4.6 GEOLOGY AND SOILS

This section presents the environmental setting and impact analysis for geology and soils that would be affected by the alternatives to the Revised Project. The Revised Project would not result in a new or increased impact on any resources related to geology and soils above what was described in the 2013 RTRP EIR, as discussed in the Initial Study Checklist (Panorama Environmental, Inc., 2017). These impacts were adequately addressed by the 2013 RTRP EIR and are not discussed further in this Subsequent EIR.

4.6.1 Consideration of Scoping Comments

The public expressed concerns regarding impacts on soils and geology during public scoping for the Subsequent EIR. Table 4.6-1 summarizes the scoping comments received regarding geology and soil impacts, and identifies how and/or where these comments are addressed.

Table 4.6-1 Scoping Comments Related to Geology and Soil Impacts

Summary of Comment	Location Comment is Addressed
Concern regarding damage to the line from earthquakes.	Potential impacts regarding damage to the power lines from earthquakes were evaluated in the 2013 RTRP EIR. The Revised Project would not result in any new or increased impact. Refer to Chapter 3 of the 2013 RTRP EIR.

4.6.2 Alternatives Setting

Environmental Setting

Physiography and Topography

The Revised Project and alternative alignments are located within the Chino Basin of the northern portion of the Peninsular Range Physiographic Province. The Peninsular Range is characterized by a series of mountain ranges separated by northwest-trending valleys sub-parallel to faults branching from the San Andreas Fault (DWR, 1967; Norris & Webb, 1990; City of Jurupa Valley, 2017c).

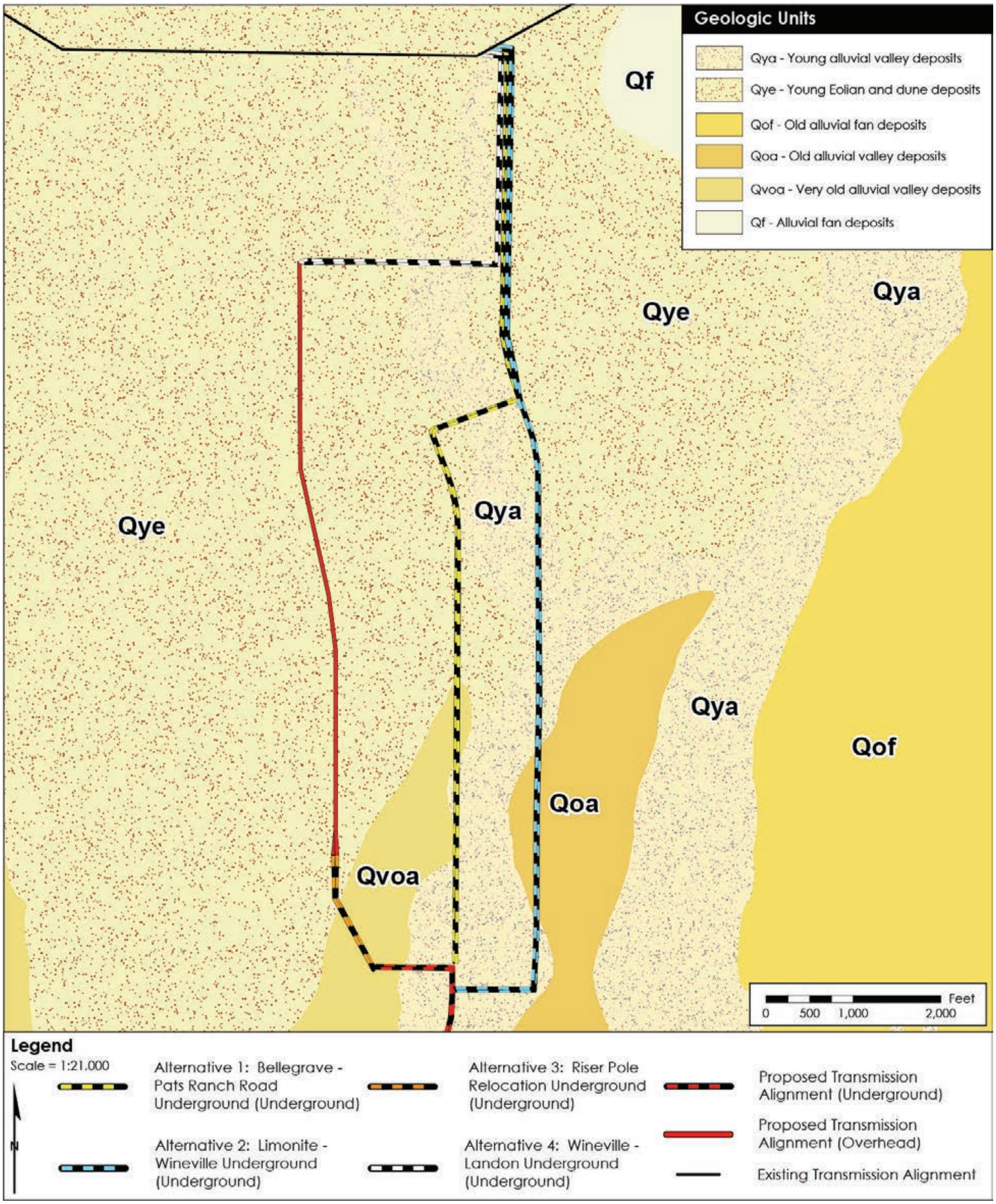
Geologic Setting and Units

The geologic units in the area of the alternative alignments are depicted in Figure 4.6-1 and are described in Table 4.6-2.

Soil Types

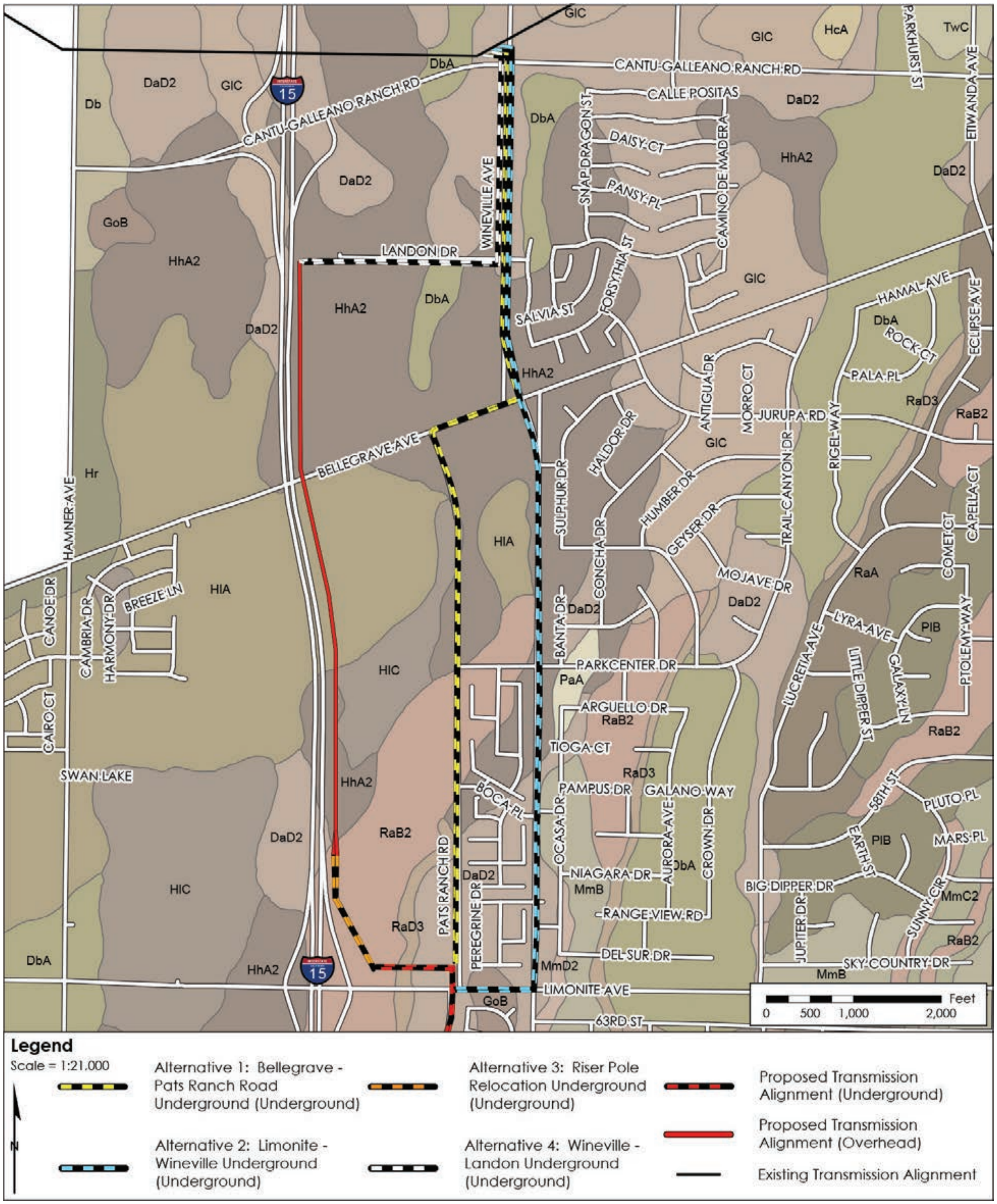
Figure 4.6-2 characterizes the major soil types in the area of the alternative alignments. The legend, and a further description of the soil types are described in Table 4.6-3.

Figure 4.6-1 Geologic Units in the Area of the Alternatives



Sources: (esri, 2017; SCE, 2017; California Geological Survey, 2012)

Figure 4.6-2 Soil Types in the Area of the Alternatives



Sources: (esri, 2017; SCE, 2017; USDA National Resources Conservation Service, 2015a)

Table 4.6-2 Geologic Units in the Area of the Alternative Alignments

Age (from youngest to oldest)	Unit	Description
Quaternary: Holocene to Late Pleistocene	Qya	Young alluvial valley deposits: unconsolidated to slightly consolidated, undissected to slightly dissected clay, silt, sand, and gravel along stream valleys and alluvial flats of larger rivers
Quaternary: Holocene to Late Pleistocene	Qye	Young Eolian and dune deposits: unconsolidated to slightly consolidated, undissected to slightly dissected wind-blown sands
Quaternary: Late to Middle Pleistocene	Qoa	Old alluvial valley deposits: slightly to moderately consolidated, moderately dissected clay, silt, sand, and gravel along stream valleys and alluvial flats of larger rivers
Quaternary: Middle to Early Pleistocene	Qvoa	Very old alluvial valley deposits: moderately to well-consolidated, highly dissected clay, silt, sand, and gravel along stream valleys and alluvial flats of larger rivers, generally uplifted and deformed

Sources: (esri, 2017; SCE, 2017; California Geological Survey, 2012)

Table 4.6-3 Major Soil Units in the Area of the Alternative Alignments

Soil Series and Description	Map Unit Name	Percent Slope	Runoff Rate	Shrink-Swell Potential	Erosion
Delhi fine sand	DaD2	2 to 15	Very slow	Low	Eroded
Hilmar loamy sand	HhA2	0 to 2	Very slow	Low	Eroded
Ramona sandy loam	RaB2	2 to 5	Medium	Low	Eroded
Grangeville loamy fine sand, drained	GoB	0 to 5	Slow	Low	Slight
Delhi loamy fine sand	DbA	0 to 2	Very slow	Low	Slight

Sources: (City of Jurupa Valley, 2017c; USDA National Resources Conservation Service, 2015b)

Expansive and Collapsible Soils

Expansive soils generally contain fine-grained clays that can absorb greater amounts of water than other soils, which swell and expand the soil's volume during the wet season. During the dry season, the soil shrinks and contracts as it sheds water that was absorbed during the wet season. This behavior results in cyclical shrink-swell. All soils within the alternative alignments have a low shrink-swell potential as shown in Table 4.6-3. No expansive soil units are located in the alternative alignments.

Soil collapse occurs when increased moisture weakens chemical or physical bonds between soil particles, which allows the soil structure to collapse and the ground surface to subside. Collapsible soils occur as relatively dry alluvial fan, colluvium, and wind-blown deposits or as generally low-density, fine-grained combinations of clay and sand left by mudflows that have dried, resulting in the formation of small air pockets in the subsurface. These soils typically consist of silt and sand, with minor amounts of clay. When moisture is added, the soils weaken, resulting in collapse or subsidence. In Riverside County, collapsible soils occur predominately at the base of the mountains, where alluvial fan and wash sediments have been deposited during rapid runoff events (Riverside County Planning Department, 2016). No collapsible soil units occur in the alternative alignments.

Erosion

Erosion is the process by which rocks, soil, and other land materials are abraded or worn away from the Earth's surface over time by physical forces such as rainfall, flowing water, wind, or anthropogenic agents. The erosion rate depends on factors such as geologic parent material, soil type, slope, soil placement, vegetation, and human activity. Erosion potential generally is higher in areas with steep slopes and on granular soils. Erosion potential also increases when vegetation is removed, and soils are compacted. Jurupa Valley is susceptible to wind erosion.

Wind erosion generates soil movement as blowing air exerts force against the surface of the ground, releasing soil particles, or dust (City of Jurupa Valley, 2017b). Table 4.6-3 describes the erosion potential for soils found in the areas of the alternative alignments.

Landslides

The alternative alignments are located along relatively level ground and away from steep slopes. This area has a very low potential for slope stability issues (POWER Engineers, 2010).

Seismicity and Faults

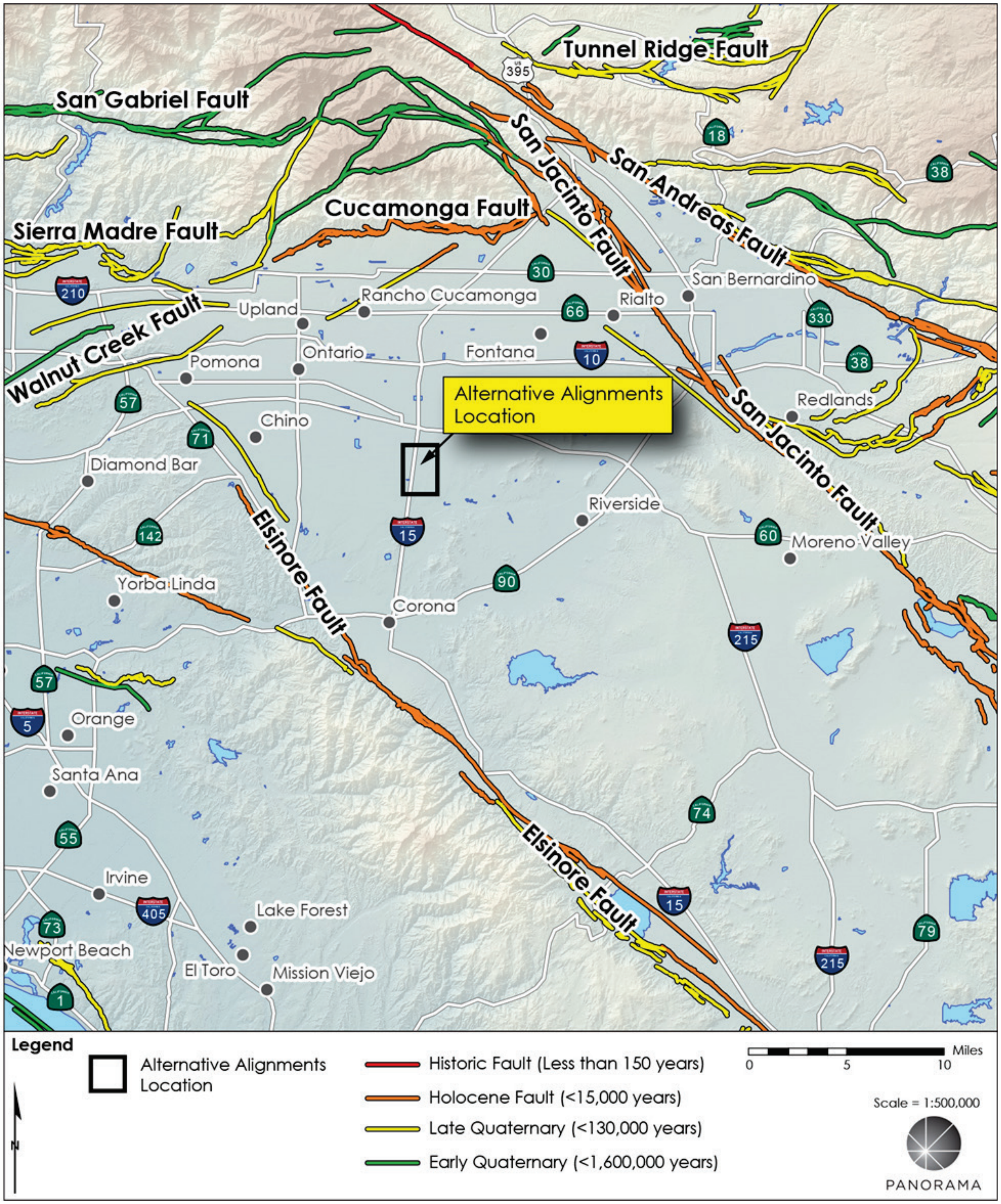
Faults

Faults are fractures or lines of weakness in the Earth's crust. Sudden movement along a fault generates an earthquake. There are several active and potentially active regional fault systems near the City of Jurupa Valley (California Geological Survey, 2010a). Fault locations are illustrated on Figure 4.6-3. No active or potentially active faults underlie the alternative routes.

The Alquist-Priolo Earthquake Fault Zoning Act designates Earthquake Fault Zones based on the presence of an active fault. The California Geologic Survey has developed criteria to classify fault activity for the Alquist-Priolo Earthquake Fault Zoning Act. An active fault is one that has ruptured in the last 11,000 years. A potentially active fault displaces Quaternary deposits (last 1.6 million years). Potentially active faults also represent possible surface rupture hazards, although to a lesser degree. Faults considered inactive have not moved in the last 1.6 million years. The most current California Geologic Survey maps indicate that no portions of the alternatives are included within or cross an Alquist-Priolo Earthquake Fault Zone designated by the State. This means that surface rupture due to faults mapped in the current Alquist-Priolo zones are not anticipated, although the area may still be affected by other seismic hazards such as ground shaking (California Department of Conservation, n.d.).

The principle source of seismic activity is movement along the northwest-trending regional fault systems such as the San Andreas and Sierra Madre Fault Zones. While the potential earthquake risk is considered low, regional faults such as the Rialto-Colton, San Jacinto, and Chino Faults pose earthquake risks to the western Riverside County area, including Jurupa Valley. The three closest active subsidiary faults are the Elsinore Fault (approximately 6.5 miles from the project study area in Jurupa Valley); the Cucamonga Fault (approximately 10.1 miles from the project study area in Jurupa Valley); and the San Jacinto Fault (approximately

Figure 4.6-3 Major Faults in the Jurupa Valley Region



Source: (esri, 2017; SCE, 2017; California Geological Survey, 2010a)

11.0 miles from the project study area in Jurupa Valley) (California Geological Survey, 2010b). There are no active faults that cross the alternative alignments.

Ground Motion
Ground shaking is the seismic effect that causes the most structural damage. The intensity of seismic shaking during an earthquake affecting the alternatives would depend on the distance to the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the area. Earthquakes occurring on faults closest to the project area would have the potential to generate the largest ground motions. Seismic waves attenuate with distance from their sources, so estimated bedrock accelerations are highest in areas closest to the source. Local soil conditions may amplify or dampen seismic waves as they travel from the underlying bedrock to the ground surface.

Liquefaction
Liquefaction is most common in areas with shallow groundwater (i.e., less than 50 feet bgs) dominated by granular, unconsolidated materials. The area's most susceptible to liquefaction are along the active Santa Ana River channel. Areas that are topographically at higher elevations than the Santa Ana River are mapped as having high to very high susceptibility to liquefaction due to shallow groundwater conditions and the underlying alluvial soils (POWER Engineers, 2010). The alternative alignments are located within County of Riverside liquefaction zones 102 and 103, which have high and moderate liquefaction susceptibility, respectively (County of Riverside, 2016).

Lateral Spreading
Lateral spreading is a phenomenon that involves lateral displacement of large, intact blocks of soil down gentle slopes or toward a steep, free face such as a stream bank. Lateral spreading can occur in fine-grained, sensitive soils such as quick clays, particularly if remolded or disturbed by construction and grading. Loose, granular soils present on gentle slopes and underlain by a shallow water table commonly produce lateral spreads through liquefaction. Lateral spreading occurs as a result of liquefaction of a shallow underlying deposit during an earthquake. It typically occurs on slopes of 0.3 to 5 percent underlain by loose sands and a shallow water table. The susceptibility of the alternative alignments area to lateral spreading is moderate to high due to the moderate to high liquefaction susceptibility.

Subsidence
Subsidence refers to the sudden sinking or gradual downward settling and compaction of soil and other surface material with little or no horizontal motion. This process can be gradual or rapid and can pose significant hazards to property and life. In Jurupa Valley, subsidence and fissuring has resulted from rising and falling ground water tables (City of Jurupa Valley, 2017b).

Regulatory Setting

Federal and State Regulations
The federal and state geology and soils regulatory setting for the alternatives is described in the 2013 RTRP EIR.

Local Regulatory Setting

Jurupa Valley General Plan

The Jurupa Valley Draft 2017 General Plan Land Use Element, Community Safety, Services, and Facilities Element, and Conservation and Open Space Element, (City of Jurupa Valley, 2017a) include policies that are relevant to geologic hazards. The relevant policies are described below.

Policy LUE 10.4	**Hillside Grading.** Ensure that hillside structures, site improvements, landscaping and drainage, and public facilities (including but not limited to public streets, utilities, grading and drainage, signs and other features) are developed in a manner that minimizes hazards from erosion and slope failures.
Policy LUE 10.7	**Grading.** Limit grading, cut, and fill to minimum quantities necessary to provide stable areas for structural foundations, street rights of way, parking facilities, and other intended uses.
Policy CSSF 1.1	**Fault Rupture Hazards.** When reviewing new development, minimize fault rupture hazards through enforcement of Alquist-Priolo Earthquake Fault Zoning Act provisions and the following requirement: 3. Require that critical infrastructure, including roads, bridges, and utilities be designed to resist, without failure, their crossing of a fault, if fault rupture occurs.
Policy CSSF 1.2	**Geologic Investigations.** Require geological and geotechnical investigations as part of the environmental and development review process. This requirement shall apply to the development of any structure proposed for human occupancy or to unoccupied structures whose damage could cause secondary hazards in areas with potential for earthquake-induced liquefaction, landslides, or settlement.
Policy CSSF 1.4	**Structural Damage.** Utilize the latest approaches to minimize damage to structures located in areas determined to have high liquefaction potential during seismic events.
Policy COS 1.4	**Soil Conservation and Landform Modification.** Public and private development projects shall be designed to prevent soil erosion, minimize landform modifications to avoid habitat disturbance, and conserve and reuse on-site soils.

4.6.3 Alternatives Impact Analysis

Alternatives Analysis Scope

The following analysis considers only the environmental impacts resulting from construction and operation of each alternative alignment segment. Any specific alternative replaces only a portion of the Revised Project and would require combination with the remaining unaffected segments of the Revised Project to form a complete alternative route through Jurupa Valley. Impacts resulting from construction and operation of the additional Revised Project elements necessary to form a complete alternative route are not considered in this section. A discussion of the environmental impacts resulting from construction and operation of the complete alternative route, comprised of each alternative alignment plus the unaffected Revised Project elements, is provided in Chapter 6: Comparison of Alternatives.

Impacts Avoided by the Alternatives

Alternatives 1, 2, 3, and 4 would be constructed within paved roadways, an open land parcel, and in an active agricultural field. None of the alternatives would have an impact on the following CEQA Appendix G significance criterion:

e. Have soils incapable of adequately supporting the use of septic tanks of alternative wastewater disposal systems where sewers are not available for the disposal of wastewater

Alternatives 1 through 4 include the construction of an underground transmission line and riser poles. None of the alternatives require use or installation of septic tanks. Geologic impacts associated with this significance criterion is not discussed further.

Alternatives 1 through 4 Environmental Impacts and Mitigation Measures

Alternative 1 and Alternative 2 involve construction of two riser poles at the northwest corner of Wineville Avenue and Cantu-Galleano Ranch Road. The Alternative 1 underground transmission line would be located within Wineville Avenue, Bellegrave Avenue, and Pats Ranch Road. The Alternative 2 underground transmission line would be located within Wineville Avenue and Limonite Avenue. Both Alternative 1 and Alternative 2 would meet the Revised Project underground alignment at the intersection of Limonite Avenue and Pats Ranch Road. Alternative 3 involves extending the underground segment of the Revised Project by 0.25 mile along I-15 in the Revised Project alignment. The riser poles would be constructed at the north end of the extended underground segment. Alternative 4 involves construction of a segment of underground transmission line that follows Wineville Avenue and Landon Drive. Two riser poles would be constructed at either end of the underground segment.

SCE has proposed EPEs to reduce environmental impacts. EPEs that avoid or reduce potentially significant impacts of the alternatives on geology and soils are described in Section 3.2.6 of the 2013 RTRP EIR.

Impact Geology-a: Would Alternative 1, 2, 3, or 4 expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault; strong seismic ground-shaking; seismic-related ground failure including liquefaction; or landslides?	Significance Determination
	Construction: ***Less than Significant***
	Operation & Maintenance: ***Less than Significant***

Construction

Construction of Alternatives 1 through 4 would occur in a seismically active region; however, the risk of an earthquake during construction is low. The potential for construction crews to experience impacts from fault rupture or other seismic ground shaking would be minimal. In the unlikely event of an earthquake, construction workers could be exposed to hazards from strong seismic ground shaking or ground failure; however, construction activities would not substantially increase the risks of seismic hazard exposure over typical seismic hazard risks throughout the region. Work areas for Alternatives 1 through 4 would be located in areas with a low potential for liquefaction and landslides. The potential for construction crews and structures to be exposed to seismically-induced liquefaction, landslides, or other types of ground failures would be low. ***The impact would be less than significant.***

Operation and Maintenance

A significant seismic event is likely to occur over the operational lifetimes of Alternatives 1 through 4. There would be no risk to property or life from the underground transmission lines of Alternatives 1, 2, or 4 because the transmission lines would be located within existing roads constructed on engineered fill and road base, and in an agricultural field for Alternative 3. Alternative riser poles would be located in proximity to existing and future developments. The risk to property and life as a result of downed riser poles during an earthquake would increase relative to existing conditions and is potentially significant. EPE GEO-01 requires SCE to conduct a geotechnical study and incorporate recommendations into the final project designs. Incorporation of geotechnical recommendations would address the risk of impact from seismic failure for Alternatives 1 through 4. ***The impact would be less than significant.***

Mitigation Measures: None Required

Impact Geology-b: Would Alternative 1, 2, 3, or 4 result in substantial soil erosion or the loss of topsoil?	Significance Determination
	Construction: ***Less than Significant***
	Operation & Maintenance: ***Less than Significant***

Construction

Construction of the underground transmission lines for Alternatives 1 through 4 would involve open trenching and installation of riser poles. For Alternatives 1, 2, and 4, open trenching would occur within existing roadways, which would be subsequently repaved after construction. There would be no potential for substantial erosion or loss of topsoil from trenching within roadways. Construction of the underground transmission line for Alternative 3 would involve open trenching and installation of riser poles within farmland north of Limonite Avenue.

Ground disturbance from these activities could potentially result in soil erosion or loss of topsoil if the area was not properly stabilized, which would result in a significant impact. Excavation for the installation of Alternatives 1, 2, and 4 riser poles would occur in farmland. Excavations at these locations could loosen soil and accelerate erosion if the areas were not properly stabilized, resulting in a significant impact.

EPE GEO-02 would reduce the potential for erosion from soil-disturbing activities, by requiring SCE to implement sediment and erosion control practices in compliance with project SWPPP requirements. ***The impact would be less than significant after the implementation of this EPE. No mitigation is required.***

Operation and Maintenance
Operation and maintenance of Alternatives 1 through 4 underground alignments would include routine inspections, maintenance of access roads, and vegetation management. Operation and maintenance activities would not cause in increased erosion or topsoil loss. ***The impact would be less than significant.***

Mitigation Measures: None Required

Impact Geology-c: Would Alternative 1, 2, 3, or 4 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?	Significance Determination
	Construction: ***Less than Significant***
	Operation & Maintenance: ***Less than Significant***

Construction, Operation, and Maintenance
Alternatives 1 through 4 would be located in areas with low potential for landslides or soil collapse. The alternatives are all located in areas that are susceptible to lateral spreading, subsidence, and liquefaction. Although construction, operation and maintenance of Alternatives 1 through 4 would not increase the potential for these geological hazards to occur, the alternatives would introduce or relocate riser poles that could be affected by these hazards over the life of the project. The potential impact is significant.

SCE would implement EPE GEO-01 which would require SCE to conduct a geotechnical study and incorporate recommendations into the final project designs. As part of the geotechnical investigations, location-specific analyses (including seismic-related processes such as liquefaction) would be conducted and structure foundations and locations would be modified if appropriate to address the potential geologic hazard. ***The impact would be less than significant.***

Mitigation Measures: None Required

Impact Geology-d: Would Alternative 1, 2, 3, or 4 be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	Significance Determination
	Construction: ***Less than Significant***
	Operation & Maintenance: ***Less than Significant***

Construction, Operation, and Maintenance
Alternatives 1 through 4 would occur in soil units with a low shrink-swell potential as shown in Figure 4.6-1 and Table 4.6-3. The risks to life or property from expansive soils would be considered low, but impacts to riser pole foundations from expansive soils are possible over the life of the project. The impact is potentially significant impact.

SCE would implement EPE GEO-01, which would require SCE to conduct geotechnical studies. As part of the geotechnical investigation, location-specific analyses (including soil characteristics) would be conducted. The final designs would incorporate recommendations from the geotechnical study. ***The impact would be less than significant.***

Mitigation Measures: None Required

4.6.4 No Project Alternative Impact Analysis

Depending on the location, impacts from construction of the No Project Alternative could be significant if ground disturbing activities occurred in soils which are susceptible to ground failure, liquefaction, landslides, erosion, lateral spreading, or subsidence. Compliance with California building standards would address geologic risks from the impact from expansion of facilities under the No Project Alternative. ***The impact would be less than significant.***

4.6.5 References

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