Section 3.5
Geology

SECTION SUMMARY

This section presents the geologic conditions for the proposed Project area and analyzes: 1) seismic hazards including surface rupture, ground shaking, liquefaction, subsidence, tsunamis, and seiches; 2) other geologic issues including potentially unstable soils and slopes. This evaluation is based on published reports, applicable computer software programs, and the general geologic setting as indicators of potential geologic hazards. While most impact sections in this EIS/EIR look at the potential impact the proposed Project or alternative could have on the affected resources area, in Geology, impacts are also determined on whether the geological process could cause additional environmental impacts as a result of the proposed Project or alternative. This difference is because geological processes such as earthquakes would occur independent of any proposed Project or alternative.

Section 3.5, Geology, provides the following:

- A description of existing geological setting in both the Port and proposed Project area;
- A description of geological processes such as faults, tsunamis, and subsidence;
- A discussion on the methodology used to determine whether the proposed Project or alternatives would result in an impact to geological resources or whether the impacts of geological hazards on components of the proposed Project or alternative would result in an impact to structures or expose people to risk of injury;
- An impact analysis of both the proposed Project and alternatives; and
- A description of any mitigation measures proposed to reduce any identified impacts, as applicable.

Key Points of Section 3.5:

All impacts related to geology were determined to result in a less than significant level or no impact, as identified below:

- With implementation of applicable building codes, regulations and modern engineering and safety standards, and LAHD policies and regulations, construction and operation of the proposed Project or an alternative would not expose people and structures to potential substantial adverse effects, including the risk of loss, injury, or death, related to:
    - surface rupture, ground shaking, and liquefaction
    - tsunamis or seiches
    - land subsidence/soil settlement
    - expansive soils

- unstable soil conditions from excavation, grading, or fill

- The topography at the proposed Project site and surroundings is flat and not subject to landslides or mudflows
- There are no prominent geologic or topographic features located at the proposed Project site that could be destroyed as a result implementation of the proposed Project or an alternative.
- The proposed Project site is comprised entirely of fill and does not contain mineral resources.
- There is no substantial risk of flooding at the proposed Project site from earthquake based tsunamis and seiches, nor would the risk increase with implementation of the proposed Project or Alternatives 2 through 6. This potential risk would be further reduced with implementation of the following lease measure:

> **LM GEO-1: Emergency Response Planning Lease Requirement.** The terminal operator would work with Port engineers and Port police to develop tsunami response training and procedures to assure that construction and operations personnel would be prepared to act in the event of a large seismic event. Such procedures would include immediate evacuation requirements in the event that a large seismic event is felt at the proposed Project site, as part of overall emergency response planning for this proposed Project.

3.5.1 Introduction

This section describes the existing geologic conditions within the Port and potential geologic impacts associated with implementation of the proposed Project or alternatives.

In addition, an analysis of potential sea-level rise impacts on the proposed Project and alternatives is included.

3.5.2 Environmental Setting

3.5.2.1 Regional Setting

3.5.2.2 Geology

The proposed Project is located near sea level and underlain by artificial fill of varying depths. A great majority of these fill materials were placed as spoils from various nearby dredging operations. Figure 3.4-1 (in Section 3.4, Cultural Resources) depicts the development of Terminal Island since the 1970s, from the original Rattlesnake Island to the current configuration. Quaternary and Neogene[1] deposits make up most of the regional vicinity and lie under the Pier 300 fill (see Figure 3.5-1). The alluvial sands and silts were deposited from recent and Pleistocene[2] river action as outwash from the Los Angeles Basin. A northwest-southeast trending fault system marks the southwestern structural block, one of four such blocks underlying the Los Angeles Basin (Yerkes et al., 1965).

3.5.2.3 Seismicity and Major Faults

An earthquake is classified by the magnitude of wave movement (related to the amount of energy released), which traditionally has been quantified using the Richter scale. This is a logarithmic scale, wherein each whole number increase in magnitude represents a tenfold increase in the wave magnitude generated by an earthquake. A magnitude 8.0 earthquake is not twice as large as a 4.0 earthquake; it is 10,000 times larger (i.e., 10^4 or 10 x 10 x 10 x 10). Damage typically begins at magnitude 5.0. One limitation of the Richter magnitude scale is that it has an upper limit at which large earthquakes have about the same magnitude. As a result, the moment magnitude scale, which does not have an upper limit magnitude, was introduced in 1979, and is often used for earthquakes greater than magnitude 3.5. Earthquakes of magnitude 6.0 to magnitude 6.9 are classified as moderate; those between magnitude 7.0 and magnitude 7.9 are classified as major; and those of magnitude 8.0 or greater are classified as great.

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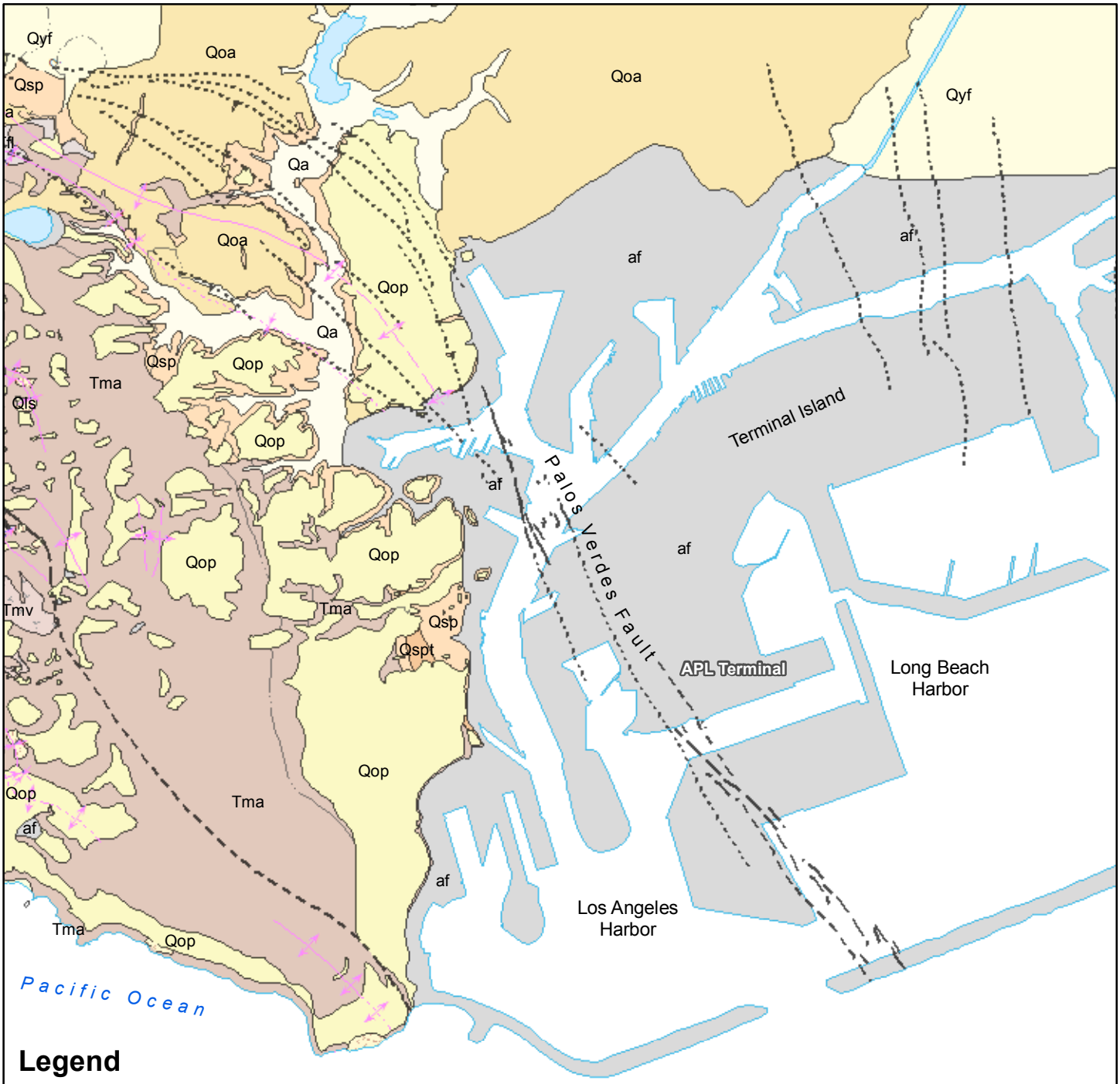
[1] The **Neogene** is a geologic period and system starting 23.03 ± 0.05 million years ago and lasting until 2.588 million years ago with the beginning of the Quaternary period. The **Quaternary period** is the youngest of three periods of the Cenozoic era in the geologic time scale. It follows after the Neogene period, spanning 2.588 +/- 0.005 million years ago to the present. Quaternary includes two geologic epochs: the Pleistocene and the Holocene epochs. Quaternary and Neogene deposits refer to the geologic materials that were being deposited during the respective time periods.

[2] The **Pleistocene** is the epoch from 2.588 million to 12 000 years BP covering the world's recent period of repeated glaciations.



Legend

- Anticline
- Syncline
- Fault, identity and existence certain
- water
- af Artificial fill
- Qls Landslide eeposits
- Qa Alluvial flood plain deposits
- Qyf Young alluvial fan and valley deposits, undivided
- Qoa Old alluvial flood plain deposits, undivided
- Qop Old paralic deposits, undivided
- Qsp Altamira Shale Member
- Qspt Timms Point Silt Member
- Tfl Fernando Formation Lower Member
- Tma Monterey Formation Altamira Shale Member
- Tmv Miocene volcanic rocks

Source: California Geological Survey (2010) Geologic Compilation of Quaternary Surficial Deposits in Southern California

CDM

N

2,000 0 2,000

Feet

Port of Los Angeles
Berths 302 - 306 [APL]
Container Terminal Project
Geologic and Palos Verdes Fault Zone Map
Figure 3.5-1

The site of the proposed improvements is located in a seismically active region of southern California. Since 1796, the region has been subjected to at least 52 major earthquakes of magnitude 6.0 or greater. Ground motion in the region is generally a result of sudden movements of large blocks of the earth along active faults. Great earthquakes, like the 1857 San Andreas Fault earthquake (see Table 3.5-1), are quite rare in southern California. However, the probability of a magnitude 6.7 or greater earthquake in southern California in the next 30 years is 97 percent and the probability of a magnitude 7.5 or greater earthquake in the next 30 year is 37 percent (Working Group on California Earthquake Probabilities, 2008).

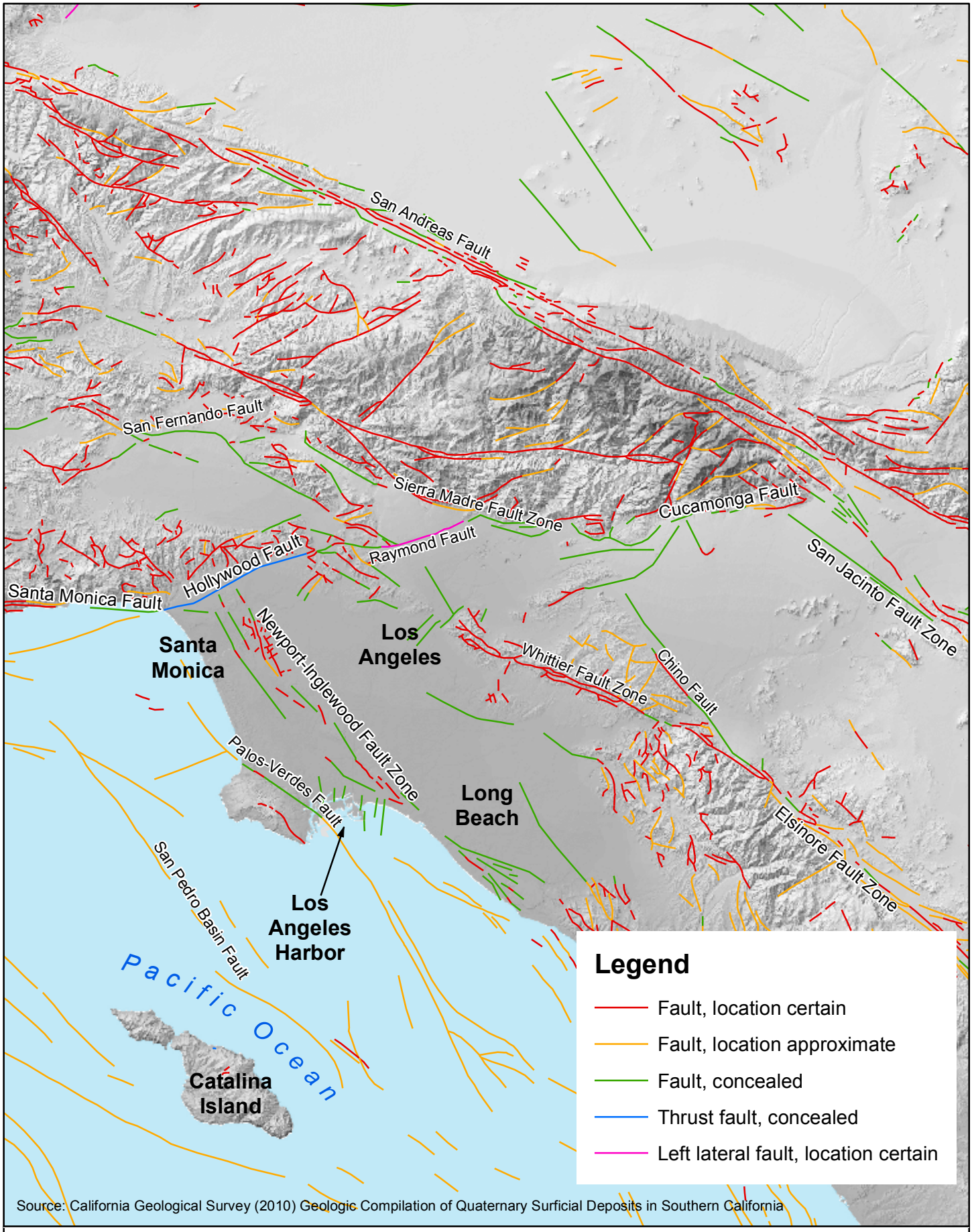
Seismic analyses generally include discussions of maximum credible and maximum probable earthquakes. A maximum credible earthquake (MCE) is usually defined as the maximum earthquake that appears capable of occurring under the known tectonic framework. The probability of occurrence is not considered in this characterization. A maximum probable earthquake (MPE) is defined as the maximum historical earthquake and also as the largest earthquake a fault is predicted capable of generating within a specified time period (i.e, 100 years). In addition, the Port uses a combination of probabilistic and deterministic seismic hazard assessments for seismic design. Probabilistic hazard assessments are required to define two-level design events, including the Operational Level Earthquake (OLE), which is the peak horizontal firm ground acceleration with a 50 percent probability of exceedance in 50 years and the Contingency Level Earthquake (CLE), which is the peak ground acceleration with a 10 percent probability of exceedance in 50 years.

3.5.2.3.1 Faults

Segments of the active Palos Verdes Fault cross the Los Angeles Harbor (Figure 3.5-1), including the proposed Project site. Studies by Earth Mechanics Inc. (EMI) indicate that the MCE for the Palos Verdes Fault is in the magnitude 7.0 to 7.2 range in the southern area and up to 7.4 in the northern area. Predicted recurrence intervals for a magnitude 6.8 to 7.4 earthquake range from a few hundred years for a magnitude 6.8 event to a few thousand years for a magnitude 7.4 event (EMI, 2006). The width of the zone of potential surface ruptures is variable and estimated to range approximately 1,640 ft to as narrow as about 246 ft. The zone is known to be widest in near the Vincent Thomas Bridge, and may also be as wide beneath Pier 300 (EMI, 2006). No known earthquakes have occurred along the Palos Verdes Fault in the past 200 years.

The San Pedro Basin fault is located within the nearby deep seafloor and may be associated with small magnitude (3 to 5) earthquakes (EMI, 2006), though no known large earthquakes have occurred along this fault in the past 200 years (Ninyo & Moore, 1992). While maximum earthquake of approximately magnitude 7.0 to 7.2 could possibly occur, a smaller magnitude earthquake (6.5 to 7.0) would be more likely given that the fault is highly segmented (EMI, 2006).

Numerous other active faults and fault zones are located in the general region, such as the Newport-Inglewood Whittier-Elsinore, Santa Monica, Raymond, San Fernando, Sierra Madre, San Gabriel, Cucamonga, San Jacinto, and San Andreas Faults as shown in Figure 3.5-2. Table 3.5-2 presents an overview of these major regional faults along with the anticipated earthquake magnitudes.



CDM

Port of Los Angeles
Berths 302 - 306 [APL]
Container Terminal Project
Major Regional Faults in Southern California
Figure 3.5-2

Active faults, such as those noted above, are typical of southern California. Therefore, it is reasonable to expect a strong ground motion seismic event during the lifetime of the proposed Project, or alternative, in the region.

Numerous active faults located off-site are capable of generating earthquakes in the proposed Project area (see Tables 3.5-1 and 3.5-2). Most noteworthy, due to its proximity to the site, is the Newport-Inglewood Fault, which has generated earthquakes of magnitudes ranging from 4.7 to 6.3 on the Richter scale (Southern California Earthquake Data Center, 2011). Large events could occur in the general area on more distant faults, but because of the greater distance from the site, earthquakes generated on these faults could be less significant with respect to ground accelerations.

Table 3.5-1: Earthquakes with Magnitude Greater than 5.5 in the LA Basin Area

Fault Name	Date	Richter Magnitude
Palos Verdes Fault	*	*
San Pedro Basin Fault	*	*
Santa Monica-Raymond Fault Zone	1855	6.0
San Andreas Fault	1857 1952	8.2 7.7
Newport-Inglewood Fault	1933	6.3
San Jacinto Fault	1968	6.4
San Fernando/Sierra Madre- Cucamonga Fault Zone	1971 1991	6.4 6.0
Whittier-Elsinore Fault Zone	1987	5.9
Camp Rock/Emerson Fault	1992	7.4
Blind-thrust fault beneath Northridge	1994	6.6

Source: Ninyo & Moore, 1992; U.S. Geological Survey/Caltech, 1992 and 1994.
Notes: *No known earthquakes have occurred within the last 200 years.

Table 3.5-2: Hazardous Faults and Maximum Magnitudes — Los Angeles Basin Area

Fault Name	Distance in miles from Project Site	Fault Type	Maximum Magnitude	Slip Rate* (mm/year)
Palos Verdes Fault	< 1	SS	7.7*	3
Newport-Inglewood Fault Zone	7	SS	7.5	1 – 1.5
San Pedro Basin Fault	15	SS	7.2	0.5 – 1
Whittier-Elsinore Fault Zone (Whittier, Chino, and Elsinore Faults)	22	R/O	7.7	3 – 5
Santa Monica Fault	28	R/O	6.6	1
Hollywood Fault	23	R/O	6.7	1
Raymond Hill Fault	27	R/O	6.8	1.5
Cucamonga Fault	45	R	6.7	5
Sierra Madre/San Fernando Fault	40	R	6.7	2
San Jacinto Fault	57	SS	7.8	6 – 18
San Andreas Fault	54	SS	8.2	16 – 34

Source: USGS, 2008; EMI, 2006.
SS – Strike Slip
R – Reverse
O – Oblique
*Slip rate refers to how fast the two sides of a fault are slipping relative to one another,

Active faults, such as those noted above, are typical of southern California. Therefore, it is reasonable to expect a strong ground motion seismic event during the lifetime of any project in the region. Active faults that are not exactly located beneath the proposed Project site are capable of generating earthquakes in the proposed Project areas and region (refer to Table 3.5-1 and Table 3.5-2).

In 1974, the California Division of Mines and Geology (CDMG) was designated by the Alquist-Priolo Act as the agency responsible for delineating those faults deemed active and likely to rupture the ground surface. The Alquist-Priolo Act does not currently zone faults in the area of the Port; however, there is evidence that the Palos Verdes Fault may be active and could result in ground rupture (Fischer et al., 1987; McNeilan et al., 1996).

3.5.2.3.2 Liquefaction

Liquefaction is defined as the transformation of a granular material from a solid state into a liquefied state because of increased pore pressure, which results in the loss of grain-to-grain frictional resistance. Seismic ground shaking is capable of providing the mechanism for liquefaction, which can occur in fine-grained, loose to medium dense, saturated sands and silty sand. The effects of liquefaction may be excessive if total and/or differential settlement of structures occurs on liquefiable soils or bearing capacity is compromised by the sudden loss of frictional resistance beneath the foundation.

Natural drainages at Port berths have been backfilled with undocumented fill materials. Dredged materials from the harbor area were spread across lower Wilmington from 1905 until 1910 or 1911 (Ludwig, 1927). In addition, the natural alluvial deposits below the adjacent sites are generally unconsolidated, soft, and saturated. Previous soil and

groundwater investigations conducted at the proposed Project site have encountered groundwater at varying depths, ranging between 10 ft to 16.5 ft below ground surface (bgs). These conditions are conducive to liquefaction. See Section 3.7, Groundwater and Soils, for a summary of these studies.

Some studies have indicated that the liquefaction potential in the Harbor area during a major earthquake on the San Andreas, Newport-Inglewood, or Palos Verdes Faults is high (Tinsley and Youd, 1985; Toppozada et al., 1988; Davis et al., 1982). The City of Los Angeles General Plan, Safety Element identifies the proposed Project site as an area susceptible to liquefaction because of the presence of recent alluvial deposits and groundwater less than 30 ft bgs (City of Los Angeles, 1996). Other authors indicate that the overall probability of widespread liquefaction of un-compacted hydraulic fills and major damage in the Port is relatively low; however, even minor damage resulting from liquefaction can be very significant in terms of loss of functionality and repair costs (Pyke, 1990).

3.5.2.3.3 Tsunamis

Tsunamis are gravity waves of long wavelength generated by a sudden disturbance in a body of water. Tsunamis, like tides, produce waves of water that move inland, but in the case of tsunami the inland movement of water is much greater and lasts for a longer period than normal tides, giving the impression of an incredibly high tide. Typically, oceanic tsunamis are the result of sudden vertical movement along a fault rupture in the ocean floor, submarine landslides, subsidence, or volcanic eruption, where the sudden displacement of water sets off transoceanic waves with wavelengths of up to 125 miles and with periods generally from 5 to 60 minutes. The trough of the tsunami wave arrives first leading to the classic retreat of water from the shore as the ocean level drops. This is followed by the arrival of the crest of the wave, which can run up on the shore in the form of bores or surges in shallow water or simple rising and lowering of the water level in relatively deeper water such as in harbor areas.

Tsunamis are a relatively common natural hazard, although most of the events are small in amplitude and not particularly damaging. However, run-up of broken tsunamis in the form of bores and surges or by relatively dynamic flood waves my cause coastal flooding in the event of a large submarine earthquake or landslide. In the process of bore/surge-type run-up, the onshore flow (up to tens of ft per second) can cause tremendous dynamic loads on the structures onshore in the form of impact forces and drag forces, in addition to hydrostatic loading. The subsequent draw-down of the water after run-up exerts the often crippling opposite drags on the structures and washes loose/broken properties and debris to sea; the floating debris brought back on the next onshore flow have been found to be a significant cause of extensive damage after successive run-up and draw-down. As has been shown historically, the potential loss of human life in the process can be great if such events occur in populated areas.

Abrupt sea level changes associated with tsunamis in the past have reportedly caused damage to moored vessels in the outer portions of the Los Angeles Harbor. The Chilean Earthquake of May 1960, for example, caused local damages of over $1 million and Harbor closure. One person drowned at Cabrillo Beach and one was injured. Seriously damaged small craft moorings were in the Harbor area, especially in the Cerritos Channel where a seiche occurred. Hundreds of small boats broke loose from their moorings, 40 sank, and about 200 were damaged. Gasoline from damaged boats caused a major spill

in the Harbor waters and created a fire hazard. Currents of up to 8 knots and a rapid 6-ft rise of water were observed in the West Basin. The maximum water level fluctuations recorded by gauges were 5.0 ft at Port Berth 60 (near Pilot Station) and 5.8 ft in Long Beach Harbor (National Geophysical Data Center, 1993).

Until recently, the basis of projected tsunami run-ups along the western U.S. were on far-field events, such as submarine earthquakes or landslides occurring at great distances from the U.S., as described above for the Chilean Earthquake of May 1960. Based on such distant sources, tsunami-generated wave heights of between 6.5ft and 8 ft above mean lower low water (MLLW), at 100-year intervals and between 10 ft and 11 ft, at 500-year intervals, were projected, including the effects of astronomical tides (Houston 1980). The MLLW is the benchmark from which infrastructure (e.g., wharf and berth heights) is measured in the Port, and mean sea level (MSL) is +2.8 ft above MLLW (NOAA, 2011). Houston (1980) used these run-up estimates for the tsunami analysis contained in the Deep Draft Navigation Improvements EIS/EIR in September 1992 (USACE and LAHD, 1992).

However, recent studies (e.g., Synolakis et al., 1997; Borrero et al., 2001 and 2005a) have projected larger tsunami run-ups based on near-field events, such as earthquakes or submarine landslides occurring in proximity to the California coastline. Off-shore faults present a larger local tsunami hazard than previously thought, posing a direct threat to near-shore facilities. For example, the Catalina Fault is one of the largest such features and lies directly underneath Catalina Island, located only 22 miles from the Port. Simulations of tsunamis generated by uplift on this fault suggest waves in the Port in excess of 12 ft, with an arrival time within 20 minutes (Legg et al., 2003; Borrero et al., 2005b). These simulations were based on rare events, representing worst-case scenarios.

In addition, landslide-derived tsunamis are now perceived as a viable local tsunami hazard. Such tsunamis potentially can be more dangerous, due to the lack of warning for such an event. An earthquake illustrated this mechanism in 1998, centered onshore in Papua-New Guinea, which appears to have created an offshore landslide that caused tsunami inundation heights in excess of 33 ft, claiming more than 2,500 lives. In a study modeling potential tsunami generation by local offshore earthquakes, Legg et al. (2004), consider the relative risk of tsunamis from a large catastrophic submarine landslide (likely generated by a seismic event) in offshore southern California versus fault-generated tsunamis. The occurrence of a large submarine landslide appears quite rare by comparison with the tectonic faulting events. Although there are numerous mapped submarine landslides off the southern California shore, few appear to be of the scale necessary to generate a catastrophic tsunami. Of two large landslides that appear to be of this magnitude, Legg et al. (2004) indicated that one landslide is over 100,000 years old and the other landslide approximately 7,500 years old. In contrast, the recurrence of 3- to 20-ft fault movements on off-shore faults would be several hundred to several thousand years. Consequently, the study concludes that the most likely direct cause of most of the local tsunamis in southern California is tectonic movement during large off-shore earthquakes.

Based on these recent studies (e.g., Synolakis et al., 1997; Borrero et al., 2001), the California State Lands Commission (CSLC) has developed tsunami run-up projections for the Ports of Los Angeles and Long Beach. The CSLC estimates tsunami run-ups to be approximately 8.0 ft and 15.0 ft above MSL, at 100- and 500-year intervals, respectively, as a part of their Marine Oil Terminal Engineering and Maintenance

Standards (MOTEMS) (CSLC, 2004). However, these projections do not incorporate consideration of the localized landfill configurations, bathymetric features, and the interaction of the diffraction, reflection, and refraction of the tsunami wave propagation within the Port Complex in its predictions of tsunami wave heights.

Most recently, a model has been developed specifically for the Port Complex that incorporates consideration of the localized landfill configurations, bathymetric features, and the interaction of the diffraction, reflection, and refraction of tsunami wave propagation, in the predictions of tsunami wave heights (Moffatt and Nichol, 2007). The Port Complex model uses a methodology similar to the above studies to generate a tsunami wave from several different potential sources, including local earthquakes, remote earthquakes, and local submarine landslides. More specifically, the potential seismic tsunamigenic sources include: two scenarios based on a magnitude 7.6 Santa Catalina Fault earthquake (Segments 1-7 and Segments 5-7); one scenario based on a magnitude 7.1 Lasuen Knoll Fault earthquake; one scenario based on a magnitude 7.0 San Mateo Thrust Fault earthquake; one scenario based on a magnitude 9.2 Cascadia Subduction zone earthquake located in the Pacific Northwest; and two landslide events based on the Palos Verdes Escarpment located south of the Port. This model indicates that a reasonable maximum source for future tsunami events at the proposed Project site would either be an earthquake on the Santa Catalina Fault or a submarine landslide along the nearby Palos Verdes Peninsula.

The Port Complex model predicts a maximum tsunami wave height, or reasonable worst-case scenario, of approximately 1.6 ft to 6.0 ft above MSL for the earthquake scenarios and approximately 5.3 ft to 13.7 ft above MSL for the landslide scenario at certain locations within the Port. The highest anticipated water levels from the earthquake scenarios are predicted to occur in the East Channel and East Basin area of the Port. The highest anticipated water levels from the landslide scenarios would occur in the Outer Harbor area and the western side of Pier 400. The report determined that for the worst case landslide scenario, water levels could exceed the adjacent deck levels in some localized areas (Pier 400) and some limited overtopping of the wharves could occur, however, no overtopping is expected at the Port for any of the other scenarios analyzed. Further, the modeled worst-case tsunami scenario was based partially on a moment magnitude 7.6 earthquake on the offshore Catalina Fault. The recurrence interval for a magnitude 7.5 earthquake along an offshore fault in southern California is about 10,000 years. Similarly, the recurrence interval of a magnitude 7.0 earthquake is about 5,000 years, and the recurrence interval of a magnitude 6.0 earthquake is about 500 years. However, there is no certainty that any of these earthquake events would result in a tsunami, because only about 10 percent of earthquakes worldwide result in a tsunami. In addition, available evidence indicates that tsunamigenic landslides would be extremely infrequent and occur less often than large earthquakes. This suggests recurrence intervals for such landslide events would be longer than the 10,000-year recurrence interval estimated for a magnitude 7.5 earthquake (Moffatt and Nichol, 2007).

Incorporating the Port MSL of +2.8 ft, the Port Complex model predicts tsunami wave heights of a maximum 6.4 ft MLLW for the earthquake scenario to 8.7 ft MLLW for the worst landslide scenario at the proposed Project site (Berths 302-306) in the Pier 300 Channel. The anticipated tsunami-induced water levels under these scenarios in the Shallow Water Habitat area of Pier 300 (north of the proposed 41-acre backland area) water levels are predicted to range from of maximum 6.5 to 6.6 ft MLLW for the earthquake and landslide scenario respectively.

3.5.2.3.4 Seiches

Seiches are seismically induced water waves that surge back and forth in an enclosed basin or in a harbor; often, these events are seismically-induced. A significant seiche wave front could cause damage to seawalls and docks and breach sea walls at the proposed Project site. The Port Complex model, referred to above, considered impacts from both tsunami and seiche and concluded that impacts from a tsunami were equal to or more severe than the impacts from a seiche. As a result, the impact discussion below refers primarily to tsunamis, as this will be the worst case of potential impacts.

3.5.2.3.5 Sea Level Rise

Models suggest that sea levels along the California coast could rise substantially over the next century as a result of climate change (for additional discussion of climate change and the role of greenhouse gases [GHGs] see Section 3.2, Air Quality, Meteorology, and Greenhouse Gases). Risks associated with rising sea levels include inundation of low lying areas along the coast, exposure of new areas to flood risk, an increase in the intensity and risk in areas already susceptible to flooding, and an increase in coastal erosion in erosion prone areas.

The State of California Sea-Level Rise Interim Guidance Document prepared by the Sea Level Rise Task Force of the Coastal and Ocean Working Group of the California Climate Action Team (CO-CAT), recommends using the ranges of Sea Level Rise presented in the December 2009 "Proceedings of National Academy of Sciences" publication by Vermeer and Rahmstorf as a starting place for estimating sea level projections, as shown in Table 3.5-3 (CO-CAT, 2010) [3] Until 2050, there is strong agreement among the various climate models on sea level projections. For dates after 2050, three different values for sea level rise are shown based on low, medium, and high future GHG emission scenarios. As shown in the Table 3.5-3, sea level rise is predicted to be greater with higher concentrations of GHGs.

Table 3.5-3: Sea Level Rise Projections Using 2000 as the Baseline

Year	Level of GHG Emissions	Average of Models (in inches)	Range of Models (in inches)
2030		7	5-8
2050		14	10-17
2070	Low	23	17-27
	Medium	24	18-29
	High	27	20-32
2100	Low	40	31-50
	Medium	47	37-60
	High	55	43-69

Source: CO-CAT, 2010

LAHD reported to the California State Lands Commission (CSLC) in response to a survey in 2009 that some possible flooding and wave damage would occur from a 55 inch rise in sea level (CSLC, 2009). As shown in Table 3.5-3 above, a 55 inch rise in sea level could occur in 2100 under the highest GHG emissions scenario. LAHD and the Rand Corporation have initiated a study that identifies Port facilities that are vulnerable to sea

[3] These projections do not account for catastrophic ice melting, so they may underestimate actual sea level rise.

level rise, analyzes various strategies for managing seal level rise, and identifies sea level rise considerations for incorporation into design guidelines. The draft study is anticipated to be released in 2012.

3.5.2.3.6 Subsidence

Subsidence is the phenomenon where the soils and other earth materials underlying the site settle or compress, resulting in a lower ground surface elevation. Fill and native materials on-site can be water saturated and a net decrease in the pore pressure and contained water will allow the soil grains to pack closer together. This closer grain packing results in less volume and the lowering of the ground surface.

Subsidence was first observed in the Los Angeles-Long Beach Harbor area in 1928 and the phenomenon has affected the majority of the harbor area. Based on extensive studies by the City of Long Beach and the California Division of Oil and Gas and Geothermal Resources, it has been determined that most of the area subsidence was the result of oil and gas extraction from the Wilmington Oil Field following its discovery in 1936. However, groundwater withdrawal and tectonic movement also appears to have contributed to subsidence in the area, especially prior to discovery of oil in 1936.

The general harbor area, including the area of the proposed improvements experienced maximum cumulative subsidence of approximately 1.6 ft, from 1928 to 1970 (Allen, 1973). Today, water injection continues to be maintained at rates greater than the total volume of extracted substances, including oil, gas, and water to prevent further reservoir compaction and subsidence (City of Long Beach, 2006).

3.5.2.3.7 Landslides

Generally, a landslide is defined as the downward and outward movement of loosened rock or earth down a hillside or slope. Landslides can either occur very suddenly or very progressively. They are frequently accompanied by other natural hazards such as earthquakes, floods, or the aftermath of wildfires. Most landslides are single events, but more than a third are associated with heavy rains or the melting of winter snows. Ocean wave action, undercutting of slopes during construction, improper compaction, or over saturation can also trigger landslides. In areas on hillsides where the ground cover has been destroyed, landslides are more probable because water can more easily infiltrate the soils. Immediate dangers from landslides include destruction of property and possible fatalities from rocks, mud, and water sliding downhill or downstream. Other dangers include broken electrical, water, gas, or sewage lines.

Hazards due to landslides are not expected to be problematic at the proposed Project site due to its relatively flat terrain. No known or probable bedrock landslide areas have been identified within the Port during this investigation (City of Los Angeles, 1996).

3.5.2.3.8 Expansive Soils

Expansive soils generally result from specific clay minerals that expand when saturated and shrink in volume when dry. The characteristics of the sediments within the harbor that were used to create the 41-acre backland area of the proposed Project site varied from coarse-grained sands to sediments consisting primarily of silt and clay. Fine-grained sediments with high clay content would be most susceptible to potential expansive soil impacts. Further, expansive clay minerals are common in the geologic

units in the adjacent Palos Verdes Peninsula. Clay minerals are likely to be present in the geologic units as well as the artificial fill at the site.

3.5.3 Applicable Regulations

3.5.3.1 Geologic Hazards

The City of Los Angeles primarily governs the geologic resources and geotechnical hazards in the proposed Project vicinity. The Conservation and Safety Elements of the City of Los Angeles General Plan contain policies for the protection of geologic features and avoidance of geologic hazards (City of Los Angeles, 1996 and 2001). Local grading ordinances establish detailed procedures for excavation and earthwork required during construction in backland areas. In addition, City of Los Angeles Building Code (LABC) and building design standards for the Port establish requirements for construction of aboveground structures (City of Los Angeles, 2011). Most local jurisdictions rely on the latest California Uniform Building Code (UBC) as a basis of seismic design. However, with respect to wharf construction, LAHD would apply their standards and specifications to the design of the proposed Project or alternatives. The LAHD must comply with regulations of the Alquist-Priolo Act, which regulates development near active faults to mitigate the hazard of a surface fault rupture.

The LAHD also has developed a seismic code to provide construction standards. The LAHD seismic design codes are contained in the "Proceedings of the Port of Los Angeles Seismic Workshop on Seismic Engineering" and “The Port of Los Angeles Code for Seismic Design, Upgrade, and Repair of Container Wharves” (LAHD, 1990; POLA, 2004).

3.5.3.2 Mineral Resources

The enactment of the Surface Mining and Reclamation Act of 1975 (SMARA) was to promote conservation of the mineral resources of the state and to ensure adequate reclamation of mined lands. Among other provisions, the SMARA requires the State Geologist to classify land in California for mineral resource potential. The four categories include Mineral Resource Zone (MRZ)-1, areas of no mineral resource significance; MRZ-2, areas of identified mineral resource significance; MRZ-3, areas of undetermined mineral resource significance; and MRZ-4, areas of unknown mineral resource significance.

The distinction between these categories is important for land use considerations. The presence of known mineral resources, which are of regional significance and possibly unique to that particular area, could potentially result in non-approval or changes to a given project if it were determined that those mineral resources would no longer be available for extraction and consumptive use. To be significant for the purpose of mineral land classification, a mineral deposit or a group of mineral deposits mined as a unit must meet marketability and threshold value criteria adopted by the California State Mining and Geology Board. The criteria vary for different minerals depending on whether the minerals are strategic or nonstrategic, the uniqueness or rarity of the minerals and the commodity-type category (e.g., metallic minerals, industrial minerals or construction materials) of the minerals. The State Geologist submits the mineral land classification report to the State Mining and Geology Board, which transmits the information to appropriate local governments that maintain jurisdictional authority in

mining, reclamation, and related land use activities. Local governments are required to incorporate the report and maps into their general plans and consider the information when making land use decisions.

The proposed Project site and vicinity is predominately underlain by recent alluvium and dredged fill material and has been designated as having a classification of MRZ-1 (California Department of Conservation, 2002). This designation means that there is adequate information about the area to indicate that no significant mineral deposits are present or it has been judged that little likelihood exists for their presence (POLA, 2006).

3.5.4 Impacts and Mitigation Measures

3.5.4.1 Methodology

In this document, geological impacts are evaluated in two ways: 1) impacts of the proposed Project or alternative on the local geologic environment; and 2) impacts of geological hazards on components of the proposed Project or alternative that may result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Impacts would be significant if the proposed Project or alternative meets the significance criteria listed in Section 3.5.4.2.

3.5.4.1.1 CEQA Baseline

Section 15125 of the CEQA Guidelines requires EIRs to include a description of the physical environmental conditions in the vicinity of a project that exist at the time of the NOP. These environmental conditions normally would constitute the baseline physical conditions by which the CEQA lead agency determines if an impact is significant. For purposes of this Draft EIS/EIR, the CEQA baseline for determining the significance of potential Project impacts is the environmental set of conditions that prevailed at the time the NOP was published for the proposed Project - July 2009. The CEQA baseline takes into account the throughput for the 12-month period preceding July 2009 (July 2008 through the end of June 2009) in order to provide a representative characterization of activity levels throughout the year. The CEQA baseline conditions are described in Section 2.6.1. The CEQA baseline for this proposed Project includes approximately 1.13 million TEUs per year, 998,728 annual truck trips, and 247 annual ship calls that occurred on the 291-acre APL Terminal in the year prior to and including June 2009.

The CEQA baseline represents the setting at a fixed point in time and differs from the No Project Alternative (Alternative 1) in that the No Project Alternative addresses what is likely to happen at the proposed Project site over time, starting from the existing conditions. Therefore, the No Project Alternative allows for growth at the proposed Project site that could be expected to occur without additional approvals, whereas the CEQA baseline does not.

3.5.4.1.2 NEPA Baseline

For purposes of this Draft EIS/EIR, the evaluation of significance under NEPA is defined by comparing the proposed Project or other alternative to the NEPA baseline. The NEPA baseline conditions are described in Section 2.6.2. Briefly, the NEPA baseline condition for determining significance of impacts includes the full range of construction and operational activities the applicant could implement and is likely to implement absent a federal action, in this case the issuance of a USACE permit. The NEPA baseline includes

minor terminal improvements in the upland area (i.e., conversion of a portion of the dry container storage unit area to reefers and utility infrastructure), operation of the 291-acre container terminal, and assumes that by 2027, the terminal (Berths 302 to 305) handles up to approximately 2.15 million TEUs annually and accommodates 286 annual ships calls and 2,336 on-way rail trips, without any federal action. Because the NEPA baseline is dynamic, it includes different levels of terminal operations at each study year (2012, 2015, 2020, 2025, and 2027).

Unlike the CEQA baseline, which is defined by conditions at a point in time, the NEPA baseline is not bound by statute to a "flat" or "no-growth" scenario. Therefore, the USACE could project increases in operations over the life of a project to properly describe the NEPA baseline condition. Normally, any federal permit decision would focus on direct impacts of the proposed Project to the aquatic environment, as well as indirect and cumulative impacts in the uplands determined to be within the scope of federal control and responsibility. Significance of the proposed Project or alternative under NEPA is defined by comparing the proposed Project or alternative to the NEPA baseline (i.e., the increment).

The NEPA baseline, for purposes of this Draft EIS/EIR, is the same as the No Federal Action Alternative. Under the No Federal Action Alternative, only minor terminal improvements (utility infrastructure, and conversion of dry container storage to refrigerated container storage) would occur, but no new cranes would be added, and the terminal configuration would remain as it was configured in 2008 (291 acres, 12 A-frame cranes, and a 4,000-ft wharf). However, forecasted increases in cargo throughput and annual ship calls would still occur as container growth occurs.

3.5.4.2 Thresholds of Significance

The *L.A. CEQA Thresholds Guide* (City of Los Angeles, 2006) is the basis for the following significance criteria and for determining the significance of impacts associated with geology resulting from development of the proposed Project or alternative.

To consider geologic hazard impacts significant, the proposed Project or alternative would cause or accelerate hazards that would result in substantial damage to structures or infrastructure or exposes people to substantial risk of injury. Because the region is geologically active, there is exposure of most projects to some risk from geologic hazards, such as earthquakes. Therefore, geologic impacts are significant only if the proposed Project or alternative would result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from the following:

GEO-1 Fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure;

GEO-2 Tsunamis or seiches;

GEO-3 Land subsidence/soil settlement;

GEO-4 Expansive soils;

GEO-5 Landslides, mudflows; or

GEO-6 Unstable soil conditions from excavation, grading or fill.

In addition, a project or alternative would normally have a significant impact with respect to landform alteration or mineral resources if:

GEO-7 One or more distinct and prominent geologic or topographic features would be destroyed, permanently covered or materially and adversely modified. Such features may include, but not be limited to, hilltops, ridges, hillslopes, canyons, ravines, rocky outcrops, water bodies, streambeds, and wetlands.

GEO-8 It would result in the permanent loss of availability of a known mineral resource of regional, state, or local significance that would be of future value to the region and the residents of the state.

GEO-9 It would result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

There are no established sea level rise significance thresholds, nor has the Federal government or the state adopted any by regulations. In the absence of an adopted threshold, the USACE will not utilize the Port of Los Angeles' proposed GEO-9 CEQA standard, propose a new standard, or make a NEPA impact determination if the proposed Project or any alternative would be affected by sea level rise anticipated to result from the proposed Project. Rather, in compliance with the NEPA implementing regulations, the anticipated affects relative to the NEPA baseline will be disclosed for the proposed Project and each alternative without expressing a judgment as to their significance.

See Section 3.14 (Water Quality, Sediment, and Oceanography) for significance criteria related to erosion.

3.5.4.3 Analysis Assumptions

The basis of the assessment is on regulatory controls and on the assumptions that the proposed Project and alternatives would include the following:

- As applicable, proposed Project elements would be implemented in accordance with the Los Angeles Municipal Code (LAMC), including the LABC, to minimize impacts associated with seismically induced geological hazards. These building codes and criteria provide requirements for construction, grading, excavations, use of fill and foundation work, including type of materials, design, procedures, etc. The intention of these codes is to limit the probability of occurrence and the severity of consequences from geological hazards. Necessary permits, plan checks, and inspections are also specified. The LAMC also incorporates structural seismic requirements of the UBC, which classifies almost all of coastal California (including the proposed Project site) in Seismic Zone 4, on a scale of 1 to 4, with four being most severe. The Project engineers would review the proposed Project plans for compliance with the appropriate standards in the building codes.
- The Port would design and construct wharf improvements in accordance with LAHD seismic design and engineering criteria (including recommendations in geotechnical reports that are prepared as part of the design process), to minimize potential damage risks to new terminal features in the event of seismically-induced geological hazards. Such design and construction practices would include, but not be limited to, completion of site-specific geotechnical investigations regarding construction and foundation engineering. The design would incorporate measures pertaining to temporary

construction conditions, such as maximum temporary slope gradient. A licensed geologist or engineer would monitor construction to verify that construction occurs in concurrence with proposed Project design.

3.5.4.4 Impact Determination

3.5.4.4.1 Proposed Project

Impact GEO-1: Seismic activity along the Palos Verdes Fault zone or other regional faults would not produce fault ruptures, seismic ground shaking, liquefaction, or other seismically induced ground failure that would expose people and structures to substantial risk during the construction period (through 2014) and operations period (through 2027).

There would be a minor increase in the exposure of people and property to seismic hazards relating to current and future baseline conditions. The proposed Project lies near the Palos Verdes Fault zone and traces of the fault pass beneath the proposed Project area (refer to Figure 3.5-1). Strong-to-intense ground shaking, surface rupture, and liquefaction could occur in these areas, due to the location of the fault beneath the proposed Project area and the presence of water-saturated hydraulic fill. With the exception of ground rupture, similar seismic impacts could occur due to earthquakes on other regional faults. The Los Angeles region routinely experiences earthquake-related hazards, such as liquefaction, ground rupture, ground acceleration, and ground shaking. In particular, the harbor area cannot avoid earthquake hazards where the Palos Verdes Fault is present, and hydraulic and alluvial fill is pervasive.

The LABC of the LAMC, regulates construction in backland areas of the Port. These building codes and criteria provide requirements for construction, grading, excavations, use of fill and foundation work, including type of materials, design, procedures, etc. The intention of these codes is to limit the probability of occurrence and the severity of consequences from geological hazards, such as earthquakes. Necessary permits, plan checks, and inspections are required. The LAMC also incorporates structural seismic requirements of the UBC, which classifies almost all of coastal California (including the proposed Project site) in Seismic Zone 4, on a scale of 1 to 4, with four being most severe. The Port's and City of Los Angeles' Department of Building and Safety engineers would review the proposed Project plans to ensure compliance with the appropriate standards established in the building codes. New terminal construction would incorporate LAHD seismic design standards.

The proposed Project features would not cause or accelerate geologic hazards. Design objectives for components of the proposed Project include optimizing the use of existing land and associated waterways at Berths 302-306; improving the container terminal at Berths 302-306; and increasing accommodations for container ship berthing and providing sufficient backland area and associated improvements. It would also include incorporating modern backland design efficiencies into improvements to the existing vacant landfill area and improving the access into and out of the terminal, as well as internal terminal circulation to maintain operation following an OLE and to survive without collapse and provide public safety following an OLE. At the lower-level OLE, structures will suffer minor, nonstructural damage and resume operations immediately after an earthquake. At the higher-level OLE, structural damage is permissible as long as

it does not jeopardize public safety. The Los Angeles region, as with the southern California region as a whole, cannot avoid earthquake-related hazards, such as liquefaction, ground rupture, ground acceleration, and ground shaking. In particular, the harbor area cannot avoid these hazards where the Palos Verdes fault zone is present, and hydraulic and alluvial fill is pervasive.

CEQA Impact Determination

Because active faults are located near the proposed Project site, and the area is mapped within an area of historic liquefaction, there is a potential for substantial risk of seismic impacts and subsequent potential to contribute to seismically induced ground shaking that could result in injury to people and damage to structures during construction and operation. However, with incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to seismically induced ground failure would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

There would be a minor increase in the exposure of people and property to seismic hazards relative to NEPA baseline conditions. The federal action associated with the proposed Project would be limited to in-water and over-water construction and operation activities not included in the NEPA baseline, such as new wharf construction, installation of 12 new cranes, dredging along Berth 306 and associated ocean transport and disposal activities, and limited development of backland areas as described in Chapter 2, Section 2.7, Federal Scope of Analysis. As stated above, seismic hazards are common to the Los Angeles region and the proposed Project does not increase them. With incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to seismically induced ground failure would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-2: Construction and operation of the proposed Project within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.

Local or distant seismic activity and/or offshore landslides could result in the occurrence of tsunamis or seiches in the proposed Project area and vicinity. Due to the historic occurrence of earthquakes and tsunamis along the Pacific Rim, placement of development on or near coastal waters in southern California, including the proposed Project site, would always involve some measure of risk of impacts from a tsunami or

seiche. Although relatively rare, should a large tsunami or seiche occur, it would cause some amount of property damage and possibly personal injuries to most on or near-shore locations. As a result, LAHD considers this as the average or normal condition for most on- and near-shore locations in southern California. Therefore, a tsunami- or seiche-related impact would be one that would exceed this normal condition and cause substantial damage and/or substantial injuries.

Since tsunamis and seiches are forms of wave action, the risk of damage or injuries from these events at a particular location is less if the location is high enough above sea level, inland, or protected by manmade structures such as dikes or concrete walls. The height of a given site above sea level is either the result of an artificial structure (e.g., a dock or wall), topography (e.g., a hill or slope), or both, and a key variable related to the height of a site's location relative to sea level is the behavior of tides. During high tide, for instance, the distance between the site and sea level is less. During low tide, the distance is greater. How high a site must be located above sea level to avoid substantial wave action during a tsunami or seiche depends upon the height of the tide at the time of the event and the height of the potential tsunami or seiche wave. These factors are considered for the proposed Project site, as described below.

The Port is subject to semidiurnal tides, meaning two high tides and two low tides during a 24-hour period. The average of the lowest water level during low tide periods each day is typically set as a benchmark of 0 ft and is the MLLW. For purposes of this discussion, proposed Project structures and land surfaces are expressed as height above (or below) MLLW. The MSL in the Port is +2.8 ft above MLLW. This height reflects the arithmetic mean of hourly heights observed over the National Tidal Datum Epoch (19 years) and therefore reflects the mean of both high and low tides in the Port. The Port Complex model described in Section 3.5.2.3.3 predicts tsunami wave heights with respect to MSL, rather than MLLW, and therefore can be a reasonable average condition under which a tsunami might occur. The consideration of the Port MSL of +2.8 ft must include comparing projected tsunami run-up (i.e., amount of wharf overtopping and flooding) to proposed wharf height and topographic elevations and measured with respect to MLLW.

As discussed above in Section 3.5.2.3.3, the Port Complex model predicts a maximum tsunami wave height, or reasonable worst-case scenario, of approximately 1.6 ft to 6.0 ft above MSL for the earthquake scenarios and approximately 5.3 ft to 13.7 ft above MSL for the landslide scenario. The maximum wave height under the worst-case earthquake scenarios are predicted to occur in the East Channel and East Basin area of the Port, and the western side of Pier 400 under the landslide scenarios. Incorporating the Port MSL of +2.8 ft, the model predicts tsunami wave heights of a maximum 6.4 ft above MLLW for the earthquake scenario to 8.7 ft above MLLW for the landslide scenario at the proposed Project site (Berths 302-306) in the Pier 300 Channel. Since the existing deck elevation along the wharf at Berths 302-305 is at approximately 15 ft MLLW, and the improvements under the proposed Project (i.e., wharf extension and Berth 306) would be constructed at approximately the same elevation, localized tsunami-induced flooding is not expected to occur.

As previously discussed, the likelihood of a large tsunami is very low. An earthquake with a magnitude of 7.6 on the offshore Santa Catalina Fault was partially the basis of the most likely worst-case tsunami scenario. The recurrence interval for a magnitude 7.5 earthquake along an offshore fault in the Southern California Continental Borderland is about 10,000 years. Similarly, the recurrence interval of a magnitude 7.0 earthquake is

about 5,000 years and the recurrence interval of an earthquake with a magnitude of 6.0 is about 500 years. However, there is no certainty that these earthquake events would result in a tsunami, since only about 10 percent of earthquakes worldwide result in a tsunami. In addition, available evidence indicates that landslides that result in tsunamis would be extremely infrequent and occur less often than large earthquakes. This suggests recurrence intervals for such landslide events would be longer than the 10,000-year recurrence interval estimated for an earthquake with a magnitude of 7.5 (Moffatt and Nichol, 2007).

Under the highly unlikely event of the single highest tide predicted over the next 40 years at the Port Complex coinciding with the theoretical maximum worst-case tsunami scenario, as described above, there would not be a risk of coastal flooding due to an earthquake-caused tsunamis and/or seiches that could affect upland construction, but such an event could result in damage to property or injury related to in-water construction. However, given the limited duration of in-water construction activities and very low likelihood of a worst-case tsunami occurring during construction activities, this scenario is unlikely to occur.

During terminal operations, for on-site personnel, the risk of tsunami or seiches is a part of an ocean-shore interface and hence personnel working at the proposed Project berths cannot avoid some risk of exposure. However, as discussed above, localized tsunami-induced flooding is not expected to occur on-site given the elevation of site is approximately 15 ft above MLLW.

Similarly, for vessels, the risk of tsunami or seiches is a part of an ocean-shore interface and hence vessels in transit or at berth cannot avoid some risk of exposure. A vessel destined for the proposed Project berths (or another berth in the Port) would be under its own power and have one or more tugs in attendance. Under this circumstance, the vessel would likely be able to maneuver to avoid damage as it would with an ocean wave. The exposure of a tsunami or seiche to a vessel in transit to or from the proposed Project berth and the associated risk is no different from another vessel entering the Port Complex.

Port engineers have indicated that currents moving over five meters per second (m/s) could potentially render a ship out of control (Morgan pers. comm., 2006). Modeling indicates that tsunami-related currents created because of a large earthquake on the Santa Catalina Fault or submarine landslide off the coast of the nearby Palos Verdes Peninsula would not create currents in excess of 5 m/s in the Port. Highest anticipated current speeds of 2 m/s would occur near Pier 400 and at the entrance to the main channel (Moffatt and Nichol, 2007).

A vessel docked at one of the proposed Project berths would be subject to the rising and falling of the water levels and the accompanying currents during a tsunami or seiche. Two scenarios could arise. Most likely, the vessel would stay secured to the berth and ride out the tsunami, or, less likely, the motion during a tsunami would cause the mooring lines of the vessel to break free and the vessel would be set adrift. In the first scenario, the transmitted energy of the tsunami wave goes through the vessel moored at berth and into the wharf. Forces transmitted through the vessel would be transferred to the fendering system of the wharf and then to the wharf structure.

The assumption of the designed existing wharf fendering systems are that, under a normal docking scenario, a berthing vessel will contact only one fender. For such scenarios,

each fender can absorb the berthing energy of the entire vessel. During a tsunami occurrence, the wave can move the vessel against more than one of the existing fenders, so that the vessel would be contacting a minimum of four to five fenders, often simultaneously. In such cases, the forces experienced by each fender during a tsunami are often less than the standard docking forces for the designed fendering system because more than one fender would absorb these forces at the same time. Therefore, in the event of a tsunami, substantial damage to secured vessels or the wharf is not likely.

Under the second scenario, a vessel set adrift in the Port area could have serious consequences from the potential of collision, including a potential hull breach and possible fuel spill. Section 3.8, Hazards and Hazardous Materials, examines this scenario.

CEQA Impact Determination

Impacts due to tsunamis and seiches are typical for the entire California coastline and the construction and operation of the proposed Project would not increase them. The proposed Project site's elevation is approximately 15 ft above MLLW; therefore, no substantial risk of flooding from tsunamis and seiches are likely at the proposed Project site. In-water construction activities could be subject to risk should a large tsunami occur during construction activities, however, the likelihood of this occurring is remote. LAHD's Risk Management Plan contains applicable risk management measures and policies (LAHD, 1983). Also, as discussed further in Section 3.8, Hazards and Hazardous Materials, the LAHD has a Port-wide emergency notification system in place to warn of tsunamis or other hazards by telephone/email/text alerts which would serve to reduce potential risks (Malin pers. comm., 2011). The Port has also implemented measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation.

Based on the relative risk of substantial damage or injury involving tsunamis or seiches, impacts during construction and operations would be less than significant under CEQA.

Mitigation Measures

Although significant impacts related to the risk of substantial damage or injury involving tsunamis or seiches would not occur, lease measure **LM GEO-1** would further reduce potential impacts.

LM GEO-1: **Emergency Response Planning Lease Requirement:** The terminal operator will work with Port engineers and Port police to develop tsunami response training and procedures to assure that construction and operations personnel would be prepared to act in the event of a large seismic event. Such procedures would include immediate evacuation requirements in the event that a large seismic event is felt at the Project site, as part of overall emergency response planning for the proposed Project.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As discussed above, the proposed Project site's elevation is approximately15 ft above MLLW; therefore, no substantial risk of flooding from earthquake-based tsunamis and seiches is likely at the Project site. In-water construction activities could be subject to risk should a large tsunami occur during construction activities, however, the likelihood of this occurring is remote. LAHD's Risk Management Plan contains applicable risk management measures and policies (LAHD, 1983). Also, as discussed further in Section 3.8, Hazards and Hazardous Materials, the LAHD has a Port-wide emergency notification system in place to warn of tsunamis or other hazards by telephone/email/text alerts, which would serve to reduce potential risks (Malin pers. comm., 2011). The Port has also implemented measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation and lease requirements related to emergency response planning and training. Based on the above, impacts during the construction and operational periods relative risk of substantial damage or injury involving tsunamis or seiches would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-3: Construction and operation of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.

Subsidence near the proposed Project due to previous oil extraction in the Port area has been mitigated and is not anticipated to affect the proposed Project adversely. During the design phase of the proposed Project (as a standard engineering practice), the Project engineer would evaluate the settlement potential in areas where future structures may be located and design the structures (i.e., new Power Shop) to withstand anticipated settlement, as necessary.

The evaluation of settlement potential of existing onshore soils would be through a site-specific geotechnical investigation, which includes subsurface soil sampling, laboratory analysis of samples collected to determine soil compressibility, and an evaluation of the laboratory testing results by a geotechnical engineer. Incorporated recommendations of the engineer would be in the design specifications for the proposed Project, and comply with City design guidelines, including Sections 91.000 through 91.7016 of the LAMC, and the criteria established by the LAHD. Recommendations for soils subject to settlement typically include over excavation and re-compaction of compressible soils, which would allow for construction of a conventional slab-on-grade; or alternatively, installation of concrete or steel foundation piles through the settlement-prone soils, to a depth of competent soils. Such geotechnical engineering would substantially reduce the potential for soil settlement and would ensure that construction of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury.

CEQA Impact Determination

Subsidence/soil settlement impacts in backland areas would be less than significant under CEQA because the design and construction of the proposed Project would comply with recommendations of a geotechnical engineer, Sections 91.000 through 91.7016 of the LAMC, and the criteria established by the LAHD. Construction and operation of the proposed Project would not cause settlement or subsidence that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The federal action associated with the proposed Project would be limited to in-water and over-water construction and operation activities not included in the NEPA baseline, such as new wharf construction, installation of 12 new cranes, dredging along Berth 306 and associated ocean transport and disposal activities, and limited development of backland areas as described in Section 2.7, Federal Scope of Analysis. Construction and operation of the proposed Project is not expected to cause settlement or subsidence that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, impacts would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-4: Construction and operation of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.

Expansive soil may be present beneath or near Berths 302-306. Expansive soils beneath building foundations could result in cracking and distress of foundations, or otherwise damage structures built on these sediments. However, during the proposed Project design phase, the proposed Project engineer would evaluate the expansion potential associated with on-site soils, as a standard engineering practice. The evaluation of the soil expansion potential would be through a site-specific geotechnical investigation, which includes subsurface soil sampling, laboratory analysis of samples collected to determine soil expansion potential, and an evaluation of the laboratory testing results by a geotechnical engineer. Incorporated recommendations of the engineer would be in the design specifications for the proposed Project, and compliance with the City's design guidelines, including Sections 91.000 through 91.7016 of the LAMC, and the criteria established by the LAHD. Recommendations for soils subject to expansion typically include over excavation and replacement of expansive soils with sandy, non-expansive soils, which would allow for construction of the proposed structure. Other

recommendations could include installation of concrete or steel foundation piles through the expansion-prone soils, to a depth of non-expansive soils.

CEQA Impact Determination

As discussed above, the proposed Project would be designed and constructed in accordance with the recommendations of the geotechnical engineer, and in accordance with Sections 91.000 through 91.7016 of the LAMC, and the criteria established by the LAHD. Compliance with these applicable standards and policies would ensure that construction and operation of the proposed Project would not result in substantial elevation of risk to life or property. Therefore, the proposed Project would result in less than significant impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The federal action associated with the proposed Project would be limited to in-water and over-water construction and operation activities not included in the NEPA baseline, such as new wharf construction, installation of 12 new cranes, dredging along Berth 306 and associated ocean transport and disposal activities, and limited development of backland areas as described in Section 2.7, Federal Scope of Analysis. As discussed above, compliance with applicable standards and policies of the LAMC and other applicable regulations would ensure that construction and operation of the proposed Project would not result in substantial elevation of risk to life or property. Therefore, the proposed Project would result in less than significant impacts under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-5: Construction and operation of the proposed Project would not result in or expose people or property to a substantial risk of landslides or mudflows.

The topography at the proposed Project site and vicinity is flat and not subject to landslides or mudflows. Further, as discussed in 3.5.2.3.7, the proposed Project site is not located within an area mapped as susceptible to landslides.

CEQA Impact Determination

Because the topography in the vicinity of the proposed Project site is flat and not subject to landslides or mudflows, the proposed Project would not result in impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

The topography near the proposed Project site is flat and not subject to landslides or mudflows. Therefore, construction and operation of the proposed Project would not result in impacts under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-6: Shallow groundwater, which would cause unstable collapsible soils, may be encountered during excavation, but it would not expose people or structures to substantial risk.

Natural alluvial and estuarine deposits, as well as artificial fill consisting of dredged deposits or of imported soils, might be encountered during excavations for the installation of utilities, or construction of other terminal improvements. Groundwater has been encountered locally at depths ranging between 10 ft to 16.5 ft bgs, and underground utility construction could require excavations at or below this depth. Materials near and below the shallow groundwater table would be relatively fluid, requiring implementation of standard engineering practices regarding saturated, collapsible soils, such as shoring, dewatering wells, and other special handling procedures to facilitate excavation. For example, dewatering wells would locally increase the depth to groundwater, therefore reducing the potential for collapsible soils. Various types of temporary shoring would also be used to stabilize excavations within saturated, collapsible soils. Such engineering practices would be implemented where necessary.

Dewatered groundwater would likely be discharged to the City's sewer system under an Industrial Waste Discharge Permit (through the City's Bureau of Sanitation). Pretreatment of the dewatered groundwater could be required. The groundwater would be conveyed to the TIWRP for further treatment prior to discharge through the plant's ocean outfall. Refer to Section 3.14, Water Quality, Sediment, and Oceanography, regarding required permits for discharge of any treated groundwater. Also refer to Section 3.7, Groundwater and Soils regarding potential soil and/or groundwater contamination and treatment thereof, during construction excavations.

CEQA Impact Determination

With the implementation of standard engineering and construction practices regarding saturated, collapsible soils, there would be no increased exposure of risk to substantial adverse effects from construction of the proposed Project and impacts associated with shallow groundwater would be less than significant under CEQA. During operation of the proposed Project, no excavation activities, either with or without shoring are anticipated, and thus on-site soils would not be subject to collapse or caving. Therefore, impacts associated with collapsible soils would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The federal action associated with the proposed Project would be limited to in-water and over-water construction and operation activities not included in the NEPA baseline, such as new wharf construction, installation of 12 new cranes, dredging along Berth 306 and associated ocean transport and disposal activities, and limited development of backland areas as described in Section 2.7, Federal Scope of Analysis. As stated above, the proposed Project would be implemented in accordance with standard engineering and construction practices; therefore, exposure to substantial adverse effects and impacts associated with shallow groundwater would be less than significant under NEPA. Further, on-site soils would not be subject to collapse or caving since excavation would not occur during operation of the proposed Project. Therefore, impacts associated with collapsible soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-7: Construction and operation of the proposed Project would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geologic or topographic features.

The proposed Project area is relatively flat, with no prominent geologic or topographic features, proposed Project construction and operation would not result in the destruction, permanent covering or the material and adverse modification of distinct and prominent geologic or topographic features.

CEQA Impact Determination

Since the topography near the proposed Project site is flat and does not contain prominent geologic or topographic features, no impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

Since the topography near the proposed Project site is flat and does not contain prominent geologic or topographic features, no impacts would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-8: Construction and operation of the proposed Project would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.

With respect to aggregate potential, the proposed Project site is located in MRZ-1, which is an area where adequate information indicates that no significant mineral deposits are present or where little likelihood exists for their presence. With respect to petroleum resources, the proposed Project site is located adjacent to, but outside of, the Wilmington Oil Field. In addition, the proposed Project site is located on Terminal Island, which has been developed for water-dependent commercial uses over time (refer to Figure 3.4-1, which shows the progression of Terminal Island development).

CEQA Impact Determination

The proposed Project site is comprised entirely of fill and does not contain mineral resources. Therefore, construction and operation of the proposed Project would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State. No impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

The proposed Project site is comprised of fill and does not contain mineral resources. Therefore, construction and operation of the proposed Project would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State. No impacts would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-9: Construction and operation of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

As previously discussed, LAHD and the RAND Corporation are currently in the process of developing a study to assess potential effects of sea level rise at the Port. While the study has not yet been finalized, initial data released in January 2011 as part of a public presentation has indicated that portions of the Port may be susceptible certain sea level rise elevation. As such, the following evaluation of potential impacts associated with sea level rise on the proposed Project is presented herein.

The January 2011 presentation on the status of the LAHD and RAND Corporation study to assess sea level rise included maps showing sea level projections under three scenarios – 1 meter (39.37 inches or approximately 3 ft), 2 meters (78.74 inches or approximately 7 ft) and 3 meters (118.11 inches or approximately 10 ft). The maps indicate the following at the Project site as it currently exists (i.e., at existing elevation) for each sea level rise scenario:

- A 1 meter (39.37 inches or 3 ft) sea level rise would have limited effect on the Project site or access to the site;
- A 2 meters (78.74 inches or 7 ft) sea level rise would have limited no direct effect on the proposed Project site, but may have limited affects on access to the site (i.e., access roads may be flooded); and
- A 3 meters (118.11 inches or 10 ft) sea level rise could result in flooding on some portions of the proposed Project site and could limit access to the site due to flooding.

Flood hazard maps prepared by researchers at the Pacific Institute suggest that sea level rise of 1.4 meters (55.11 inches or approximately 5 ft) would not affect have direct impact on the Project site and surroundings (Pacific Institute, 2009).

Measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation, are currently in place throughout the Port, which would also serve to limit the effects of sea level rise. Further, upon completion of the sea level rise study, LAHD will begin planning for and implementing strategies to address predicted sea level rise to minimize potential future adverse affects on Port operations and access.

CEQA Impact Determination

Pursuant to CEQA Guidelines Section 15126.2, an EIR should evaluate any potential significant impacts of locating development in areas susceptible to hazard conditions identified in authoritative hazard maps, risk assessments or in land use plans addressing such hazard areas. This analysis is required should the potential hazard be likely occur within the projected life of the project and that there is some degree of certainty associated with the risk associated with a potential hazard (California Natural Resources Agency, 2009). As discussed in Section 3.5.2.3.5, there is strong agreement among climate models on sea level projections through 2050; but models diverge after 2050 depending on the level of GHG emissions assumed. Additionally, given that it cannot be known at this time if the APL Terminal will continue to be operating at the project site in 2050 and beyond, this analysis focuses on potential sea level rise project to occur through 2050.

The proposed Project site's elevation is approximately 15 ft MLLW. High tide is 7 ft MLLW, so a sea level rise of less than 8 ft (96 inches) would not directly impact the proposed Project site. However, a sea level rise of 7 ft could affect some lower elevation areas along the western edge of the site. As shown in Table 3.5-3, models predict that over the next century sea level could rise as much as approximately 6 ft (69 inches) and by 1.5 ft (17 inches) or less through 2050. Therefore, the proposed Project is not expected to be adversely affected by sea level rise.

Additionally, measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation, are currently in place throughout the Port, and strategies planned and implemented after the completion of the sea level rise study, would also serve to limit the effects of sea level rise. Therefore, the proposed Project would not expose people or property to substantial risk or injuries related to sea level rise and impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

There are no established significance thresholds for sea level rise, nor has the Federal government or the state adopted any by regulations. In the absence of an adopted threshold or standard, in compliance with the NEPA implementing regulations, a significance determination regarding sea level rise will not be made under NEPA.

As described above, sea levels are predicted to rise by 1.5 ft or less through 2050. The proposed Project's site's elevation is 15 ft MLLW and high tide is 7 ft. Therefore, a sea level rise of 1.5 ft would not cause flooding at the proposed Project site nor would it affect site access. Additionally, measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation, are currently in place throughout the Port, and strategies planned and implemented after the completion of the sea level rise study, would also serve to limit the effects of sea level rise. Therefore, the proposed Project would not expose people or property to substantial risk or injuries related to sea level rise.

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

This evaluation is for information only, and therefore, an impact determination is not applicable.

3.5.4.4.2 Alternatives

3.5.4.4.2.1 Alternative 1 – No Project

Under Alternative 1, no further Port action or federal action would occur. The Port would not construct and develop additional backlands, wharves, or terminal improvements. No new cranes would be added, no gate or backland improvements would occur, and no infrastructure for AMP at Berth 306 or automation in the backland area adjacent to Berth 306 would be provided. This alternative would not include any dredging, new wharf construction, or new cranes. The No Project Alternative would not include development of any additional backlands because the existing terminal is berth-constrained and additional backlands would not improve its efficiency.

Under the No Project Alternative, the existing APL Terminal would continue to operate as an approximately 291-acre container terminal. Based on the throughput projections, terminal operations are expected to grow over time as throughput demands increase. Under Alternative 1, the existing APL Terminal would handle approximately 2.15 million TEUs by 2027, which would result in 286 annual ship calls at Berths 302-305. In addition, this alternative would result in up to 7,273 peak daily one-way truck trips (1,922,497 annual), and up to 2,336 annual one-way rail trip movements. Under Alternative 1, cargo ships that currently berth and load/unload at the Berths 302-305 terminal would continue to do so.

The No Project Alternative would not preclude future improvements to the proposed site. However, any future changes in use or new improvements with the potential to significantly impact the environment would need to be analyzed in a separate environmental document.

Impact GEO-1: Seismic activity along the Palos Verdes Fault zone or other regional faults would not produce fault ruptures, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk during the construction period (through 2014) and operation period (through 2027).

CEQA Impact Determination

Under the No Project Alternative, the proposed site would continue to occupy 291 acres and the construction of improvements would not occur, which is the same as the CEQA baseline conditions. No significant impacts under CEQA would occur, as no changes to the terminal would be constructed.

Terminal operations would increase under this alternative, with projected throughput of up to 2.15 million TEUs and 1,202 employees by 2027, which is greater than the CEQA baseline conditions (1,128,080 TEUs and 1,041 employees). Because of the potential of underlying strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill

under the proposed Project area, there is a risk that seismic activity could affect the future terminal operations. However, the No Project Alternative would not cause or accelerate geologic hazards and the existing terminal has incorporated modern construction engineering and safety standards. Therefore, impacts due to seismically-induced ground failure are less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The impacts of this No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-2: Construction and operation of Alternative 1 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.

CEQA Impact Determination

Under the No Project Alternative, the proposed site would continue to occupy 291 acres and the construction of improvements would not occur, which is the same as the CEQA baseline conditions. No construction-related impacts under CEQA would occur. However, future terminal operations under this alternative would increase and be greater than the CEQA baseline conditions, and the terminal would have a greater number of employees and stored containers in the future. The existing terminal elevation is approximately 15 ft above MLLW; therefore, no substantial risk of flooding from earthquake-based tsunamis and seiches is likely at the proposed site. No in-water construction would occur under the No Project Alternative that could be subject to a tsunami. Therefore, the impact would be less significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The impacts of this No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-3: Construction and operation of Alternative 1 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.

CEQA Impact Determination

Under the No Project Alternative, the proposed site would continue to occupy 291 acres and the construction of improvements would not occur, which is the same as the CEQA baseline conditions. Construction of the existing terminal was completed in 1997 and incorporated recommendations of the geotechnical engineer, consistent with implementation of Sections 91.000 through 91.7016 of the LAMC and criteria established by LAHD. The terminal improvements were designed to correct then existing settlement and subsidence issues. Future terminal operations are not expected cause subsidence or experience significant soil settlement; therefore no substantial damage to structures or infrastructure, or exposure of people to substantial risk of injury is anticipated to occur and construction and operation of Alternative 1 would not result in significant impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-4: Construction and operation of the Alternative 1 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.

CEQA Impact Determination

Under the No Project Alternative, the proposed site would continue to occupy 291 acres and the construction of improvements would not occur, which is the same as the CEQA baseline conditions. Construction of the existing terminal was completed in 1997 and incorporated recommendations of the geotechnical engineer, consistent with implementation of Sections 91.000 through 91.7016 of the LAMC, criteria established by LAHD and in conformance with standard geotechnical evaluations performed during the design process. The terminal improvements were designed to address potential expansive soil issues, and future terminal operations are not expected to result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, construction and operation of Alternative 1 would not result in significant impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-5: Construction and operation of the Alternative 1 would not result in or expose people or property to a substantial risk of landslides or mudflows.

The topography at the proposed site and vicinity under the No Project Alternative is flat and not subject to landslides or mudflows.

CEQA Impact Determination

Under the No Project Alternative, the proposed site would continue to occupy 291 acres and the construction of improvements would not occur, which is the same as the CEQA baseline conditions. Further, since the topography near the terminal is flat and not subject to landslides or mudflows, no construction or operational exposure of people or property to landslide or mudflow impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-6: Shallow groundwater, which would cause unstable collapsible soils, would not be encountered and would not expose people or structures to substantial risk.

CEQA Impact Determination

Under the No Project Alternative, the proposed site would continue to occupy 291 acres and the construction of improvements would not occur, which is the same as the CEQA baseline conditions. No construction impacts under CEQA would occur. No excavations would take place as part of the operation of the terminal under this alternative; therefore, impacts associated with collapsible soils would not occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-7: Construction and operation of Alternative 1 would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geologic or topographic features.

CEQA Impact Determination

Under the No Project Alternative, the proposed site would continue to occupy 291 acres and the construction of improvements would not occur, which is the same as the CEQA baseline conditions. Further, since the topography near the terminal is flat and does not contain prominent geologic or topographic features, no construction or operation impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-8: Construction and operation of Alternative 1 would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.

CEQA Impact Determination

Under the No Project Alternative, the proposed site would continue to occupy 291 acres and the construction of improvements would not occur, which is the same as the CEQA baseline conditions. Further, the proposed site under Alternative 1 does not contain mineral resources. Therefore, operation of this alternative would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State. No construction or operational impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

An impact determination is not applicable.

Impact GEO-9: Construction and operation of Alternative 1 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

CEQA Impact Determination

Under the No Project Alternative, the proposed site would continue to occupy 291 acres and the construction of improvements would not occur, which is the same as the CEQA baseline conditions. Further, as described from the proposed Project under Impact GEO-9, sea levels are predicted to rise by 1.5 ft or less through 2050, while the site's elevation is 15 ft MLLW and high tide is 7 ft. Therefore, a sea level rise of 1.5 ft would not cause flooding at the site nor would it affect site access. Therefore, the No Project Alternative would not expose people or property to substantial risk or injuries related to sea level rise and the impact would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The impacts of the No Project Alternative are not required to be analyzed under NEPA. NEPA requires the analysis of a No Federal Action Alternative (see Alternative 2 in this document).

Mitigation Measures

Mitigation measures are not applicable.

Residual Impacts

This evaluation is for information only, and therefore, an impact determination is not applicable.

3.5.4.4.2.2 Alternative 2 – No Federal Action

The No Federal Action Alternative would be the same as the NEPA baseline and would include only the activities and impacts likely to occur absent further USACE federal approval but could include improvements that require a local action. Under Alternative 2, no federal action would occur; however, minor terminal improvements in the upland area

of the existing APL Terminal would be implemented. These minor upland improvements would include conversion of a portion of the dry container storage area to an additional 200 reefers, associated electrical lines, and installation of utility infrastructure at locations in the existing backland areas. Beyond these minor upland improvements, the Port would not construct and develop additional backlands or wharves. No gate or additional backland improvements would occur, and no in-water features such as dredging or a new berth, wharf extension, or over-water features such as new cranes would occur under the No Federal Action Alternative.

Under the No Federal Action Alternative, the existing APL Terminal would continue to operate as an approximately 291-acre container terminal, and up to approximately 2.15 million TEUs could be handled at the terminal by 2027. Based on the throughput projections, the No Federal Action Alternative would result in 286 annual ship calls at Berths 302-305. In addition, this alternative would result in up to 7,273 peak daily truck trips (1,922,497 annual), and up to 2,336 annual one-way rail trip movements. Cargo ships that currently berth and load/unload at the Berths 302-305 terminal would continue to do so.

Impact GEO-1: Seismic activity along the Palos Verdes Fault zone or other regional faults would not produce fault ruptures, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk during the construction period (through 2014) and operational period (through 2027).

CEQA Impact Determination

Because of the potential of underlying strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill under the project area, there is a risk that seismic activity could affect the future terminal operations. However, the No Federal Alternative would not cause or accelerate geologic hazards and the existing terminal has incorporated modern construction engineering and safety standards, as will all new development , With incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to seismically-induced ground failure are less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The No Federal Action Alternative would have the same conditions as the NEPA baseline, as explained in Section 2.6.2 in Chapter 2; therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-2: Construction and operation of Alternative 2 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.

CEQA Impact Determination

Under the No Federal Action Alternative, the proposed site would continue to occupy 291 acres and the construction of in and over water improvements would not occur, which is the same as the CEQA baseline conditions. No construction-related impacts under CEQA would occur. However, minor terminal improvements not requiring federal approval could occur and terminal operations under Alternative 2 would be greater than CEQA baseline conditions. The proposed site under Alternative 2 would have a greater number of employees and stored containers in the future under build-out conditions (2027). The existing terminal elevation is approximately 15 ft above MLLW; therefore, no substantial risk of flooding from earthquake based tsunamis and seiches is likely under CEQA at the proposed site under Alternative 2.

Mitigation Measures

Although significant impacts related to the risk of substantial damage or injury involving tsunamis or seiches would not occur, lease measure **LM GEO-1** would further reduce potential impacts.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The No Federal Action Alternative would have the same conditions as the NEPA baseline, as explained in Section 2.6.2 in Chapter 2; therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-3: Construction and operation of Alternative 2 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.

CEQA Impact Determination

The existing terminal was completed in 1997 and incorporated recommendations of the geotechnical engineer, consistent with implementation of Sections 91.000 through 91.7016 of the LAMC and criteria established by LAHD. The terminal improvements were designed to address settlement and subsidence issues, and future terminal improvements, that could occur under this alternative, would be designed and constructed to meet the same standards; thus, future operations are not expected to elevate the exposure of people, structures, or infrastructure to increased risk of harm from subsidence or soil settlement beyond what currently exists. Therefore, under CEQA, Alternative 2 would not result in significant impacts.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The No Federal Action Alternative would have the same conditions as the NEPA baseline, as explained in Section 2.6.2 in Chapter 2; therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-4: Construction and operation of Alternative 2 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.

CEQA Impact Determination

The existing terminal was completed in 1997 and incorporated recommendations of the geotechnical engineer, consistent with implementation of Sections 91.000 through 91.7016 of the LAMC, criteria established by LAHD and in conformance with standard geotechnical evaluations performed during the design process. Future terminal improvements, that could occur under this alternative, would be designed and constructed to meet the same standards; thus, future operations are not expected to elevate the exposure of people, structures, or infrastructure to increased risk of harm from soil expansion under this alternative and Alternative 2 would not result in significant impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The No Federal Action Alternative would have the same conditions as the NEPA baseline, as explained in Section 2.6.2 in Chapter 2; therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-5: Construction and operation of Alternative 2 would not result in or expose people or property to a substantial risk of landslides or mudflows.

CEQA Impact Determination

The topography at the proposed site and vicinity is flat and not subject to landslides or mudflows. Since construction and operation of this alternative would be located in an area not susceptible to landslides or mudflows, no construction or operational impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

The No Federal Action Alternative would have the same conditions as the NEPA baseline, as explained in Section 2.6.2 in Chapter 2; therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-6: Shallow groundwater, which would cause unstable collapsible soils, may be encountered during excavations, but it would not expose people or structures to substantial risk.

CEQA Impact Determination

Construction of minor terminal improvements would occur, and any excavations would be properly shored. In addition, excavations would not take place as a part of the operation. With the implementation of standard engineering and construction practices regarding saturated, collapsible soils, people or structures would not be exposure to substantial risk under Alternative 2. Therefore, impacts associated with collapsible soils would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The No Federal Action Alternative would have the same conditions as the NEPA baseline, as explained in Section 2.6.2 in Chapter 2; therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-7: Construction and operation of Alternative 2 would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geologic or topographic features.

CEQA Impact Determination

As previously noted, the topography near the proposed site is flat and does not contain prominent geologic or topographic features, no impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

The No Federal Action Alternative would have the same conditions as the NEPA baseline, as explained in Section 2.6.2 in Chapter 2; therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-8: Construction and operation of Alternative 2 would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.

CEQA Impact Determination

As previously described, the proposed site does not contain mineral resources. Therefore, neither construction nor operation of Alternative 2 would result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State, and no impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

The No Federal Action Alternative would have the same conditions as the NEPA baseline, as explained in Section 2.6.2 in Chapter 2; therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline. As a consequence, Alternative 2 would result in no impact under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-9: Construction and operation of Alternative 2 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

CEQA Impact Determination

As described from the proposed Project under Impact GEO-9, sea levels are predicted to rise by 1.5 ft or less through 2050, while the proposed site's elevation is 15 ft MLLW and high tide is 7 ft. Therefore, a sea level rise of 1.5 ft would not cause flooding at the site

nor would it affect site access. Therefore, Alternative 2 would not expose people or property to substantial risk or injuries related to sea level rise under CEQA and impacts would be less than significant.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

The No Federal Action Alternative would have the same conditions as the NEPA baseline, as explained in Section 2.6.2 in Chapter 2; therefore, there would be no incremental difference between Alternative 2 and the NEPA baseline.

Mitigation Measures

No mitigation is required.

Residual Impacts

This evaluation is for information only, and therefore, an impact determination is not applicable.

3.5.4.4.2.3 Alternative 3 – Reduced Project: Four New Cranes

Under Alternative 3, four new cranes would be added to the existing wharf along Berths 302-305 and only minor improvements to the existing APL Terminal would be made utility infrastructure and conversion of dry container storage to reefers). No other upland terminal improvements would be constructed. The existing terminal is berth-constrained, and adding the additional four cranes would improve the terminal's efficiency.

The total acreage of backlands under Alternative 3 would remain at approximately 291 acres, which would be less than the proposed Project. This alternative would not include the extension of the existing wharf, construction of a new berth, dredging, or the relocation and improvement of various gates and entrance lanes.

Based on the throughput projections, TEU throughput under Alternative 3 would be less than the proposed Project, with an expected throughput of approximately 2.58 million TEUs by 2027. This would translate into 338 annual ship calls at Berths 302-305. In addition, this alternative would result in up to 8,725 peak daily truck trips (2,306,460 annual), and up to 2,544 annual one-way rail trip movements. Configuration of all other landside terminal components would be identical to the existing terminal.

Impact GEO-1: Seismic activity along the Palos Verdes Fault zone or other regional faults would not produce fault ruptures, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk during the construction period (through 2014) and operation period (through 2027).

Alternative 3 would add four new A-frame cranes to the existing wharf at the proposed site. Under Alternative 3, operational throughput is projected to be approximately 2.58 million TEUs by year 2027. As discussed under the proposed Project, seismic activity along the Palos Verdes Fault zone, or other regional faults, could produce seismic hazards that could expose people and property during construction and operations. However, seismic hazards are common to the Los Angeles and southern California region would not be increased by this alternative.

CEQA Impact Determination

Because of the potential of underlying strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill under the proposed site, there is a risk of seismic activity that could affect construction and operation under Alternative 3. However, with incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to seismically induced hazards would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Because of the potential of underlying strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill under the proposed site, there is a risk of seismic activity that could affect construction and operation. However, incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to seismically induced hazards would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-2: Construction and operation of Alternative 3 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.

Construction of Alternative 3 would include the installation of four new cranes along the existing wharf along Berths 302-305, and operations would increase to approximately 2.58 million TEUs by 2027. Impacts due to tsunamis and seiches are typical for the

entire California coastline and the construction and operation of Alternative 3 would not increase them. However, similar to the proposed Project, implementation of Alternative 3 could potentially be subject to the effects of a large tsunami because of an offshore earthquake or landslide. A tsunami or seiche that occurs during construction could result in damage to property or injury related to over-water activities (crane delivery).

CEQA Impact Determination

Construction of Alternative 3 would increase site features along the existing wharf (i.e., new cranes along Berths 302-305). Under Alternative 3, terminal operations would increase by 1.45 million TEUs (129 percent) by year 2027, which is greater than the CEQA baseline. The terminal elevation under Alternative 3 is approximately 15 ft above MLLW; therefore, no substantial risk of flooding from earthquake-based tsunamis or seiches is likely. In-water construction activities could be subject to risk should a large tsunami occur during construction activities, however, the likelihood of this occurring during in-water construction activities is remote. LAHD's Risk Management Plan contains applicable risk management measures and policies (LAHD, 1983). Also, as discussed further in Section 3.8, Hazards and Hazardous Materials, the LAHD has a Port-wide emergency notification system in place to warn of tsunamis or other hazards by telephone/email/text alerts which would serve to reduce potential risks (Malin pers. comm., 2011). The Port has also implemented measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation and LAHD requirements related to emergency response planning and training. Based on the above, impacts during the construction and operational periods relative risk of substantial damage or injury involving tsunamis or seiches would be less than significant under CEQA.

Mitigation Measures

Although significant impacts related to the risk of substantial damage or injury involving tsunamis or seiches would not occur, lease measure **LM GEO-1** would further reduce potential impacts.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 3 would include new cranes along Berths 302-305, which are not included in the NEPA baseline. Crane delivery activities would be susceptible to tsunamis and should one occur during the construction phase, the likelihood of which is remote. LAHD's Risk Management Plan contains applicable risk management measures and policies (LAHD, 1983). Also, as discussed further in Section 3.8, Hazards and Hazardous Materials, the LAHD has a Port-wide emergency notification system in place to warn of tsunamis or other hazards by telephone/email/text alerts, which would serve to reduce potential risks (Malin pers. comm., 2011). The Port has also implemented measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation and LAHD lease requirements related to emergency response planning and training. Based on the above, impacts during the construction and operational periods relative risk of substantial damage or injury involving tsunamis or seiches would be less than significant under NEPA.

Mitigation Measures

Although significant impacts related to the risk of substantial damage or injury involving tsunamis or seiches would not occur, lease measure **LM GEO-1** would further reduce potential impacts.

Residual Impacts

Impacts would be less than significant.

Impact GEO-3: Construction and operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.

Under Alternative 3, four new cranes would be installed on the existing wharf along Berths 302-305. Construction of the improvements under Alternative 3 would occur in compliance with recommendations of a geotechnical engineer and comply with applicable criteria established by LAHD, which are measures intended to prevent settlement or subsidence events that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Implementation of these standard measures would reduce the risk associated with settlement or subsidence impacts that could result in substantial damage to structures or infrastructure or exposure of people to substantial risk of injury.

CEQA Impact Determination

As with the proposed Project, Alternative 3 would be designed and constructed to comply with criteria established by LAHD, Sections 91.000 through 91.7016 of the LAMC, and would incorporate standard geotechnical engineering requirements (including recommendations from geotechnical evaluations that are conducted during the design phase). Compliance with applicable standards and policies related to subsidence and settlement would ensure that construction and operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 3 would be implemented in accordance with engineering recommendations and applicable seismic criteria established by the LAHD. Consequently, construction and operation of Alternative 3 would not be subject to excessive settlement or subsidence that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, impacts would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-4: Construction and operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.

Construction activities under Alternative 3 would include the installation of four new cranes to the existing wharf along Berths 302-305. Similar to the proposed Project, incorporation of measures during construction of Alternative 3 to address expansive soils would ensure that substantial damage to structures or infrastructure or exposure of people to substantial risk of injury would not occur.

CEQA Impact Determination

As with the proposed Project, Alternative 3 would be designed and constructed to comply with criteria established by LAHD, Sections 91.000 through 91.7016 of the LAMC, and would incorporate standard geotechnical engineering requirements (including recommendations from geotechnical evaluations regarding the treatment of expansive soils, if present, that are conducted during the design phase). Compliance with applicable standards and policies related to expansive or unstable soils would ensure that construction and operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, construction and operational impacts related to expansive soils would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As indicated above, construction and operation of Alternative 3 would comply with standard geotechnical evaluations performed during the design phase, Sections 91.000 through 91.7016 of the LAMC, and criteria established by LAHD. Therefore construction and operational impacts related to expansive soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-5: Construction and operation of Alternative 3 would not result in or expose people or property to a substantial risk of landslides or mudflows.

The topography at the proposed site and vicinity is flat and not subject to landslides or mudflows.

CEQA Impact Determination

Since construction and operation of this alternative would be located in an area not susceptible to landslides or mudflows, no impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

Similar to the NEPA baseline, the topography of the proposed site and vicinity is flat and not subject to landslides or mudflows; therefore, no construction or operation impacts would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-6: Shallow groundwater, which would cause unstable collapsible soils, may be encountered during excavations, but it would not expose people or structures to substantial risk.

Construction and operational impacts resulting from Alternative 3 would be similar to, but less than those identified under the proposed Project. With the implementation of standard engineering and construction practices regarding saturated, collapsible soils, there would not be exposure to substantial adverse effects from construction or operation of Alternative 3.

CEQA Impact Determination

Because standard engineering and construction practices would be incorporated under Alternative 3, construction impacts associated with shallow groundwater would be less than significant under CEQA. Since excavations would not be a part of the operation of Alternative 3, impacts associated with collapsible soils during operation would not occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As discussed above, standard engineering and construction practices would be implemented under Alternative 3 in order to manage saturated and collapsible soils. Construction activities would not cause exposure of people and structures to substantial adverse effects from construction of Alternative 3 and operation of Alternative 3 would not involve excavation activities. Therefore, impacts associated with collapsible soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-7: Construction and operation of Alternative 3 would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geologic or topographic features.

The topography at and near the proposed site is flat and does not contain prominent geologic or topographic features.

CEQA Impact Determination

Since there are no prominent geologic or topographic features located within the proposed site or in close proximity, construction and operation of Alternative 3 would not result in impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

As the topography at and near the proposed site is flat and does not contain prominent geologic or topographic features; no construction or operation impacts would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-8: Construction and operation of Alternative 3 would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.

The proposed site is comprised of fill and does not contain significant mineral resources. Therefore, construction of Alternative 3 would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State.

CEQA Impact Determination

Construction and operation of Alternative 3 would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State. Therefore, no impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

Construction and operation of Alternative 3 would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State. Therefore, no impacts would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-9: Construction and operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

As described from the proposed Project under Impact GEO-9, sea levels are predicted to rise by 1.5 ft or less through 2050, while the proposed site's elevation is 15 ft MLLW and high tide is 7 ft.

CEQA Impact Determination

A sea level rise of 1.5 ft would not cause flooding at the site nor would it affect site access. Therefore, Alternative 3 would not expose people or property to substantial risk or injuries related to sea level rise and thus, impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

A sea level rise of 1.5 ft would not cause flooding at the site nor would it affect site access. Therefore, Alternative 3 would not expose people or property to substantial risk or injuries related to sea level rise under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

This evaluation is for information only, and therefore, an impact determination is not applicable.

3.5.4.4.2.4 Alternative 4 – Reduced Project: No New Wharf

Under Alternative 4, six cranes would be added to the existing terminal wharf at Berths 302-305, and the 41-acre fill area adjacent to the APL Terminal would be developed as container yard backlands. EMS would relinquish the 30 acres of backlands under space assignment. EMS would not add the nine acres of land behind Berth 301 or the two acres at the main gate to its permit. Because no new wharf would be constructed at Berth 306, the 41-acre backland would be operated using traditional methods and would not be expected to transition to use of automated equipment. As the existing wharf would not be extended to create Berth 306, no dredging would occur.

Under Alternative 4, the total terminal acreage would be 302 acres, which is less than the proposed Project. Based on the throughput projections, TEU throughput would be less than the proposed Project, with an expected throughput of approximately 2.78 million TEUs by 2027. This would translate into 338 annual ship calls at Berths 302-305. In addition, Alternative 4 would result in up to 9,401 peak daily truck trips (2,485,050 annual), and up to 2,563 annual one-way rail trip movements. Configuration of all other landside terminal components (i.e., Main Gate improvements) would be identical to the proposed Project.

Impact GEO-1: Seismic activity along the Palos Verdes Fault zone or other regional faults would not produce fault ruptures, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk during the construction period (through 2014) and operation period (through 2027).

Alternative 4 would add six new cranes to the existing wharf along Berths 302-305, develop the existing 41-acre fill area as backlands, and relinquish the existing 30 acres of backlands under space assignment. Under this alternative, terminal throughput would reach approximately 2.78 million TEUs by year 2027. As with the proposed Project, Alternative 4 would result in a minor increase in the exposure of people and property to seismic hazards relating to current and future baseline conditions. Seismic hazards are common to the Los Angeles region and Alternative 4 would not increase them. However, because of the potential of underlying segments of the active Palos Verdes Fault and liquefaction-prone hydraulic fill under the proposed site, there is a risk of seismic activity that could affect the terminals future operations. Increased exposure of people and property to seismic hazards during construction and operational activities cannot be precluded under Alternative 4, even with incorporation of modern construction engineering and safety standards.

CEQA Impact Determination

Because of the potential of underlying strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill under the proposed site, there is a risk of seismic activity that could affect construction and operations. However, incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to seismically induced ground failure would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Because of the potential of underlying strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill under the proposed site, there is a risk of seismic activity that could affect construction and operations. However, incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to seismically induced ground failure would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-2: Construction and operation of Alternative 4 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.

Construction impacts of Alternative 4 would be similar to but less than those identified for the proposed Project. Alternative 4 would add six new cranes to the existing wharf along Berths 302-305, develop the existing 41-acre fill area as backlands, and relinquish the existing 30 acres of backlands under space assignment. The operational throughput at the APL Terminal under Alternative 4 would reach approximately 2.78 million TEUs by year 2027. Impacts due to tsunamis and seiches are typical for the entire California coastline and the construction and operation of Alternative 4 would not increase them. Similar to the proposed Project, implementation of Alternative 4 could potentially be subject to the effects of a large tsunami because of an offshore earthquake or landslide. A tsunami or seiche that occurs during construction could result in damage to property or injury related to in-water activities.

CEQA Impact Determination

Alternative 4 would require in-water construction activities associated with installation of the new cranes. The operational throughput under Alternative 4 is projected to reach 2.78 million TEUs by 2027, which is an increase of approximately 1.65 million TEUs over the CEQA baseline level of 1,128,080 TEUs. The annual growth in cargo throughput is expected to occur gradually through year 2027. The elevation under Alternative 4 is approximately 15 ft above MLLW; therefore, no substantial risk of flooding from earthquake-based tsunamis or seiches is likely. In-water construction activities could be subject to risk should a large tsunami occur during construction activities, however, the likelihood of this occurring is remote. LAHD's Risk Management Plan contains applicable risk management measures and policies (LAHD, 1983). Also, as discussed further in Section 3.8, Hazards and Hazardous Materials, the LAHD has a Port-wide emergency notification system in place to warn of tsunamis or other hazards by telephone/email/text alerts, which would serve to reduce potential risks (Malin pers. comm., 2011). The Port has also implemented measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation and LAHD lease requirements related to emergency response planning and training. Based on the above, impacts during the construction and operational periods relative risk of substantial damage or injury involving tsunamis or seiches would be less than significant under CEQA.

Mitigation Measures

Although significant impacts related to the risk of substantial damage or injury involving tsunamis or seiches would not occur, lease measure **LM GEO-1** would further reduce potential impacts.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 4 would require in-water construction activities associated with installation of the new cranes, activities which are not included in the NEPA baseline. The elevation of the proposed site is approximately 15 ft above MLLW; therefore, no substantial risk of

flooding from earthquake-based tsunamis or seiches is likely. In-water construction activities could be subject to risk should a large tsunami occur during construction activities, however, the likelihood of this occurring is remote. LAHD's Risk Management Plan contains applicable risk management measures and policies (LAHD, 1983). Also, as discussed further in Section 3.8, Hazards and Hazardous Materials, the LAHD has a Port-wide emergency notification system in place to warn of tsunamis or other hazards by telephone/email/text alerts, which would serve to reduce potential risks (Malin pers. comm., 2011). The Port has also implemented measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation and LAHD lease requirements related to emergency response planning and training. Based on the above, impacts during the construction and operational periods relative risk of substantial damage or injury involving tsunamis or seiches would be less than significant under NEPA.

Mitigation Measures

Although significant impacts related to the risk of substantial damage or injury involving tsunamis or seiches would not occur, lease measure **LM GEO-1** would further reduce potential impacts.

Residual Impacts

Impacts would be less than significant.

Impact GEO-3: Construction and operation of Alternative 4 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.

Alternative 4 would include the installation of six new cranes along Berths 302-305, development of additional backlands, and relinquishment of the existing 30 acres under space assignment. Alternative 4 would be designed and constructed in compliance with recommendations of a geotechnical engineer, consistent with Sections 91.000 through 91.7016 of the LAMC, and applicable criteria established by LAHD, which are measures intended to prevent settlement or subsidence events that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Implementation of these standard measures would reduce the risk associated with settlement or subsidence impacts that could result in substantial damage to structures or infrastructure or exposure of people to substantial risk of injury.

CEQA Impact Determination

As with the proposed Project, Alternative 4 would be designed and constructed to comply with criteria established by LAHD, Sections 91.000 through 91.7016 of the LAMC, and would incorporate standard geotechnical engineering requirements (including recommendations from geotechnical evaluations that are conducted during the design phase). Compliance with applicable standards and policies related to subsidence and differential settlement issues would ensure that construction and operation of Alternative 4 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury arising from subsidence or differential soil settlement. Therefore, impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 4 would be implemented in accordance with engineering recommendations and applicable criteria established by the LAHD during construction and operational activities. Construction and operation of Alternative 4 would not cause settlement or subsidence that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, impacts would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-4: Construction and operation of Alternative 4 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.

Alternative 4 would include the installation of six new cranes along Berths 302-305, development of additional backlands, and relinquishment of the existing 30 acres under space assignment. Similar to the proposed Project, incorporation of measures during construction of Alternative 4 to address expansive soils would ensure that substantial damage to structures or infrastructure or exposure of people to substantial risk of injury would not occur.

CEQA Impact Determination

As with the proposed Project, Alternative 4 would be designed and constructed to comply with criteria established by LAHD, Sections 91.000 through 91.7016 of the LAMC, and would incorporate standard geotechnical engineering requirements (including recommendations from geotechnical evaluations that are conducted during the design phase). Compliance with applicable standards and policies related to expansive or unstable soils would ensure that construction and operation of Alternative 4 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, Alternative 4 would result in less than significant impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As indicated above, construction and operation of Alternative 4 would comply with standard geotechnical evaluations performed during the design phase, and Sections 91.000 through 91.7016 of the LAMC, and criteria established by LAHD. Therefore construction and operational impacts related to expansive soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-5: Construction and operation of Alternative 4 would not result in or expose people or property to a substantial risk of landslides or mudflows.

The topography at the proposed site and vicinity is flat and not subject to landslides or mudflows.

CEQA Impact Determination

Since construction and operation of this alternative would be located in an area not subject to landslides or mudflows, no impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

Similar to the NEPA baseline, the topography of the proposed site and vicinity is flat and not subject to landslides or mudflows; therefore, no construction or operation impacts would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-6: Shallow groundwater, which would cause unstable collapsible soils, may be encountered during excavations, but it would not expose people or structures to substantial risk.

Construction and operational impacts resulting from Alternative 4 would be similar to, but less than those identified under the proposed Project. With the implementation of standard engineering and construction practices regarding saturated, collapsible soils,

there would not be exposure to substantial adverse effects as a result of implementation of Alternative 4.

CEQA Impact Determination

Because standard engineering and construction practices would be incorporated under Alternative 4, construction impacts associated with shallow groundwater would be less than significant under CEQA. Since excavations would not be a part of the operation of Alternative 4, impacts associated with collapsible soils during operation would not occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As discussed above, standard engineering and construction practices would be implemented under Alternative 4 in order to manage saturated and collapsible soils. The standard measures would manage saturated and collapsible soils, to prevent the exposure of people and structures to substantial adverse impacts, relative to the NEPA baseline and operation of Alternative 4 would not require excavations activities. Therefore, impacts related to collapsible soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-7: Construction and operation of Alternative 4 would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geologic or topographic features.

The topography at and near the proposed site is flat and devoid of prominent geologic or topographic features.

CEQA Impact Determination

Since construction and operation of this alternative would not affect distinct and prominent geologic or topographic features, no impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

Since the topography of the proposed site under Alternative 4 is flat and without prominent geologic or topographic features, construction and operation of this alternative would result in no impacts under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-8: Construction and operation of Alternative 4 would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.

The proposed site is comprised of fill and does not contain significant mineral resources. Therefore, construction and operation of Alternative 4 would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the state.

CEQA Impact Determination

Construction and operation of Alternative 4 would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State. Therefore, Alternative 4 would not result in impacts to mineral resources under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

As discussed above, construction and operation of Alternative 4 would not result in the permanent loss of availability of a known mineral resource. Therefore, no impacts to mineral resources would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-9: Construction and operation of Alternative 4 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

As described from the proposed Project under Impact GEO-9, sea levels are predicted to rise by 1.5 ft or less through 2050, while the proposed site's elevation is 15 ft MLLW and high tide is 7 ft.

CEQA Impact Determination

A sea level rise of 1.5 ft would not cause flooding at the site nor would it affect site access. Therefore, Alternative 4 would not expose people or property to substantial risk or injuries related to sea level rise and thus, impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

A sea level rise of 1.5 ft would not cause flooding at the site nor would it affect site access. Therefore, Alternative 4 would not expose people or property to substantial risk or injuries related to sea level rise under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

This evaluation is for information only, and therefore, an impact determination is not applicable.

3.5.4.4.2.5 Alternative 5 – Reduced Project: No Space Assignment

Alternative 5 would improve the existing terminal, construct a new wharf (1,250 ft) creating Berth 306, add 12 new cranes to Berths 302-306, add 56 acres for backlands, wharfs, and gates improvements, construct electrification infrastructure in the backlands behind Berths 305-306, and relinquish the 30 acres currently on space assignment. This alternative would be the same as the proposed Project, except that EMS would relinquish the 30 acres of backlands under space assignment. As with the proposed Project, the 41-acre backlands and Berth 306 under Alterative 5 could utilize traditional container operations, electric automated operations, or a combination of the two over time. Dredging of the Pier 300 Channel along the new wharf at Berth 306 (approximately 20,000 cy) would occur, with the dredged material beneficially reused, and/or disposed of at an approved disposal site (such as the CDF at Berths 243-245 and/or Cabrillo shallow water habitat) or, if needed, disposed of at an ocean disposal site (i.e., LA-2).

Under Alternative 5, the total gross terminal acreage would be 317 acres, which is less than the proposed Project. TEU throughput would be the same as the proposed Project,

with an expected throughput of approximately 3.2 million TEUs by 2027. This would translate into 390 annual ship calls at Berths 302-306. In addition, this alternative would result in up to 11,361 peak daily truck trips (3,003,157 annual) including drayage, and up to 2,953 annual one-way rail trip movements. Configuration of all other landside terminal components would be identical to the existing terminal.

Impact GEO-1: Seismic activity along the Palos Verdes Fault zone or other regional faults would not produce fault ruptures, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk during the construction period (through 2014) and operation period (through 2027).

Alternative 5 would extend the wharf by 1,250 lf, construct Berth 306, install 12 new cranes to the wharf along Berths 302-306, dredge approximately 20,000 cy from the Pier 300 Channel along Berth 306, develop the existing 41-acre fill area as backlands, and relinquish the existing 30 acres of backlands currently under space assignment. Under this alternative, terminal throughput would reach approximately 3.2 million TEUs by year 2027. As with the proposed Project, Alternative 5 would result in a minor increase in the exposure of people and property to seismic hazards relating to current and future baseline conditions. Seismic hazards are common to the Los Angeles region and Alternative 5 would not increase them.

CEQA Impact Determination

Because of the potential of underlying segments of the active Palos Verdes Fault and liquefaction-prone hydraulic fill under the proposed site, there is a risk of seismic activity that could affect construction and operation under Alternative 5. However, incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to seismically induced ground failure would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Because of the potential of underlying strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill under the proposed site, there is a risk of seismic activity that could affect construction and operation. However, incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to seismically induced ground failure would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-2: Construction and operation of Alternative 5 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.

Alternative 5 would include the construction of a new wharf, installation of new cranes, development of additional backlands on existing fill, and dredging of Berths 302-306. The operational throughput under Alternative 5 is projected to reach to 3.2 million TEUS by 2027, an increase of approximately 2.1 million TEUs over the CEQA baseline level, Impacts due to tsunamis and seiches are typical for the entire California coastline and the construction and operation of Alternative 5 would not increase them. Similar to the proposed Project, implementation of Alternative 5 could potentially be subject to the effects of a large tsunami because of an offshore earthquake or landslide.

CEQA Impact Determination

The elevation of the proposed site would be approximately 15 ft above MLLW and no substantial risk of flooding from earthquake-based tsunamis or seiches is likely. In-water construction activities could be subject to risk should a large tsunami occur during construction activities, however, the likelihood of this occurring is remote. LAHD's Risk Management Plan contains applicable risk management measures and policies (LAHD, 1983). Also, as discussed further in Section 3.8, Hazards and Hazardous Materials, the LAHD has a Port-wide emergency notification system in place to warn of tsunamis or other hazards by telephone/email/text alerts which would serve to reduce potential risks (Malin pers. comm., 2011). The Port has also implemented measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation and LAHD lease requirements related to emergency response planning and training. Based on the above, impacts during the construction and operational periods relative risk of substantial damage or injury involving tsunamis or seiches would be less than significant under CEQA.

Mitigation Measures

Although significant impacts related to the risk of substantial damage or injury involving tsunamis or seiches would not occur, lease measure **LM GEO-1** would further reduce potential impacts.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 5 would require in-water construction activities which are not included in the NEPA baseline. The elevation of the proposed site is approximately 15 ft above MLLW; therefore, no substantial risk of flooding from earthquake-based tsunamis or seiches is likely. In-water construction activities could be subject to risk should a large tsunami occur during construction activities, however, the likelihood of this occurring is remote.

LAHD's Risk Management Plan contains applicable risk management measures and policies (LAHD, 1983). Also, as discussed further in Section 3.8, Hazards and Hazardous Materials, the LAHD has a Port-wide emergency notification system in place to warn of tsunamis or other hazards by telephone/email/text alerts which would serve to reduce potential risks (Malin pers. comm., 2011). The Port has also implemented measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation and LAHD lease requirements related to emergency response planning and training. Based on the above, impacts during the construction and operational periods relative risk of substantial damage or injury involving tsunamis or seiches would be less than significant under NEPA.

Mitigation Measures

Although significant impacts related to the risk of substantial damage or injury involving tsunamis or seiches would not occur, lease measure **LM GEO-1** would further reduce potential impacts.

Residual Impacts

Impacts would be less than significant.

Impact GEO-3: Construction and operation of Alternative 5 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.

Alternative 5 would include the construction of a new wharf, installation of new cranes, development of additional backlands on existing fill, and dredging Berth 306. Alternative 5 would be designed and constructed in compliance with recommendations of a geotechnical engineer, consistent with Sections 91.000 through 91.7016 of the LAMC, and in conjunction with criteria established by the LAHD, which are measures intended to prevent settlement or subsidence events that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Implementation of these standard measures would reduce the risk associated with settlement or subsidence impacts that could result in substantial damage to structures or infrastructure or exposure of people to substantial risk of injury.

CEQA Impact Determination

As with the proposed Project, Alternative 5 would be designed and constructed to comply with criteria established by LAHD, Sections 91.000 through 91.7016 of the LAMC, and would incorporate standard geotechnical engineering requirements (including recommendations from geotechnical evaluations that are conducted during the design phase). Compliance with applicable standards and policies related to subsidence and differential settlement issues would ensure that construction and operation of Alternative 5 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury arising from subsidence or differential soil settlement. Therefore, impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Similar to the proposed Project, improvements under Alternative 5 would be designed and implemented in accordance with engineering recommendations and applicable criteria established by the LAHD. Construction and operation of Alternative 5 would not cause settlement or subsidence that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, impacts would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-4: Construction and operation of Alternative 5 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.

Construction impacts of Alternative 5 would be similar to those identified for the proposed Project, and incorporation of measures to address expansive soils would ensure that substantial damage to structures or infrastructure or exposure of people to substantial risk of injury would not occur.

CEQA Impact Determination

As with the proposed Project, Alternative 5 would be designed and constructed to comply with criteria established by LAHD, Sections 91.000 through 91.7016 of the LAMC, and would incorporate standard geotechnical engineering requirements (including recommendations from geotechnical evaluations that are conducted during the design phase). Compliance with applicable standards and policies related to expansive or unstable soils would ensure that construction and operation of Alternative 5 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, both construction and operational impacts related to expansive soils would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As indicated above, construction and operation of Alternative 5 would comply with standard geotechnical evaluations performed during the design phase, Sections 91.000 through 91.7016 of the LAMC, and criteria established by LAHD. Therefore construction and operational impacts related to expansive soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-5: Construction and operation of Alternative 5 would not result in or expose people or property to a substantial risk of landslides or mudflows.

The topography at the proposed site and vicinity is flat and not subject to landslides or mudflows.

CEQA Impact Determination

Since construction and operation of this alternative would be located in an area not susceptible to landslides or mudflows, no impacts would occur under CEQA during the construction or operational period.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

The topography of the proposed site is flat and not subject to landslides or mudflows, therefore, no construction or operation impacts would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-6: Shallow groundwater, which would cause unstable collapsible soils, may be encountered during excavations, but it would not expose people or structures to substantial risk.

Alternative 5 would include the development of additional backlands, extension of the wharf (1,250 lf) to create Berth 306, installation of new cranes, and dredging along Berth 306. As with the proposed Project, standard engineering and construction practices

related to saturated or collapsible soils, would be implemented. Operation of Alternative 5 would not include excavation.

CEQA Impact Determination

Because standard engineering and construction practices would be incorporated under Alternative 5, construction impacts associated with shallow groundwater would be less than significant under CEQA. Since excavations would not be a part of the operation of Alternative 5, impacts associated with collapsible soils would not occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As discussed above, standard engineering and construction practices would be implemented under Alternative 5 in order to manage saturated and collapsible soils. Construction activities would not cause exposure of people and structures to substantial adverse effects from construction of Alternative 5 and operation of Alternative 5 would not involve excavation. Therefore, impacts associated with collapsible soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-7: Construction and operation of Alternative 5 would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geologic or topographic features.

The topography at and near the proposed site is flat and does not contain prominent geologic or topographic features.

CEQA Impact Determination

Since construction and operation of this alternative would not affect prominent geologic and topographic features, no impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

As the topography near the proposed site is flat and does not contain prominent geologic or topographic features; no construction or operation impacts would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-8: Construction and operation of Alternative 5 would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.

The proposed site is comprised of fill and does not contain significant mineral resources. Therefore, construction of Alternative 5 would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State.

CEQA Impact Determination

Construction and operation of Alternative 5 would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State. Therefore, no impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

Construction and operation of Alternative 5 would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State. Therefore, no impacts would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-9: Construction and operation of the Alternative 5 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

As described for the proposed Project under Impact GEO-9, sea levels are predicted to rise by 1.5 ft or less through 2050, while proposed site's elevation is 15 ft MLLW and high tide is 7 ft.

CEQA Impact Determination

Therefore, a sea level rise of 1.5 ft would not cause flooding at the site nor would it affect site access. Therefore, Alternative 5 would not expose people or property to substantial risk or injuries related to sea level rise and thus, impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As described from the proposed Project under Impact GEO-9, sea levels are predicted to rise by 1.5 ft or less through 2050, while the proposed site's elevation is 15 ft MLLW and high tide is 7 ft. Therefore, a sea level rise of 1.5 ft would not cause flooding at the site nor would it affect site access. Therefore, Alternative 5 would not expose people or property to substantial risk or injuries related to sea level rise under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

This evaluation is for information only, and therefore, an impact determination is not applicable.

3.5.4.4.2.6 Alternative 6 – Proposed Project with Expanded On-Dock Railyard

Alternative 6 would be the same as the proposed Project; however, the existing on-dock railyard on the terminal would be redeveloped and expanded. Under this alternative, approximately 10 acres of backlands would be removed from container storage for the railyard expansion. Alternative 6 would improve the existing terminal, develop the existing 41-acre fill area as backlands, add 1,250 ft of new wharf creating Berth 306, and dredge the Pier 300 Channel along Berth 306. Under this alternative, 12 new cranes would be added to the wharves along Berths 302-306, for a total of 24 cranes. As with the proposed Project, the 41-acre backlands and Berth 306 under Alterative 6 could utilize traditional container operations, electric automated operations, or a combination of the two over time. Dredging of the Pier 300 Channel along Berth 306 would occur (removal of approximately 20,000 cy of material), with the dredged material beneficially reused and/or disposed of at an approved disposal site (such as the CDF at Berths 243-245 and/or Cabrillo shallow water habitat) or, if needed, disposed of at an ocean disposal site (i.e., LA-2). Total terminal acreage (347) would be the same as the proposed Project.

Based on the throughput projections, TEU throughput would be the same as the proposed Project, with an expected throughput of approximately 3.2 million TEUs by 2027. This would translate into 390 annual ship calls at Berths 302-306. In addition, Alternative 6 would result in up to 10,830 peak daily truck trips (2,862,760 annual), and up to 2,953 annual rail trip movements. Configuration of all other landside terminal components would be identical to the existing terminal.

Impact GEO-1: Seismic activity along the Palos Verdes Fault zone or other regional faults would not produce fault ruptures, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk during the construction period (through 2014) and operation period (through 2027).

Alternative 6 would operate the terminal with an additional 12 new A-frame cranes, a new wharf, dredged Berths 302-306, increased backlands, and an expanded on-dock railyard. Under Alternative 6, annual cargo throughput would increase to approximately 3.2 million TEUs by year 2027. As with the proposed Project, increased exposure of people and property during construction related to seismic hazards cannot be precluded under Alternative 6. However, seismic hazards are common to the Los Angeles and southern California region would not be increased by this alternative.

CEQA Impact Determination

Because of the potential of underlying segments of the active Palos Verdes Fault and liquefaction-prone hydraulic fill under the proposed site, there is a risk of seismic activity that could affect construction and operation under Alternative 6. Exposure of people and property during operations to seismic hazards from a major earthquake cannot be precluded. However, with incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to seismically induced hazards would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Because of the potential of underlying strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill under the proposed site, there is a risk of seismic activity that could affect construction and operation. However, incorporation of modern construction engineering and safety standards and compliance with current building regulations, impacts due to seismically induced hazards would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-2: Construction and operation of Alternative 6 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.

Alternative 6 would result in the construction of a new wharf at Berth 306, addition of 12 new cranes, dredging along Berth 306, backlands development, and expansion of the existing on-dock railyard. Under Alternative 6, annual cargo throughput is projected to reach approximately 3.2 million TEUs by year 2027. Impacts due to tsunamis and seiches are typical for the entire California coastline and the construction and operation of Alternative 6 would not increase them. Similar to the proposed Project, implementation of Alternative 6 could potentially be subject to the effects of a large tsunami because of an offshore earthquake or landslide. A tsunami or seiche that occurs during construction or operation could result in damage to property or injury related to in-water activities.

CEQA Impact Determination

The terminal elevation under Alternative 6 is approximately 15 ft above MLLW; therefore, no substantial risk of flooding from earthquake-based tsunami or seiche is likely. In-water construction activities could be subject to risk should a large tsunami occur during construction activities, however, the likelihood of this occurring is remote. LAHD's Risk Management Plan contains applicable risk management measures and policies (LAHD, 1983). Also, as discussed further in Section 3.8, Hazards and Hazardous Materials, the LAHD has a Port-wide emergency notification system in place to warn of tsunamis or other hazards by telephone/email/text alerts which would serve to reduce potential risks (Malin pers. comm., 2011). The Port has also implemented measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation and LAHD lease requirements related to emergency response planning and training. Based on the above, impacts during the construction and operational periods relative risk of substantial damage or injury involving tsunamis or seiches would be less than significant under CEQA.

Mitigation Measures

Although significant impacts related to the risk of substantial damage or injury involving tsunamis or seiches would not occur, lease measure **LM GEO-1** would further reduce potential impacts.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

Alternative 6 would result in in-water construction activities associated with a new wharf at Berth 306, addition of 12 new cranes, and dredging along Berth 306 that is not included in the NEPA baseline. The terminal elevation under Alternative 6 is approximately 15 ft above MLLW; therefore, no substantial risk of flooding from earthquake-based tsunami or seiche is likely. In-water construction activities could be subject to risk should a large tsunami occur during construction activities, however, the likelihood of this occurring is remote. LAHD's Risk Management Plan contains applicable risk management measures and policies (LAHD, 1983). Also, as discussed further in Section 3.8, Hazards and Hazardous Materials, the LAHD has a Port-wide emergency notification system in place to warn of tsunamis or other hazards by telephone/email/text alerts which would serve to reduce potential risks (Malin pers. comm., 2011). The Port has also implemented measures to minimize impacts from seiches or tsunamis, such as the breakwater and constructing facilities at adequate elevation and LAHD lease requirements related to emergency response planning and training. Based on the above, impacts during the construction and operational periods relative risk of substantial damage or injury involving tsunamis or seiches would be less than significant under NEPA.

Mitigation Measures

Although significant impacts related to the risk of substantial damage or injury involving tsunamis or seiches would not occur, lease measure **LM GEO-1** would further reduce potential impacts.

Residual Impacts

Impacts would be less than significant.

Impact GEO-3: Construction and operation of Alternative 6 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.

Alternative 6 would include the construction of a new wharf, dredge Berth 306, install new cranes, develop additional backlands, and expand the existing on-dock railyard. Subsidence/soil settlement impacts in backland areas would be less than significant under CEQA because the expanded terminal under Alternative 6 would be designed and constructed in compliance with recommendations of a geotechnical engineer, consistent with Sections 91.000 through 91.7016 of the LAMC, and in conjunction with criteria established by LAHD. Construction of Alternative 6 would not result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

CEQA Impact Determination

As with the proposed Project, Alternative 6 would be designed and constructed to comply with criteria established by LAHD, Sections 91.000 through 91.7016 of the LAMC, and would incorporate standard geotechnical engineering requirements (including recommendations from geotechnical evaluations that are conducted during the design phase). Compliance with applicable standards and policies related to subsidence and differential settlement issues would ensure that construction and operation of Alternative 6 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury arising from subsidence or differential soil settlement. Therefore, impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As with the proposed Project, under Alternative 6, improvements would be implemented in compliance with seismic criteria established by LAHD. Consequently, construction and operation of Alternative 6 would not be subject to excessive settlement or subsidence that could result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Therefore, subsidence/soil settlement impacts would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-4: Construction and operation of Alternative 6 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.

Alternative 6 would include the construction of a new wharf, dredging Berth 306, installing new cranes, developing additional backlands, and expanding the existing on-dock railyard. Similar to the proposed Project, incorporation of measures during construction of Alternative 6 to address expansive soils would prevent substantial damage to structures or infrastructure or exposure of people to substantial risk of injury.

CEQA Impact Determination

As with the proposed Project, the design and construction of terminal improvements under Alternative 6 would comply with the recommendations of a geotechnical engineer, consistent with Sections 91.000 through 91.7016 of the LAMC and in conjunction with criteria established by LAHD. Compliance with applicable standards and policies related to expansive or unstable soils would ensure that construction and operation of Alternative 6 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury arising from subsidence or differential soil settlement. Therefore, construction and operational impacts related to expansive soils would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As with the proposed Project, terminal improvements under Alternative 6 would be designed and constructed consistent with standard geotechnical evaluations performed during the design phase, Sections 91.000 through 91.7016 of the LAMC, and criteria established by LAHD. Construction of other Alternative 6 features would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury as a result of expansive soils. Therefore construction and operational impacts related to expansive soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-5: Construction and operation of Alternative 6 would not result in or expose people or property to a substantial risk of landslides or mudflows.

The topography near the Port is flat and not subject to landslides or mudflows.

CEQA Impact Determination

Since construction and operation of this alternative would be located in an area not susceptible to landslides or mudflows, no impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

Similar to the NEPA baseline, the topography of the proposed site and vicinity is flat and not subject to landslides or mudflows; therefore, no construction or operation impacts would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-6: Shallow groundwater, which would cause unstable collapsible soils, may be encountered during excavations, but it would not expose people or structures to substantial risk.

Alternative 6 would include the construction of a new wharf, dredge Berth 306, install new cranes, develop additional backlands, and expand the existing on-dock railyard.

Similar to the proposed Project, with the implementation of standard engineering and construction practices regarding saturated, collapsible soils, there would not be exposure to substantial adverse effects from construction of the Alternative 6. Operation of Alternative 6 would not include excavation activities.

CEQA Impact Determination

Because standard engineering and construction practices would be incorporated under Alternative 6, construction impacts associated with shallow groundwater would be less than significant under CEQA. Since excavations would not be a part of the operation of Alternative 6, impacts associated with collapsible soils would not occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

As discussed above, standard engineering and construction practices would be implemented under Alternative 6 in order to manage saturated and collapsible soils. Construction activities would not cause exposure of people and structures to substantial adverse effects from construction of Alternative 6 and operation of Alternative 6 would not involve excavation activities. Therefore, impacts associated with collapsible soils would be less than significant under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

Impact GEO-7: Construction and operation of Alternative 6 would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geologic or topographic features.

The topography of the proposed site under Alternative 6 is flat and does not contain prominent geologic or topographic features.

CEQA Impact Determination

Since there are no prominent geologic or topographic features located within the proposed site or in close proximity, construction and operation of Alternative 3 would not result in impacts under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

As the topography at and near the proposed site is flat and does not contain prominent geologic or topographic features; no construction or operation impacts would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-8: Construction and operation of Alternative 6 would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.

The proposed site is comprised of fill and does not contain significant mineral resources. Therefore, the Alternative would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State.

CEQA Impact Determination

Construction and operation of Alternative 6 would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the State. Therefore, no construction or operation impacts would occur under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

NEPA Impact Determination

Construction and operation of Alternative 6 would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the state, and therefore, no impact to mineral resources would occur under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

There would be no impacts.

Impact GEO-9: Construction and operation of Alternative 6 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.

As described from the proposed Project under Impact GEO-9, sea levels are predicted to rise by 1.5 ft or less through 2050, while the proposed site's elevation is 15 ft MLLW and high tide is 7 ft.

CEQA Impact Determination

A sea level rise of 1.5 ft would not cause flooding at the site nor would it affect site access. Therefore, Alternative 6 would not expose people or property to substantial risk or injuries related to sea level rise and thus, impacts would be less than significant under CEQA.

Mitigation Measures

No mitigation is required.

Residual Impacts

Impacts would be less than significant.

NEPA Impact Determination

A sea level rise of 1.5 ft would not cause flooding at the site nor would it affect site access. Therefore, Alternative 6 would not expose people or property to substantial risk or injuries related to sea level rise under NEPA.

Mitigation Measures

No mitigation is required.

Residual Impacts

This evaluation is for information only, and therefore, an impact determination is not applicable.

3.5.4.5 Summary of Impact Determinations

The following Table 3.5-4 summarizes the CEQA and NEPA impact determinations of the proposed Project and alternatives related to Geology, as described in the detailed discussion above. This table allows for easy comparison between the potential impacts of the proposed Project and alternatives with respect to this resource. The potential impacts identified below may be based on federal, state, or City of Los Angeles significance criteria, Port criteria, and the scientific judgment of the report preparers.

For each impact threshold, the table describes the impact, notes the CEQA and NEPA impact determinations, describes applicable mitigation measures, and notes the residual impacts (i.e., the impact remaining after mitigation). The impacts, whether significant or not, are included in this table.

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
Proposed Project	**GEO-1:** Seismic activity along the Palos Verdes Fault zone or other regional faults, would not produce fault rupture, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk during the construction period (through 2014) and operation period (through 2027).	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-2: Construction and operation of the proposed Project within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.	CEQA: Less than significant	Mitigation not required; however, **LM GEO-1: Emergency Response Planning Lease Requirement** would further reduce any potential for impact	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-3: Construction and operation of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-4: Construction and operation of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-5: Construction and operation of the proposed Project would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-6: Shallow groundwater, which would cause unstable collapsible soils, may be encountered during excavation, but it would not expose people or structures to substantial risk.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-7: Construction and operation of the proposed Project would not result in the destruction, permanent	CEQA: No impact	Mitigation not required	CEQA: No impact

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
	covering or the material and adverse modification of one or more distinct and prominent geologic or topographic features.	NEPA: No impact		NEPA: No impact
	GEO-8: Construction and operation of the proposed Project would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-9: Construction and operation of the proposed Project would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable
Alternative 1 – No Project	**GEO-1:** Seismic activity along the Palos Verdes Fault zone or other regional faults would not produce fault rupture, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk from construction period (through 2014) but would during operation period (through 2027).	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable
	GEO-2: Construction and operation of Alternative 1 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable
	GEO-3: Construction and operation of Alternative 1 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable
	GEO-4: Construction and operation of Alternative 1 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable
	GEO-5: Construction and operation of Alternative 1 would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
	GEO-6: Shallow groundwater, which would cause unstable collapsible soils, would not be encountered and would not expose people or structures to substantial risk	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable
	GEO-7: Construction and operation of Alternative 1 would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geologic or topographic features.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable
	GEO-8: Construction and operation of Alternative 1 would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable
	GEO-9: Construction and operation of Alternative 1 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable
Alternative 2 – No Federal Action	**GEO-1:** Seismic activity along the Palos Verdes Fault zone or other regional faults would not produce fault rupture, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk from construction period (through 2014) but would during operation period (through 2027).	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: No impact		NEPA: No impact
	GEO-2: Construction and operation of Alternative 2 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.	CEQA: Less than significant	Mitigation not required; however, **LM GEO-1** would further reduce any potential for impact	CEQA: Less than significant
		NEPA: No impact		NEPA: No impact
	GEO-3: Construction and operation of Alternative 2 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: No impact		NEPA: No impact

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
	GEO-4: Construction and operation of Alternative 2 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: No impact		NEPA: No impact
	GEO-5: Construction and operation of Alternative 2 would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-6: Shallow groundwater, which would cause unstable soils, may be encountered during excavations, but it would not expose people or structures to substantial risk.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: No impact		NEPA: No impact
	GEO-7: Construction and operation of Alternative 2 would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geologic or topographic features.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-8: Construction and operation of Alternative 2 would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-9: Construction and operation of Alternative 2 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable
Alternative 3 – Reduced Project: Four New Cranes	**GEO-1:** Seismic activity along the Palos Verdes Fault zone or other regional faults would not produce fault ruptures, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk during the construction period (through 2014) and operation period (through 2027).	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
	GEO-2: Construction and operation of Alternative 3 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.	CEQA: Less than significant	Mitigation not required; however, **LM GEO-1** would further reduce any potential for impact	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-3: Construction and operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-4: Construction and operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-5: Construction and operation of Alternative 3 would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-6: Shallow groundwater, which would cause unstable collapsible soils, may be encountered during excavations, but it would not expose people or structures to substantial risk.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-7: Construction and operation of Alternative 3 would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geologic or topographic features.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-8: Construction and operation of Alternative 3 would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-9: Construction and operation of Alternative 3 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
Alternative 4 – Reduced Project: No New Wharf	**GEO-1:** Seismic activity along the Palos Verde Fault zone or other regional faults would not produce fault ruptures, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk during the construction period (through 2014) and operation period (through 2027).	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-2: Construction and operation of Alternative 4 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.	CEQA: Less than significant	Mitigation not required; however, **LM GEO-1** would further reduce any potential for impact	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-3: Construction and operation of Alternative 4 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-4: Construction and operation of Alternative 4 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-5: Construction and operation of Alternative 4 would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-6: Shallow groundwater, which could cause unstable collapsible soils, may be encountered during excavations, but it would not expose people or structures to substantial risk.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-7: Construction and operation of Alternative 4 would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geological or topographic features.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-8: Construction and operation of Alternative 4 would not result in the permanent loss of availability	CEQA: No impact	Mitigation not required	CEQA: No impact

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
	of a known mineral resources of regional, statewide, or local significance.	NEPA: No impact		NEPA: No impact
	GEO-9: Construction and operation of Alternative 4 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable
Alternative 5 – Reduced Project: No Space Assignment	**GEO-1:** Seismic activity along the Palos Verde Fault zone or other regional faults would not produce fault ruptures, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk during the construction period (through 2014) and operation period (through 2027).	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-2: Construction and operation of Alternative 5 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.	CEQA: Less than significant	Mitigation not required; however, **LM GEO-1** would further reduce any potential for impact	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-3: Construction and operation of Alternative 5 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-4: Construction and operation of Alternative 5 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-5: Construction and operation of Alternative 5 would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-6: Shallow groundwater, which could cause unstable collapsible soils, may be encountered during excavations, but it would not expose people or structures to substantial risk.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
	GEO-7: Construction and operation of Alternative 5 would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geological or topographic features.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-8: Construction and operation of Alternative 5 would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-9: Construction and operation of Alternative 5 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable
Alternative 6 – Proposed Project with Expanded On-Dock Railyard	**GEO-1:** Seismic activity along the Palos Verde Fault zone or other regional faults would not produce fault ruptures, seismic ground shaking, liquefaction or other seismically induced ground failure that would expose people and structures to substantial risk during the construction period (through 2014) and operation period (through 2027).	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-2: Construction and operation of Alternative 6 within the Port area would not expose people and structures to substantial risk involving tsunamis or seiches.	CEQA: Less than significant	Mitigation not required; however, **LM GEO-1** would further reduce any potential for impact	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-3: Construction and operation of Alternative 6 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from subsidence/soil settlement.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-4: Construction and operation of Alternative 6 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from soil expansion.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant

Table 3.5-4: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

Alternative	Environmental Impacts	Impact Determination	Mitigation Measures	Residual Impacts after Mitigation
	GEO-5: Construction and operation of Alternative 6 would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-6: Shallow groundwater, which could cause unstable collapsible soils, may be encountered during excavations, but it would not expose people or structures to substantial risk.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Less than significant		NEPA: Less than significant
	GEO-7: Construction and operation of Alternative 6 would not result in the destruction, permanent covering or the material and adverse modification of one or more distinct and prominent geological or topographic features.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-8: Construction and operation of Alternative 6 would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.	CEQA: No impact	Mitigation not required	CEQA: No impact
		NEPA: No impact		NEPA: No impact
	GEO-9: Construction and operation of Alternative 6 would not result in substantial damage to structures or infrastructure or expose people to substantial risk of injury from sea level rise.	CEQA: Less than significant	Mitigation not required	CEQA: Less than significant
		NEPA: Not applicable	Mitigation not applicable	NEPA: Not applicable

3.5.4.6 Mitigation Monitoring

In the absence of significant impacts, mitigation measures are not required. Compliance with existing regulations and implementation of the following lease measure (described below and under Impact GEO-2) would contribute to preparing construction and operations personnel for a large seismic event.

Impact GEO-2: Construction of the proposed Project within the Port area would expose people and structures to substantial risk involving tsunamis or seiches.	
Lease Measure	**LM GEO-1: Emergency Response Planning.** The terminal operator shall work with Port engineers and Port police to develop tsunami response training and procedures to assure that construction and operations personnel shall be prepared to act in the event of a large seismic event. Such procedures shall include immediate evacuation requirements in the event that a large seismic event is felt at the proposed Project site, as part of overall emergency response planning for this proposed Project.
Timing	Prior to construction and/or operation.
Methodology	LAHD will include this mitigation measure in lease agreements with tenants.
Responsible Parties	APL, LAHD
Residual Impacts	Less than significant

3.5.5 Significant Unavoidable Impacts

No significant unavoidable impacts to Geology would occur as a result of construction or operation of the proposed Project or any of the alternatives.

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