environmental Setting

Regional Geology

San Francisco County

San Francisco is located in the Coast Ranges geomorphic province, which is a relatively young geologically and seismically active region on the western margin of the North American plate. The Coast Ranges province lies between the Pacific Ocean and the Great Valley province (Sacramento and San Joaquin Valleys) and stretches from the Oregon border to the Santa Ynez Mountains near Santa Barbara. Much of the Coast Ranges province is composed of marine sedimentary deposits and volcanic rocks that form northwest trending mountain ridges and valleys, running roughly parallel to the San Andreas Fault Zone. San Francisco rests on a foundation of Franciscan Formation bedrock in a northwest-trending band that cuts diagonally across the city. The Franciscan Formation is composed of greywacke, shale, greenstone, basalt, chert, and sandstone that originated as ancient sea floor sediments.

San Mateo County

San Mateo County is within the Coast Ranges geomorphic province. It is characterized by trending valleys and ridges. The valleys and ridges are controlled by a series of folds and faults that resulted from the collision of the Farallon and North American tectonic plates and subsequent strike-slip faulting along the San Andreas fault zone. According to the 1985 San Mateo County General Plan, soil types in San Mateo County have been classified according to eight major groups composed of 25 association types (San Mateo County 1985). Soils within each association have similar properties and characteristics. Approximately 80 percent of the county is covered with sandy loam, clay loam, and clay upland soils, generally on slopes of 30 percent or greater. The deepest and best drained soils occur on small alluvial fans and low terraces, especially along major stream channels. Other well-drained soils, originally formed primarily from marine sediments, occur on the high terraces of the coastal plain. Together, the areas of well-drained soils compose less than 20 percent of the county land area.

San Mateo County is also host to serpentine-based soils, a unique soil group due to the restricted range of plant species it supports. Serpentine soils occur infrequently and are sporadically distributed. Undisturbed habitats are quite rare, occurring primarily within the San Francisco Watershed, Jasper Ridge Biological Reserve, and Emerald Lake Hills area.

Santa Clara County

Santa Clara County is composed of folded and faulted sedimentary and volcanic rocks of the Central California Coast Ranges and more recent alluvial and Bay deposits in lower valley areas (Santa Clara County 1994).

The Santa Clara Valley is underlain by Quaternary-age alluvial deposits, which are up to several hundred feet deep. At the extreme northern end of the valley, recent bay deposits are present. South of the project area, the Santa Cruz Mountains are composed primarily of Franciscan Assemblage sandstone, shale, chert and serpentine with lesser amounts of Santa Clara, Purisima, San Lorenzo, Monterey and Vaqueros formations of Tertiary age also occurring. The active San Andreas Fault passes through the center of the Santa Cruz Mountains along their axis.

Project-Specific Geology and Soils

According to the Soil Survey of San Mateo County, Eastern Part, and San Francisco County, California and data found in the United States Department of Agriculture's Web Soil Survey, all TPFs would be located in soil areas classified as "Urban Land" with the exception of SWS1 <u>Option 1</u>, which would be located within an "Orthents, Cut and Fill" soil classification.

Urban Land is described as areas covered by asphalt, concrete, buildings, and other structures. Also included in this classification can be small areas of Orthents, Cut and Fill, and Orthents, Reclaimed (Orthents are described below). Urban Land units are typically used for home site, urban, and recreational development. The properties and characteristics of these soils are highly variable because of the differences in the kind and amount of fill material used. Runoff is slow, and the hazard of water erosion is low. If these units are used for urban and recreational development, the main limitations are the susceptibility of the soils to subsidence and the highly variable soil properties, including texture, permeability, and available water capacity. Areas of fill are not suitable for use as a base for structures until sufficient time has passed for compaction to take place naturally or unless the areas have been compacted mechanically so that the potential for subsidence is minimized.

Orthents are described as very shallow to very deep, very poorly drained to excessively drained soils on uplands, including hills and ridge tops; alluvial fans; coastal terraces; floodplains; and tidalflats. These soils formed in alluvium derived from various kinds of rock; sandy coastal deposits; hard and soft sandstone, shale, siltstone, serpentine, and volcanic rock; and various manmade fill materials. Also included in this unit can be deep, dark alluvial soils in areas that are loam or fine sandy loam throughout. The properties and characteristics of the soils in this unit can be highly variable because of the differences in the kind and amount of fill material used. Runoff is medium and the hazard of water erosion is moderate. Table 3.6-1 denotes soil composition at each TPS, PS and SWS location.

Table 3.6-1. Soil Classifications at Proposed Traction Power Facility Locations

TPF Location	Soil Classification	Soil Composition
PS1, TPS1 Option 4, PS2, PS4 Options 1 ~~and~~ 2, and 3, SWS1 Option 2	131—Urban land	Included here are small areas of Orthents, cut and fill, and Orthents, reclaimed.
PS3 Options 1 and 2, TPS1 Options 1, 2 and 3	134—Urban land-Orthents	Urban Land: 65 percent. Orthents, reclaimed: 30 percent. Reyes clay, Novato clay, and Orthents, cut and fill: 5 percent.
SWS1 Option 1	121—0rthents, cut and fill	Composition highly variable. Included in this unit are deep, dark alluvial soils, in areas adjacent to San Bruno Mountain that are loam o fine sandy loam.
PS5 Option 1	140—Urban land-Flaskan complex*	Urban land: 70 percent. Flaskan and similar soils: 20 percent. Minor components: 10 percent.
PS5 Option 1B	185 – Urban land – Bayshore complex	Urban land: 70 percent. Bayshore and similar soils: 20 percent. Minor components: 10 percent.
PS5 Option 2	160—Urbanland-Clear Lake complex[a]	Urban land: 65 percent. Clear Lake and similar soils: 25 percent. Minor components: 10 percent.
PS6 Options 1 and 2	102—Urban land	Urban land, basins: 98 percent. Minor components: 2 percent.
TPS2 Options 1, 2 and 3, PS7	145—Urban land-Hangerone complex[a]	Urban land: 70 percent. Hangerone, drained, and similar soils: 25 percent. Minor components: 5 percent.
PS7, Variant A and B	165 – Urbanland – Campbell complex	Urban land: 70 percent. Campbell and similar soils: 20 percent. Minor components: 10 percent.

[a] Flaskan Complex, Clear Lake Complex and Hangerone Complex; Alluvium derived from metamorphic and sedimentary rock and/or alluvium derived from metavolcanics.

Seismicity

The Caltrain corridor is located within the seismically active San Francisco Bay region and has been subjected to numerous earthquake events. The U.S. Geological Survey (USGS) has organized a working group, known as WG99, to study earthquakes in the Bay Area. The WG99 has estimated that there is a 70 percent chance of at least one magnitude 6.7 or greater earthquake affecting the San Francisco Bay region in the next 30 years. The major active fault that could impact the project corridor is the San Andreas Fault, which runs roughly north-south along the west coast of the San Francisco Peninsula. This fault is approximately 1.9 miles to 10 west of the corridor. The San Andreas Fault dominates the tectonics, geology, and physiography of the entire Project corridor. Other major active faults in the vicinity that could cause seismic events in the project corridor are the Hayward, Calaveras, and Seal Cove-San Gregorio Faults.

When an earthquake occurs, waves of energy are transmitted through the earth, resulting in a variety of seismic effects, including surface rupture, ground shaking, and ground failure such as liquefaction. Surface rupture is most common within the vicinity of a main fault trace and along other faults associated with the main fault. Ground shaking is the phenomenon most readily associated with earthquakes and may be experienced as a violent shuddering or rocking motion, or as a gentle nudge.

Soil Liquefaction

Soil liquefaction is a phenomenon in which saturated soils experience sudden and nearly complete loss of strength during seismic events. If not confined, the soil acquires sufficient mobility to allow for horizontal and vertical movements. Liquefaction can result in shallow foundation failures, boiling, severe settlement, and failure of fill supported on liquefiable soils. The magnitude of liquefaction-induced settlement depends on the thickness and relative density of the liquefiable soils and on the intensity of ground shaking. Soils most susceptible to liquefaction are loose, uniformly graded, fine-grained sands. Saturated silty and clayey sands may also liquefy during strong ground shaking, although clayey sands liquefy only if the clay content is quite low.

According to data obtained from the California Geological Survey Seismic Hazard Zones maps depicting the project area's susceptibility to liquefaction, all TPFs would be located within a "High" liquefaction susceptibility area with exception of PS1, PS2 and TPS1. PS1 and TPS1 (all options) would be located in areas of "Very High" liquefaction susceptibility. PS2 is the only TPF that would be located in an area of "Low" susceptibility. Due to the geographical area covered, the Caltrain ROW encompasses areas of all susceptibility ratings (Low, Moderate, High and Very High).

Landslides

Landslides are movements of relatively large landmasses, either as nearly intact bedrock blocks or as jumbled mixes of bedrock blocks, fragments, debris, and soil. Landslides are common near major fault zones where the rock has been weakened by fracturing, shearing, and crushing. Landslides may result from seismic shaking, local climatic conditions, or human-made modifications to the slide mass.

Data for areas susceptible to landslides was obtained from the California Geological Survey Seismic Hazard Zones maps. According to the California Geological Survey all TPFs would be located in areas of "Low" landslide susceptibility. The Caltrain ROW encompasses areas of all landslide susceptibility ratings (Low, Moderate, High and Very High).

Subsidence

Subsidence is the phenomenon in which the soils and other earth materials underlying a site settle or compress, resulting in a lower ground surface elevation. Fill and native materials beneath a site can be water saturated, and a net decrease in the pore pressure and contained water will allow the soil grains to pack closer together. This closer grain packing results in less volume and the lowering of the ground surface.

As mentioned in the *Project-Specific Geology and Soils* section, the majority of the soil composition underlying TPF locations are areas of fill and other highly variable soil designated as Urban Land (and Orthents). Also as mentioned, the main limitations of these types of soil are susceptibility to subsidence and their highly variable soil properties, including texture, permeability, and available water capacity. Areas of fill are not suitable for use as a base for structures until properly compacted so that the potential for subsidence is reduced.

Expansive Soils

Expansive soils generally result from specific clay minerals that expand when saturated and shrink in volume when dry. Clay minerals in geologic units found underlying proposed project locations (such as TPS1 and PS3) could have expansive characteristics.

3.6.2 Impact Analysis

3.6.2.1 Methods for Analysis

In this document, geological impacts are evaluated in two ways: 1) impacts of the proposed Project or alternative on the local geologic environment and 2) impacts of geological hazards on components of the proposed Project or alternative that may result in substantial damage to structures or infrastructure or expose people to substantial risk of injury.

3.6.2.2 Thresholds of Significance

In accordance with Appendix G of the State CEQA Guidelines, the proposed Project would be considered to have a significant effect if it would result in any of the conditions listed below.

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault.
  - Strong seismic ground shaking.
  - Seismic-related ground failure, including liquefaction.
  - Landslides and debris flows.
- Result in substantial soil erosion or the loss of topsoil.
- Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the Proposed Project and potentially result in an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse.
- Be located on expansive soil, as defined in Table 18-1-B of the UBC (1994), creating substantial risks to life or property.
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater.
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

3.6.2.3 Impacts and Mitigation Measures

<u>None of the Project Variants described in Chapter 2, *Project Description*, would result in any changes to the impact analyses presented below because the geological and soil conditions for the project facilities would not be substantially different than that described for the Proposed Project.</u>

Impact GEO-1	Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death, involving rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides
Level of Impact	Significant
Mitigation Measure	GEO-1: Perform a site-specific geotechnical study for traction power facilities
Level of Impact after Mitigation	Less than significant

Construction and Operation

Fault rupture along the project alignment is unlikely because no known faults cross the project corridor. Strong ground shaking would, however, be experienced during an earthquake. During an earthquake, TPFs and OCS poles could be subject to liquefaction effects (such as foundation failure or settlement), if they are constructed on liquefiable soils.

The Proposed Project would be located in a seismically active area and must, therefore, comply with the California Building Code. The California Building Code provides standards intended to permit structures to withstand seismic hazards. To this end, the code sets standards for excavation, grading, earthwork construction, fill embankments, expansive soils, foundation investigations, liquefaction potential, and soil strength loss.

Additionally, Mitigation Measure GEO-1 would require the JPB to conduct site-specific geotechnical investigations for TPFs. Adherence to applicable building code requirements and implementation of Mitigation Measure GEO-1 would minimize potential construction and operational impacts of the proposed Project due to seismic ground shaking, seismic-related ground failure (including liquefaction), and landslides. Therefore, with implementation of Mitigation Measure GEO-1, this impact would be less than significant.

Mitigation Measure GEO-1: Perform a site-specific geotechnical study for traction power facilities

Prior to final design, the JPB will ensure that a qualified geologist will prepare a design-level geotechnical investigation for all TPFs. The investigation will include subsurface soil sampling, laboratory analysis of samples collected to determine soil characteristics (including identifying and defining the limits of unstable, compressible, and collapsible soils), and an evaluation of the laboratory testing results by a geotechnical engineer. Recommendations based on the results will be used in the design specifications for the proposed TPF structures. The report will include recommendations typical to avoid potential risks associated with seismic groundshaking and liquefaction, in accordance with the specifications of California Geological Survey's Special Publication 117A, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, and the requirements of the Seismic Hazards Mapping Act. This report will also identify thickness and distribution of compressible materials, anticipated amounts of total and differential settlement, and tolerance of the structure(s) for displacement of soils. Following identification and delineation of compressible and collapsible soils, the JPB and qualified geologists will identify recommendations for building on compressible soils, which may include the following measures.

- Surcharging of compressible fine-grained soils prior to construction to reduce anticipated post-construction settlements to acceptable levels or use of deep foundations to support improvements in non-compressible soil strata.
- Removal and/or compaction of collapsible granular soils and non-compacted fills before placing fill to reduce anticipated post-construction settlements to acceptable levels.
- Deep-dynamic compaction, rapid impact compaction, vibro-compaction or stone columns.

Impact GEO-2	Result in substantial soil erosion or the loss of topsoil
Level of Impact	Less than significant

Construction and Operation

Erosion is a condition that could significantly and adversely affect development on any site. Construction could exacerbate erosion conditions by exposing soils and adding water to the soil from irrigation and runoff from new impervious surfaces.

Construction activities would adhere to National Pollutant Discharge Elimination System (NPDES) requirements under the Construction General Permit (CGP). The CGP requires development of a SWPPP (refer to Section 3.9, *Hydrology and Water Quality*). Erosion and sediment control features included in the SWPPP would include the following provisions.

- Minimize sediment transport during construction. Development located on slopes or at the base of slopes would use standard best management practices—such as dust control, impoundment dikes, interceptor ditches, desilting basins, erosion control, and revegetation or similar methods—to minimize potential for increases in sediment transport and soil erosion during construction. Such measures would be subject to approval of a notice of intent and preparation of a SWPPP consistent with State Water Resources Control Board requirements for construction sites.
- Minimize slope erosion during construction. If manufactured slopes were incorporated into project construction, the slopes would be designed in consultation with a qualified geologist to include erosion control measures. As determined by the geologist, erosion control measures may include establishment of protective vegetation, mulching to slow the flow of water across the slope, installation of rock faces, rock-filled galvanized wire cages (gabions), or building blocks with open spaces for plantings on the slope faces.

The existing at-grade alignment in the project corridor does not have a high potential for erosion. The Proposed Project would not result in an increase in pervious areas and would maintain the existing topography along the Caltrain corridor. Because the Proposed Project would adhere to the NPDES requirements, impacts related to soil erosion or loss of topsoil would be less than significant. No mitigation is required.

Impact GEO-3	Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the Proposed Project and potentially result in an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse.
Level of Impact	Significant
Mitigation Measure	GEO-1: Perform a Site-Specific Geotechnical Study for Traction Power Facilities
Level of Impact after Mitigation	Less than significant

Construction and Operation

As discussed in Section 3.6.1.2, *Environmental Setting*, the Caltrain corridor is located within the seismically active San Francisco Bay region. Additionally, underlying soils at the various TPF locations are prone to geologic hazards such as liquefaction and subsidence.

Where construction of proposed TPFs and OCS poles is planned within areas with compressible and collapsible soils (as mentioned above), the structures would be susceptible to damage due to ground settlement from the weight of the structures or the addition of water in the form of irrigation or concentrated runoff.

Consequently, all the factors mentioned could contribute to potential impacts related to soil instability during construction and operation of the proposed Project. Implementation of Mitigation Measure GEO-1 and compliance with the California Building Code during project construction would reduce potential impacts related to unstable soils to a less-than-significant level.

Impact GEO-4	Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property
Level of Impact	Significant
Mitigation Measures	GEO-4a: Identification of expansive soils GEO-4b: Mitigation of expansive soils
Level of Impact after Mitigation	Less than significant

Construction and Operation

Expansive soils are typically composed of clays and can undergo a volume change with changes in moisture content. They have tendencies to expand and soften when wet and to harden when dry. If not properly considered prior to the construction of structures, this expansive behavior can damage foundations and other building components. ~~For example~~ as discussed in Section 3.6.1.2, *Environmental Setting*, TPS1 (~~all options~~ Options 1, 2, and 3) and PS3 (Options 1 and 2) would be located in areas ~~known to~~ that may contain clay soil composition and could, therefore, create a risk related to expansive soils. It is possible that other facilities may also occur in areas with expansive soils as well, since the analysis in this section is based on soil mapping, not site specific soil sampling. Mitigation Measures GEO-4a and GEO-4b would be implemented ~~in such aforementioned areas~~ where construction of proposed TPFs and OCS poles are planned atop of soils composed of clay or silty clays, which are expansive soils with high shrink-swell potential. Implementation of these mitigation measures would reduce impact of constructing and operating the project in areas with expansive soils to a less-than-significant level.

Mitigation Measure GEO-4a: Identification of expansive soils

Before submission of final grading plans, the JPB will retain a qualified geotechnical engineer and engineering geologist. The geologist/engineer will conduct field observations and testing of onsite soils and formations to identify and define the limits of expansive materials. A final report will be prepared and submitted to all appropriate agencies. This report will include identification of thickness and distribution of the expansive materials, anticipated depth of moisture variation, expansiveness of the earth materials, structure tolerance for displacement, and confirmation or modification of mitigation measures for expansive materials.

Mitigation Measure GEO-4b: Mitigation of expansive soils

Following identification and delineation of expansive materials, the geologist/engineer will identify the most appropriate methods of mitigation. Mitigation measures can include the following measures.

- Excavation and replacement with non-expansive fill materials.
- Design building foundations to limit foundation deflections from expansive soil movement. This could include heavy conventional mat or post-tensioned slab foundations, heavy reinforced grid footings, or pier and grade beam foundations.

Impact GEO-5	Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater
Level of Impact	No impact

Construction and Operation

There are no features in the Proposed Project that would require the use of septic tanks or any alternative wastewater disposal system where sewers are not available. Therefore, there would be no impacts related to soils that are incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems.

Impact GEO-6	Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature
Level of Impact	No impact

Construction and Operation

Proposed TPFs and OCS poles would be constructed in mostly developed, urban areas that are disturbed and are not likely to contain unique geologic features. Additionally, it is highly unlikely that the construction of the proposed TPFs would result in the discovery or destruction of a unique paleontological resource because construction and ground disturbance is expected to be limited to shallow depths at proposed locations. In the case of the OCS pole placement, the excavation diameter is expected to be of approximately 3 feet, and, therefore, soil disturbance is expected to be minimal. Therefore, there are no impacts related to the destruction of a unique paleontological resource or site or unique geologic feature during Project construction or operation.