5.6 Geology and Soils

GEOLOGY AND SOILS Would the project:	Potentially Significant Impact	Less than Significant With Mitigation Incorporated	Less than Significant Impact	No Impact
a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) 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? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☑
ii) Strong seismic groundshaking?	☐	☐	☑	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☑	☐	☐
iv) Landslides?	☐	☐	☐	☑
b. Result in substantial soil erosion or the loss of topsoil?	☐	☑	☐	☐
c. Be located on geologic units 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?	☐	☐	☑	☐
d. Be located on expansive soil, as defined in Section 1803.5.3 of the California Building Code (2010), creating substantial risks to life or property?*	☐	☐	☑	☐
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☑

Significance criteria established by CEQA Guidelines, Appendix G.

5.6.1 Setting

This section describes geologic, seismic, and soil conditions and analyzes environmental impacts related to geologic and seismic hazards as they pertain to the implementation of the Proposed Project. The discussion addresses existing environmental conditions in the affected area, identifies and analyzes environmental impacts, and recommends measures to reduce or avoid adverse impacts anticipated from Project construction and operation. In addition, existing laws and regulations relevant to geologic and seismic hazards are described. In some cases, compliance with these existing laws and regulations would serve to reduce or avoid certain impacts that might otherwise occur with the implementation of the Proposed Project.

Baseline geologic, seismic, and soils information were collected from published and unpublished literature, GIS data, and online sources for the Proposed Project site and surrounding area. Data sources included the following: the Proponent's Environmental Assessment, geologic literature from the U.S. Geological Survey and California Geological Survey, geologic and soils GIS data, and online reference materials. The study area was defined as the locations of Proposed Project components and the areas of Tehachapi, Brite, and Cummings Valleys immediately adjacent to the Proposed Project for most geologic and soils issue areas. The study area related to seismically induced ground shaking includes significant regional active and potentially active faults within 50 miles of the Proposed Project.

Regional Geologic Setting

The Proposed Project components and the existing Correction-Cummings–Kern River 66 kV Subtransmission line are located in and across the Tehachapi Valley, Brite Valley, and Cummings Valley. These valleys are located at the eastern edge of the Tehachapi Mountains, which are at the southern end of the Sierra Nevada geomorphic province. The Sierra Nevada geomorphic province is dominated by the north-south trending Sierra Nevada range, a tilted fault block nearly 400 miles long, which grades into the Tehachapi Mountains. The Tehachapi Mountains are an east-west trending mountain range at the southern end of the Sierra Nevada, separating the Great Valley and the Mojave Desert. The Tehachapi Mountains have been sheared into this east-west trend by left-lateral fault movement of the Garlock fault, which runs near the southern boundary of the range. The mountains are bounded on the north by the White Wolf fault and the San Joaquin Valley and on the south by the Garlock fault and the Mojave Desert.

Local Geology

Geologic units underlying the Proposed Project consists primarily of Holocene alluvium in the Cummings, Brite, and Tehachapi Valleys, with smaller areas of Pleistocene older alluvium underlying parts of the telecommunication routes in the western Tehachapi Valley, and Mesozoic granitic rocks consisting of hornblende-biotite quartz diorite and Paleozoic metasedimentary rocks consisting of schist and marble underlying parts of the telecommunication routes along and crossing the hills bounding Brite Valley (Dibblee, 2008). Holocene alluvium underlies all areas of planned ground disturbance for the Proposed Project in the Cummings Valley, including construction of the proposed Banducci Substation, excavation for new subtransmission structures, trenching for underground portions of Telecommunication Route 1, and excavation for replacement poles along Telecommunication Route 2. Where Telecommunication Route 2 crosses and is adjacent to the hills bounding Brite Valley, areas of proposed ground disturbance for installation of replacement poles for Route 2 include a mix of Holocene alluvium, Mesozoic hornblende-biotite quartz diorite, and Paleozoic schist and marble. The Holocene alluvium along Route 2 in the Brite Valley area likely shallowly overlies the older bedrock. In the western Tehachapi Valley, areas of ground disturbance are underlain by Pleistocene older alluvium along Telecommunication Route 1 for trenching for new underground cable into Cummings Substation and along Route 2 for excavation for replacement poles and trenching for a new underground section of telecommunication cable. The remainder of the ground disturbance areas in the Tehachapi Valley area are underlain by Holocene alluvium, including areas of excavation for replacement poles along Route 2 and trenching at Monolith Substation for a new underground section of Route 1 where it enters the substation.

Soils

Soils within the Proposed Project area reflect the underlying rock type, the extent of weathering of the rock, the degree of slope, and the degree of human modification. The Proposed Project is located in a mix of undeveloped desert/grassland, agricultural, rural residential land, and developed city area. The National Resource Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database for Kern County, California, Southeastern Part was reviewed to identify soil units and characteristics underlying the Proposed Project (NRCS, 2006). Five main soil associations/complexes are mapped as underlying soil in disturbance areas of the Proposed Project, listed in approximate order of prevalence: Steuber, Havala, Tehachapi, Walong, and Xerothents. The proposed Banducci Substation area is underlain by the Steuber association. In the Proposed Project area these soils all consist primarily of sandy loam. The major components of the Steuber, Havala, and Tehachapi soil associations are all primarily deep well drained soils formed on alluvial fans, stream terraces, and floodplains. The Walong soils are moderately deep well drained soils formed in colluvium weathered from granitic rocks. The Xerothents are shallow soils formed in colluvium and weathered granitic rock.

The general description and select physical characteristics of hazards of erosion, and shrink/swell potential for these soils were reviewed to evaluate potential hazards to the Proposed Project related to unsuitable soil conditions. Table 5.6-1 presents the general susceptibility of the soil associations underlying the Proposed Project to sheet and rill erosion,[1] wind erodibility, and shrink-swell potential. Each association is made up of numerous soil units, therefore the table presents a general potential for these characteristics to occur in the association based on the major soil components of these associations.

Table 5.6-1. Key Characteristics of Soils Underlying the Proposed Project

Soil Association	Susceptibility to Sheet and Rill Erosion[1]	Wind Erodibility[2]	Shrink-Swell Potential[3]
Steuber	Low	Low to Moderate	Low
Havala	Low	Low to Moderate	Low to Moderate
Tehachapi	Moderate	Low to Moderate	Low to Moderate
Walong	Low	Moderate	Low
Xerothents	Low	Low	Low to Moderate

1 - Based on Erosion factor K (used by the NRCS in the Universal Soil Lose Equation), which indicates the susceptibility of a soil to sheet and rill erosion. Values of K range from 0.02 to 0.69 with higher values being more susceptible to sheet and rill erosion.

2 - Soils are assigned to wind erodibility groups based on their susceptibility to wind erosion, soils assigned to group 1 are the most susceptible and soils assigned to group 8 are the least susceptible.

3 - Linear extensibility is the method used by the NRCS to determine the shrink-swell potential of soils. Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. The volume change is reported as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3 percent, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed in areas with expansive soils.

Potential soil erosion hazards vary depending on the use, conditions, and textures of the soils. The properties of soil that influence erosion by rainfall and runoff are ones that affect the infiltration capacity of a soil, and those that affect the resistance of a soil to detachment and being carried away by falling or flowing water. Additionally, soils on steeper slopes would be more susceptible to erosion due to the effects of increased surface flow (runoff) on slopes where there is little time for water to infiltrate before runoff occurs. Soils containing high percentages of fine sands and silt and that are low in density, are generally the most erodible. As the clay and organic matter content of these soils increases, the potential for erosion decreases. Clays act as a binder to soil particles, thus reducing the potential for erosion.

Expansive soils are characterized by their ability to undergo significant volume change (shrink and swell) due to variation in soil moisture content. Changes in soil moisture could result from a number of factors, including rainfall, landscape irrigation, utility leakage, and/or perched groundwater. Expansive soils are typically very fine grained with a high to very high percentage of clay. Soils with moderate to high shrink-swell potential would be classified as expansive soils.

Slope Stability

Important factors that affect the slope stability of an area include the steepness of the slope, the relative strength of the underlying rock material, and the thickness and cohesion of the overlying colluvium and alluvium. The steeper the slope and/or the less strong the rock, the more likely the area is susceptible to landslides. The steeper the slope and the thicker the colluvium, the more likely the area is sus-

[1] Sheet and rill erosion is the removal of soil from the land surface by the action of rainfall and runoff. Sheet erosion occurs when water runs over a large uniform area picking up and distributing soil particles. Rill erosion occurs as concentrated surface runoff begins to remove soil along concentrated zones which numerous small, but conspicuous, water channels or tiny rivulets.

ceptible to debris flows. Another indication of unstable slopes is the presence of old or recent landslides or debris flows.

The Proposed Project components traverse flat to relatively flat topography and no known landslides occur in the immediate project vicinity, therefore landslides and other slope failures would not occur.

Seismicity

The seismicity of the project area is dominated by the intersection of the north-northwest trending San Andreas Fault zone and the east-west trending Garlock fault zone. Both systems are responding to strain produced by the relative motions of the Pacific and North American Tectonic Plates. This strain is relieved by right-lateral strike-slip faulting on the San Andreas and related faults, left-lateral strike slip on the Garlock fault zone, and by vertical, reverse-slip or left-lateral strike-slip displacement on faults in the Sierra Nevada and Transverse Ranges. The effects of this deformation include mountain building; basin development, deformation of Quaternary marine terraces, widespread regional uplift, and generation of earthquakes. The Tehachapi Mountains and surrounding area contain numerous faults of varying ages and activity. These faults can be classified as historically active, active, potentially active, or inactive, based on the following criteria (CGS, 1999):

- Faults that have generated earthquakes accompanied by surface rupture during historic time (approximately the last 200 years) and faults that exhibit aseismic fault creep are defined as Historically Active.
- Faults that show geologic evidence of movement within Holocene time (approximately the last 11,000 years) are defined as Active.
- Faults that show geologic evidence of movement during the Quaternary (approximately the last 1.6 million years) are defined as Potentially Active.
- Faults that show direct geologic evidence of inactivity during all of Quaternary time or longer are classified as Inactive.

Although it is difficult to quantify the probability that an earthquake will occur on a specific fault, this classification is based on the assumption that if a fault has moved during the Holocene epoch, it is likely to produce earthquakes in the future. Since periodic earthquakes accompanied by surface displacement can be expected to continue in the study area through the lifetime of the Proposed Project, the effects of strong groundshaking and fault rupture are of primary concern to safe operation of the Proposed Project components. The Project area will be subject to ground shaking associated with earthquakes on faults of the San Andreas, Garlock, and Transverse Ranges fault systems. Active faults of the San Andreas system are predominantly strike-slip faults accommodating translational movement. The predominant active faults in the Project area are the San Andreas and Garlock faults.

The Project area will be subject to ground shaking associated with earthquakes on faults of the San Andreas and Garlock systems, and other regional faults. Figure 5.6-1 (Regional Active Faults and Historic Earthquakes) shows locations of active and potentially active faults (representing possible seismic sources) and earthquakes greater than magnitude 5.0 in the region surrounding the Proposed Project. Active and potentially active faults within 50 miles of the Project alignments that are significant potential seismic sources relative to the Proposed Project are presented in Table 5.6-2.

Table 5.6-2. Significant Active and Potentially Active Faults within 50 miles of the Proposed Project

Fault Name	Distance[1] (miles)	Closest Project Component(s)	Estimated Maximum Magnitude[2]
Garlock fault zone	3.4	Southeast of Proposed Telecommunication Route 1	7.3
White Wolf fault zone	8.7	Northwest of Proposed Telecommunication Route 2	7.2
Plieto fault zone	19.6	Southwest of Proposed Banducci Substation	7.1
San Andreas fault zone	24.5	Southwest of Proposed Banducci Substation	7.0–7.6[3]
Lenwood-Lockhart fault zone	34.7	East of Monolith Substation	7.5
Southern Sierra Nevada fault	36.9	Southeast of Monolith Substation	7.5

1 - Fault distances measured from USGS GIS Quaternary fault data (USGS and CGS, 2010).

2 - Maximum Earthquake Magnitude – the maximum earthquake that appears capable of occurring under the presently known tectonic framework, magnitude listed is "Ellsworth-B" magnitude from USGS OF08-1128 (Documentation for the 2008 Update of the United States National Seismic Hazard Maps) unless otherwise noted.

3 - Range of Magnitude for San Andreas fault zone represents varying potential rupture scenarios with single or multiple segments rupturing in various combinations.

The closest fault to the site, the Garlock fault zone, is a major active (Holocene), east to northeast-striking left lateral strike-slip fault that forms the boundary between the Tehachapi Mountains, Sierra Nevada, and Basin and Range province on the north and the Mojave Desert province to the south. The Garlock fault zone is divided into three sections, with the central section being the closest to the Proposed Project. Although, no earthquakes have produced surface rupture on the Garlock fault in historic times, there have been a few large earthquakes recorded along the Garlock fault zone, with the most recent being a magnitude (M) 5.7 earthquake near the town of Mojave on July 11, 1992 (SCEDC, 2014).

The next closest fault to the Proposed Project is the White Wolf fault zone. This fault zone is an active, east to northeast-striking left lateral reverse range front fault that dips to the southeast located on the northwest flank of the Tehachapi Mountains. This fault was responsible for the July 21, 1952 M 7.3 Kern County Earthquake. The Kern County Earthquake resulted in the death of 12 people, damage to hundreds of buildings in Kern County, and over $50 million in property damage. It was felt as far away as Reno and San Diego.

Fault Rupture

Fault rupture is the surface displacement that occurs when movement on a fault deep within the earth breaks through to the surface. Fault rupture and displacement almost always follows preexisting faults, which are zones of weakness, however not all earthquakes result in surface rupture (i.e., earthquakes that occur on blind thrusts do not result in surface fault rupture). Rupture may occur suddenly during an earthquake or slowly in the form of fault creep. In addition to damage caused by ground shaking from an earthquake, fault rupture is damaging to buildings and other structures due to the differential displacement and deformation of the ground surface that occurs from the fault offset, leading to damage or collapse of structures across this zone.

While the closest fault to the project site is the active Garlock fault, no known active or potentially active faults are mapped crossing or immediately adjacent to any project components. Therefore there is little to no potential for primary fault rupture to impact the project site.

Ground Shaking

An earthquake is classified by the amount of energy released, which traditionally has been quantified using the Richter scale. Recently, seismologists have begun using a Moment Magnitude (M) scale because it provides a more accurate measurement of the size of major and great earthquakes. For earthquakes of less than M 7.0, the Moment and Richter Magnitude scales are nearly identical. For earthquake magnitudes greater than M 7.0, readings on the Moment Magnitude scale are slightly greater than a corresponding Richter Magnitude. Review of earthquake data for the project area indicates that approximately 35 earthquakes of greater than magnitude 5.0 have occurred within 50 miles of the Proposed Project, including the M 7.3 Kern County Earthquake and its numerous aftershocks (NCEDC, 2014).

The intensity of the seismic shaking, or strong ground motion, during an earthquake is dependent on the distance between the Project area and the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the Project area. Earthquakes occurring on faults closest to the Project area would most likely generate the largest ground motion. The intensity of earthquake induced ground motions can be described using peak site accelerations, represented as a fraction of the acceleration of gravity (g). The USGS National Seismic Hazards (NSH) Maps were used to estimate approximate peak ground accelerations (PGAs) in the Proposed Project area (USGS, 2014). The NSH Maps depict peak ground accelerations with a 2 percent probability of exceedance in 50 years, which corresponds to a return interval of 2,475 years and for a maximum considered earthquake. The estimated approximate peak ground acceleration from large earthquakes for the project area is approximately 0.5 to 0.6 g, which corresponds to moderate to strong ground shaking.

Liquefaction. Liquefaction is the phenomenon in which saturated granular sediments temporarily lose their shear strength during periods of earthquake-induced strong groundshaking. The susceptibility of a site to liquefaction is a function of the depth, density, and water content of the granular sediments and the magnitude and frequency of earthquakes in the surrounding region. Saturated, unconsolidated silts, sands, and silty sands within 50 feet of the ground surface are most susceptible to liquefaction. Liquefaction-related phenomena include lateral spreading, ground oscillation, flow failures, loss of bearing strength, subsidence, and buoyancy effects (Youd and Perkins, 1978). In addition, densification of the soil resulting in vertical settlement of the ground can also occur.

In order to determine liquefaction susceptibility of a region, three major factors must be analyzed. These include the density and textural characteristics of the alluvial sediments, the intensity and duration of groundshaking, and the depth to groundwater.

A review of the California Department of Water Resources (DWR) Water Data Library and the Tehachapi-Cummings County Water District Watermaster Reports for Cummings and Tehachapi Valleys indicates that water levels in the Cummings, Brite, and Tehachapi Valley areas is generally greater than 100 feet below ground surface (DWR, 2014 and TCCCWD, 2014a & 2014b), however local wells within Cummings and Tehachapi Valleys do exhibit shallower water levels ranging from near artesian conditions with levels just below ground surface (bgs) to approximately 30 to 40 feet bgs. Due to the varying groundwater depths in Cummings and Tehachapi Valleys in the vicinity of the Proposed Project and the presence of potentially liquefiable Holocene alluvium underlying project components, there is a potential that the project components would be subject to liquefaction-related phenomena in the event of a large regional earthquake.

Seismic Slope Instability. The other form of seismically induced ground failure which may be caused by an earthquake is seismically induced landslides. Landslides triggered by earthquakes have been a significant cause of earthquake damage. In southern California large earthquakes such as the 1971 San Fernando and 1994 Northridge earthquakes triggered landslides that were responsible for destroying or damaging numerous structures, blocking major transportation corridors, and damaging life-line infrastructure. Areas that are most susceptible to earthquake-induced landslides are steep slopes in poorly cemented or highly fractured rocks, areas underlain by loose, weak soils, and areas on or adjacent to existing landslide deposits. However, as the Proposed Project components would be in flat to relatively flat topography and are not located immediately adjacent to steep slopes, earthquake induced slope instability is not likely to affect the Proposed Project.

Regulatory Background

Federal

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the Waters of the U.S. The CWA authorizes the Public Health Service to prepare comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries and improving the sanitary condition of surface and underground waters with the goal of improvements to and conservation of waters for public water supplies, propagation of fish and aquatic life, recreational purposes, and agricultural and industrial uses. The Proposed Project construction would disturb a surface area greater than one acre; therefore, under Clean Water Act regulations, SCE would be required to obtain a National Pollution Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activity. Compliance with the NPDES would require that the Applicant submit a Storm Water Pollution Prevention Plan (SWPPP).

State

The International Building Code (IBC) is published by the International Code Council (ICC), the scope of this code covers major aspects of construction and design of structures and buildings, except for three-story one- and two-family dwellings and town homes. The International Building Code has replaced the Uniform Building Code as the basis for the California Building Code and contains provisions for structural engineering design. The 2015 IBC addresses the design and installation of structures and building systems through requirements that emphasize performance. The IBC includes codes governing structural as well as fire- and life-safety provisions covering seismic, wind, accessibility, egress, occupancy, and roofs.

The California Building Code, Title 24, Part 2 (CBC, 2013) provides building codes and standards for design and construction of structures in California. The 2013 CBC is based on the 2012 International Building Code with the addition of more extensive structural seismic provisions. The 2013 CBC remains in effect through 2016. Chapter 16 of the CBC contains definitions of seismic sources and the procedure used to calculate seismic forces on structures.

The Alquist-Priolo Earthquake Fault Zoning Act of 1972, Public Resources Code (PRC), sections 2621–2630 (formerly the Special Studies Zoning Act) regulates development and construction of buildings intended for human occupancy to avoid the hazard of surface fault rupture. While this act does not specifically regulate transmission and telecommunication lines; it does help define areas where fault rupture is most likely to occur. This Act groups faults into categories of active, potentially active, and inactive. Historic and Holocene age faults are considered active, Late Quaternary and Quaternary age faults are considered potentially active, and pre-Quaternary age faults are considered inactive. These classifications are qualified by the conditions that a fault must be shown to be “sufficiently active” and “well defined” by detailed site-specific geologic explorations in order to determine whether building setbacks should be established.

The Seismic Hazards Mapping Act (the Act) of 1990 (Public Resources Code, Chapter7.8, Division 2, sections 2690–2699.) directs the California Department of Conservation, Division of Mines and Geology [now called California Geological Survey (CGS)] to delineate Seismic Hazard Zones. The purpose of the Act is to reduce the threat to public health and safety and to minimize the loss of life and property by identifying and mitigating seismic hazards. Cities, counties, and State agencies are directed to use seismic hazard zone maps developed by CGS in their land-use planning and permitting processes. The Act requires that site-specific geotechnical investigations be performed prior to permitting most urban development projects within seismic hazard zones.

California Public Utilities General Order 95 (GO95) and General Order 128 (GO128) contain State of California rules formulated to provide uniform requirements for overhead electrical line construction and underground electrical supply and communication systems, respectively, to insure adequate service and secure safety to persons engaged in the construction, maintenance, operation or use of overhead electrical lines and underground electrical supply and communication systems and to the public. GO95 and GO128 are not intended as complete construction specifications, but to embody requirements which are most important from the standpoint of safety and service. Construction shall be according to accepted good practice for the given local conditions in all particulars not specified in the rules. GO95 applies to all overhead electrical supply and communication facilities which come within the jurisdiction of the California Public Utilities Commission, located outside of buildings, including facilities that belong to non-electric utilities, as follows: Construction and Reconstruction of Lines, Maintenance of Lines, Lines Constructed Prior to This Order, Reconstruction or Alteration, Emergency Installation, and Third Party Nonconformance. GO128 applies to (a) all underground electrical supply systems used in connection with public utility service; when located in buildings, the vaults, conduit, pull boxes or other enclosures for such systems shall also meet the requirements of any statutes, regulations or local ordinances applicable to such enclosures in buildings; and (b) all underground communication systems used in connection with public utility service located outside of buildings. GO128 applies to the following activities related to underground electrical supply and communication systems: Construction and Reconstruction of Lines, Maintenance, Systems Constructed Prior to These Rules, Reconstruction or Alteration, and Third Party Nonconformance.

The Institute of Electrical and Electronics Engineers (IEEE) 693 "Recommended Practices for Seismic Design of Substations" was developed by the Substations Committee of the IEEE Power Engineering Society, and approved by the American National Standards Institute and the IEEE-SA Standards Board. This document provides seismic design recommendations for substations and equipment consisting of seismic criteria, qualification methods and levels, structural capacities, performance requirements for equipment operation, installation methods, and documentation. This recommended practice emphasizes the qualification of electrical equipment. IEEE 693 is intended to establish standard methods of providing and validating the seismic withstand capability of electrical substation equipment. It provides detailed test and analysis methods for each type of major equipment or component found in electrical substations. This recommended practice is intended to assist the substation user or operator in providing substation equipment that will have a high probability of withstanding seismic events to predefined ground acceleration levels. It establishes standard methods of verifying seismic withstand capability, which gives the substation designer the ability to select equipment from various manufacturers, knowing that the seismic withstand rating of each manufacturer's equipment is an equivalent measure. Although most damaging seismic activity occurs in limited areas, many additional areas could experience an earthquake with forces capable of causing great damage. This recommended practice should be used in all areas that may experience earthquakes.

Local

Kern County. The Kern County General Plan, the Kern County Zoning Ordinance, and the Kern County Code of Building Regulations include policies for the avoidance of geologic hazards and/or the protection of unique geologic features. The Safety Element (Chapter 4) of the Kern County General Plan (County of

Kern, 2009) provides policies and measures to minimize injuries and loss of life and reduce property damage from seismic and geologic hazards. The main policy relevant to the Proposed Project is "The County shall encourage extra precautions be taken for the design of significant lifeline installations, such as highways, utilities, and petrochemical pipelines." Proper design of the Project facilities, including any and all mitigation measures outlined in this document, would comply with this policy and would be consistent with the Safety Element.

Greater Tehachapi Area Specific and Community Plan (GTASCP). The Greater Tehachapi Area (GTA) is a collection of unincorporated communities located in eastern Kern County along state route (SR) 58 between the San Joaquin valley and the Mojave Desert that includes the rural communities of Alpine Forest, Bear Valley Springs, Brite Valley, Cummings Ranch, Cummings Valley, Golden Hills, Mendiburu Springs, Monolith, Old Towne, and Stallion Springs. Chapter 5 of the GTASCP, The Safety Element, contains a discussion of the existing safety concerns within the GTA and the policies and implementation measures, if necessary, to mitigate any adverse safety concerns. The identified safety concerns provide direction for developing goals and policies to protect the GTA from adverse safety impacts through subsequent development implementation within the Plan.

Applicant Proposed Measures

No APMs related to geology and soils hazards have been proposed by SCE.

5.6.2 Environmental Impacts and Mitigation Measures

a. Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) 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? Refer to Division of Mines and Geology Special Publication 42.

NO IMPACT. None of the Proposed Project components are located across or immediately adjacent to active or potentially active fault and thus would not be subject to damage due to fault rupture.

ii) Strong seismic ground shaking?

LESS THAN SIGNIFICANT. The majority of the Proposed Project area is located in an area mapped as likely to experience moderate to strong ground shaking in the event of a large earthquake. The area has historically experienced minor to moderate groundshaking due to earthquakes that have occurred in the region. Although the Proposed Project is located in an area that may experience moderate to strong groundshaking due to large local or regional earthquakes, the proposed Banducci Substation would be designed as required by the Institute of Electrical and Electronic Engineers per guidelines in IEEE 693 (Recommended Practices for Seismic Design of Substations), and the new structures for the Proposed Project's new 115 kV subtransmission line segments, new poles, and new underground substructures for Telecommunications Routes 1 and 2 would be designed as required by CPUC General Orders 95 and 128 (overhead electrical line construction requirements and underground electrical supply and communication systems requirements, respectively). Design of these new structures to these guidelines and standards would reduce any potential damage from groundshaking to these features to less than significant.

The remainder of the Proposed Project consists of the installation of fiber optic telecommunications cables on the existing poles and in existing underground conduit of Routes 1 and 2, with 39 poles being replaced along Route 2 as part of the Proposed Project. These 39 poles are being replaced to ensure wind loading design loading criteria are met with the additional weight of the fiber optic telecommunication cable. The existing and new poles would be and have been designed to a wind loading standard that generally also exceeds seismic loading criteria, thus reducing the risk of a pole failing during a seismic event. It is not expected that the addition of the fiber optic cable to the existing and replacement poles or within the existing and new underground conduit would add substantial instability to the existing structures or create instability in the new structures; the potential for earthquake-induced groundshaking damage to the existing and new poles and conduit along most of the fiber optic telecommunications routes would not change from the current conditions, resulting in a less-than-significant impact.

iii) Seismic-related ground failure, including liquefaction?

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED. The portions of the Proposed Project located within loose, Holocene alluvial sediments of Cummings and Tehachapi Valleys, where there is a potential for shallow groundwater, may be subject to liquefaction in the event of strong ground shaking. The proposed Banducci Substation and related structures, the new subtransmission structures, and the new segments of underground conduit and replacement poles for the telecommunications routes located in areas with potentially liquefiable Holocene alluvial sediment could potentially suffer liquefaction-related damage in a large earthquake if not properly designed. As required by required by the Institute of Electrical and Electronic Engineers per guidelines in IEEE 693 (Recommended Practices for Seismic Design of Substations) and CPUC General Orders 95 and 128 these structures would be designed to withstand seismic loading; however, to ensure that impacts associated with seismically induced ground failures or liquefaction would be less than significant, Mitigation Measure G-1 (Conduct geotechnical investigations for liquefaction) shall be implemented prior to final project design to ensure that people or structures are not exposed to hazards associated with earthquake-induced liquefaction.

Generally, the addition of fiber optic telecommunication cable along existing and new poles and conduit in these potentially liquefiable areas is not expected to add substantial instability to the existing or new structures because they do not meet CPUC GO95 wind loading requirements and/or SCE design standards with the addition of the fiber optic cable. The potential for liquefaction-related damage to the existing poles along most of the transmission/fiber optic telecommunications alignments would not change from the current conditions with the addition of the fiber optic cable, resulting in a less-than-significant impact for this portion of the Proposed Project.

Mitigation Measure for Seismic-related Ground Failure and Liquefaction

MM G-1 **Conduct Geotechnical Investigations for Liquefaction.** Because seismically induced liquefaction-related ground failure has the potential to damage or destroy Project components, the design-level geotechnical investigations to be performed by the SCE shall include investigations designed to assess the potential for liquefaction to affect the new Project structures and replacement poles within Cummings and Tehachapi Valleys in areas with potential liquefaction-related impacts. Where these hazards are found to exist, appropriate engineering design and construction measures shall be incorporated into the Project designs as deemed appropriate by the project engineer. Design measures that would mitigate liquefaction-related impacts could include ground improvement of liquefiable zones, installation of flexible bus connections, and incorporation of slack in cables to allow ground deformations without damage to structures. Study results and proposed solutions to mitigate liquefaction shall be provided to the CPUC for review and approval at least 60 days before final Project design.

iv) Landslides?

NO IMPACT. The Proposed Project components are on and traverse flat to relatively flat topography and no known landslides occur in the immediate project vicinity, therefore landslides and other slope failures would not occur, thus there would be no impact related to landslides or slope instability.

b. Would the project result in substantial soil erosion or the loss of topsoil?

LESS THAN SIGNIFICANT WITH MITIGATION INCORPORATED. Increased rates of soil erosion are not expected to result from the installation of structures for the new proposed subtransmission line segments or replacement of the 39 existing wood poles on Telecommunication Route 2 due to the limited amount of surface ground disturbance anticipated for construction of these features. Additionally, installation of the fiber optic telecommunication cable in areas of existing overhead structures is not expected to create substantial ground disturbance that would cause increased levels of soil erosion.

Areas of trenching and grading for the Proposed Banducci Substation, and for installation of the new underground substructures for the fiber optic telecommunications cables along Telecommuncations Routes 1 and 2 would present the highest risk of adverse impacts. The soils in these areas with the highest ground disturbance for the Proposed Project have low to moderate susceptibility for sheet and rill erosion and low to moderate wind erodibility. However, Mitigation Measure G-2 provides for a Stormwater Pollution Prevention Plan (SWPPP), which would be required in accordance with the Clean Water Act. Implementation of Mitigation Measure HYD-1 (Develop Stormwater Pollution Prevention Plan and Implement Best Management Practices) in Section 5.9 (Hydrology and Water Quality) would limit erosion from the construction sites and would result in a less-than-significant impact.

c. Would the project be located on geologic units 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?

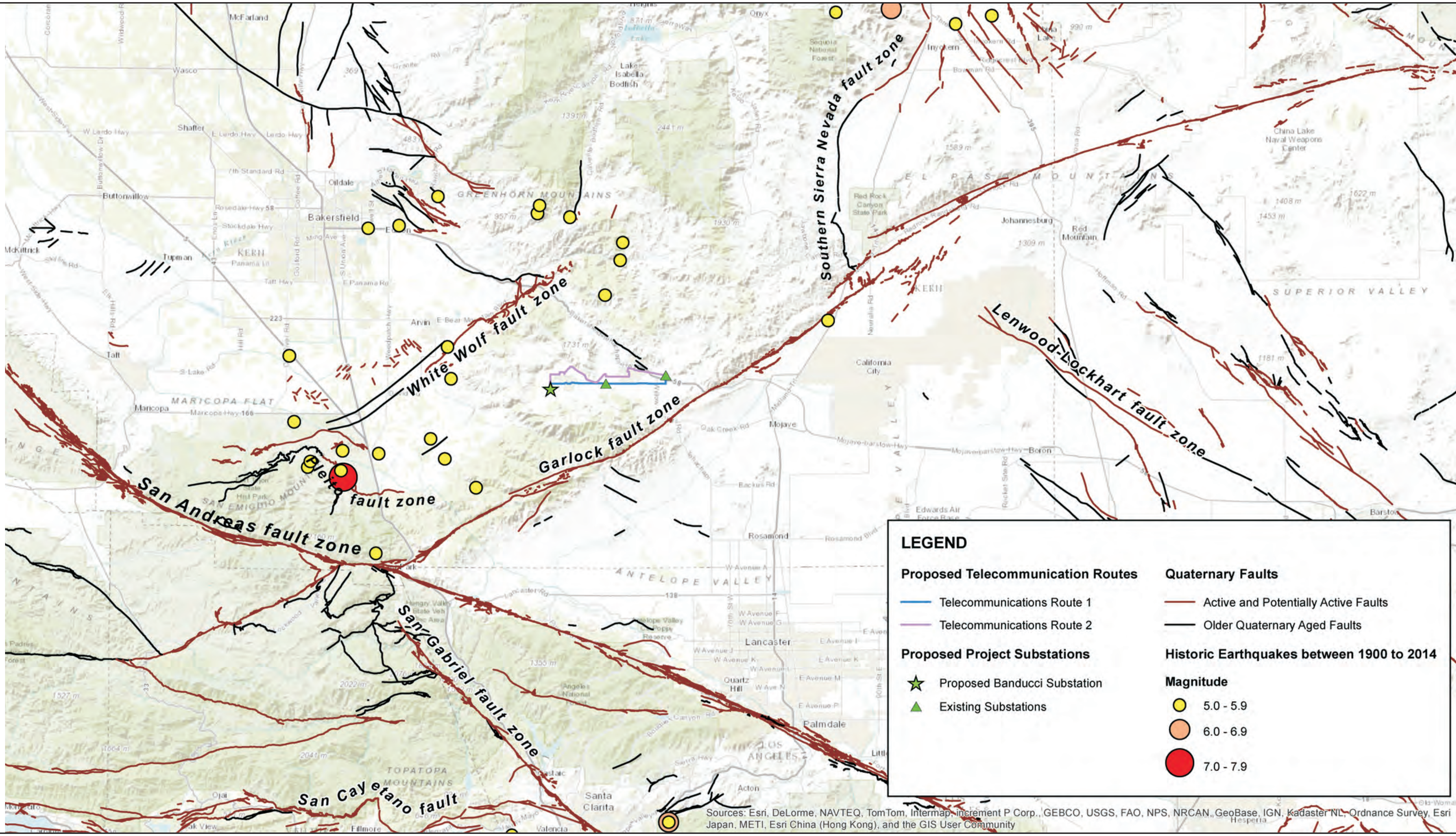
LESS THAN SIGNIFICANT. As discussed above in item a.(iii) – Liquefaction, portions of the Proposed Project where new project structures would be constructed in the Cummings and Tehachapi Valleys are located in areas with potentially liquefiable alluvial sediment and could potentially suffer liquefaction-related damage; however, implementation of Mitigation Measure G-1 (Conduct geotechnical investigations for liquefaction) prior to final project design would ensure that people or structures are not exposed to hazards associated with earthquake-induced liquefaction, reducing the impact to less than significant. Additionally, as discussed above in item a.(iv) – Landslides, there would be no impact from landslides as the Proposed Project is located on and traverses flat to gently sloping terrain and would not be subject to landslides.

d. Would the project 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?

LESS THAN SIGNIFICANT. Most of the Proposed Project's new structures (the Banducci Substation, new subtransmission structures, and the new underground segment of Telecommunication Route 1 near the substation) are underlain by the Steuber soil association, which has a low potential for expansion. Therefore, these project components would not be subject to damage related to expansive soils. The remaining project structures (replacement poles and new underground structures) are located in soils with low to moderate expansion potential and could potentially be subject to damage related to expansive soils. However, these structures would be designed to meet CPUC General Order 95 and 128 requirements, which would reduce the impact to less than significant.

e. Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

NO IMPACT. There is no sewer service available at the proposed Banducci Substation site. A permanent stand-alone restroom equipped with self-contained water- and waste-holding tanks would be installed within the substation perimeter wall. No septic system would be installed at this site. No other components of the Proposed Project would require new connections to a sewer or septic system. Thus, there would be no impact from disposal of wastewater.



Aspen Environmental Group

Source: SCE, 2014.

Figure 5.6-1
Regional Active Faults and Historic Earthquakes

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