3.6 GEOLOGY AND SOILS

3.6.1 Environmental Setting

Physiography and Topography

The proposed project would be located on the coastal plains of the southern Santa Ana Mountains of the Peninsular Range Physiographic Province, mostly within MCB CPEN. The Peninsular Range trends northwest to southeast and is the main topographic feature in the region (DWR 1967). The terrain at MCB CPEN includes sandy beaches, seaside cliffs, coastal plains and hills, and steep canyons and mountains. The marine terraces of the proposed project area incline evenly to the southwest at 5 percent slope or less, whereas the terrain within most of MCB CPEN exceeds 15 percent slope (MCB CPEN 2012). The elevation in the proposed project area ranges from approximately 25 feet amsl to a peak of approximately 565 feet amsl near the Basilone Road entry to the military base (SDG&E 2016b).

Geologic Setting and Units

MCB CPEN is located on Holocene to late Pleistocene (recent to one million years BP) unconsolidated sedimentary deposits with alluvium in canyon bottoms and coastal terraces; Eocene to Pliocene (2 to 55 million years BP) sedimentary rocks of marine and non-marine origin; and Cretaceous to Triassic (63 to 240 million years BP) bedrock with highly consolidated and cemented sedimentary rock and plutonic and metamorphic crystalline rock (MCB CPEN 2012). The proposed project is situated on igneous basement rock bound in the east by the Elsinore Fault Zone and the west by the Newport-Inglewood-Rose Canyon fault zone. Sedimentary rocks, alluvial floodplains, and historical landslides make up most of the proposed project area (SDG&E 2016b). Localized landslide deposits are present within the quaternary deposits along steeply sloping areas within Segment A. The geologic units in the proposed project area are presented in Figure 3.6-1.

Soil Types

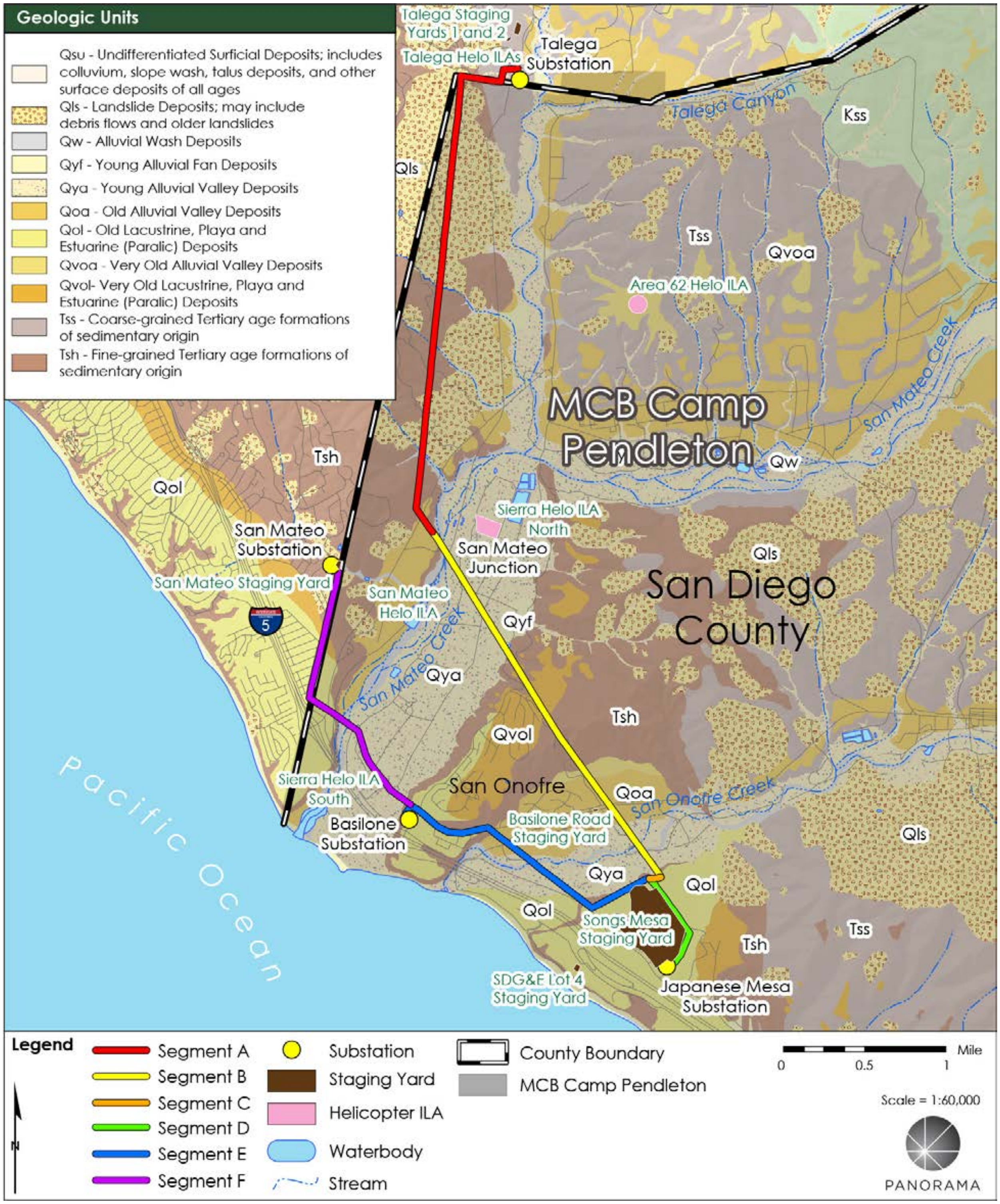
The proposed project area includes soils found in foothills, uplands, marine terraces, alluvial fans, and flood plains. Table 3.6-1 characterizes the major soil units in the proposed project area, which are shown in Figure 3.6-2 and Figure 3.6-3.

Geologic Hazards

Faults

Faults are fractures or lines of weakness in the Earth's crust. Sudden movement along a fault generates an earthquake. Earthquake fault zones are established along known active faults in California under the Alquist-Priolo Act. Alquist-Priolo Earthquake Fault Zones have at least one fault with active displacement within the Holocene or the last 11,000 years. The proposed project would not be located in an area with known active faults or Alquist-Priolo Earthquake Fault Zones. Major active faults in the proposed project region are shown on Figure 3.6-4 and listed in Table 3.6-2.

Figure 3.6-1 Geologic Units in the Proposed Project Area (Revised)



Sources: (ESRI 2016, California Geological Survey 2012, SDG&E 2016a)

Table 3.6-1 Major Soil Units in the Proposed Project Area

Soil Series and Description	Soil Unit	Acreage of Project Study Area [a]	Percent Slope	Runoff Rate	Shrink-swell Potential [b]	Erosion Hazard
Alo clay. Well-drained soils in the foothills formed in material weathered from calcareous sandstone and shale at 200 to 2,500 feet elevation.	100 101 102	0.4 1.5 59.0	9 to 15 15 to 30 30 to 50	Medium Rapid Rapid	High High High	Moderate High High
Bosanko clay. Well-drained formed in material derived from acid igneous rock, weathered from calcareous shale, sandstone, or weakly consolidated sediments. Found on uplands and foothills at 200 to 2,500 feet elevation.	126 127 128	0.5 25.3 8.6	9 to 15 15 to 30 30 to 50	Medium Rapid Rapid	High High High	Moderate Moderate High
Calleguas clay loam. Well-drained soils formed in material weathered from lime coated shale or lime coated sandstone, or both. Found on uplands.	134	30.3	50 to 75	Rapid	Moderate	High
Cieneba sandy loam. Somewhat excessively-drained soil formed in material weathered from granitic rocks and sandstones of coastal foothills. Found on or near ridgetops at 200 to 4,000 feet elevation.	141 142	0.1 13.8	15 to 30 30 to 75	Rapid Rapid	Low Low	High High
Cropley clay. Well-drained soils derived from sedimentary rocks and underlain by moderately alkaline and increasingly calcareous subsoil. Occur in irregular, oblong areas of fans and valley fill at 50 to 1,000 feet elevation.	149	0.4	2 to 9	Medium	High	Slight
Myford sandy loam. Moderately well-drained medium acid sandy loam formed in sandy sediments. Found on side slopes of marine terraces at elevations of 50 to 1,500 feet.	175 176 177	10.3 1.4 2.1	9 to 15 15 to 30 9 to 30	Medium to Rapid Rapid Rapid	Low/High/Low [c] Low/High/Low [c] Low/High/Low [c]	Moderate to High High High

Soil Series and Description	Soil Unit	Acreage of Project Study Area [a]	Percent Slope	Runoff Rate	Shrink-swell Potential [b]	Erosion Hazard
Sorrento loam. Well-drained soils on upper valley fans and along stream channels of 50 to 700 feet elevation with silty clay loam and sandy loam sublayers.	207	0.2	2 to 9	Slow to Medium	Low/Mod/Low[d]	Sight to Moderate
Xeralfic Arents, loamy. Moderately well-drained or well-drained soils with characteristics that are most likely altered by mechanical mixing or, if undisturbed, are former argillic horizons remnants. Generally sandy clay loam in texture after reshaping and found at elevations of 50 to 1,500 feet.	217 218	8.4 5.2	2 to 9 9 to 15	Rapid Rapid	Moderate to High Moderate to High	High High
Altamont clay. Well-drained soils that formed in material weathered from calcareous shale. Found on uplands at elevations of 200 to 600 feet.	AtD AtF	4.3 0.6	9 to 15 30 to 50	Medium Rapid	High High	Moderate High
Carlsbad gravelly loamy sand. Moderately well-drained and well-drained gravelly loamy sands that are moderately deep over a hardpan. Formed in material weathered in place from soft ferruginous sandstone. Found on ridges and in swales at 50 to 500 feet in elevation.	CbB CbD	2.9 3.6	2 to 5 9 to 15	Slow Medium	Low Low	Slight Moderate
Diablo clay. Well-drained, moderately deep to deep clays of soft, calcareous sandstone and shale. Found on uplands at 100 to 600 feet elevation.	DaC DaD DaF	94.4 15.7 20.6	2 to 9 9 to 15 30 to 50	Slow to Medium Medium Rapid	High High High	Slight to Moderate Slight to Moderate High
Gaviota fine sandy loam. Well-drained, steep soil of 9 to 18 inches deep over sandstone. Found on uplands at elevations of 300 to 500 feet.	GaF	39.2	30 to 50	Rapid	Low	High

Soil Series and Description	Soil Unit	Acreage of Project Study Area [a]	Percent Slope	Runoff Rate	Shrink-swell Potential [b]	Erosion Hazard
Grangeville fine sandy loam. Somewhat poorly-drained, very deep fine sandy loams derived from granitic alluvium. Soils are found on alluvial fans and alluvial plains at elevations of 50 to 200 feet.	GoA	13.4	0 to 2	Very Slow	Low	Slight
Hambright gravelly clay loam. Well-drained, shallow gravelly clay loams that formed in material derived from shaly breccia. Found in steep mountainous regions at elevations of 200 to 1,800 feet.	HaG	2.0	30 to 75	Rapid to Very Rapid	Moderate	High to Very High
Huerhuero loam. Moderately well-drained loams with a clay subsoil, developed in sandy marine sediments. Found at elevations of 10 to 400 feet.	HrE2	5.0	15 to 30	Medium to Rapid	High	Moderate to High
Las Flores loamy fine sand. Moderately well-drained loamy fine sands with a sandy clay subsoil, formed in material weathered from siliceous marine sandstone. Found on uplands at elevations of 100 to 500 feet.	LeC LeD LeD2 LeE2	5.9 8.1 0.9 6.2	2 to 9 9 to 15 9 to 15 15 to 30	Slow to Medium Medium Medium Medium to Rapid	High High High High	Slight to Moderate Moderate Moderate Moderate to High
Las Posas fine sandy loam. Well-drained, non-stony soil over hard rock formed in material weathered from basic igneous rocks. Found in the uplands at elevations of 200 to 3,000 feet.	LpC	0.7	5 to 9	Slow to Medium	High	Slight to Moderate
Marina loamy coarse sand. Somewhat excessively-drained, very deep loamy coarse sands from weakly consolidated to noncoherent ferruginous eolian sand. Found on old beach ridges from near sea level to 300 feet elevation.	MlC MlE	4.4 28.5	2 to 9 9 to 30	Slow to Medium Medium to Rapid	Low Low	Slight to Moderate Moderate to High

Soil Series and Description	Soil Unit	Acreage of Project Study Area [a]	Percent Slope	Runoff Rate	Shrink-swell Potential [b]	Erosion Hazard
Olivenhain cobbly loam. Well-drained, moderately deep to deep cobbly loams with very cobbly clay subsoil. Found at 100 to 600 feet elevation.	OhC	8.8	2 to 9	Slow to Medium	Moderate	Slight to Moderate
Riverwash. Excessively-drained and rapidly permeable material that is typically sandy, gravelly, or cobbly. Found in intermittent stream or channels that support little or no vegetation.	Rm	17.5	-	Negligible	Low	-
Salinas clay loam. Well-drained and moderately well-drained clay loams that formed in sediments washed from Diablo, Linne, Las Flores, Huerhuero, and Olivenhain soils. Found on flood plains and alluvial fans at elevations of 25 to 300 feet.	SbA SbC	17.3 8.9	0 to 2 2 to 9	Very Slow Slow to Medium	Moderate Moderate	Slight Slight to Moderate
Salinas clay. See above.	ScA ScB	5.2 10.5	0 to 2 2 to 5	Very Slow Slow	High High	Slight Slight
Terrace escarpments. Steep to very steep escarpments and escarpment-like landscapes found on nearly even front of terraces or alluvial fans. Most places have 4 to 10 inches of loamy or gravelly soil over soft marine sandstone, shale, or gravelly sediments.	TeF	12.2	-	-	Variable	-
Tidal flats. Very poorly-drained, barren areas periodically covered by tidal water that range in texture from clay to very fine sand. Used for wildlife habitat.	Tf	3.0	-	Negligible	High	-

Soil Series and Description	Soil Unit	Acreage of Project Study Area [a]	Percent Slope	Runoff Rate	Shrink-swell Potential [b]	Erosion Hazard
Tujunga sand. Very deep, somewhat excessively-drained sands derived from granitic alluvium. Found on alluvial fans and flood plains at sea level to 1,500 feet elevation. Mainly used for range and golf courses.	TuB	6.4	0 to 5	Very Slow to Slow	Low	Slight
Visalia sandy loam. Moderately well-drained, very deep sandy loams derived from granitic alluvium. Found on alluvial fans and flood plains at 400 to 2,000 feet elevation.	VaA VaB VaC	59.6 6.3 0.0	0 to 2 2 to 5 5 to 9	Very Slow Slow Slow to Medium	Low Low Low	Slight Slight Slight to Moderate
Visalia gravelly sandy loam. Moderately sloping, moderately well-drained, very deep sandy loams of about 15 percent gravel, derived from granitic alluvium.	VbC	1.5	5 to 9	Slow to Medium	Low	Slight to Moderate

Note:

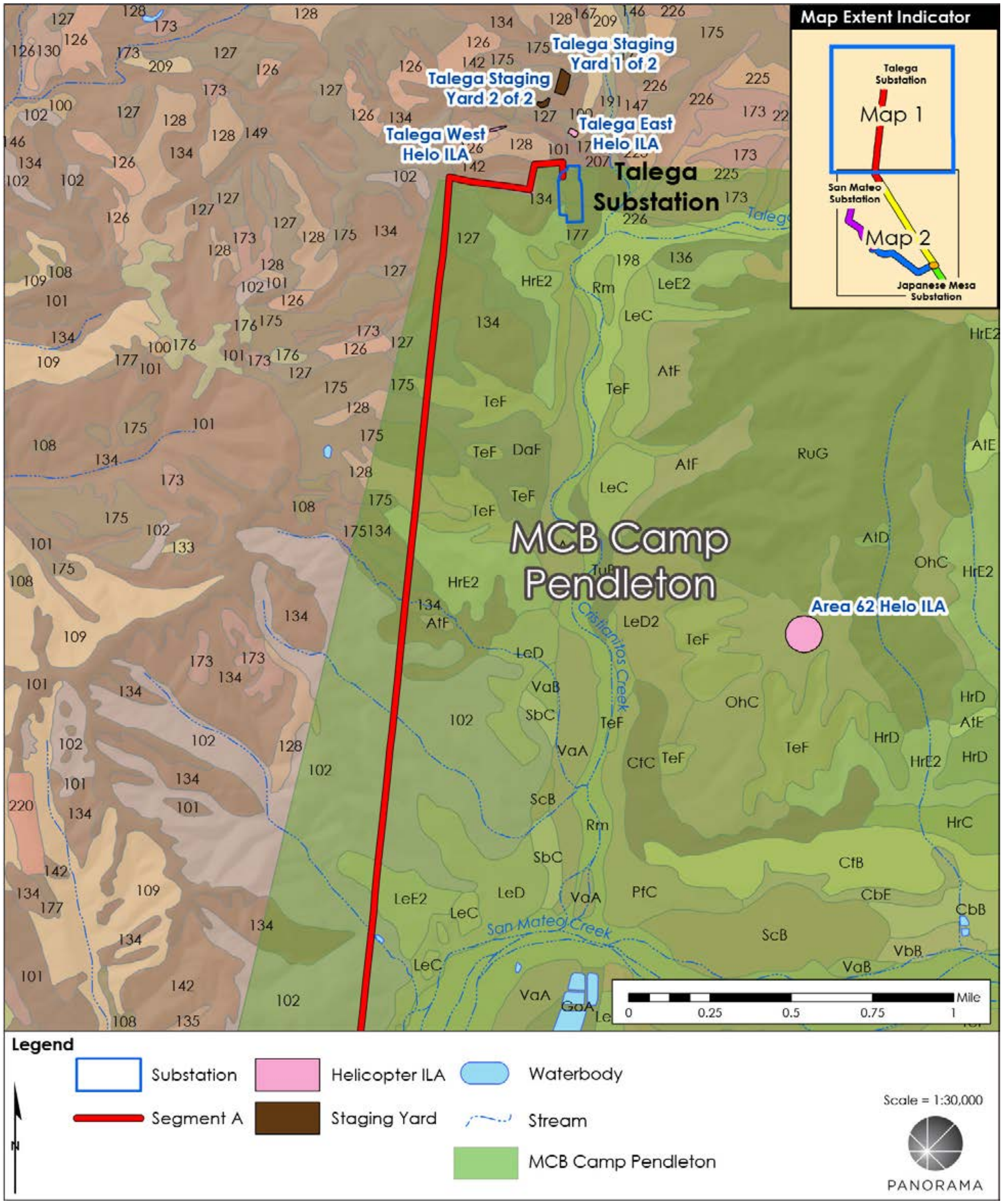
[a] The project study area refers to a 300-foot wide survey corridor centered along the TL 695 and TL 6971 alignment, extending 150 feet on either side. The project study area includes stringing sites, staging yards, ILAs, and additional 50 feet around the perimeter of these components. Access roads outside of the 300-foot survey corridor along with a 20-foot survey area on both sides of the access roads were also included in the survey.

[b] Criteria for shrink-swell potential is based on the amount of clay, predominant clay mineral, and coefficient of linear extensibility.

- Soils with low shrink-swell potential have 0 to 18 percent clay and any clay mineral or 0 to 35 percent kaolinitic clay with a coefficient of linear extensibility of less than 0.03.
- Soils with moderate shrink-swell potential have 18 to 35 percent mixed or montmorillonitic clays or more than 35 percent kaolinitic clay with a coefficient of linear extensibility of 0.03 to 0.06.
- Soils with high shrink-swell potential have more than 35 percent mixed or montmorillonitic clays with a coefficient of linear extensibility of more than 0.06.

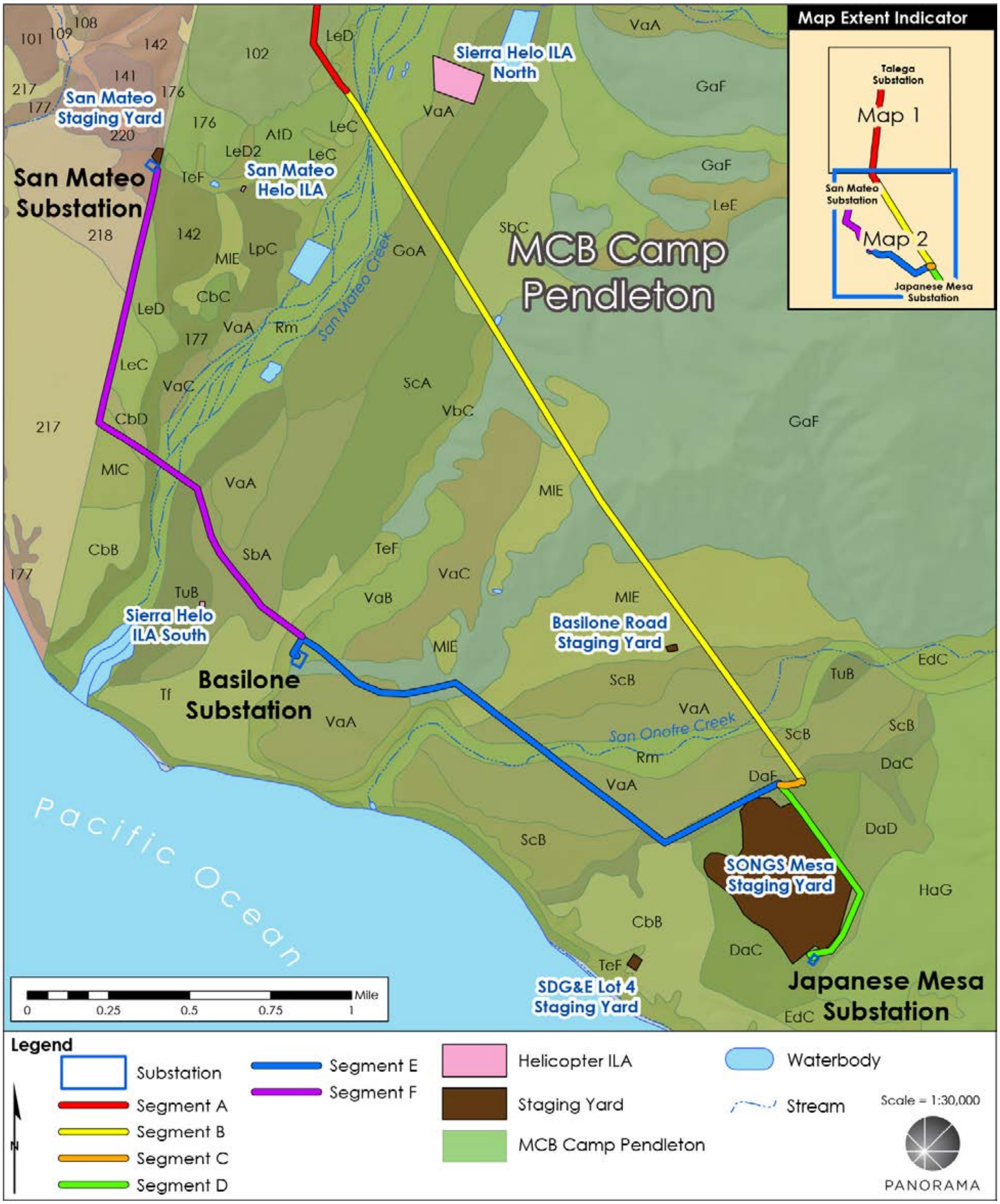
Sources: (R. H. Bowman 1973, Bowman, et al. 1973, NRCS 2016, Wachtell 1978)

Figure 3.6-2 Soil Units in the Proposed Project Area (Map 1 of 2) (Revised)



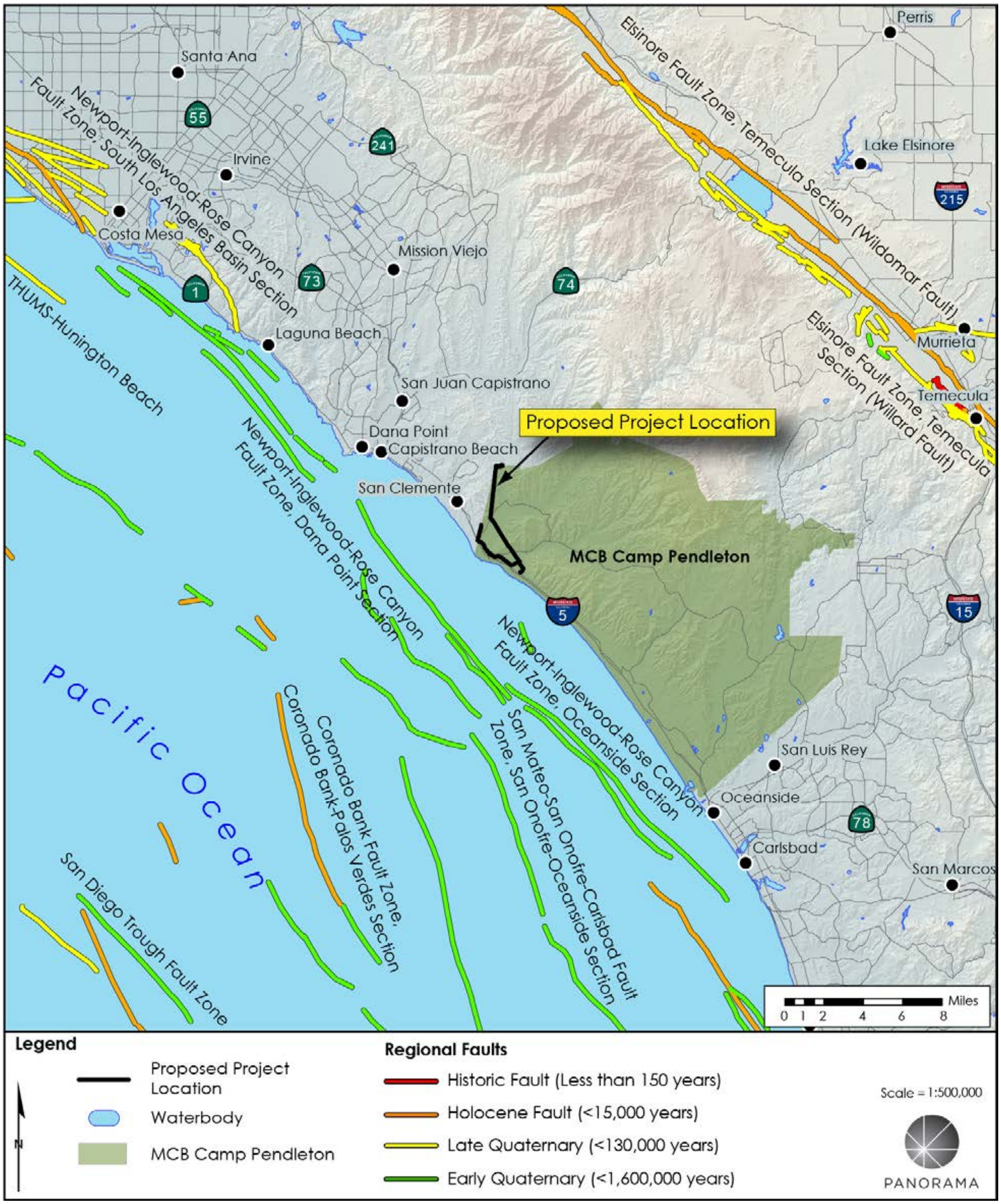
Sources: (ESRI 2016, NRCS 2015b, NRCS 2015a, SDG&E 2016a)

Figure 3.6-3 Soil Units in the Proposed Project Area (Map 2 of 2) (Revised)



Sources: (ESRI 2016, NRCS 2015b, NRCS 2015a, SDG&E 2016a)

Figure 3.6-4 Major Faults in the Proposed Project Region (Revised)



Sources: (ESRI 2016, SDG&E 2016a, California Geological Survey 2012)

Table 3.6-2 Active Faults in the Proposed Project Region

Fault Zone	Distance from Project Alignment (miles)	30-Year Probability of at least a Magnitude 6.7 (%) [a]	Maximum Earthquake Magnitude (M) [b]	Slip Rate (mm/year)[c]
Newport-Inglewood, offshore	4 – 7	-	7.5 [d]	1 – 5
Elsinore, Temecula Section	20	5	7.1	1 – 5
San Jacinto, San Jacinto Valley Section	45	9	7.0	>5
San Andreas, San Bernardino Mountain Section	80	53	6.9	>5

Notes:

[a] Aggregate 30-year magnitude >6.7 probabilities for the main faults rounded to the nearest percent as reported by the Uniform California Earthquake Rupture Forecast, Version 3 (Field, et al. 2015)

[b] Ellsworth Type-B magnitude reported by the 2008 Update of the United States National Seismic Hazard Maps (Petersen, et al. 2008)

[c] (SDG&E 2016b, USGS and California Geologic Survey 2006)

[d] (Geocon Incorporated 2015)

Ground Motion

Ground shaking is the seismic effect that results in most structural damage. Southern California is a seismically active region. The Newport-Inglewood Fault and other faults in southern California and northern Baja California could generate significant ground motion in the proposed project vicinity (Geocon Incorporated 2015).

Earthquake magnitude, distance from the earthquake epicenter, and the geologic materials underlying and surrounding an area determine the intensity of ground motion during a seismic event. Structures built on bedrock experience less destructive shaking than those built on friable, granular soil deposits. Portions of the proposed project area are located on alluvium and residuum (an accumulation of weathered bedrock and remnants of its least soluble constituents), which typically experience stronger ground shaking than areas located on hard rock. Active faults listed in Table 3.6-2 have the potential to cause strong seismic shaking in the proposed project region.

Liquefaction

Liquefaction is a seismic phenomenon in which sand, silt, and other water-saturated, cohesionless sediments temporarily lose strength and liquefy during a seismic event. Liquefaction occurs when intense and prolonged ground-shaking (e.g., during an earthquake) place dynamic forces on saturated sediments. Liquefaction is affected by soil type, soil density, and grain size; confining pressure; depth to groundwater; and intensity and duration of ground-shaking. Liquefaction can result in loss of bearing capacity below foundations, settlement, ground tilting, and instability on sloped areas. Liquefaction is most common in areas with shallow groundwater (i.e., less than 50 feet below ground surface [bgs]) dominated by granular, unconsolidated materials. The San Mateo Creek and the San Onofre Creek drainages (refer Figure 3.9-4 in Section 3.9: Hydrology and Water Quality) are designated as liquefaction hazard zones (Geocon Incorporated 2015, Radbruch-Hall et al 1982). There is no history of ground failure or structural damage resulting from liquefaction in San Diego County (Office of Emergency Services and Unified Disaster Council 2010). Seismic shaking has not been of sufficient magnitude to trigger liquefaction.

Landslides

A landslide is the slipping down or flowing of a mass of rock, soil, and debris from a mountain or hill. Landslide potential is high in steeply sloped areas underlain by alluvial soils, highly weathered material, thinly bedded shale, or bedrock where the bedding planes are oriented in an out-of-slope direction (i.e., bedding plane angles that are greater than horizontal, but less than the slope face) or with fracture planes. Landslides can be caused by human activities (slope over-steepening or overloading) and natural events (e.g., earthquakes, rainfall, and erosion). Landslide potential is high in Segment A in areas with steep slopes and landslide deposits (refer to Figure 3.6-1). A landslide deposit was encountered at one boring just west of the Talega Substation during the proposed project geotechnical investigation (Geocon Incorporated 2015).

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 (0.3 to 5 percent) and underlain by loose sands and 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. Liquefaction hazards in the proposed project area are along San Onofre Creek and San Mateo Creek as previously mentioned; however, the ground is relatively level within the areas of high liquefaction potential such that should the area liquefy, lateral spreading is not anticipated (Geocon Incorporated 2015).

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 is generally higher in areas with steep slopes and on granular soils. Erosion potential also increases when vegetation is removed or water flows though small, concentrated drainages.

Soil erosion and sedimentation are common on MCB CPEN. Climatic variability and winter storm patterns influence soil erosion and sedimentation pattern, where much of soil loss occurs once every 20 years (MCB CPEN 2012). Soils underlying the proposed project area are classified with slight, moderate, to high erosion hazard (Table 3.6-1).

Subsidence

Subsidence is the deep-seated settlement of soils due to mining, dissolution of subsurface carbonate rocks, or fluid withdrawal (oil, natural gas, or groundwater). Subsidence also can be caused by consolidation, hydrocompaction, oxidation or dewatering of organic-rich soils, and, more rarely, tectonic down-warping during earthquakes. MCB CPEN extracts groundwater from San Mateo Creek and San Onofre Creek groundwater basins (refer to Figure 3.9-2 in Section 3.9: Hydrology and Water Quality) where the potential for subsidence exists.

Expansive and Collapsible Soils

Expansive soils contain large amounts of clays that expand when wetted and cause damage to foundations if moisture collects beneath structures (e.g., settlement, structure heave, or slab-on-grade foundation shifting). Wetting can occur as a result of precipitation, a rise in the water table, irrigation water application, water line leakage, and other factors. Damage from expansive soils also occurs when the soils dry out and contract. Soils with high shrink-swell potential including Diablo clays that underlay approximately half of the project study area (NRCS 2016). Expansive soils pose a risk to structures in areas where the moisture content of the surrounding soil is variable over time and the confining pressure is low. Variable moisture content and low confining pressure often occur in the top 4 feet bgs; deeper soils typically exhibit consistent moisture and high confining pressure (Geocon Incorporated 2015).

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. Collapsible soil can potentially be in areas of former landslides where grading was previously or would be conducted (SDG&E 2016b). Multiple, small soil collapses, less than 3 feet in diameter, have been observed in the field in and adjacent to the proposed project (SDG&E 2016b). Soil collapse can affect structures with shallow foundations where settlement near the surface causes settlement of the structure.

3.6.2 Impact Analysis

Summary of Impacts

Table 3.6-3 presents a summary of the CEQA significance criteria and impacts on geology and soils that would occur during construction, operation, and maintenance of the proposed project.

Table 3.6-3 Summary of Proposed Project Impacts on Geology and Soils

Would the Proposed Project:	Potentially Significant Impact	Less than Significant Impact 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 ground shaking? iii. Seismic-related ground failure, including liquefaction? iv. Landslides?	☐	☒	☐	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☒	☐	☐
c) 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?	☐	☒	☐	☐
d) 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?	☐	☒	☐	☐
e) 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 water?	☐	☐	☐	☒

3.6 GEOLOGY AND SOILS

Impact Discussion

a) Would the proposed 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)? ii. Strong seismic ground shaking? iii. Seismic-related ground failure, including liquefaction? iv. Landslides?	Significance Determination
	Less than significant with mitigation

Construction

Rupture of a Known Earthquake Fault

The proposed project would not be located on any known active faults or in an Alquist-Priolo Act Earthquake Fault Zone. Construction activities would not expose people or structures to substantial adverse effects involving a rupture of a known earthquake fault. No impact would occur.

Strong Seismic Ground Shaking

San Diego County has the potential to experience strong seismic shaking from regional earthquakes of active faults that fall outside of the proposed project area. SDG&E would incorporate engineering practices in compliance with CPUC GO 95 and industry standards that would not expose people or structures to substantial adverse effects from strong seismic ground shaking. Construction personnel and structures have minimal potential to be exposed to strong seismic ground shaking in the unlikely event of an earthquake. Construction activities alone would not increase such risks to people or structures over the baseline risks. Due to the short construction period (approximately eight months) and the low probability of a seismic event occurring during the construction period, workers and structures have minimal potential to be exposed to adverse effects resulting from seismically-induced ground shaking. Impacts would be less than significant.

Seismic-related Ground Failure, Including Liquefaction

Liquefaction potential in the proposed project area is mapped along the drainage basins of San Mateo Creek and San Onofre Creek. Pole structures within Tertiary Formations and areas of young alluvial deposits are also considered to be in liquefaction hazard zones. Moderate to large regional earthquakes that result in shaking of uncompacted, granular soils can cause liquefaction where groundwater is 40 feet bgs or shallower. Replacing the existing wood structures with new steel structures within areas of high liquefaction potential would not change baseline risks from the soil properties and seismic zone. The risk of encountering liquefaction during construction is extremely low because construction would only last for eight months and the risk of an earthquake during that time is low. The impact would be less than significant.

Landslides
The proposed project has high potential for landslides to occur in portions of Segment A where steep slopes with sedimentary rocks and soils are prone to erosion (refer to Figure 3.6-1 for locations of mapped landslide deposits). The proposed excavations are limited to 30 feet for direct-bury and micropile foundations and 40 feet for concrete pier foundations. Localized excavations, vehicle access and grading could potentially destabilize the soils and trigger a localized landslide in landslide prone areas. Adverse effects to people or structures could be significant if a shallow landslide were to occur. MM Geology-1 requires SDG&E to incorporate appropriate engineering design and construction measures to address soil prone to landslides. The potential for construction activities to expose and adversely impact people and structures due to landslides would be less than significant with mitigation.

Operation and Maintenance

Rupture of a Known Earthquake Fault and Strong Seismic Ground Shaking
A significant fault rupture or strong seismic ground shaking could occur during the lifetime of the proposed project. Fault ruptures would not generally impact overhead power lines due to their location above ground; however, a resulting ground failure may lead to fallen poles and line failure, posing a significant risk of loss, injury, or death. The proposed project would be designed in accordance with CPUC GO 95 and the Institute of Electrical and Electronics Engineers, Inc. Standard 693 to withstand damage from ground rupture and strong seismic shaking. Operation and maintenance activities for the proposed project would be similar to existing activities, because the reconductored power lines would be located in the same alignment as the existing power lines and in existing transmission corridors. Impacts from exposure to ruptures or strong seismic ground shaking would also be similar to existing conditions and less than significant.

Liquefaction
Liquefaction potential was investigated as part of the geotechnical study for the proposed project. The geotechnical investigation confirmed that the proposed project would be located in areas susceptible to liquefaction, but the proposed project would not pose a risk to people or structures due to the flat ground or low expansive potential of the underlying soils (Geocon Incorporated 2015). The impact from liquefaction would be less than significant.

Landslides
A large landslide complex underlays the northern portion of Segment A and extends to the depth of the investigation (41.5 feet, the depth of the deepest proposed project excavation) (Geocon Incorporated 2015). The proposed project pole structures would impose insignificant loads relative to the mass of the landslide formation, and would have a negligible impact on landslide stability. The proposed project pole structures would also be located an average of 12 feet from the existing poles within Segment A, and would replace existing structures that are located in the same landslide deposits. The risk of landslide and associated impacts on life or property would not increase as a result of the proposed project. Impacts would be less than significant.

Mitigation Measures: MM Geology-1.

b) Would the proposed project result in substantial soil erosion or the loss of topsoil?	Significance Determination
	Less than significant

Construction

Pole replacement, conductor replacement, use of unpaved access roads, material staging and storage, and helicopter take-off and landing would result in ground disturbance during construction. Temporary and permanent disturbance areas are summarized in Table 2.7-1 in Section 2: Project Description. Vegetation trimming or removal, and minor earthwork may occur at stringing sites, work areas, temporary overland routes, and footpaths to access pole sites. Helicopter ILAs and staging yards would occur primarily in developed or disturbed areas where grading would not be required. Grading would also occur along access roads to reestablish construction equipment access to the work site. The impact from access road grading could result in substantial soil erosion or loss of topsoil if access road grading exceeded the previous access road limits or if appropriate BMPs were not installed. MM Biology-14 limits parking, driving, and staging of equipment and vehicles to previously compacted or developed areas and limits grading to established access roads. MM Hydrology-3 defines stormwater control requirements for access road grading. The impact from access road grading would be less than significant with implementation of the MM Biology-14 and MM Hydrology-3.

SDG&E is required to comply with the Construction General Permit (CAS-2012-006-DWQ) because the proposed project would disturb more than one acre of land. The Construction General Permit requires preparation of a Stormwater Pollution Prevention Plan (SWPPP) and implementation of BMPs for erosion and sediment control. The potential erosion and loss of topsoil from the proposed project would be less than significant with implementation of erosion and sediment control BMPs contained in the SWPPP due to the small area of grading and earthwork at each pole location.

Operation and Maintenance

Operation and maintenance of the proposed project would be similar to the current activities for the existing power and transmission facilities, because the proposed project would replace existing adjacent power lines with overhead power lines located within existing transmission corridors or easements. Operation and maintenance of the proposed project would not create new areas of disturbance that would result in erosion or loss of topsoil. The impact would be less than significant.

Mitigation Measures: MM Biology-14 (refer to Section 3.4: Biological Resources) and
MM Hydrology-3 (refer to Section 3.9: Hydrology and Water Quality)

c) Would the proposed project 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
	Less than significant with mitigation

Construction

Landslides

The proposed project would include installation of new steel poles within mapped landslides in the Capistrano Formation. Construction activities within areas prone to landslides would not cause a landslide to occur. As discussed in Impact a) above, proposed excavations would be limited to 30 feet for direct-bury and micropile foundations, and 40 feet for concrete pier foundations. The excavation and grading at the poles, and equipment access to work areas, could potentially destabilize the hill slope or trigger a localized landslide, which would be a significant impact. MM Geology-1 requires SDG&E to incorporate appropriate engineering design and construction measures to minimize the potential damages to proposed structures if unstable grounds are encountered. The impact would be less than significant with mitigation.

Lateral Spreading and Liquefaction

Liquefaction potential in the proposed project area is discussed in Impact a) above. The potential for liquefaction to occur during proposed project construction is extremely low, and construction activities would not increase the potential for liquefaction to occur in the area. Impacts would be less than significant.

Subsidence

The proposed project would cross two alluvial basins where there is potential for subsidence due to past and present groundwater pumping. Construction could require temporary dewatering of shallow groundwater encountered in excavations (refer to Section 3.9: Hydrology and Water Quality). The temporary dewatering of excavations would not result in subsidence due to the small amount of water that would be extracted and the short-term nature of the dewatering (i.e., a week or less during foundation construction). Construction of the proposed project would not increase the rate of subsidence in the area. No impact would occur.

Collapse

Construction would involve excavation and installation of proposed pole structures with minimal fill. The proposed project excavation and foundation work would not introduce any potentially collapsible soils to the area. No impact would occur.

Operation and Maintenance

Landslides

As discussed in Impact a) above, landslide deposits occur in the steep northern regions (Segment A) of the proposed project alignment. New or existing poles would impose insignificant loads relative to the mass of the landslide deposit. The replaced poles would not increase the landslide potential from the present condition. The impact from landslides would be less than significant.

Lateral Spreading and Liquefaction
As discussed in Impact a) above, the ground is relatively level in areas prone to liquefaction. Lateral displacement is not anticipated to have any impact on proposed project structures (Geocon Incorporated 2015). Operation and maintenance activities for the proposed project would not alter the soil properties or proximity to groundwater and would not affect the risk of lateral spreading or liquefaction in the area. The impact would be less than significant.

Subsidence
Operation and maintenance activities would not involve extraction of groundwater that would result in subsidence. The presence of the proposed project would not cause or increase the rate of subsidence. The structures that cross the alluvial basins in the proposed project area have been in place for over a decade; any subsidence that would occur in the area has likely already taken place (Geocon Incorporated 2015). Subsidence would also manifest uniformly over the general area and would not selectively appear at the proposed pole structures. The impact would be less than significant.

Collapse
The proposed project would involve the installation of pole structure foundations at a maximum of 40 feet bgs. Topsoil and fill, which could be subject to collapse, were encountered in the proposed project area at maximum depths of 5 feet and 8.5 feet bgs, respectively (Geocon Incorporated 2015). The micropile foundation and concrete pier foundations would not be affected by soil collapse because the foundations would extend below the depth of potentially collapsible topsoil or fill; however, if direct-bury poles were installed entirely within potentially collapsible topsoil or fill, the pole could become unstable as a result of soil collapse, which would be a significant impact. MM Geology-1 requires SDG&E to implement recommendations from the geotechnical report, including extending direct-bury poles to greater depths when topsoil or fill are encountered. The impact from potentially collapsible soils would be less than significant with mitigation because the poles would be installed below the depth of potentially unstable soils.

Mitigation Measures: MM Geology-1

d) Would the proposed 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?	**Significance Determination**
	Less than significant with mitigation

Several proposed project pole structures would be located on soil units with high expansive (shrink/swell) potential. The proposed project pole structures would be installed to a minimum depth of 5 feet for direct-bury poles, 10 feet for the micropile foundation, and 30 feet for concrete pier foundations. Topsoil was encountered during the geotechnical investigation at depths of up to 5 feet. The micropile and concrete pier foundations would not be affected by expansive soils due to the depth of the foundations; however, if direct-bury poles were installed entirely within potentially expansive soils, the pole could become unstable as a result of soil expansion and create a substantial risk to life or property, which would be a significant impact. MM Geology-1 requires SDG&E to implement recommendations from the geotechnical report, including extending the direct-bury poles below the depth of any encountered topsoil. With deeper excavation, the direct-bury poles would not be destabilized by potentially expansive soils. The impact from potentially expansive soils would be less than significant with mitigation.

Mitigation Measures: MM Geology-1

e) Would the proposed project 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 water?	**Significance Determination**
	No impact

No septic tanks or alternative wastewater disposal systems would be constructed as part of the proposed project. No impact would occur.

Mitigation Measures: None required.

3.6.3 Mitigation Measures

MM Geology-1: Geotechnical Investigation
The final project plans and specifications prepared by the responsible engineer shall account for known geologic hazards and include appropriate engineering design, recommendations made in the geotechnical report, and construction measures to minimize the potential for damage to proposed project structures in the event that unstable grounds are encountered. Appropriate design features during construction shall be developed by the responsible engineer and may include, but would not limited to, (1) excavation of potentially collapsible or expansive soils and replacement with engineered backfill and ground treatment processes, and (2) extending the proposed pole structures and foundations below topsoil and fill to the underlying formational units.
Applicable Locations: Direct-bury poles where topsoil is ~~encountered~~ observed during construction in the top 5 feet of the excavation ~~or where landslides could occur, if appropriate~~.
Performance Standards and Timing: **Before Construction:** Incorporate recommendations from the geotechnical report into the final project design **During Construction:** Install poles as indicated in the final design **After Construction:** N/A

3.6.4 References

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