3.7 GEOLOGY AND SOILS

GEOLOGY AND SOILS - Would the Project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation**	**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 waste water?	☐	☐	☐	☒

3.7.1 Environmental Setting

3.7.1.1 Onshore

The onshore portion of the Project is located within the western portion of the Transverse Ranges Province, characterized primarily by east-west trending topographic and structural elements. The local topography consists of a narrow beach area, coastal plain, foothills belt, and the southern slopes of the Santa Ynez Mountains. The coastal plain is generally less than 3,000 feet (914 m) wide and ranges in elevation from 50 to 200 feet (15.2 to 91 m). The area is overlain by alluvial sediments that have been deposited on one or more of the uplifted marine abrasion platforms. The present surface

is flat and slopes gradually seaward. The underlying geologic units that consist of cemented sandstone tend to develop steep canyon slopes and narrow valley floors.

As discussed within the Project EIA (ExxonMobil 2013), the original project EIR (Arthur D. Little, 1986) analyzed impacts associated with regional geologic formations, including faults. Seismic capabilities of faults within 60 miles (100 km) of the Project were evaluated. Seventeen active faults and 12 potentially active faults were identified. Potential impacts from seismic conditions were not determined to be significant.

3.7.1.2 Offshore

According to the Project EIA (ExxonMobil 2013), numerous regional and site-specific seismic investigations have been conducted to assess geologic conditions in the Project area, including several for the proposed cable replacements. The Project area is located in the Smooth Slope and Fan Provinces. Water depths range from 300 feet (91 m) (at the OCS edge) to over 1,500 feet (457 m). Slope gradients are generally low, ranging from a maximum of 7 degrees (12 percent) to a minimum of 2 degrees (4 percent) or less at the slope/basin interface.

A geophysical survey was conducted in September 2011 to document current conditions of the existing and proposed Cable route (Fugro 2011; Appendix D). In addition, the proposed cable route in shallow water, from 15 to 75 feet (4.5 to 22.9 m) ocean depth, was surveyed and reported in a separate reports (Padre 2011, 2012). The objectives of the surveys included mapping the location of the proposed cable routes, identifying and mapping seabed features in the Project area, identifying and mapping submarine cables and pipelines within the Project area, identifying and mapping bathymetric data in the Project route and providing coordinates of any anomalies.

Data were collected using single beam bathymetry, side scan sonar, sub-bottom profiler and magnetometer. Seafloor features were mapped along the proposed Cable routes from the sonar data. Features identified included topographic sea floor features such as mounds, depressions, rises, scour and areas of disrupted seabed, anchor drag and trawl scars. Areas of seafloor change, debris and bedrock outcrop were also mapped as part of the survey.

Prominent seafloor features identified along the proposed cable routes primarily include anchor scars, impact depressions and rock or hard bottom areas near Platforms Harmony and Heritage and at the OCS break. In addition, a fan channel is located between Platforms Harmony and Heritage. The seabed floor surrounding Platform Heritage is relatively free of features with the exception of several large areas of rock south of the structure.

3.7.2 Regulatory Setting

3.7.2.1 Federal and State

Laws regarding geologic resources are primarily limited to State regulations. State laws and regulations pertaining to this issue area and relevant to the Project are identified in Table 3.7-1.

Table 3.7-1. State Laws, Regulations, and Policies (Geology and Soils)

CA	Alquist-Priolo Earthquake Fault Zoning Act (Pub. Resources Code, §§ 2621-2630)	This Act requires that "sufficiently active" and "well-defined" earthquake fault zones be delineated by the State Geologist and prohibits locating structures for human occupancy across the trace of an active fault.
	California Building Code (Cal. Code Regs., tit. 23)	The California Building Code contains requirements related to excavation, grading, and construction of pipelines alongside existing structures. A grading permit is required if more than 50 cubic yards of soil are moved. Sections 3301.2 and 3301.3 contain provisions requiring protection of adjacent properties during excavations and require a 10-day written notice and access agreements with adjacent property owners.
	California Seismic Hazards Mapping Act (Pub. Resources Code, § 2690 and following as Division 2, Chapter 7.8)	This Act and the Seismic Hazards Mapping Regulations (Cal. Code Regs., tit. 14, Div. 2, Ch. 8, Art. 10) are designed to protect the public from the effects of strong ground shaking, liquefaction, landslides, other ground failures, or other hazards caused by earthquakes. The Act requires that site-specific geotechnical investigations be conducted identifying the hazard and formulating mitigation measures prior to permitting most developments designed for human occupancy. Special Publication 117, *Guidelines for Evaluating and Mitigating Seismic Hazards in California* (California Geological Survey 2008), constitutes guidelines for evaluating seismic hazards other than surface fault rupture and for recommending mitigation measures as required by section 2695, subdivision (a).
CA	Coastal Act Chapter 3 policies (see also Table 1-3)	Coastal Act policies applicable to this issue area are: • Section 30253 requires, in part, that: New development shall: (a) Minimize risks to life and property in areas of high geologic, flood, and fire hazard; and (b) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs. • Section 30243 states in part: The long-term productivity of soils and timberlands shall be protected….

3.7.2.2 Local

Local goals, policies, and/or regulations applicable to this issue area as included within the SBC General Plan - Seismic Safety Element (2010) are listed below.

- Geologic and Seismic Protection Policy 1 - The County shall minimize the potential effects of geologic, soil, and seismic hazards through the development review process.

- Geologic and Seismic Protection Policy 2 - To maintain consistency, the County shall refer to the California Building Code, the Land Use Development Code, County Ordinances, the Coastal Land Use Plan, and the Comprehensive General Plan when considering the siting and construction of structures in seismically hazardous areas.

3.7.3 Impact Analysis

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?

ii) Strong seismic ground shaking?

iii) Seismic-related ground failure, including liquefaction?

iv) Landslides?

i). Less than Significant Impact. The original SYU EIS/EIR analyzed impacts associated with regional geologic formations, including faults. Seismic capabilities of faults within 60 miles (100 km) of the onshore Project site were evaluated. Seventeen active faults and 12 potentially active faults were identified. Potential impacts from seismic conditions were not determined to be significant.

The 2011 Fugro survey indicated that the Red Mountain/North Channel Slope fault is the only documented fault located within the offshore Project area. No evidence of Holocene seafloor displacement was interpreted in the subbottom profiler data. Consequently, Fugro concluded that the risk of surface fault rupture on faults crossing the proposed cable route is considered to be low.

ii). Less than Significant with Mitigation. As summarized by Fugro 2011; a probabilistic ground motion map for peak ground acceleration as a percent of gravity with a 2 percent probability of exceedance in 50 years shows a value of approximately 0.77 standard gravity (g) to 1.0 g at the 2,475 year return period. Therefore, it has been concluded that seismicity and strong ground motions pose a significant hazard to the Project. However, in accordance with **MM GEO-1: Engineering Design**, the cables will be constructed to accommodate and withstand strong seismic shaking without suffering significant damage.

MM GEO-1: Engineering Design. ExxonMobil shall ensure that all contracts specify that contractors use current industry standards with respect to seismic considerations in engineering designs.

iii - iv). Less than Significant with Mitigation. As the proposed cable routes cross predominate features between Platform Harmony and Heritage; the slope channels (i.e., the change in elevation divided by the length of the channel along a channel distance) would provide possible conduits for turbidity currents. As determined by Fugro, active mass movement (the potential for submarine landsliding) represent a geologic hazard to the proposed cables. However, based on their report, Fugro did not conclude that this would be a significant impact. Additionally, **MM GEO-1** has been proposed to further reduce the potential for impacts resulting from geologic hazards.

b) Result in substantial soil erosion or the loss of topsoil?

Less than Significant with Mitigation. Due to the location and limited amount of onshore excavation, no increase in wind or water erosion of soils is expected, either on or off the site. However, implementation of **MM WQ-2: Stormwater Pollution Prevention Plan (SWPPP)** would further reduce impacts due to erosion. The Storm Water Pollution Prevention Plan (SWPPP) will be implemented for the onshore activities and used during any rain events. Work in the lower canyon would be outside the creek setback and work on the south side of Highway 101 would be limited to tunnel access from a paved bike and pedestrian path. As such, impacts would be less than significant with mitigation incorporated.

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?

Less than Significant with Mitigation. The onshore portion of the Project would not exacerbate or produce unstable earth conditions, due to the relatively small quantity of excavation and the location. There would be no significant cuts, fills or grading associated with the Project and no significant temporary or permanent changes in topography. In accordance with **MM GEO-1**, the use of current industry engineering standards would further reduce any impacts related to geologic instability.

During the implementation of the offshore component of the Project, the replacement cables would conform to the fan channel; no long spans are anticipated, and there would be no need for any cable supports. The replacement cables, measuring approximately 7 to 8 inches in diameter, would likely be covered with sediment over time and not result in a measurable change to the bathymetric profile of the seafloor. No permanent modifications to the ocean floor would be anticipated as anchoring has been minimized by use of a dynamically positioned CIV. As outlined in **MM MBIO-1b:**

Anchoring Plan, adherence to an anchoring plan prepared for the support vessels would ensure that anchor locations are in areas with no potential for impacts (e.g., hard bottom impacts). In accordance with **MM MBIO-3a: Cable Installation and Retrieval**, a ROV would be used during Project construction to further reduce impacts to sensitive habitat. Less than significant impacts would result after Project-incorporated mitigation.

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risk to life or property?

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

d - e). No Impact. The Project would not take place on expansive soils or involve the use of septic tanks or alternative waste water disposal systems.

3.7.4 Mitigation Summary

ExxonMobil will implement the following measure to reduce Project-related impacts from geologic hazards.

- MM GEO-1: Engineering Design.
- MM MBIO-1b: Anchoring Plan (see Section 3.5.3 or detail).
- MM MBIO-3a: Cable Installation and Retrieval (see Section 3.5.3).
- MM WQ-2: Stormwater Pollution Prevention Plan (SWPPP) (see Section 3.10.3).