

3 **SECTION SUMMARY**

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

13 Section 3.5, Geology, provides the following:

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

22 **Key Points of Section 3.5:**

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

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

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

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

18

19

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

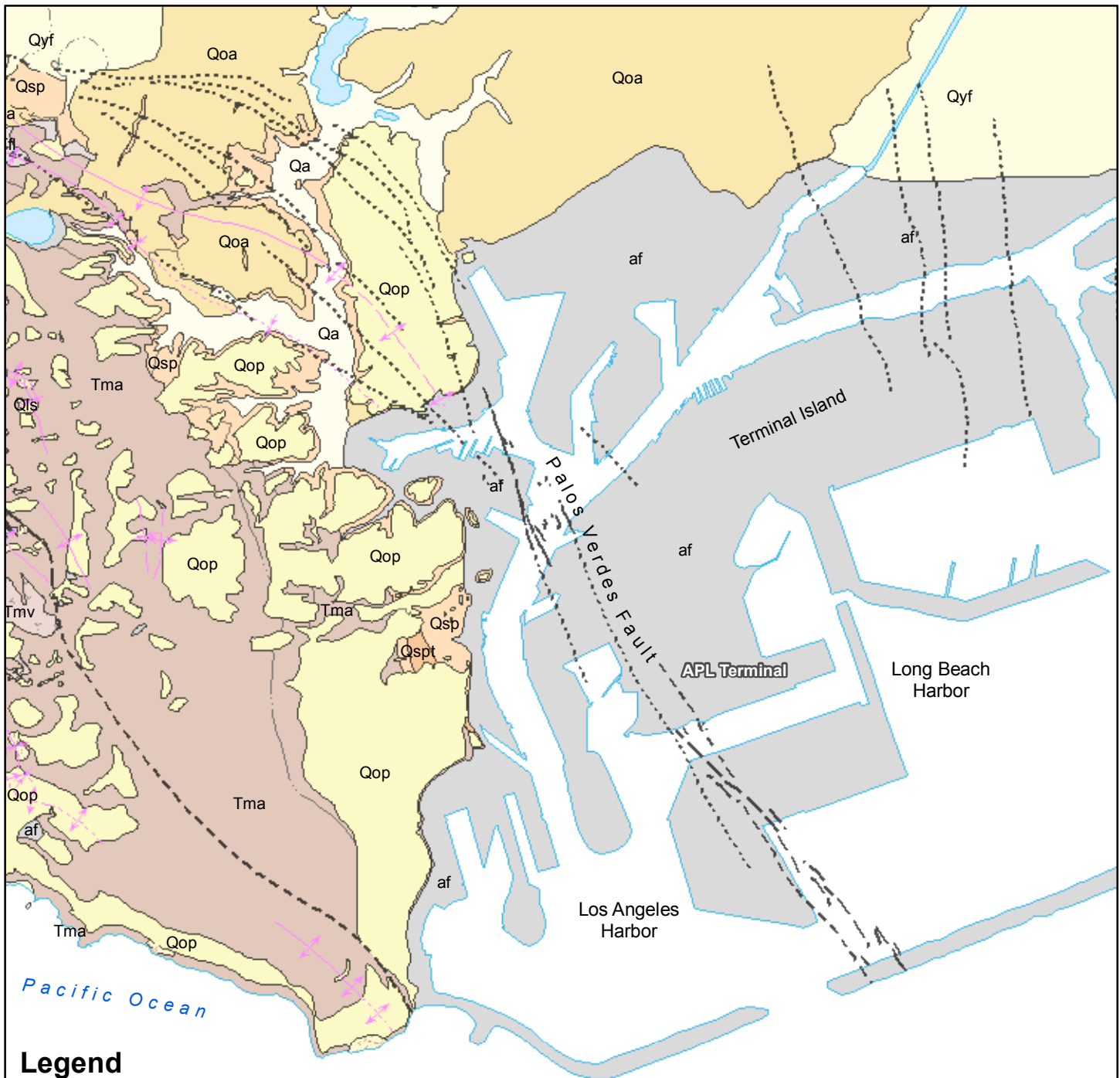
The proposed Project is located near sea level and underlain by artificial fill of varying depths. A great majority of these fill materials were placed as spoils from various nearby dredging operations. Figure 3.4-1 (in Section 3.4, Cultural Resources) depicts the development of Terminal Island since the 1970s, from the original Rattlesnake Island to the current configuration. Quaternary and Neogene¹ 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 Pleistocene² 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 $10 \times 10 \times 10 \times 10$). 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.

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.

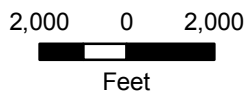
² The **Pleistocene** is the epoch from 2.588 million to 12 000 years BP covering the world's recent period of repeated glaciations.



Legend

- Anticline
- Syncline
- Fault, identity and existence certain
- water
- af Artificial fill
- Qls Landslide deposits
- 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



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

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

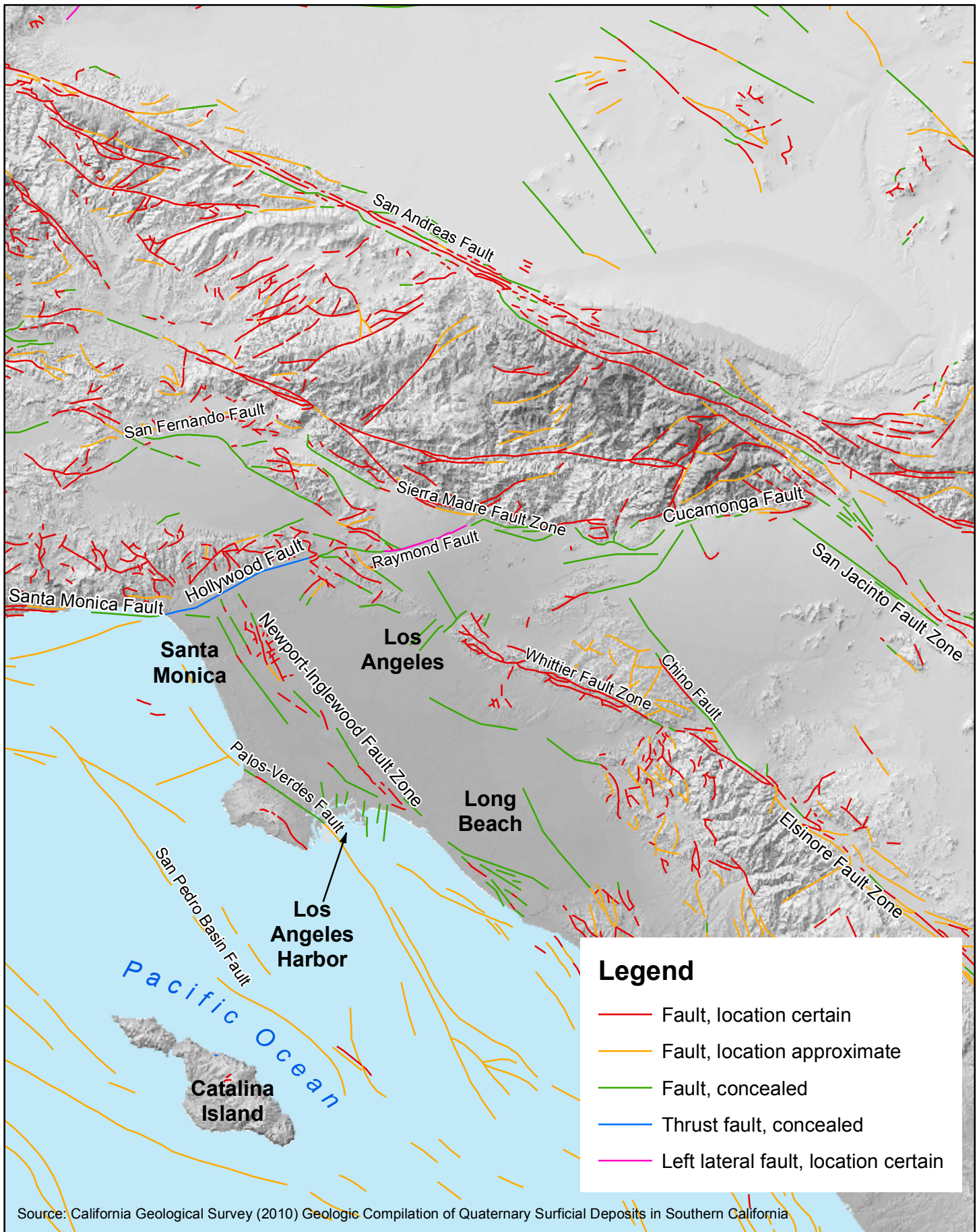
10 Seismic analyses generally include discussions of maximum credible and maximum
11 probable earthquakes. A maximum credible earthquake (MCE) is usually defined as the
12 maximum earthquake that appears capable of occurring under the known tectonic
13 framework. The probability of occurrence is not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

23 3.5.2.3.1 Faults

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

34 The San Pedro Basin fault is located within the nearby deep seafloor and may be
35 associated with small magnitude (3 to 5) earthquakes (EMI, 2006), though no known
36 large earthquakes have occurred along this fault in the past 200 years (Ninyo & Moore,
37 1992). While maximum earthquake of approximately magnitude 7.0 to 7.2 could
38 possibly occur, a smaller magnitude earthquake (6.5 to 7.0) would be more likely given
39 that the fault is highly segmented (EMI, 2006).

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



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



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

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

4 Numerous active faults located off-site are capable of generating earthquakes in the
 5 proposed Project area (see Tables 3.5-1 and 3.5-2). Most noteworthy, due to its
 6 proximity to the site, is the Newport-Inglewood Fault, which has generated earthquakes
 7 of magnitudes ranging from 4.7 to 6.3 on the Richter scale (Southern California
 8 Earthquake Data Center, 2011). Large events could occur in the general area on more
 9 distant faults, but because of the greater distance from the site, earthquakes generated on
 10 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.

11
12

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,

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

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

11 3.5.2.3.2 Liquefaction

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

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

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

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

15 3.5.2.3.3 Tsunamis

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

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

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

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

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

16 However, recent studies (e.g., Synolakis et al., 1997; Borrero et al., 2001 and 2005a) have
17 projected larger tsunami run-ups based on near-field events, such as earthquakes or
18 submarine landslides occurring in proximity to the California coastline. Off-shore faults
19 present a larger local tsunami hazard than previously thought, posing a direct threat to
20 near-shore facilities. For example, the Catalina Fault is one of the largest such features
21 and lies directly underneath Catalina Island, located only 22 miles from the Port.
22 Simulations of tsunamis generated by uplift on this fault suggest waves in the Port in
23 excess of 12 ft, with an arrival time within 20 minutes (Legg et al., 2003; Borrero et al.,
24 2005b). These simulations were based on rare events, representing worst-case scenarios.

25 In addition, landslide-derived tsunamis are now perceived as a viable local tsunami
26 hazard. Such tsunamis potentially can be more dangerous, due to the lack of warning for
27 such an event. An earthquake illustrated this mechanism in 1998, centered onshore in
28 Papua-New Guinea, which appears to have created an offshore landslide that caused
29 tsunami inundation heights in excess of 33 ft, claiming more than 2,500 lives. In a study
30 modeling potential tsunami generation by local offshore earthquakes, Legg et al. (2004),
31 consider the relative risk of tsunamis from a large catastrophic submarine landslide
32 (likely generated by a seismic event) in offshore southern California versus fault-
33 generated tsunamis. The occurrence of a large submarine landslide appears quite rare by
34 comparison with the tectonic faulting events. Although there are numerous mapped
35 submarine landslides off the southern California shore, few appear to be of the scale
36 necessary to generate a catastrophic tsunami. Of two large landslides that appear to be of
37 this magnitude, Legg et al. (2004) indicated that one landslide is over 100,000 years old
38 and the other landslide approximately 7,500 years old. In contrast, the recurrence of 3- to
39 20-ft fault movements on off-shore faults would be several hundred to several thousand
40 years. Consequently, the study concludes that the most likely direct cause of most of the
41 local tsunamis in southern California is tectonic movement during large off-shore
42 earthquakes.

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

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

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

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

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

1 **3.5.2.3.4 Seiches**

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

9 **3.5.2.3.5 Sea Level Rise**

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

17 The State of California Sea-Level Rise Interim Guidance Document prepared by the Sea
18 Level Rise Task Force of the Coastal and Ocean Working Group of the California
19 Climate Action Team (CO-CAT), recommends using the ranges of Sea Level Rise
20 presented in the December 2009 “Proceedings of National Academy of Sciences”
21 publication by Vermeer and Rahmstorf as a starting place for estimating sea level
22 projections, as shown in Table 3.5-3 (CO-CAT, 2010)³ Until 2050, there is strong
23 agreement among the various climate models on sea level projections. For dates after
24 2050, three different values for sea level rise are shown based on low, medium, and high
25 future GHG emission scenarios. As shown in the Table 3.5-3, sea level rise is predicted
26 to be greater with higher concentrations of GHGs.

27 **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

28 LAHD reported to the California State Lands Commission (CSLC) in response to a
29 survey in 2009 that some possible flooding and wave damage would occur from a 55 inch
30 rise in sea level (CSLC, 2009). As shown in Table 3.5-3 above, a 55 inch rise in sea level
31 could occur in 2100 under the highest GHG emissions scenario. LAHD and the Rand
32 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.

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

4 **3.5.2.3.6 Subsidence**

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

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

17 The general harbor area, including the area of the proposed improvements experienced
18 maximum cumulative subsidence of approximately 1.6 ft, from 1928 to 1970 (Allen,
19 1973). Today, water injection continues to be maintained at rates greater than the total
20 volume of extracted substances, including oil, gas, and water to prevent further reservoir
21 compaction and subsidence (City of Long Beach, 2006).

22 **3.5.2.3.7 Landslides**

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

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

37 **3.5.2.3.8 Expansive Soils**

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

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

3 **3.5.3 Applicable Regulations**

4 **3.5.3.1 Geologic Hazards**

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

18 The LAHD also has developed a seismic code to provide construction standards. The
19 LAHD seismic design codes are contained in the "Proceedings of the Port of Los Angeles
20 Seismic Workshop on Seismic Engineering" and "The Port of Los Angeles Code for
21 Seismic Design, Upgrade, and Repair of Container Wharves" (LAHD, 1990; POLA,
22 2004).

23 **3.5.3.2 Mineral Resources**

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

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

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

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

9 **3.5.4 Impacts and Mitigation Measures**

10 **3.5.4.1 Methodology**

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

17 **3.5.4.1.1 CEQA Baseline**

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

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

37 **3.5.4.1.2 NEPA Baseline**

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

1 minor terminal improvements in the upland area (i.e., conversion of a portion of the dry
 2 container storage unit area to reefers and utility infrastructure), operation of the 291-acre
 3 container terminal, and assumes that by 2027, the terminal (Berths 302 to 305) handles up
 4 to approximately 2.15 million TEUs annually and accommodates 286 annual ships calls
 5 and 2,336 on-way rail trips, without any federal action. Because the NEPA baseline is
 6 dynamic, it includes different levels of terminal operations at each study year (2012, 2015,
 7 2020, 2025, and 2027).

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

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

24 **3.5.4.2 Thresholds of Significance**

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

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

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

37 **GEO-2** Tsunamis or seiches;

38 **GEO-3** Land subsidence/soil settlement;

39 **GEO-4** Expansive soils;

40 **GEO-5** Landslides, mudflows; or

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

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

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

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

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

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

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

22 3.5.4.3 Analysis Assumptions

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

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

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

4 **3.5.4.4 Impact Determination**

5 **3.5.4.4.1 Proposed Project**

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

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

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

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

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

6 **CEQA Impact Determination**

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

14 *Mitigation Measures*

15 No mitigation is required.

16 *Residual Impacts*

17 Impacts would be less than significant.

18 **NEPA Impact Determination**

19 There would be a minor increase in the exposure of people and property to seismic
20 hazards relative to NEPA baseline conditions. The federal action associated with the
21 proposed Project would be limited to in-water and over-water construction and operation
22 activities not included in the NEPA baseline, such as new wharf construction, installation
23 of 12 new cranes, dredging along Berth 306 and associated ocean transport and disposal
24 activities, and limited development of backland areas as described in Chapter 2, Section
25 2.7, Federal Scope of Analysis. As stated above, seismic hazards are common to the Los
26 Angeles region and the proposed Project does not increase them. With incorporation of
27 modern construction engineering and safety standards and compliance with current
28 building regulations, impacts due to seismically induced ground failure would be less
29 than significant under NEPA.

30 *Mitigation Measures*

31 No mitigation is required.

32 *Residual Impacts*

33 Impacts would be less than significant.

34 **Impact GEO-2: Construction and operation of the proposed Project** 35 **within the Port area would not expose people and structures to** 36 **substantial risk involving tsunamis or seiches.**

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

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

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

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

30 As discussed above in Section 3.5.2.3.3, the Port Complex model predicts a maximum
31 tsunami wave height, or reasonable worst-case scenario, of approximately 1.6 ft to 6.0 ft
32 above MSL for the earthquake scenarios and approximately 5.3 ft to 13.7 ft above MSL
33 for the landslide scenario. The maximum wave height under the worst-case earthquake
34 scenarios are predicted to occur in the East Channel and East Basin area of the Port, and
35 the western side of Pier 400 under the landslide scenarios. Incorporating the Port MSL of
36 +2.8 ft, the model predicts tsunami wave heights of a maximum 6.4 ft above MLLW for
37 the earthquake scenario to 8.7 ft above MLLW for the landslide scenario at the proposed
38 Project site (Berths 302-306) in the Pier 300 Channel. Since the existing deck elevation
39 along the wharf at Berths 302-305 is at approximately 15 ft MLLW, and the
40 improvements under the proposed Project (i.e., wharf extension and Berth 306) would be
41 constructed at approximately the same elevation, localized tsunami-induced flooding is
42 not expected to occur.

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

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

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

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

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

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

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

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

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

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

11 **CEQA Impact Determination**

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

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

27 *Mitigation Measures*

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

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

39 *Residual Impacts*

40 Impacts would be less than significant.

NEPA Impact Determination

As discussed above, the proposed Project site's elevation is approximately 15 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

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

3 **CEQA Impact Determination**

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

11 *Mitigation Measures*

12 No mitigation is required.

13 *Residual Impacts*

14 Impacts would be less than significant.

15 **NEPA Impact Determination**

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

25 *Mitigation Measures*

26 No mitigation is required.

27 *Residual Impacts*

28 Impacts would be less than significant.

29 **Impact GEO-5: Construction and operation of the proposed Project 30 would not result in or expose people or property to a substantial risk 31 of landslides or mudflows.**

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

35

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.

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

4 *Mitigation Measures*
5 No mitigation is required.

6 *Residual Impacts*
7 There would be no impacts.

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

11 *Mitigation Measures*
12 No mitigation is required.

13 *Residual Impacts*
14 There would be no impacts.

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

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

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

30 *Mitigation Measures*
31 No mitigation is required.

32 *Residual Impacts*
33 There would be no impacts.

34

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.

1 *Mitigation Measures*

2 Mitigation measures are not applicable.

3 *Residual Impacts*

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

6 **3.5.4.4.2 Alternatives**

7 **3.5.4.4.2.1 Alternative 1 – No Project**

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

16 Under the No Project Alternative, the existing APL Terminal would continue to operate
17 as an approximately 291-acre container terminal. Based on the throughput projections,
18 terminal operations are expected to grow over time as throughput demands increase.
19 Under Alternative 1, the existing APL Terminal would handle approximately 2.15
20 million TEUs by 2027, which would result in 286 annual ship calls at Berths 302-305. In
21 addition, this alternative would result in up to 7,273 peak daily one-way truck trips
22 (1,922,497 annual), and up to 2,336 annual one-way rail trip movements. Under
23 Alternative 1, cargo ships that currently berth and load/unload at the Berths 302-305
24 terminal would continue to do so.

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

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

35 **CEQA Impact Determination**

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

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

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

6 *Mitigation Measures*

7 No mitigation is required.

8 *Residual Impacts*

9 Impacts would be less than significant.

10 **NEPA Impact Determination**

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

14 *Mitigation Measures*

15 Mitigation measures are not applicable.

16 *Residual Impacts*

17 An impact determination is not applicable.

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

21 **CEQA Impact Determination**

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

32 *Mitigation Measures*

33 No mitigation is required.

34 *Residual Impacts*

35 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.

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

4 **CEQA Impact Determination**

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

16 *Mitigation Measures*

17 No mitigation is required.

18 *Residual Impacts*

19 Impacts would be less than significant.

20 **NEPA Impact Determination**

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

24 *Mitigation Measures*

25 Mitigation measures are not applicable.

26 *Residual Impacts*

27 An impact determination is not applicable.

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

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

33 **CEQA Impact Determination**

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

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

4 There would be no impacts.

5 **NEPA Impact Determination**

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

9 *Mitigation Measures*

10 Mitigation measures are not applicable.

11 *Residual Impacts*

12 An impact determination is not applicable.

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

16 **CEQA Impact Determination**

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

22 *Mitigation Measures*

23 No mitigation is required.

24 *Residual Impacts*

25 There would be no impacts.

26 **NEPA Impact Determination**

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

30 *Mitigation Measures*

31 Mitigation measures are not applicable.

32 *Residual Impacts*

33 An impact determination is not applicable.

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

5 **CEQA Impact Determination**

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

11 *Mitigation Measures*

12 No mitigation is required.

13 *Residual Impacts*

14 There would be no impacts.

15 **NEPA Impact Determination**

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

19 *Mitigation Measures*

20 Mitigation measures are not applicable.

21 *Residual Impacts*

22 An impact determination is not applicable.

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

26 **CEQA Impact Determination**

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

34 *Mitigation Measures*

35 No mitigation is required.

36 *Residual Impacts*

37 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

1 of the existing APL Terminal would be implemented. These minor upland improvements
2 would include conversion of a portion of the dry container storage area to an additional
3 200 reefers, associated electrical lines, and installation of utility infrastructure at locations
4 in the existing backland areas. Beyond these minor upland improvements, the Port would
5 not construct and develop additional backlands or wharves. No gate or additional
6 backland improvements would occur, and no in-water features such as dredging or a new
7 berth, wharf extension, or over-water features such as new cranes would occur under the
8 No Federal Action Alternative.

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

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

23 **CEQA Impact Determination**

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

32 *Mitigation Measures*

33 No mitigation is required.

34 *Residual Impacts*

35 Impacts would be less than significant.

36 **NEPA Impact Determination**

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

41

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

4 There would be no impacts.

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

8 **CEQA Impact Determination**

9 Under the No Federal Action Alternative, the proposed site would continue to occupy
10 291 acres and the construction of in and over water improvements would not occur,
11 which is the same as the CEQA baseline conditions. No construction-related impacts
12 under CEQA would occur. However, minor terminal improvements not requiring federal
13 approval could occur and terminal operations under Alternative 2 would be greater than
14 CEQA baseline conditions. The proposed site under Alternative 2 would have a greater
15 number of employees and stored containers in the future under build-out conditions
16 (2027). The existing terminal elevation is approximately 15 ft above MLLW; therefore,
17 no substantial risk of flooding from earthquake based tsunamis and seiches is likely under
18 CEQA at the proposed site under Alternative 2.

19 *Mitigation Measures*

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

23 *Residual Impacts*

24 Impacts would be less than significant.

25 **NEPA Impact Determination**

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

30 *Mitigation Measures*

31 No mitigation is required.

32 *Residual Impacts*

33 There would be no impacts.

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

4 **CEQA Impact Determination**

5 The existing terminal was completed in 1997 and incorporated recommendations of the
6 geotechnical engineer, consistent with implementation of Sections 91.000 through
7 91.7016 of the LAMC and criteria established by LAHD. The terminal improvements
8 were designed to address settlement and subsidence issues, and future terminal
9 improvements, that could occur under this alternative, would be designed and constructed
10 to meet the same standards; thus, future operations are not expected to elevate the
11 exposure of people, structures, or infrastructure to increased risk of harm from subsidence
12 or soil settlement beyond what currently exists. Therefore, under CEQA, Alternative 2
13 would not result in significant impacts.

14 *Mitigation Measures*

15 No mitigation is required.

16 *Residual Impacts*

17 Impacts would be less than significant.

18 **NEPA Impact Determination**

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

23 *Mitigation Measures*

24 No mitigation is required.

25 *Residual Impacts*

26 There would be no impacts.

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

30 **CEQA Impact Determination**

31 The existing terminal was completed in 1997 and incorporated recommendations of the
32 geotechnical engineer, consistent with implementation of Sections 91.000 through
33 91.7016 of the LAMC, criteria established by LAHD and in conformance with standard
34 geotechnical evaluations performed during the design process. Future terminal
35 improvements, that could occur under this alternative, would be designed and constructed
36 to meet the same standards; thus, future operations are not expected to elevate the
37 exposure of people, structures, or infrastructure to increased risk of harm from soil
38 expansion under this alternative and Alternative 2 would not result in significant impacts
39 under CEQA.

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

4 Impacts would be less than significant.

5 **NEPA Impact Determination**

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

10 *Mitigation Measures*

11 No mitigation is required.

12 *Residual Impacts*

13 There would be no impacts.

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

17 **CEQA Impact Determination**

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

22 *Mitigation Measures*

23 No mitigation is required.

24 *Residual Impacts*

25 There would be no impacts.

26 **NEPA Impact Determination**

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

31 *Mitigation Measures*

32 No mitigation is required.

33 *Residual Impacts*

34 There would be no impacts.

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

4 **CEQA Impact Determination**

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

11 *Mitigation Measures*

12 No mitigation is required.

13 *Residual Impacts*

14 Impacts would be less than significant.

15 **NEPA Impact Determination**

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

20 *Mitigation Measures*

21 No mitigation is required.

22 *Residual Impacts*

23 There would be no impacts.

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

28 **CEQA Impact Determination**

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

31 *Mitigation Measures*

32 No mitigation is required.

33 *Residual Impacts*

34 There would be no impacts.

35

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

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

4 *Mitigation Measures*

5 No mitigation is required.

6 *Residual Impacts*

7 Impacts would be less than significant.

8 **NEPA Impact Determination**

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

12 *Mitigation Measures*

13 No mitigation is required.

14 *Residual Impacts*

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

17 **3.5.4.4.2.3 Alternative 3 – Reduced Project: Four New Cranes**

18 Under Alternative 3, four new cranes would be added to the existing wharf along Berths
19 302-305 and only minor improvements to the existing APL Terminal would be made
20 utility infrastructure and conversion of dry container storage to reefers). No other upland
21 terminal improvements would be constructed. The existing terminal is berth-constrained,
22 and adding the additional four cranes would improve the terminal's efficiency.

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

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

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

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

14 **CEQA Impact Determination**

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

21 *Mitigation Measures*

22 No mitigation is required.

23 *Residual Impacts*

24 Impacts would be less than significant.

25 **NEPA Impact Determination**

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

32 *Mitigation Measures*

33 No mitigation is required.

34 *Residual Impacts*

35 Impacts would be less than significant.

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

39 Construction of Alternative 3 would include the installation of four new cranes along the
40 existing wharf along Berths 302-305, and operations would increase to approximately
41 2.58 million TEUs by 2027. Impacts due to tsunamis and seiches are typical for the

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

6 **CEQA Impact Determination**

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

25 *Mitigation Measures*

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

29 *Residual Impacts*

30 Impacts would be less than significant.

31 **NEPA Impact Determination**

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

1 *Mitigation Measures*

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

5 *Residual Impacts*

6 Impacts would be less than significant.

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

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

19 **CEQA Impact Determination**

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

28 *Mitigation Measures*

29 No mitigation is required.

30 *Residual Impacts*

31 Impacts would be less than significant.

32 **NEPA Impact Determination**

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

38

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

4 Impacts would be less than significant.

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

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

13 **CEQA Impact Determination**

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

24 *Mitigation Measures*

25 No mitigation is required.

26 *Residual Impacts*

27 Impacts would be less than significant.

28 **NEPA Impact Determination**

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

34 *Mitigation Measures*

35 No mitigation is required.

36 *Residual Impacts*

37 Impacts would be less than significant.

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

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

6 **CEQA Impact Determination**

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

9 *Mitigation Measures*

10 No mitigation is required.

11 *Residual Impacts*

12 There would be no impacts.

13 **NEPA Impact Determination**

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

17 *Mitigation Measures*

18 No mitigation is required.

19 *Residual Impacts*

20 There would be no impacts.

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

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

29 **CEQA Impact Determination**

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

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

4 Impacts would be less than significant.

5 **NEPA Impact Determination**

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

12 *Mitigation Measures*

13 No mitigation is required.

14 *Residual Impacts*

15 Impacts would be less than significant.

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

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

22 **CEQA Impact Determination**

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

26 *Mitigation Measures*

27 No mitigation is required.

28 *Residual Impacts*

29 There would be no impacts.

30 **NEPA Impact Determination**

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

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

4 There would be no impacts.

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

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

12 **CEQA Impact Determination**

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

16 *Mitigation Measures*

17 No mitigation is required.

18 *Residual Impacts*

19 There would be no impacts.

20 **NEPA Impact Determination**

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

24 *Mitigation Measures*

25 No mitigation is required.

26 *Residual Impacts*

27 There would be no impacts.

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

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

34

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.

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

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

20 **CEQA Impact Determination**

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

27 *Mitigation Measures*

28 No mitigation is required.

29 *Residual Impacts*

30 Impacts would be less than significant.

31 **NEPA Impact Determination**

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

38 *Mitigation Measures*

39 No mitigation is required.

40 *Residual Impacts*

41 Impacts would be less than significant.

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

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

15 **CEQA Impact Determination**

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

35 *Mitigation Measures*

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

39 *Residual Impacts*

40 Impacts would be less than significant.

41 **NEPA Impact Determination**

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

1 flooding from earthquake-based tsunamis or seiches is likely. In-water construction
2 activities could be subject to risk should a large tsunami occur during construction
3 activities, however, the likelihood of this occurring is remote. LAHD's Risk
4 Management Plan contains applicable risk management measures and policies (LAHD,
5 1983). Also, as discussed further in Section 3.8, Hazards and Hazardous Materials, the
6 LAHD has a Port-wide emergency notification system in place to warn of tsunamis or
7 other hazards by telephone/email/text alerts, which would serve to reduce potential risks
8 (Malin pers. comm., 2011). The Port has also implemented measures to minimize
9 impacts from seiches or tsunamis, such as the breakwater and constructing facilities at
10 adequate elevation and LAHD lease requirements related to emergency response
11 planning and training. Based on the above, impacts during the construction and
12 operational periods relative risk of substantial damage or injury involving tsunamis or
13 seiches would be less than significant under NEPA.

14 *Mitigation Measures*

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

18 *Residual Impacts*

19 Impacts would be less than significant.

20 **Impact GEO-3: Construction and operation of Alternative 4 would not** 21 **result in substantial damage to structures or infrastructure or expose** 22 **people to substantial risk of injury from subsidence/soil settlement.**

23 Alternative 4 would include the installation of six new cranes along Berths 302-305,
24 development of additional backlands, and relinquishment of the existing 30 acres under
25 space assignment. Alternative 4 would be designed and constructed in compliance with
26 recommendations of a geotechnical engineer, consistent with Sections 91.000 through
27 91.7016 of the LAMC, and applicable criteria established by LAHD, which are measures
28 intended to prevent settlement or subsidence events that could result in substantial
29 damage to structures or infrastructure or expose people to substantial risk of injury.
30 Implementation of these standard measures would reduce the risk associated with
31 settlement or subsidence impacts that could result in substantial damage to structures or
32 infrastructure or exposure of people to substantial risk of injury.

33 **CEQA Impact Determination**

34 As with the proposed Project, Alternative 4 would be designed and constructed to comply
35 with criteria established by LAHD, Sections 91.000 through 91.7016 of the LAMC, and
36 would incorporate standard geotechnical engineering requirements (including
37 recommendations from geotechnical evaluations that are conducted during the design
38 phase). Compliance with applicable standards and policies related to subsidence and
39 differential settlement issues would ensure that construction and operation of Alternative
40 4 would not result in substantial damage to structures or infrastructure or expose people
41 to substantial risk of injury arising from subsidence or differential soil settlement.
42 Therefore, impacts would be less than significant under CEQA.

43

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

4 Impacts would be less than significant.

5 **NEPA Impact Determination**

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

12 *Mitigation Measures*

13 No mitigation is required.

14 *Residual Impacts*

15 Impacts would be less than significant.

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

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

25 **CEQA Impact Determination**

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

35 *Mitigation Measures*

36 No mitigation is required.

37 *Residual Impacts*

38 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,

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

3 **CEQA Impact Determination**

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

9 *Mitigation Measures*

10 No mitigation is required.

11 *Residual Impacts*

12 Impacts would be less than significant.

13 **NEPA Impact Determination**

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

20 *Mitigation Measures*

21 No mitigation is required.

22 *Residual Impacts*

23 Impacts would be less than significant.

24 **Impact GEO-7: Construction and operation of Alternative 4 would not** 25 **result in the destruction, permanent covering or the material and** 26 **adverse modification of one or more distinct and prominent geologic** 27 **or topographic features.**

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

30 **CEQA Impact Determination**

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

33 *Mitigation Measures*

34 No mitigation is required.

35 *Residual Impacts*

36 There would be no impacts.

1 **NEPA Impact Determination**

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

5 *Mitigation Measures*

6 No mitigation is required.

7 *Residual Impacts*

8 There would be no impacts.

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

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

16 **CEQA Impact Determination**

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

21 *Mitigation Measures*

22 No mitigation is required.

23 *Residual Impacts*

24 There would be no impacts.

25 **NEPA Impact Determination**

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

29 *Mitigation Measures*

30 No mitigation is required.

31 *Residual Impacts*

32 There would be no impacts.

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

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

7 **CEQA Impact Determination**

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

12 *Mitigation Measures*

13 No mitigation is required.

14 *Residual Impacts*

15 Impacts would be less than significant.

16 **NEPA Impact Determination**

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

20 *Mitigation Measures*

21 No mitigation is required.

22 *Residual Impacts*

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

25 **3.5.4.4.2.5 Alternative 5 – Reduced Project: No Space Assignment**

26 Alternative 5 would improve the existing terminal, construct a new wharf (1,250 ft)
27 creating Berth 306, add 12 new cranes to Berths 302-306, add 56 acres for backlands,
28 wharfs, and gates improvements, construct electrification infrastructure in the backlands
29 behind Berths 305-306, and relinquish the 30 acres currently on space assignment. This
30 alternative would be the same as the proposed Project, except that EMS would relinquish
31 the 30 acres of backlands under space assignment. As with the proposed Project, the 41-
32 acre backlands and Berth 306 under Alternative 5 could utilize traditional container
33 operations, electric automated operations, or a combination of the two over time.
34 Dredging of the Pier 300 Channel along the new wharf at Berth 306 (approximately
35 20,000 cy) would occur, with the dredged material beneficially reused, and/or disposed of
36 at an approved disposal site (such as the CDF at Berths 243-245 and/or Cabrillo shallow
37 water habitat) or, if needed, disposed of at an ocean disposal site (i.e., LA-2).

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

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

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

12 Alternative 5 would extend the wharf by 1,250 lf, construct Berth 306, install 12 new
13 cranes to the wharf along Berths 302-306, dredge approximately 20,000 cy from the Pier
14 300 Channel along Berth 306, develop the existing 41-acre fill area as backlands, and
15 relinquish the existing 30 acres of backlands currently under space assignment. Under
16 this alternative, terminal throughput would reach approximately 3.2 million TEUs by
17 year 2027. As with the proposed Project, Alternative 5 would result in a minor increase
18 in the exposure of people and property to seismic hazards relating to current and future
19 baseline conditions. Seismic hazards are common to the Los Angeles region and
20 Alternative 5 would not increase them.

21 **CEQA Impact Determination**

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

28 *Mitigation Measures*

29 No mitigation is required.

30 *Residual Impacts*

31 Impacts would be less than significant.

32 **NEPA Impact Determination**

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

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

4 Impacts would be less than significant.

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

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

16 **CEQA Impact Determination**

17 The elevation of the proposed site would be approximately 15 ft above MLLW and no
18 substantial risk of flooding from earthquake-based tsunamis or seiches is likely. In-water
19 construction activities could be subject to risk should a large tsunami occur during
20 construction activities, however, the likelihood of this occurring is remote. LAHD's Risk
21 Management Plan contains applicable risk management measures and policies (LAHD,
22 1983). Also, as discussed further in Section 3.8, Hazards and Hazardous Materials, the
23 LAHD has a Port-wide emergency notification system in place to warn of tsunamis or
24 other hazards by telephone/email/text alerts which would serve to reduce potential risks
25 (Malin pers. comm., 2011). The Port has also implemented measures to minimize
26 impacts from seiches or tsunamis, such as the breakwater and constructing facilities at
27 adequate elevation and LAHD lease requirements related to emergency response
28 planning and training. Based on the above, impacts during the construction and
29 operational periods relative risk of substantial damage or injury involving tsunamis or
30 seiches would be less than significant under CEQA.

31 *Mitigation Measures*

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

35 *Residual Impacts*

36 Impacts would be less than significant.

37 **NEPA Impact Determination**

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

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

11 *Mitigation Measures*

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

15 *Residual Impacts*

16 Impacts would be less than significant.

17 **Impact GEO-3: Construction and operation of Alternative 5 would not** 18 **result in substantial damage to structures or infrastructure or expose** 19 **people to substantial risk of injury from subsidence/soil settlement.**

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

30 **CEQA Impact Determination**

31 As with the proposed Project, Alternative 5 would be designed and constructed to comply
32 with criteria established by LAHD, Sections 91.000 through 91.7016 of the LAMC, and
33 would incorporate standard geotechnical engineering requirements (including
34 recommendations from geotechnical evaluations that are conducted during the design
35 phase). Compliance with applicable standards and policies related to subsidence and
36 differential settlement issues would ensure that construction and operation of Alternative
37 5 would not result in substantial damage to structures or infrastructure or expose people
38 to substantial risk of injury arising from subsidence or differential soil settlement.
39 Therefore, impacts would be less than significant under CEQA.

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

4 Impacts would be less than significant.

5 **NEPA Impact Determination**

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

12 *Mitigation Measures*

13 No mitigation is required.

14 *Residual Impacts*

15 Impacts would be less than significant.

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

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

23 **CEQA Impact Determination**

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

33 *Mitigation Measures*

34 No mitigation is required.

35 *Residual Impacts*

36 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

1 related to saturated or collapsible soils, would be implemented. Operation of Alternative
2 5 would not include excavation.

3 **CEQA Impact Determination**

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

8 *Mitigation Measures*

9 No mitigation is required.

10 *Residual Impacts*

11 Impacts would be less than significant.

12 **NEPA Impact Determination**

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

19 *Mitigation Measures*

20 No mitigation is required.

21 *Residual Impacts*

22 Impacts would be less than significant.

23 **Impact GEO-7: Construction and operation of Alternative 5 would not** 24 **result in the destruction, permanent covering or the material and** 25 **adverse modification of one or more distinct and prominent geologic** 26 **or topographic features.**

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

29 **CEQA Impact Determination**

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

32 *Mitigation Measures*

33 No mitigation is required.

34 *Residual Impacts*

35 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 Alternative 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.

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

7 Alternative 6 would operate the terminal with an additional 12 new A-frame cranes, a
8 new wharf, dredged Berths 302-306, increased backlands, and an expanded on-dock
9 railyard. Under Alternative 6, annual cargo throughput would increase to approximately
10 3.2 million TEUs by year 2027. As with the proposed Project, increased exposure of
11 people and property during construction related to seismic hazards cannot be precluded
12 under Alternative 6. However, seismic hazards are common to the Los Angeles and
13 southern California region would not be increased by this alternative.

14 **CEQA Impact Determination**

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

22 *Mitigation Measures*

23 No mitigation is required.

24 *Residual Impacts*

25 Impacts would be less than significant.

26 **NEPA Impact Determination**

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

33 *Mitigation Measures*

34 No mitigation is required.

35 *Residual Impacts*

36 Impacts would be less than significant.

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

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

14 **CEQA Impact Determination**

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

29 *Mitigation Measures*

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

33 *Residual Impacts*

34 Impacts would be less than significant.

35

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.

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

4 Impacts would be less than significant.

5 **NEPA Impact Determination**

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

12 *Mitigation Measures*

13 No mitigation is required.

14 *Residual Impacts*

15 Impacts would be less than significant.

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

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

24 **CEQA Impact Determination**

25 As with the proposed Project, the design and construction of terminal improvements
26 under Alternative 6 would comply with the recommendations of a geotechnical engineer,
27 consistent with Sections 91.000 through 91.7016 of the LAMC and in conjunction with
28 criteria established by LAHD. Compliance with applicable standards and policies related
29 to expansive or unstable soils would ensure that construction and operation of Alternative
30 6 would not result in substantial damage to structures or infrastructure or expose people
31 to substantial risk of injury arising from subsidence or differential soil settlement.
32 Therefore, construction and operational impacts related to expansive soils would be less
33 than significant under CEQA.

34 *Mitigation Measures*

35 No mitigation is required.

36 *Residual Impacts*

37 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.

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

5 **CEQA Impact Determination**

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

10 *Mitigation Measures*

11 No mitigation is required.

12 *Residual Impacts*

13 Impacts would be less than significant.

14 **NEPA Impact Determination**

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

21 *Mitigation Measures*

22 No mitigation is required.

23 *Residual Impacts*

24 Impacts would be less than significant.

25 **Impact GEO-7: Construction and operation of Alternative 6 would not** 26 **result in the destruction, permanent covering or the material and** 27 **adverse modification of one or more distinct and prominent geologic** 28 **or topographic features.**

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

31 **CEQA Impact Determination**

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

35

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

4 There would be no impacts.

5 **NEPA Impact Determination**

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

9 *Mitigation Measures*

10 No mitigation is required.

11 *Residual Impacts*

12 There would be no impacts.

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

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

20 **CEQA Impact Determination**

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

25 *Mitigation Measures*

26 No mitigation is required.

27 *Residual Impacts*

28 There would be no impacts.

29 **NEPA Impact Determination**

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

34

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

4 There would be no impacts.

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

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

11 **CEQA Impact Determination**

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

16 *Mitigation Measures*

17 No mitigation is required.

18 *Residual Impacts*

19 Impacts would be less than significant.

20 **NEPA Impact Determination**

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

24

1 *Mitigation Measures*

2 No mitigation is required.

3 *Residual Impacts*

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

6 **3.5.4.5 Summary of Impact Determinations**

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

13 For each impact threshold, the table describes the impact, notes the CEQA and NEPA
14 impact determinations, describes applicable mitigation measures, and notes the residual
15 impacts (i.e., the impact remaining after mitigation). The impacts, whether significant or
16 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
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

1 **3.5.4.6 Mitigation Monitoring**

2 In the absence of significant impacts, mitigation measures are not required. Compliance
 3 with existing regulations and implementation of the following lease measure (described
 4 below and under Impact GEO-2) would contribute to preparing construction and
 5 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

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7 **3.5.5 Significant Unavoidable Impacts**

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

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