D.6 Geology, Soils, and Mineral Resources

D.6.1 Environmental Setting

This section presents a discussion of the regional topography, geology, seismicity, soils, and mineral resources in the project area. The Project would be located in the San Jacinto Valley in Southern California, south and east of the City of Los Angeles. The San Jacinto Valley is bounded by the San Jacinto Mountains to the east, the Black Hills to the South, the Santa Ana Mountains to the west, and the Santa Ana Valley and the Inland Empire to the northwest.

D.6.1.1 Valley-Ivyglen 115 kV Subtransmission Line

The proposed subtransmission line's region is part of the Peninsular Ranges Geomorphic Province of Southern California (CGS 2002). Elevations in the province range from 1,200 feet to 10,804 above mean sea level (amsl). The proposed subtransmission line route is located east of the Santa Ana Mountains within Perris Valley and Elsinore Valley, which is the northwestern extension of Temecula Valley and a part of the Elsinore Fault (a structural depression). Mineral resources in the project area include natural gas, petroleum, coal, gold, copper and other heavy metals, gravel, stone, and other valuable geologic resources such as geothermal resources.

The eastern portion of the proposed subtransmission line route is on a flat to gently rolling alluvial plain formed by the Santa Jacinto River with some small hills as the route approaches Highway 74 near the end of Segment E-1 at an elevation of roughly 1,350 feet amsl. The proposed subtransmission line route continues west through hilly areas just north of the City of Lake Elsinore and then generally follows the path of Temescal Wash through Temescal Canyon, a depression formed by the Elsinore Fault. The canyon is bounded by steep hillsides and trends from southeast to northwest along the Elsinore and Chino Faults. The Santa Ana Mountains and the lower Elsinore Mountains lie to the west of the Ivyglen Substation where the proposed subtransmission line terminates. Figure D.6-1 shows major geomorphic features in the project area.

Hills along the eastern portion of the proposed subtransmission line route are comprised of metasedimentary rock, non-marine and marine sandstone, siltstone, and claystone. The Elsinore Valley floor is comprised of unconsolidated sand, silt, and clay of late Pleistocene and Holocene Age, while areas near the western portion of the proposed subtransmission line route are typically alluvium deposits near Temescal Wash or granitic rocks belonging to the Peninsular Ranges. General erosion of the mountains has created gravel, sand, and silt in the area (Morton 2004). Figure D.6-2 provides more detail on the geologic units found along the proposed subtransmission line route.

The proposed subtransmission line route area is a seismically active area with the presence of a number of active and potentially active faults that generate earthquakes. Faults are fractures or lines of weakness in the earth's crust. The major fault along the proposed subtransmission line route is the Elsinore Fault. The Elsinore Fault, a surface fault exhibiting horizontal movement, is believed to be capable of generating earthquakes with magnitudes in the range of 6.5 to 7.5, with a recurrence interval of approximately 250 years between major events. Smaller events may occur more frequently. The entire project area is likely to experience repeated moderate to strong ground shaking generated by the Elsinore Fault in the foreseeable future. The main trace of the Elsinore fault zone has only seen one historical event greater than magnitude 5.2, the magnitude 6 earthquake of 1910 near Temescal Valley. This earthquake produced no known surface rupture and caused little damage.

Significant earthquakes and moderate tremors are common in Southern California. Figure D.6-3 shows a number of the other active faults in the vicinity of the proposed subtransmission line route that have the potential to cause strong ground shaking. Table D.6-1 summarizes recurrence intervals and maximum credible earthquake (MCE) events for important faults in the vicinity surrounding the project area, including the Elsinore Fault.

Table D.6-1 Maximum Credible Earthquake and Recurrence Interval for Southern California Faults

Fault	Approximate Distance to Project Area (miles)	Richter Magnitude (Mw)	Approximate Recurrence Interval
Whittier	12	6.0-7.2	Unknown
Elsinore	<1	6.5-7.5	250 years
San Jacinto	8	6.5-7.5	100-300 years
San Andreas	21	6.8-8.0	20-300 years
North Frontal Fault of San Bernardino Mountains	35	6.0-7.1	Uncertain

Source: USGS NEIC 2006, Sowers 1994

Areas most susceptible to intense ground shaking are generally located closest to the earthquake-generating fault, as well as more distant areas underlain by thick, loosely unconsolidated and water-saturated sediments. Ground movement during an earthquake can vary depending on the overall magnitude, distance from the fault, focus of the earthquake energy, and type of geologic materials underlying the site (Mualchin 1996).

The proposed subtransmission line would likely be subject to strong ground shaking in the event of a major earthquake in the project area (County of Riverside 2003). Such strong seismic shaking can cause ground cracking in natural geologic formations, soils, and artificial fill deposits particularly at the contacts between units where different material properties are juxtaposed. In addition, during severe ground shaking, unconsolidated soils that are water-saturated may lose cohesion and convert to a fluid-like state called liquefaction. Liquefaction results from loss of soil shear strength and can occur in areas characterized by less cohesive, granular materials that are water-saturated at depths less than 40 feet. Liquefaction susceptibility generally ranges from low to moderate on much of the valley floor to high in areas just north of Lake Elsinore. Figure D.6-4 shows liquefaction hazards along the proposed subtransmission line route based on preliminary data collected by the Applicant (Earth Consultants 2000).

Land subsidence, the result of fluid withdrawal from compressible sediments, is another potential geological hazard along the proposed subtransmission line route, particularly in the Perris Valley and the Elsinore Valley (City of Perris General Plan 2005). During land subsidence, fluid is withdrawn, increasing the effective pressure in the drained sediments. Compressible sediments are then compacted due to overlying pressures no longer being compensated by hydrostatic pressure from below. Subsidence and associated fissuring have occurred in a variety of places in Riverside County due to rising and falling of groundwater tables.

Other forms of seismically induced ground failures which may affect the proposed subtransmission line include ground cracking and seismically induced landslides. Ground cracking may result from several causes including lateral spreading due to local or widespread liquefaction or similar ground failure, from areas between fault strands experiencing localized extension or dilation, and along ridgelines or other similar topographic features. Landslides are masses of rock, soil, and debris displaced downslope by sliding, flowing, or falling. Landslides can result from certain geologic features, slope steepness, excessive rainfall, earthmoving disturbance, and seismic activity. Excavation and development activities

Insert 1 of 2

Figure D.6-1 Major Geomorphic Features in the Study Area

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Figure D.6-1 Major Geomorphic Features in the Study Area

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Figure D.6-2 Geologic Units and the Project Vicinity

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Figure D.6-2 Geologic Units and the Project Vicinity

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Figure D.6-2 Map Legend

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Figure D.6-2 Map Legend

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Figure D.6-3 Regional Fault Map

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Figure D.6-3 Regional Fault Map

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Figure D.6-4 Fault Hazard and Geologic Hazard Zones

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Figure D.6-4 Fault Hazard and Geologic Hazard Zones often increase the incidence of landslides. The proposed subtransmission line route traverses hills and slopes that may be susceptible to landslides both seismically and non-seismically induced. Segments C-4 (western half) and C-6 (east of I-15) traverse or approach areas that may be susceptible to landslides based on slope and soil types (USDA 2006).

Soils can be subject to erosion caused by both natural processes and human activities. The soils along the proposed subtransmission line route, as shown in Figure D.6-5, exhibit a moderate potential for wind and water erosion throughout the year. The soils along the proposed subtransmission line belong primarily to five distinct soil series: Greenfield, Cajalco, Friant, Fallbrook, and Monserate. These soils are all generally well drained, consisting of loamy sands, coarse sandy loam, and rocky sandy loam and are moderately alkaline. The soils have relatively low fertility due to the dry climate, lack of substantial organic material, and are therefore prone to moderate erosion (NRCS 1971). Wind erosion happens primarily during the summer and fall when the weather is hot and windy as the soils lose moisture and cohesiveness under hot dry conditions. The winter and spring are associated with greater levels of precipitation and increased erosion caused by storm water runoff. Sporadic and torrential rains can cause flash floods and significant erosion throughout the region (County of Riverside 2003).

Hydrocompaction, another geological hazard along the proposed subtransmission line route, occurs when collapsible soils are subject to increased moisture content. Collapsible soils are generally low-density fine-grained combinations of clay and sand left by mud flows that have dried, leaving tiny air pockets. When the soil is dry, the clay is strong enough to bond the sand particles together. When the clay becomes wet, the moisture alters the cementation structure and the soil's strength is compromised, causing collapse or subsidence. It is likely that collapsible soils are present in the area, but collapsible soils have not been mapped to specific locations (County of Riverside 2003).

Mineral resources in the vicinity of the proposed subtransmission line route include clay, limestone, iron ore, sand, and construction aggregate (County of Riverside 2003). The proposed subtransmission line route is near to and encompasses areas with economically viable deposits of clay, sand, gravel, and stone products, including decomposed granite. Mineral Resource Zones (MRZs), as designated by the California Geological Survey (CGS), indicate the significance of mineral deposits based on available geologic information, including geologic mapping and other information on surface exposures, drilling records, and mine data. The designations are also based on socioeconomic factors, such as market conditions and urban development patterns. Most of the proposed subtransmission line route is classified as MRZ-3, areas containing mineral deposits the significance of which cannot be evaluated from available data, and areas along the I-15 corridor north of Lake Elsinore are classified MRZ-2, areas where adequate information indicates significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence. Portions of proposed subtransmission line segment W-1 pass through an area designated MRZ-2.

The Lake Elsinore area has a history of extracting mineral resources to include producing clay, stone/rock, sand and gravel, and decomposed granite (Larose et al. 1999). Portions of Segments C-4 and C-6 are located adjacent to active and planned aggregate and clay mining operations owned by Pacific Aggregates on the western side of I-15 at Nichols Road in the City of Lake Elsinore. The County's principal renewable geologic resource is geothermal. Geothermal resources associated with elevated heat flow along the Elsinore Fault Zone have been known to exist for some time with a number of hot springs present along splay faults (Norris and Webb 1990). Geothermal resources along the proposed subtransmission line route have not been developed for power production, although the County General Plan (County of Riverside 2003) identifies some potential for such development.

There are no known oil or gas reserves identified in or within 15 miles of the proposed subtransmission line route (City of Lake Elsinore 2006, State of California 2001).

D.6.1.2 Telecommunications System

The telecommunications system infrastructure would follow the proposed subtransmission line route with the exception of portions of the line that would be installed in underground conduits near the Valley, Ivyglen, and proposed Fogarty Substations. Therefore, the environmental setting for the telecommunications system mirrors that of the proposed subtransmission line with respect to Geology, Soils, and Mineral Resources.

D.6.1.3 Fogarty Substation

The proposed Fogarty Substation site is located in a tectonically inactive portion of the Elsinore Trough within the Elsinore Fault Zone; however, the site would still be affected by seismic activity in the region. The closest major active faults to the Fogarty Substation are the Glen Ivy North and Temecula segments of the Elsinore Fault Zone. CGS estimates a maximum earthquake range of magnitude 6.8 for the Temecula and Glen Ivy segments (Cao 2003). The nearest portion of the Elsinore Fault Zone within an Alquist-Priolo Earthquake Fault Zone is located approximately 1.5 miles to the west of the substation site. The San Jacinto and San Andreas faults are located approximately 21 and 32 miles to the northeast, respectively (Blake 2002). There are no known active or potentially active faults in the immediate vicinity of the substation site, although the main surface trace of the Glen Ivy North fault segment is mapped approximately 2,750-feet south of the Fogarty Substation site and a smaller Quaternary fault (approximately 1,200-feet to the south) may also be associated with the same zone (County of Riverside 2003). The CGS Seismic Hazard Mapping Program has not yet issued seismic hazards maps for the Fogarty Substation site under the mapping program mandated by the Seismic Hazards Mapping Act. Mapping is planned for the Lake Elsinore and Wildomar quadrangles in coming years (USGS 2006).

The proposed Fogarty Substation site lies within the Elsinore Valley in an area of local drainages, lower subdued surfaces, eroded bedrock formations, and remnant lake deposits. Altamont and Ramona soils together cover approximately two thirds of the proposed substation site, while Placentia soil covers the remaining third of the site (Morton 2004). Soils in the substation site are generally not expansive (USDA 2006); however, some Altamont soils formed on the older alluvium can be clay-rich and have moderate to very high expansion potential. Table D.6-2 contains a summary of these three soil types.

Table D.6-2 Soil Types at the Fogarty Substation Site

	Description	Drainage	Runoff	Permeability	Shrink-swell
Altamont	Weathered from fine-grained sandstone and shale. Clay content between 35 and 60 percent.	well drained	medium to very high runoff	slow permeability	likely high shrink-swell potential
Ramona	Sandy loams with varying amounts of clay.	well-drained	slow to rapid runoff	moderately slow permeability	low shrink-swell potential
Placentia	Sandy loam with clay lenses. Some contains gravel.	well or moderately well drained	slow to rapid runoff	very slow permeability	low shrink-swell potential

Source: NRCS (2006)

Although the Elsinore groundwater basin is in overdraft, there is no known subsidence affecting the proposed Fogarty Substation site. In addition, the topography of the Fogarty Substation site's immediate vicinity suggests that the potential for landslides (including lateral spreading) is low (Lake Elsinore General Plan 6-16).

Insert 1 of 2

Figure D.6-5 Soils in the Project Study Area

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Figure D.6-5 Soils in the Project Study Area

The Fogarty Substation site is classified as MRZ-3, an area containing mineral deposits, the significance of which cannot be evaluated from available data. The substation site is not currently utilized, nor has it been utilized in the past, for mineral extraction.

D.6.1.4 Valley-Ivyglen Substation Improvements

The Valley and Ivyglen Substations mirror much of the proposed subtransmission line route's environmental setting with regard to Geology, Soils, and Mineral Resources. The Valley Substation is not located near any prominent physical features, while the Ivyglen Substation is near the base of the Santa Ana Mountains in the Elsinore Valley approximately 0.5 mile south of Temescal Wash on a gently sloping area.

Although the entire region is seismically active, the Ivyglen Substation is located approximately 200 feet from the Elsinore Fault Zone and would therefore be subject to geological hazards related to seismic activity, particularly ground rupture (County of Riverside, 2003). Although the Valley Substation is in a seismically active area, it is not within close proximity to an active fault zone.

D.6.2 Applicable Regulations, Plans, and Standards

D.6.2.1 State

The Uniform Building Code (UBC-1997) and the California Building Code (CBC-2001) define different regions of the United States and rank them according to their seismic hazard potential. There are four types of Seismic Zones with Zone 1 having the least seismic potential and Zone 4 having the highest seismic potential. The Project is located within Seismic Zone 4 and is subject to the relevant standards listed in Seismic Zone 4. The CBC-2001 is a modified version of the UBC-1997 published in the United States by the International Conference of Building Officials. Standards and text were amended to reflect California earthquake conditions. Oversight of the CBC is assigned to the California Building Standards Commission, which is responsible by law for coordinating building standards.

The 1972 Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) provided for the delineations of rupture zones along active faults in California. The purpose of the Alquist-Priolo Act is to regulate development on or near active fault traces to reduce the hazard of fault rupture and to prohibit the location of structures for human occupancy across the traces. Cities and counties must regulate certain development projects within the zones, which may include withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement.

The California Seismic Hazards Mapping Act of 1991 was enacted to protect the public from the effects of strong ground shaking, liquefaction, landslides, or other ground failure and from other hazards caused by earthquakes. This Act mandates that the state geologist delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones.

D.6.2.2 Regional and Local

The County of Riverside General Plan (Policy S2.1a3) requires geologic studies or analyses for critical structures including critical facilities, high-occupancy buildings, schools, and high-risk structures, within 0.5 miles of all Quaternary to historic faults shown on the County's Earthquake Fault Studies Zones map. Critical facilities include infrastructure that must remain operational after an earthquake and facilities that pose unacceptable risks to public safety if severely damaged. In Riverside County, critical facilities include schools, hospitals, fire and police stations, emergency operation centers, communication centers, electrical infrastructure, dams, and industrial sites that use or store explosives, toxic materials, or petroleum products (County of Riverside 2003).

The City of Lake Elsinore General Plan Public Safety and Urban Services Element (City of Lake Elsinore 2007) recommends several policies be adopted to protect people and structures from geologic hazards (Policy 7.1, 7.2, and 7.3). These policies include reducing the threat of earthquake-induced fires, encouraging seismic retrofitting of critical facilities, and identifying the potential for geologic hazards in areas of new development and implementing site-specific remediation measures.

The City of Perris' General Plan includes one applicable policy related to seismic hazards (Policy I.E) that requires all development to include adequate protection from damage due to seismic incidents.

Riverside County designates land as Open Space-Mineral Resource based on the federal Surface Mining Control and Reclamation Act. Areas held in reserve for future mining also fall under this designation. Ancillary structures or uses may be permitted in these areas that assist in the extraction, processing, or preservation of minerals. Actual building structure size, siting, and design are determined on a case-by-case basis. Properties designated as Open Space-Mineral Resources are subject to policies (LU 21.2 and LU 21.3) that protect lands from encroachment of incompatible land uses as well as road access to mining activities.

In addition, the Lake Elsinore Public Resources Code Section 2763 requires that city and county land use decisions affecting areas with minerals of regional or statewide significance are consistent with mineral resource management policies in the General Plan.

D.6.3 Project Impacts and Mitigation

A wide range of potential impacts, including loss of mineral resources, slope instability including landslides, debris flows and slope creep, and seismic hazards including surface fault rupture, strong ground shaking, liquefaction, and seismically induced landslides, was considered in this analysis. Each of these potential geologic, soils, and mineral resources impacts is discussed in the following sections.

D.6.3.1 Significance Criteria

For the purposes of the following evaluation, the project would cause a significant impact on geology, soils, and mineral resources if it would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, or 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 (Division of Mines and Geology Special Publication 42); strong seismic ground shaking; seismic-related ground failure, including liquefaction; and landslides
- 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 project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse
- 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

- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water
- Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state
- Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan

Potential impacts are discussed according to the significance criteria above. Each impact is categorized according to the following classifications:

Class III – Less than significant impact without mitigation measures
Class II – Less than significant impact after mitigation measures are implemented
Class I – Significant impact and no feasible mitigation measures are available

D.6.3.2 Applicant Proposed Measures

GEO-SCE-1: SCE seismic design specifications for the improvements and construction of substations would be based on criteria presented by the Institute of Electrical and Electronics Engineers provisions set forth in its “Recommended Practices for Seismic Design of Substations.” The foundation for the Fogarty Substation shall be designed in compliance with CBC-2001, UBC-1997, and anchorage loads as provided by equipment manufacturers, whichever is more severe.

GEO-SCE-2: Prior to final grading plans, design of substation equipment foundations, and subtransmission line placement, a geotechnical study would be performed to identify site-specific geologic conditions in enough detail to support final engineering and requirements of reviewing agencies. Recommendations from the geotechnical and engineering geology study would be incorporated into the final project design.

GEO-SCE-3: The proposed subtransmission line, telecommunications system, Fogarty Substation, and Valley and Ivyglen Substation improvements and construction activities would be performed in accordance with the soil erosion, sediment containment measures, and water quality protection measures specified in the Construction Storm Water Pollution Prevention Plan (SWPPP). Implementation of the SWPPP would help stabilize graded areas and waterways and reduce erosion and sedimentation. The SWPPP would identify best management practices (BMPs) to be implemented during construction activities. Mulching, seeding, or other suitable stabilization measures would be used to protect exposed areas during construction activities. The Applicant would obtain a grading permit.

D.6.3.3 Impacts Analysis

Soils, geologic, and paleontological effects associated with construction of the Project would be limited to erosion during construction activities and seismic hazards during operation. The Applicant’s BMPs would be implemented to minimize soil erosion for all construction components. Seismic hazards are reduced or avoided in the design of the proposed subtransmission line, telecommunications system, Fogarty Substation, and Valley and Ivyglen Substation improvements.

Impact GEO-1: Adverse effects to people and structures due to seismic activity

All of the Project components are located in a region of several active and potentially active earthquake faults. Although there is always a risk of an earthquake in the area, the chance of significant seismic activity occurring during project construction is low. However, in the event of an earthquake during construction, there could be significant adverse effects to people and structures. Therefore, all construction personnel should adhere to the Applicant's worker safety guidelines and policies to avoid additional adverse effects to health and safety in the event of an earthquake during construction as outlined in Mitigation Measure (MM) GEO-1a. Implementation of Applicant Proposed Measures GEO-SCE-1, and -2 and MM GEO-1a will reduce impacts to people and structures due to seismic activity during construction to less than significant levels (Class II).

The proposed subtransmission line route is located in a region of several active seismic fault zones; therefore, strong ground shaking is likely during the operational lifetime of the proposed subtransmission line and telecommunications system. Engineering, design, and the geotechnical studies would identify the hazard levels in the area, and the Applicant's design engineers would follow the geotechnical recommendations and seismic building guidelines to withstand seismic ground shaking. One particular hazard would be the occurrence of ground ruptures due to significant ground shaking, which would have the potential to put significant strain on the proposed subtransmission line poles. The proposed subtransmission line poles would be located outside of known ground rupture zones, and engineering standards would be applied to the design of the proposed subtransmission line poles that would reduce the impacts of ground rupture. Implementation of Applicant Proposed Measure GEO-SCE-2 and MMs GEO-1b, GEO-1c, and GEO-1d would reduce potential impacts to the proposed subtransmission line due to ground shaking to less than significant levels (Class II).

Portions of the telecommunications system would be installed in underground conduits and portions would be attached to the proposed subtransmission line poles. The underground portion of the system would have limited risk of effects from seismic activity because it would be designed in accordance with standard building codes and seismic standards for utilities, most notably the California Building Code for underground construction. The telecommunications system would traverse the documented Alquist-Priolo Hazard Zone for the Ivyglen Fault on overhead lines immediately before entering the underground portion leading to the Ivyglen Substation. The telecommunications system line attached to the proposed subtransmission line poles would be subject to ground shaking. As noted in the preceding paragraph, the subtransmission line poles would be constructed to seismic standards and would be expected to withstand most ground shaking in the area. Portions of the telecommunications system installed in underground conduits would be designed to withstand ground shaking. Implementation of Applicant Proposed Measure GEO-SCE-2 and MMs GEO-1b, GEO-1c, and GEO-1d would reduce potential impacts to the telecommunications system due to ground shaking to less than significant levels (Class II).

Due to the Fogarty Substation's proximity to an active fault zone, the substation would experience moderate to high levels of earthquake-induced ground shaking generated by large earthquakes occurring on the Elsinore fault zone. The nearest active or potentially active fault is approximately 0.5 mile south of the substation site; however, the Fogarty Substation is not subject to the Alquist-Priolo Earthquake Fault Zoning Act. The substation site is not within the County of Riverside General Plan earthquake fault study zone encompassing the Glen Ivy North fault south of the site. However, the site is within 0.5 mile of a Quaternary fault. Even though the Fogarty Substation is located in an area susceptible to earthquake forces, the proposed structures are not designed for human occupancy, and it is unlikely that any personnel operating the facility would be indoors if a large local earthquake occurred. In addition, the substation will be designed in accordance with Applicant Proposed Measure GEO-SCE-1. Potential impacts associated with fault rupture are addressed in GEO-SCE-2. Therefore, anticipated impacts due to seismic activity during operation of the Fogarty Substation are considered less than significant (Class II).

The Valley Substation is not located within an active fault zone or area at risk of ground rupture; however, it could be impacted by seismic activity from a nearby fault. The Applicant would design equipment to withstand strong ground shaking and moderate deformation. The substation is staffed and periodic maintenance or emergency repairs would be conducted by the Applicant's existing personnel.

Potential effects to people and structures from seismic shaking would be less than significant because the substation has been designed to minimize damage caused by seismic ground shaking and any upgrades will comply with seismic standards identified in GEO-SCE-1 (Class II).

The Ivyglen Substation is located in proximity to several active seismic fault zones of the Elsinore Fault and an area at risk of ground rupture. During the operational lifetime of the substation improvements it is likely that moderate to strong ground shaking could occur in the substation side. Design studies would identify the relative hazard levels in the area, and the Applicant's design engineers would follow building code recommendations to support appropriate seismic designs of equipment that would be susceptible to seismic ground shaking. All equipment would be engineered and constructed to minimize damage caused by strong ground shaking and moderate deformation. The substation would be unattended, and the Applicant's personnel would only visit for periodic maintenance or emergency repairs. Potential effects to people and structures from seismic shaking would be less than significant (Class II).

Mitigation Measures for Impact GEO-1

MM GEO-1a: All construction personnel shall adhere to the Applicant's worker safety guidelines and policies to avoid additional adverse effects to health and safety in the event of an earthquake during construction. A site-specific safety plan with seismic activity highlighted as a potential hazard during all onsite construction activity shall be submitted to the California Public Utilities Commission (CPUC) for review and approval at least 60 days before construction.

MM GEO-1b: The Applicant shall perform design-level geotechnical investigations including site-specific seismic analyses to evaluate the peak ground acceleration for design of project components. The design guidelines determined in SCE-GEO-2 shall be implemented during construction of all project components. Compliance with this measure shall be documented to the CPUC at least 60 days before construction by submittal of reports describing potential peak ground accelerations expected for design level earthquake and a description of how the design will accommodate this anticipated motion.

MM GEO-1c: For overhead transmission lines, site-specific geotechnical investigations will be performed at proposed pole locations to evaluate the potential for fault surface rupture. Where significant potential for fault surface rupture exists, pole locations will be adjusted as possible. Incorporation of standard engineering practices in accordance with the UBC, CBC, and Alquist-Priolo Act as part of the project will ensure that people or structures are not exposed to fault rupture hazards such as strong seismic ground shaking, seismic-related ground failure such as liquefaction, and landslides.

MM GEO-1d: Project design and construction shall be in conformance with current best standards for earthquake resistant construction in accordance with the CBC (Seismic Zone 4). In addition, project design shall follow the recommendations of the site-specific geotechnical investigation report in MM GEO-1b and Applicant Proposed Measure SCE-GEO-2.

Impact GEO-2: Soil erosion

The proposed subtransmission line route and telecommunications system would traverse maximum slopes of approximately four to eight percent. BMPs would be used to minimize erosion and direct runoff that could flow from the pole construction pads to natural drainages. The construction of the proposed subtransmission line poles requires some grading to create the pole pad and to expand the access road system to the poles. Grading results in soil disturbance and loss of vegetation that would in turn promote short term increases in erosion.

BMPs, including erosion control measures, would be included as part of the SWPPP as identified in GEO-SCE-3. The SWPPP would be implemented during construction to minimize erosion and sedimentation during grading. Use of existing roads for access would be maximized. Roads would follow natural hillside contours and avoid steep slopes when possible. New service roads would be compacted and gravel would be used in areas where soils may be susceptible to erosion. Construction will take place over 12 to 18 months and areas would be graded at one time using BMPs to minimize runoff and dust erosion. Implementation of APM GEO-SCE-3 and MM GEO-2a would reduce impacts to soil erosion to less than significant levels (Class II).

Construction of the Fogarty Substation would disturb more than one acre of land and would therefore be subject to specific erosion control measures identified as part of the National Pollution Discharge Elimination System (NPDES) permit and SWPPP required for the project. During construction, the SWPPP erosion control measures would be implemented to avoid or minimize soil erosion and off-site sediment deposition as outlined in GEO-SCE-3. There would be no soil removed from the substation site; however, 50,000 cubic yards of new clean fill material may be imported depending on final engineering design. Therefore, soil erosion impacts associated with proposed earthwork are anticipated. To address this issue, the Applicant has proposed implementing erosion control measures at the substation site during construction in order to protect soil and surface water in the project area through the implementation of GEO-SCE-3. With the implementation of BMP's, related SWPPP requirements outlined in GEO-SCE-3, and MM GEO-2a, soil erosion or the loss of topsoil impacts due to construction activities at the Fogarty Substation site would be reduced to less than significant (Class II).

Erosion impacts associated with improvements at the Valley and Ivyglen Substations would be very limited and contained within the existing substation boundaries. Substation improvements at both Valley and Ivyglen substations would occur on level ground that has been previously developed and prepared for further construction. The ground has been compacted and all vegetation removed. The applicant proposed erosion control measures presented in Sections D.10 Air Quality and D.7 Hydrology and Water Quality would further reduce the potential for erosion at the site, thus ensuring wind and water erosion impacts would be less than significant (Class II).

Operation of the Project would not result in substantial soil erosion or loss of topsoil; therefore, impacts to soil erosion due to operation would not be significant (Class III).

Mitigation Measures for Impact GEO-2

MM GEO-2a: An erosion and sedimentation control plan shall be incorporated into the SWPPP for project construction activities to minimize onsite soil erosion and offsite sedimentation. The plan shall include site maps, identification of construction activities, and measures for providing erosion and sediment control. The erosion and sedimentation control plan as part of the SWPPP shall be submitted to the CPUC for review and approval at least 60 days before construction.

Impact GEO-3: Soil stability

Significant subsidence has not been documented along the proposed subtransmission line route. The potential hazard from subsidence would be reviewed during detailed engineering and design. Standard design features would be incorporated into the design of the project. Implementation of Applicant Proposed Measures SCE-GEO-1, -2, and -3 would reduce impacts related to subsidence to less than significant (Class II).

Portions of all proposed subtransmission line segments, except Segments E-1 and W-8, would traverse areas delineated as moderate to high liquefaction hazard zones (Earth Consultants International 2000). Portions of Segments C-1, C-3, C-4, and C-6 would be placed in areas delineated as high liquefaction hazard, while Segments E-1 and W-8 pass through areas of very low or low liquefaction hazard. Liquefaction and landslide hazards are addressed with appropriate foundation designs, including excavation, grading, and compaction as part of the technical design and engineering of the proposed subtransmission line as identified in SCE-GEO-2. The design would include identification of liquefaction and landslide areas and would apply the appropriate engineering standards to ensure the integrity of the poles and lines. Implementation of Applicant Proposed Measure SCE-GEO-2 and MM GEO-3a would reduce impacts related to liquefaction and landslide hazards to less than significant levels (Class II).

The portions of the telecommunications system placed underground would not be at risk in the event of soil liquefaction or landslides as the line would be placed in duct banks designed to withstand seismic events and stresses. The remainder of the line would be installed on the poles erected for the proposed subtransmission line that would be designed to seismic standards and are expected to withstand any liquefaction and landslides. Therefore, potential impacts to the telecommunications system as a result of liquefaction or landslides after the implementation of SCE-GEO-2 and MM GEO-3a would be reduced to less than significant levels (Class II).

The Fogarty Substation would not be located on a geologic unit or soil that is unstable, or that would become unstable due to construction or operation of the substation. The Fogarty Substation site is located on a relatively flat area, which has negligible potential for landslides or other slope stability concerns from construction activities. Although the Elsinore groundwater basin is in overdraft, there is no known subsidence affecting the site, and construction of the Fogarty Substation would not include activities that would induce subsidence. Additionally, due to the low likelihood that a sequence of thick, low density saturated alluvium exists beneath the western portion of the substation site (see Section D.7 Hydrology and Water Quality) liquefaction potential is low. Any hazards at the Fogarty Substation associated with subsidence, landslides, and liquefaction would be identified in a detailed geotechnical report. With the implementation of SCE-GEO-2 and MM GEO-3a, impacts associated with unstable geologic conditions would be reduced to less than significant levels (Class II).

The Valley and Ivyglen Substations are located in an area delineated by the Applicant's data as low risk of liquefaction or landslide activity in the event of seismic shaking either during construction or operation. Liquefaction potential was evaluated during site specific design level studies prior to construction and possible liquefaction hazards were addressed with appropriate foundation designs, including excavation, grading, and compaction. Therefore, impacts related to liquefaction or landslides at the Valley and Ivyglen Substations would be less than significant (Class II).

Mitigation Measures for Impact GEO-3

MM GEO-3a: The Applicant shall perform design-level geotechnical investigations to assess the potential for geological hazards to include liquefaction, unstable slopes, landslides, earth flows, debris flows, and expansive soils to affect the approved project structures. Where hazards are found to exist, appropriate engineering design and construction measures shall be incorporated into the final project design. Appropriate measures could include:

- Ground improvement of liquefiable zones
- Incorporation of slack in underground portions of the telecommunications system
- Positioning of project structures away from steep hillsides and steep drainages
- Excavation of potentially expansive soils during construction and replacement with tested and engineered backfill
- Redirection of surface water and draining away from expansive foundation soils

The Applicant shall submit a report of the geotechnical survey and proposed measures to reduce the potential impacts of geological hazards to the CPUC for review and approval at least 60 days before construction.

Impact GEO-4: Expansive soils

Geotechnical studies would be conducted prior to construction of the proposed subtransmission line, telecommunications system, and Fogarty Substation as outlined in Applicant Proposed Measure GEO-SCE-2. The studies would evaluate the presence and extent of expansive or collapsible soil for all aspects of the Project. Soil expansion is a phenomenon by which clay-rich soils expand or swell when they are wet and shrink upon drying. Standard design practices are available and would be used to mitigate hazardous soil conditions, if encountered. Standard practices require soil at pole and substation sites to be compacted. Other standard design practices are available to address unstable soil conditions if needed. No adverse soils impacts are anticipated within the proposed subtransmission line route or at either substation where improvements are proposed and would not be significant (Class III).

The Fogarty Substation, however, has the potential to be located on expansive soils. The clay content of the Fogarty Substation site varies, and soils may have a moderate to very high shrink and swell potential. Corrective measures would be implemented during project design and construction in order to minimize the impact of expansive soils. Therefore, potential hazards associated with expansive soils are anticipated. Implementation of Applicant Proposed Measure GEO-SCE-2 and MM GEO-3a would ensure impacts to life and property related to expansive soils during construction would be reduced to less than significant levels (Class II).

The operation of the Project would not create substantial risks to life or property due to the presence of expansive soils, and any impact to life and property would be less than significant (Class III).

Impact GEO-5: Wastewater disposal

Construction and operation of the Project does not require septic tanks or alternative wastewater disposal systems. Wastewater generated on site would be minimal and portable toilets would be utilized during construction. No restrooms or other facilities that generate wastewater would be utilized during the operation of the Project. Construction of the project will comply with the SWPPP plan identified in GEO-SCE-03 to ensure any storm water runoff does not compromise water quality or increase erosion in the project area. Additional information on wastewater generated by the project can be found in Section D.7 Hydrology and Water Quality. Implementation of Applicant Proposed Measure GEO-SCE-03 will reduce any potential impacts to less than significant levels (Class III).

Impact GEO-6: Availability of a known valuable mineral resource

Mineral resources along the proposed subtransmission line route include clay, limestone, iron ore, sand, and construction aggregate (County of Riverside 2003). The project area is near to and encompasses areas with economically viable deposits of clay, sand, gravel, and stone products, including decomposed granite. Most of the project area is classified as MRZ-3, and areas along the I-15 corridor north of Lake Elsinore are classified MRZ-2. Portions of the proposed subtransmission line segment W-1 pass through an area designated MRZ-2. The region has a history of mining clay, stone/rock, decomposed granite, sand, and gravel. In addition, geothermal resources associated with elevated heat flow along the Elsinore Fault Zone have been known for some time. Geothermal resources along the proposed subtransmission line have not been developed for power production, although the County General Plan (County of Riverside 2007) identifies some potential for development using geothermal resources. The Fogarty Substation site is located in an area classified as MRZ-3. The Fogarty Substation site is not located on land known to contain an important mineral resource.

Because the Project's footprint is relatively small and does not pass through areas of significantly valuable mineral resources that are not already being mined, any impacts on the availability of a mineral resources during construction and operation would be less than significant (Class III).

Impact GEO-7: Mineral resource recovery sites

Segment W-1B of the proposed subtransmission line route and telecommunications system would bisect an active clay mining operation owned by Pacific Aggregates, also referred to as Pacific Clay, on the western side of I-15 at Nichols Road in the City of Lake Elsinore. The Pacific Clay mining facility constitutes a locally important mineral resource recovery site. Five mines were active in the Lake Elsinore area producing clay, stone/rock, and sand and gravel (County of Riverside 2005; Larose et al. 1999). Decomposed granite has also been mined in the Lake Elsinore area (Larose et al. 1999). Construction of the Project would disrupt extraction of the clay deposits because subtransmission line poles would be constructed amidst the active mining operations. The clay deposits beneath and surrounding the poles would be removed from production and result in reduced availability of a known mineral resource. The impacts to mineral resource recovery sites during construction and operation would be significant and unavoidable (Class I).

The underground portions of the telecommunications system would not be located in areas known to contain mineral or geothermal resources. In addition, construction and operation of the Fogarty Substation would not result in loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan. Except for Segment W-1B of the proposed subtransmission line route, the project area does not contain locally important mineral resource recovery sites, and thus there are no impacts associated with resource recovery sites. Construction and operation of the Ivyglen and Valley Substation improvements would also have no significant impacts on a current or planned mineral resource recovery site (Class III).

D.6.4 Cumulative

Riverside County is expected to experience rapid residential and commercial development in the next twenty years. Construction activities involved in such large scale development will include excavation and grading. Among other issues, such activities can cause slope instability and accelerate erosion. The proliferation of structures presents a potential hazard as structures can be damaged by corrosive soils, landslides, and seismic activity.

Potential cumulative impacts related to geology would likely be site specific. For the purpose of this analysis, the geographic scope would constitute the areas in the immediate vicinity of the Project, including those areas around the subtransmission line ROW, the Fogarty Substation site, the Valley and Ivyglen stations, areas temporarily used for construction activities, and all access roads used for construction and maintenance. A cumulative geological impact would occur if the construction activities contribute to damage to soils in conjunction with recent, concurrent, and planned development in the area or if the structural elements of the Project, in conjunction with the structural elements of nearby development, are unsound due to seismic activity or soil instability.

Construction activities include grading of pole sites and access roads which has the potential to cause erosion and sedimentation. This would contribute to the geological impacts of recent, concurrent, and projected construction projects in the area. To minimize the effect of construction on top soil, the Applicant will employ BMPs and implement APM GEO-SCE-3 which mandates the adoption of a Storm Water Pollution Prevention Plan (SWPPP) including soil erosion, sediment containment, and water quality protection measures. In conjunction with the SWPPP, this document recommends mitigation measure Geo-2a which requires an erosion and sediment control plan including site maps, identification of construction activities, and measures for providing erosion and sediment control. With these measures, the Project would not substantially contribute to cumulative impacts through soil erosion and sedimentation (Class II).

Structural elements of the Project are susceptible to damage from both seismic activity and soil instability, which can lead to liquification or landslides. Unstable structures pose a danger to both construction workers and the public, as seismic activity and soil instability can lead to partial or total collapse. The Applicant has proposed GEO-SCE-1 and GEO-SCE-2 to prevent accidents related to earthquake or soil instability. These APMs require design elements to adhere to the Institute of Electrical and Electronics Engineers provisions set forth in its "Recommended Practices for Seismic Design of Substations" and to conduct a geotechnical study to identify site-specific geologic conditions in enough detail to support final engineering and requirements of reviewing agencies. All of the Project components are located in a region of several active and potentially active earthquake faults. As such, this document outlines a number of additional mitigation measure designed to minimize the risks of structural instability during a potential earthquake. Mitigation measures 1a through 1d require site specific plans be submitted to the CPUC sixty days prior to construction outlining worker safety plans and offering seismic analyses. The Applicant must conduct surveys to ensure that pole locations avoid all sites deemed susceptible to fault surface ruptures, and all designs must be in compliance with CBC earthquake standards. Mitigation measure GEO-3a requires a similar geotechnical investigation to ensure that engineering design avoids geological hazards to include liquefaction, unstable slopes, landslides, earth flows, debris flows, and expansive soils. With the implementation of the AMPs and mitigation measures, the Project would not substantially contribute to cumulative impacts by constructing structures on land susceptible to seismic hazards or hazards relating to soil instability.