TABLE OF CONTENTS

LIST OF TABLES

4.6 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?[1]			✓	
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 waste water?				✓

[1] Refers to Divisions of Mines and Geology Special Publication #42.

4.6.0 Introduction

This section describes the existing geologic and pedogenic conditions related to the proposed San Diego Gas & Electric Company (SDG&E) TL674A Reconfiguration & TL666D Removal Project (Proposed Project). This section analyzes the exposure of people and structures to substantial adverse effects involving strong seismic ground shaking, fault rupture, liquefaction, unstable soils, landslides, expansive soil, substantial soil erosion, or the loss of topsoil. As described in Section 4.6.3 Impacts, SDG&E will conduct a Proposed Project-specific geotechnical investigation per Applicant-Proposed Measure (APM-) GEO-01 and incorporate the recommendations of this investigation into the final design of the Proposed Project. Because the majority of the Proposed Project will involve the removal of existing overhead facilities, impacts to structures resulting from geologic hazards will generally be reduced as a result of the Proposed Project. Therefore, the geotechnical investigation will be prepared primarily for the installation of new poles where required based on civil and transmission engineering reviews that will be conducted by SDG&E prior to construction. Potential geological impacts will be less than significant with the implementation of SDG&E's Project Design Features and Ordinary Construction Restrictions, as described in Chapter 3 – Project Description, the recommendations in the geotechnical investigation, and with the incorporation of an APM to address potential geologic hazards and existing soil conditions.

4.6.1 Methodology

The existing conditions and potential impacts associated with geologic hazards were primarily obtained from a thorough review of available geologic resource and seismic literature relevant to the Proposed Project area. Data were obtained and reviewed from the following resources and agencies:

- United States (U.S.) Geological Survey (USGS);
- California Geological Survey (CGS);
- Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSUGRO);
- University of California (UC) Davis Soil Resource Lab webpage;
- City of San Diego Seismic Safety Study; and
- City of San Diego and City of Del Mar planning documents.

Soil characteristics including drainage, erosion potential, slope, and permeability were examined to determine potential impacts resulting from the construction of the Proposed Project. These soil characteristics were reviewed in conjunction with available seismic data to identify areas where the installation of new Proposed Project components will expose people or structures to substantial adverse effects.

4.6.2 Existing Conditions

Regulatory Background

Federal

Uniform Building Code

Published by the International Conference of Building Officials, the Uniform Building Code (UBC) provides complete regulations covering all major aspects of building design and construction relating to fire and human safety and structural safety. The UBC has been adopted by most western states. Volume 1 of the 1997 UBC contains the administrative, fire and life safety, and field inspection provisions, including all nonstructural provisions and those structural provisions necessary for field inspections. Volume 2 contains provisions for structural engineering design, including the design provisions formerly in the UBC Standards. Volume 3 contains the remaining material testing and installation standards previously published in the UBC Standards.

State

Alquist-Priolo Earthquake Fault Zoning Act of 1972

In response to the 1971 San Fernando earthquake, which damaged numerous homes, commercial buildings, and other structures, California passed the Alquist-Priolo Earthquake Fault Zoning Act of 1972. Formerly known as the Special Studies Zoning Act, the Alquist-Priolo Earthquake Fault Zoning Act regulates construction and development of buildings intended for human occupancy to avoid rupture hazards from surface faults. This act does not specifically address power line facilities, but it does aid in defining areas where fault rupture is most likely to occur.

In accordance with the law, the CGS establishes regulatory zones, known as Earthquake Fault Zones, around the surface traces of active faults and issues corresponding maps for affected areas. Any project that involves the construction of buildings or structures for human occupancy is subject to review under this law. Structures for human occupancy must be constructed at least 50 feet from any active fault.

The Proposed Project is not located within any mapped Earthquake Fault Zones. Therefore, the regulations established under the Alquist-Priolo Earthquake Fault Zoning Act will not apply to the Proposed Project.

California Seismic Hazards Mapping Act of 1990

The Seismic Hazards Mapping Act is designed to protect the public from the effects of strong ground shaking, liquefaction, landslides, additional ground failures, or other hazards caused by earthquakes. The Seismic Hazards Mapping Act requires site-specific geotechnical investigations to identify the hazard and to formulate mitigation measures before permitting most developments designed for human occupancy. In addition to the information provided through the Probabilistic Seismic Hazards Mapping program, Special Publication 117 (Guidelines for Evaluating and Mitigating Seismic Hazards in California) provides additional guidelines for evaluating seismic hazards other than surface fault rupture; and for recommending mitigation measures, as required by Section 2695(a) of the California Public Resources Code.

California Public Utilities Commission General Order 95

California Public Utilities Commission (CPUC) General Order 95 designates rules and regulations for overhead electric line construction.

Local

The Proposed Project is not subject to local discretionary regulations because the CPUC has exclusive jurisdiction over the siting, design, and construction of the Proposed Project. The following discussion of the local regulations relating to geology and soils is provided for informational purposes.

City of San Diego General Plan

The Public Facilities, Services, and Safety Element of the City of San Diego General Plan provides information related to seismic and geologic hazards. The following geologic hazards policy is relevant to the Proposed Project:

- PF-Q.1: Protect public health and safety through the application of effective seismic, geologic, and structural considerations.

Chapter 14, Article 2 of the City of San Diego Land Development Code provides regulations related to grading, storm water runoff, and drainage. This chapter also establishes minimum standards for controlling soil erosion, sedimentation, and increased rates of water runoff and related environmental damage.

Community Plan for the City of Del Mar

The Community Plan for the City of Del Mar provides information related to seismic and geologic hazards. The following geologic hazards objective is relevant to the Proposed Project:

- Objective O: Minimize the loss of life and destruction of property from seismic and geological occurrences.

Geologic Setting

The Proposed Project area is situated in the western portion of the Peninsular Ranges geomorphic province of Southern California. This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges and the Los Angeles Basin south to the southern tip of Baja California, and varies in width from 30 to 100 miles. The geomorphic province is characterized by mountainous terrain on the east, composed mostly of Mesozoic igneous and metamorphic rocks; and relatively low-lying coastal terraces to the west, underlain by Upper-Cretaceous, Tertiary-age, and Quaternary-age sedimentary rocks. Most of the coastal region of San Diego County, including the general Proposed Project area, occurs within this coastal region and is underlain by sedimentary rock. Specifically, the Proposed Project area is underlain by Quaternary alluvium and marine deposits, as well as Eocene marine rocks.

Faults, Seismicity, and Related Hazards

Faults

Southern California is considered one of the most seismically active regions in the U.S. The City of San Diego is located approximately 100 miles west of the San Andreas Fault, which is the predominate earthquake hazard in the state. Active fault zones influencing seismicity in the Proposed Project area include the Elsinore, Coronado Bank, San Diego Trough, and Newport-Inglewood-Rose Canyon fault zones. The State of California considers a fault to be active if the fault is well-defined and if there is evidence of surface displacement along the fault during the Holocene epoch (i.e., within the past 11,500 years).[2] In addition, potentially active faults are those that have demonstrated activity within the Pleistocene epoch of the Quaternary period (i.e., approximately 11,500 to 1.6 million years ago).

No active faults and/or fault zones are crossed by the Proposed Project. The closest potentially active faults to the Proposed Project are located along the Del Mar section of the Newport-Inglewood-Rose Canyon Fault zone. This fault zone is located approximately 2.4 miles west of the Proposed Project. The closest active faults and fault zones in the Proposed Project vicinity are listed in Table 4.6-1: Active Faults in the Vicinity of the Proposed Project.

Table 4.6-1: Active Faults in the Vicinity of the Proposed Project

Faults	Approximate Distance to the Proposed Project (miles)	Approximate Fault Length (miles)	Maximum Estimated Earthquake Magnitude
Coronado Bank Fault Zone	12.9	53.1	7.6
Elsinore Fault Zone (Glen Ivy Section)	44.3	9.1	6.8
Elsinore Fault Zone (Julian Section)	28.1	66.3	7.1
Elsinore Fault Zone (Temecula Section)	28.0	68.5	6.8
Newport-Inglewood-Rose Canyon Fault Zone (Oceanside Section)	6.5	17.1	6.9
Newport-Inglewood-Rose Canyon Fault Zone (San Diego Section)	4.5	35.2	7.1
Newport-Inglewood-Rose Canyon Fault Zone (Silver Strand Section)	11.6	73.1	7.1
San Diego Trough Fault Zone	26.2	61.5	7.7
Unnamed Fault	23.5	11	Not Available (NA)

Sources: CGS 2016a, 2106b, 2016c; California Department of Conservation (DOC) 2016a, 2016b, 2016c; USGS 2016a, 2016b, 2016c

[2] The USGS considers a fault to be active if it has moved one or more times in the past 10,000 years.

Fault Rupture

As previously discussed, the Proposed Project is not located within any Earthquake Fault Zones designated under the Alquist-Priolo Earthquake Fault Zoning Act. According to the City of San Diego Seismic Safety Study, the Proposed Project is also not located within the "Downtown Special Fault Zone." This fault zone was designated in downtown San Diego based on the presence of the Alquist-Priolo Earthquake Fault Zones. As described in Table 4.6-1: Active Faults in the Vicinity of the Proposed Project, the closest active faults to the Proposed Project are located along the San Diego section of the the Newport-Inglewood-Rose Canyon fault zone. The San Diego section is located approximately 4.5 miles south of the Proposed Project.

The most recent, significant earthquake in the Proposed Project vicinity occurred approximately 57 miles northeast of the Proposed Project in the City of Long Beach. This earthquake, which is known as the Long Beach Earthquake, occurred in 1933 along the north Los Angeles Basin section of the Newport-Inglewood-Rose Canyon fault zone and resulted in 120 deaths and over $50 million in property damage. The Long Beach Earthquake was reported directly south of present-day Huntington Beach and was reported to have a magnitude of 6.4.

Strong Ground Motion

Strong ground motion or intensity of seismic shaking during an earthquake is dependent on the distance from the epicenter of the earthquake, the magnitude of the earthquake, and the geologic conditions underlying and surrounding the area. Structures built on thick, soft soil deposits are more likely to experience more destructive shaking, with higher amplitude and lower frequency than structures founded on bedrock.

An earthquake is commonly described by the amount of energy released, which has traditionally been quantified using the Richter scale. However, seismologists have recently begun using a Moment Magnitude scale because it provides a more accurate measurement of a major earthquake's size. The Moment Magnitude and Richter scales are almost identical for earthquakes with magnitudes of 7.0 or less. Moment Magnitude scale readings are slightly greater than a corresponding Richter scale reading for earthquakes with magnitudes greater than 7.0. The maximum magnitude earthquake is defined by the CGS as the maximum earthquake that appears capable of occurring under the presently known tectonic framework. The Modified Mercalli scale is another common measure of earthquake intensity, which is a subjective measure of earthquake strength at a particular place, as determined by its effects on people, structures, and earth materials. Table 4.6-2: Earthquake Intensity Scale presents the Modified Mercalli scale for earthquake intensity, including a range of approximate average peak ground acceleration (PGA) values associated with each intensity value. PGA values are expressed as a fraction of the acceleration of gravity (g). As previously described, the most recent significant earthquake in the Proposed Project vicinity—the Long Beach Earthquake—occurred in 1933 with a magnitude of 6.4. This earthquake occurred approximately 57 miles northeast of the Proposed Project.

The probabilistic seismic hazard assessment (PSHA) for the state of California considers a range of possible earthquake sources and estimates their characteristic magnitudes to generate a probability map for ground shaking. The PSHA maps depict values of PGA that have a 10-percent probability of being exceeded in 50 years.

Table 4.6-2: Earthquake Intensity Scale

Intensity Value	Intensity Description	Average PGA Range (g)
I	Not felt except by very few people under especially favorable circumstances.	<0.0017
II	Felt only by a few people at rest, especially on upper floors of buildings. Delicately suspended objects may swing.	0.0017–0.014
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly; vibration similar to a passing truck.	
IV	During the day, felt indoors by many and outdoors by few. At night, some awakened. Dishes, windows, and doors disturbed; walls make cracking sound. Sensation is like a heavy truck striking a building. Standing motor cars rock noticeably.	0.014–0.039
V	Felt by nearly everyone, and many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees and poles may be noticed. Pendulum clocks may stop.	0.039–0.092
VI	Felt by all; many frightened and run outdoors. Some heavy furniture moves and plaster falls or chimneys are damaged. Damage slight.	0.092–0.18
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built, ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by people driving motor cars.	0.18–0.34
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Chimneys, factory stacks, columns, monuments, and walls fall. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. People driving motor cars disturbed.	0.34–0.65
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	0.65–1.24
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	>1.24

Intensity Value	Intensity Description	Average PGA Range (g)
XI	Few, if any, masonry structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	>1.24
XII	Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.	

Sources: Bolt 1988; Wald 1999

Based on the CGS Probabilistic Seismic Hazards Ground Motion Interpolator, the PGA in the vicinity of the Proposed Project ranges from 0.262 to 0.267g. These values fall within Intensity Value VII of the Modified Mercalli scale, as shown in Table 4.6-2: Earthquake Intensity Scale.

These PGA values typically indicate a very strong earthquake that is capable of causing negligible damage in buildings of good design and construction, slight to moderate damage in well-built ordinary structures, considerable damage in poorly built or badly designed structures, and some broken chimneys. The northern portion of the Proposed Project alignment is located within an area that could potentially be exposed to stronger ground motions.

Liquefaction

Liquefaction is the process in which the soil below the water table converts to a fluid state and loses its strength when sufficiently shaken or vibrated during a seismic event. The soil types considered most susceptible to liquefaction are granular, low-plasticity, fine-grained soils, which are saturated and have a density that ranges loose to medium. Adverse effects of liquefaction include loss of bearing strength, lateral spreading, sand boils, ground oscillation, and settlement when liquefied ground reconsolidates following the seismic event.

Although the TL674A reconfiguration activities will occur within liquefaction-prone Quaternary alluvium, the City of San Diego Seismic Safety Study indicated that the majority of the TL674A reconfiguration will be conducted within areas mapped with a low potential for liquefaction. These areas were designated with a low potential for liquefaction based on fluctuating groundwater levels and minor drainages. However, several portions of the TL666D removal activities will be conducted within areas mapped with a high potential of liquefaction. These areas were designated with a high potential for liquefaction based on shallow groundwater, the presence of major drainages, and hydraulic fills. In addition, several areas in the immediate vicinity of the San Dieguito Lagoon and Del Mar Fairgrounds are prone to liquefaction due to a mixture of alluvial sediments, beach sand, bay sand and salt, and dry marsh deposits in the subsurface. Construction along the TL666D, C510, and C738 alignments may occur within these liquefaction-prone areas.

Slope Instability

Strong ground motion can result in rockfall hazards and/or slope instability. Within the City of San Diego, deep soils capable of retaining water may be susceptible to earthquake-induced failure, especially in areas where landslides were previously recorded. Steep slopes are typically considered those that are greater than 15 percent. As presented in Table 4.6-3: Soils in the Proposed Project Area, the steepest slopes crossed by the Proposed Project belong to the Gaviota fine sandy loam, Huerhuero loam, and loamy alluvial land-Huerhuero complex soil map units.[3]

Slopes associated with these soil map units range from nine to 50 percent and primarily underlie work areas along the TL666D alignment. However, the Proposed Project is generally located on flat, previously developed terrain where 50-percent slopes are not likely present.

[3] Each soil map unit corresponds with a specific range of slopes based on official NRCS soil survey data, which are used in conjunction with reconnaissance-level soil surveys for planning purposes.

Table 4.6-3: Soils in the Proposed Project Area

Soil Type	Soil Map Unit[4]	Slope (percent)	Drainage Class	Erosion Potential	Length of Soil Type Crossed by the Proposed Project
Carlsbad gravelly loamy sand	CbC	5 to 9	Moderately well-drained	Moderate	0.1 mile
Chino silt loam	Cka	0 to 2	Moderately well-drained	Slight	170 feet
Corralitos loamy sand	CsB	0 to 5	Somewhat excessively drained	Moderate	2.6 miles
	CsC	5 to 9			
	CsD	9 to 15		Severe	
Gaviota fine sandy loam	GaF	30 to 50	Well-drained	Severe	0.1 mile
Huerhuero loam	HrC	2 to 9	Moderately well-drained	Moderate	0.5 mile
	HrC2	5 to 9			
	HrD2	9 to 15		Severe	
	HrE2	15 to 30			
Huerhuero loam-Urban land complex	Huc	2 to 9	Moderately well-drained	Moderate	210 feet
Lagoons	NA	NA	NA	NA	0.1 mile
Loamy alluvial land-Huerhuero complex	LvF3	9 to 50	Moderately well-drained	Severe	1.0 mile
Made land	Md	NA	NA	Moderate	0.9 mile
Terrace escarpments	Tf	NA	NA	Slight	1.7 miles
Tidal flats	Tf	NA	Very poorly drained	Slight	1.1 miles
Tujunga sand	TuB	0 to 5	Somewhat excessively drained	Slight	0.5 mile

Sources: UC Davis 2016; NRCS n.d., 2016c

[4] Soil map units are utilized by the NRCS to identify and display specific soils and/or groups of soils on a map based on their soil profile, soil type, relationship to other soils, or suitability for various uses.

Landslides occur when masses of rock, earth, or debris move down a slope, including rock falls, deep failure of slopes, and shallow debris flows. The actuators of landslides can be both natural events (e.g., earthquakes, rainfall, and erosion) and human activities.

Those induced by man are most commonly related to large grading activities that can potentially cause new slides or reactivate old ones when compacted fill is placed on potentially unstable slopes. Excavation operations can also contribute to landslides when lateral support is removed near the base of unstable hillside areas. Conditions to be considered in regards to slope instability include slope inclination, characteristics of the soil materials, the presence of groundwater, and degree of soil saturation.Landslide-prone areas in the Proposed Project area have not been mapped or studied by the CGS. Therefore, geologic formation, soil characteristics, and associated slopes were utilized to assess landslide hazards. Geologic formations prone to landslides in the City of San Diego primarily include the Friars, Ardath, Otay, and Sweetwater formations. According to the City of San Diego Seismic Safety Study, Proposed Project components within in the City of San Diego are not underlain by landslide-prone geologic formations. Based on the results of the same study, no confirmed landslides or locations where landslides are possible have been mapped within the Proposed Project area. The majority of the Proposed Project is located on level or sloping terrain. However, a review of aerial imagery indicated that steep slopes may be present in the vicinity of work areas underlain by terrace escarpments between Pole 70 and Pole 77 along the TL666D alignment. Based on geologic hazard maps presented in the Community Plan for the City of Del Mar, the Proposed Project components within in the City of Del Mar are not underlain by soils with steep slopes. In addition, the landslide-prone formations identified in the City of San Diego Seismic Safety Study will not be crossed by Proposed Project components in the City of Del Mar.

Differential Settlement

If the soil beneath a structure settles non-uniformly, the structure can be damaged. The reasons for differential settlement are usually traced to differences in the bearing characteristics of the soils. Alternatively, a portion of the soil beneath a structure may lose strength during an earthquake due to liquefaction. If liquefaction occurs non-uniformly, differential compaction will occur. As previously discussed, the Proposed Project is located in areas mapped with a low to high liquefaction potential. Unconsolidated or weakened geologic units, including areas underlain by alluvium and highly weathered rock, may also be subject to differential settlement. The entirety of the Proposed Project is located within lacustrine, playa, estuarine, and alluvial deposits. These deposits are considered to be weakened geologic units that may be subject to differential settlement. However, the majority of these weakened geologic units are likely stabilized beneath existing structures and developments in the Proposed Project area.

Subsidence

Subsidence occurs most often when fluids are withdrawn from the ground, removing partial support for previously saturated soils. More rarely, subsidence occurs due to tectonic down-warping during earthquakes. With the exception of the 1.1 miles of tidal flats crossed by the Proposed Project, the majority of the soil types mapped within the Proposed Project area are moderately well-drained, well-drained, or somewhat excessively drained. Therefore, the majority of the soil types in the Proposed Project area have a low potential to hold water and a subsequent low potential for subsidence. Tidal flats are crossed by the existing TL666D

alignment in several areas south of Carmel Valley Road and in the immediate vicinity of the San Dieguito Lagoon.

Soils

Approximately 15 distinct soil map units are crossed by the Proposed Project, including temporary work areas, although several of these map units contain the same soil types. The soil characteristics along the Proposed Project alignment are summarized in Table 4.6-3: Soils in the Proposed Project Area.

Expansive or Collapsible Soils

Expansive soils are characterized by the ability to undergo significant volume change (i.e., shrink and swell) as a result of variation in soil moisture content. Soil moisture content can change due to many factors, including perched groundwater, landscape irrigation, rainfall, and utility leakage. Expansive soils are commonly very fine-grained with a high to very high percentage of clay. Section 1808 of the International Building Code (IBC) provides design standards for structures constructed on expansive soils. According to Section 1803.5.3 and Table 18-1-B of the IBC, soils with an expansion index of 20 or greater require additional foundation design considerations.

As previously described, soils underlying the entirety of the Proposed Project consist of lacustrine, playa, estuarine, and alluvial deposits. According to available USGS data, soils underlying existing facilities associated with the Proposed Project generally contain less than 50-percent clay and have a slight to moderate swelling potential. Clayey soils in the Proposed Project area consist primarily of Huerhuero loam soils on two- to nine-percent slopes.

4.6.3 Impacts

Significance Criteria

Standards of significance were derived from Appendix G of the California Environmental Quality Act Guidelines. Impacts to geology and soils will be considered significant if the Proposed Project:

- Exposes people or structures to potential substantial adverse effects involving strong seismic ground shaking, fault rupture, liquefaction, or landslides
- Results in substantial soil erosion or the loss of topsoil
- Is located on a geologic unit or soil that is unstable, or that will become unstable as a result of the Proposed Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse
- Is located on expansive soil, as defined in Table 18-1-B of the UBC (1994), creating substantial risks to life or property

- Is located on 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

Question 4.6a – Human Safety and Structural Integrity

i. Earthquake Fault Rupture – Less-than-Significant Impact

The Proposed Project does not cross any active faults, potentially active faults, or Alquist-Priolo Earthquake Fault Zones. According to the City of San Diego Seismic Safety Study, the Proposed Project is not located within the "Downtown Special Fault Zone." This fault zone was designated in downtown San Diego based on the presence of the Alquist-Priolo Earthquake Fault Zones. As previously described, the closest active faults to the Proposed Project are located within the San Diego section of the Newport-Inglewood-Rose Canyon fault zone, which are mapped approximately 4.5 miles south of the Proposed Project. Based on the proximity to the Proposed Project, faults within this zone represent the dominant source of potential ground motion in the Proposed Project area. The closest significant earthquake that occurred within the Newport-Inglewood-Rose Canyon fault zone was the Long Beach Earthquake, which was recorded approximately 57 miles northeast of the Proposed Project in 1933.

The Proposed Project involves the removal of approximately 34 existing wood poles, the installation of eight new poles, and the removal of six miles of existing 69 kilovolt (kV) power lines. Although a total of six new poles will be installed during the C510 and C738 conversion activities, portions of the existing 12 kV distribution lines will be converted from an overhead to underground configuration, which will reduce the number of overhead facilities in the Proposed Project area. Although the existing overhead facilities were constructed and engineered to withstand seismic activity, earthquake fault rupture could potentially result in damage to poles or conductors in the Proposed Project area.

SDG&E will conduct civil and transmission engineering reviews prior to construction to identify Proposed Project components requiring geotechnical investigations. Upon completion of the engineering reviews, SDG&E will implement APM-GEO-01, which requires the preparation of a geotechnical investigation and the incorporation of the site-specific results and recommendations from this investigation into the final design of the Proposed Project. Because the majority of the Proposed Project will involve the removal of existing overhead facilities, impacts to structures resulting from geologic hazards will generally be reduced as a result of the Proposed Project. Therefore, a geotechnical investigation will be conducted primarily for the installation of new poles to ensure that the poles will be engineered to withstand potential damage caused by fault rupture lurching, or cracking of the ground surface due to nearby or distant seismic events.

As previously discussed, the removal of existing overhead facilities will result in a reduced risk of loss, injury, or death to people or structures that could result from earthquake rupture and subsequent damage to existing SDG&E facilities. Therefore, the Proposed Project will reduce potential hazards to people and structures in the event of a potential fault rupture. Based on the implementation of APM-GEO-01, the adherence to all appropriate codes and seismic standards, and the reduced risk to people and structures following construction of the Proposed Project, impacts will be less than significant.

ii. Strong Seismic Shaking – Less-than-Significant Impact

The Proposed Project will be designed to withstand strong seismic accelerations and major seismic events in accordance with SDG&E's Project Design Features Ordinary Construction Restrictions. The design and construction of the Proposed Project will conform to the specific mandated structural design and performance requirements to protect against the effects of strong seismic shaking. As previously discussed, a Proposed Project-specific geotechnical investigation will be conducted per APM-GEO-01, and the recommendations of this investigation will be considered in the final design to ensure that Proposed Project components are constructed to withstand strong seismic shaking. In addition, the majority of the Proposed Project will involve the removal of existing facilities, which will subsequently result in a reduced risk of loss, injury, or death to people or structures that could result from earthquake rupture and subsequent damage to existing SDG&E facilities. Because SDG&E will implement the recommendations from the geotechnical investigation and adhere to SDG&E's Project Design Features and Ordinary Construction Restrictions, which comply with all appropriate and applicable codes and seismic standards, the potential for damage caused by strong seismic shaking will be less than significant.

iii. Ground Failure – Less-than-Significant Impact

The potential for liquefaction and seismic settlement along the Proposed Project alignment ranges from low to high. As previously described, potential liquefaction and seismic settlement may occur in the immediate vicinity of the San Dieguito Lagoon, Del Mar Fairgrounds, and proposed TL666D removal activities south of Carmel Valley Road within Los Peñasquitos Lagoon. Additional TL666D removal work areas near the southern terminus of the Proposed Project may also be located within areas mapped with a high liquefaction potential. Although the Proposed Project primarily involves the removal of existing power poles and conductors, the TL674A reconfiguration, C510 conversion, and C738 conversion activities will require the installation of underground facilities. The TL674A reconfiguration activities will not be conducted in areas mapped with a high liquefaction potential. The C510 and C738 conversions may occur within areas mapped with a high liquefaction potential. However, SDG&E will implement APM-GEO-01, which will require the preparation of a geotechnical investigation to address the installation of new poles within liquefaction-prone areas as required based on SDG&E's civil and transmission engineering reviews. The site-specific results and recommendations of this investigation will be considered in the final design to ensure that the Proposed Project is constructed in accordance with applicable codes, seismic standards, and requirements set forth by state, county, and city agencies. As a result, impacts resulting from ground failure will be less than significant.

iv. Landslides – Less-than-Significant Impact

The majority of the Proposed Project is located in existing roadways, relatively flat topography, or rolling terrain where landslides are less likely to occur. According to the City of San Diego Seismic Safety Study, the Proposed Project is not underlain by landslide-prone geologic formations or located in the vicinity of significantly steep slopes. The Seismic Safety Study also identified specific locations where landslides have occurred or could likely occur based on topography and underlying geologic formations. The maps generated by the City of San Diego Seismic Safety Study depicted no confirmed or possible landslide locations along the Proposed

Project alignment. However, the Proposed Project is underlain by soils with slopes ranging from nine to 50 percent. These soils include the Gaviota fine sandy loam, Huerhuero loam, and loamy alluvial land-Huerhuero complex. Based on a review of aerial imagery and NRCS soil data, steep slopes may be present near Proposed Project components between Pole 70 and Pole 77 along the TL666D alignment.

Although soils types with potentially steep slopes are mapped within the Proposed Project area, no landslide-prone geologic formations or confirmed landslides were mapped within the Proposed Project area. In addition, Proposed Project components underlain by soil map units with steep slopes will primarily involve the removal of existing overhead facilities and will not require the installation of new facilities. Therefore, the removal of these overhead facilities will reduce the number of overhead structures that could potentially be exposed to impacts resulting from landslides.

Ground-disturbing activities during construction have the potential to increase surface instability, and these activities include vegetation clearing and grubbing, trenching, incidental grading at stringing sites, and excavation during pole and underground duct bank and vault installation. One new direct-bury steel pole, one new steel riser pole, and approximately 1.1 miles of underground duct bank will be installed during the TL674A reconfiguration. The C510 and C738 conversions will involve the installation of six new poles and approximately 4,230 feet of underground facilities. However, SDG&E will implement APM-GEO-01, which will require the preparation of a geotechnical investigation to address the installation of new structures in the vicinity of steep slopes where required based on the results of SDG&E's civil and transmission engineering reviews. The final design will consider the recommendations provided in the Proposed Project-specific geotechnical investigation, and the depth and foundation diameter of each new pole will be engineered based on site-specific conditions. Therefore, impacts resulting from landslides are anticipated to be less than significant.

Operation and Maintenance – No Impact

Operation and maintenance (O&M) activities for the Proposed Project will be continue to be conducted in the same manner as they have been prior to construction of the Proposed Project. As described in Chapter 3 – Project Description, O&M of the proposed underground duct banks within Via De La Valle will be installed parallel to existing facilities where O&M activities are currently being conducted. The removal of an approximately six-mile segment of TL666D will eliminate all future O&M activities associated with these facilities. The C510 and C738 conversions will eliminate O&M requirements associated with approximately 4,530 feet of existing overhead distribution line. Although these conversions will introduce approximately 4,230 feet of new underground duct bank, SDG&E currently owns and operates existing underground distribution facilities in the vicinity of these Proposed Project components. In addition, the C738 conversion will involve the installation of underground facilities in the same general location as the existing overhead facilities that will be removed. Based on the removal of existing overhead facilities and the installation of Proposed Project components in areas already covered by existing O&M activities, post-construction O&M requirements in the Proposed Project area will be reduced, and no new impacts will occur.

Based on the removal of existing overhead facilities during construction, O&M of the Proposed Project will expose fewer structures to seismic activity and related geologic hazards. In addition, O&M of existing and proposed facilities will not impact soil stability or result in landslide activity. Engineered fill or excavated native material will be used to backfill trenches during duct bank installation, which will stabilize the existing geologic conditions and reduce the potential for movement resulting from seismic activity. Excavated native material will be tested prior to backfilling to ensure that the soils are geotechnically suitable. Therefore, the Proposed Project will reduce the risk of loss, injury, or death that could result from seismic activity, and no impact will occur.

Question 4.6b – Soil Erosion or Topsoil Loss

Construction – Less-than-Significant Impact

The Proposed Project primarily involves the removal of existing facilities and the installation of new poles and underground duct banks in previously disturbed utility corridors, paved franchise areas, and existing rights-of-way. The majority of the ground disturbance during the construction of these facilities will be temporary in nature. As described in Chapter 3 – Project Description, incidental grading may be required at stringing sites to create level pads for equipment. Grading activities may create the potential for soil erosion by removing the existing paved surface and exposing soil during the construction phase of the Proposed Project. Rain and wind may further detach soil particles and transport them off site. To reduce impacts resulting from potential soil erosion and sediment transport, SDG&E will implement a Storm Water Pollution Prevention Plan (SWPPP) and adhere to SDG&E's Best Management Practices (BMPs) Manual for Water Quality Construction (BMP Manual). The SWPPP and associated BMPs will be implemented to minimize soil erosion during construction and to reduce impacts to a less-than-significant level. BMPs may include the implementation of silt fences, fiber rolls, berms, and stockpile management practices to minimize sediment transport. As described in Chapter 3 – Project Description, a Rain Event Action Plan will also be prepared for all phases of construction to prevent sediment transport during inclement weather. The SWPPP and the SDG&E BMP Manual are described in more detail in Section 4.9 Hydrology and Water Quality.

As previously discussed, the majority of the Proposed Project will be constructed within previously disturbed utility corridors and paved franchise areas where valuable topsoil is not present. However, approximately 17.5 acres of temporary ground disturbance will be required for pole excavation, trenching, and the establishment of temporary work areas. Following removal of existing facilities and the installation of new poles and underground facilities, disturbed areas will be returned to near pre-construction conditions using engineered fill or native soil excavated on site during construction activities. Based on the temporary nature of ground disturbance and the implementation of BMPs, substantial erosion or the loss of topsoil are not expected to occur. As a result, impacts will be less than significant.

Operation and Maintenance – Less-than-Significant Impact

As discussed in the response to Question 4.6a, O&M activities will continue to be conducted in the same manner as they have been prior to construction of the Proposed Project. Based on the removal of existing overhead facilities and the installation of Proposed Project components in

areas already covered by existing O&M activities, post-construction O&M requirements in the Proposed Project area will not change.

O&M activities are not expected to involve ground disturbance, substantial erosion, or the loss of topsoil. If grading or ground disturbance is required during O&M, SDG&E will implement the BMPs outlined in the BMP Manual. As a result, impacts related to soil erosion and the loss of topsoil during O&M will be less than significant.

Question 4.6c – Geologic Unit Instability

Construction – Less-than-Significant Impact

As described previously in the response to Question 4.6a, proposed overhead and underground power line facilities are engineered to withstand strong ground movement and moderate ground deformation. As previously discussed, engineered fill or excavated native material will be used to backfill trenches during duct bank installation, which will stabilize the existing geologic conditions and reduce the potential for movement resulting from unstable geologic units. Excavated native material will be tested prior to backfilling to ensure that the soils are geotechnically suitable.

Based on data presented in the City of San Diego Seismic Safety Study, the majority of the TL674A reconfiguration will be conducted within areas mapped with a low potential for liquefaction. However, soils underlying Proposed Project areas along the existing TL666D, C510, and C738 alignments are underlain by geologic formations with a high liquefaction potential. Therefore, per APM-GEO-01, the results and recommendations from the Proposed Project-specific geotechnical investigation will be considered and implemented during the final design of the Proposed Project to address geologic hazards where new poles will be installed. The implementation of these recommendations, as needed, will reduce the potential for adverse effects, such as differential settlement, lateral spreading, subsidence, or collapse resulting from liquefaction events in the Proposed Project area. In addition, the majority of the Proposed Project will involve the removal of existing overhead facilities, which will reduce the number of structures exposed to potentially unstable geologic units. Based on the implementation of recommendations provided by the geotechnical investigation and the reduced number of structures exposed to unstable geologic units following Proposed Project construction, impacts resulting from geologic instability will be less than significant.

Operation and Maintenance – No Impact

As discussed in the response to Question 4.6a, O&M activities will continue to be conducted in the same manner as they have been prior to construction of the Proposed Project. Based on the removal of existing overhead facilities and the installation of Proposed Project components in areas already covered by existing O&M activities, post-construction O&M requirements in the Proposed Project area will not change. Therefore, no impacts will result from geologic unit instability during O&M.

Question 4.6d – Expansive Soils

Construction – Less-than-Significant Impact

As described in the County of San Diego Guidelines for Determining Significance of Geologic Hazards, certain types of clay soils swell when saturated and shrink when dried. Soils underlying the entirety of the Proposed Project generally contain less that 50 percent of clays and have a slight to moderate swelling potential. Clayey soils in the Proposed Project area primarily consist of Huerhuero loam soils with two- to nine-percent slopes. However, these soils are crossed by a less than a 0.1-mile segment of the TL666D alignment where new structures and extensive ground disturbance are not proposed.

As previously described, per APM-GEO-01, the results and recommendations of a geotechnical investigation will be incorporated into the final design of the Proposed Project to address potentially expansive soils where new poles will be installed. The implementation of these recommendations will ensure that the soil composition, compaction, and grade mitigates the risk of damage from potentially expansive soils during the installation of new structures. Based on the limited quantity of clayey soils underlying the Proposed Project and the implementation of recommendations provided by the geotechnical investigation, impacts resulting from expansive soils will be less than significant.

Operation and Maintenance – No Impact

As discussed in the response to Question 4.6a, O&M activities will continue to be conducted in the same manner as they have been prior to construction of the Proposed Project. Based on the removal of existing overhead facilities and the installation of Proposed Project components in areas already covered by existing O&M activities, post-construction O&M requirements in the Proposed Project area will not change. Therefore, no impact will result from expansive soils during O&M.

Question 4.6e – Septic Suitability – *No Impact*

Soil permeability is a consideration for projects that require septic system installation. Because the Proposed Project will not involve the installation of a septic tank or alternative wastewater disposal system, no impacts will occur.

4.6.4 Applicant-Proposed Measures

The following APM will be implemented to reduce potential impacts resulting from geologic hazards in the vicinity of the Proposed Project:

- **APM-GEO-01:** SDG&E will consider the recommendations and findings of a final geotechnical investigation and the contractor's Geotechnical Engineer regarding the potential for seismic activity, landslides, expansive soils, slope instability and differential settling. SDG&E will incorporate those recommendations, as appropriate, into the final design of the Proposed Project. The final Proposed Project design will be reviewed and approved by a Professional Engineer registered in the State of California prior to construction.

4.6.5 References

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