

3.5

GEOLOGY

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3.5.1 Introduction

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This section presents the geologic conditions for the proposed Project area and analyzes: (1) seismic hazards including surface rupture, ground shaking, liquefaction, subsidence, tsunamis, and seiches; (2) other geologic issues including potentially unstable soils and slopes; and (3) mineral resources. This evaluation is based on published reports and the general geologic setting as indicators of potential geologic hazards. The proposed Project would be exposed to significant and unavoidable seismic- and tsunami-related impacts as a result of numerous active faults in southern California, as well as the relatively low elevation of Port berths and backland areas.

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3.5.2 Environmental Setting

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3.5.2.1 Regional Setting

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The proposed Project is located near sea level on Holocene alluvial outwash materials, Pleistocene terrace deposits, and Pleistocene Palos Verdes Sand, within the southwestern structural block of the Los Angeles Basin Province (Bryant 1987; Kennedy 1975; Yerkes et al. 1965). The southwestern structural block, one of four such blocks underlying the Los Angeles Basin, is marked by a northwest-southeast trending fault system (Yerkes et al. 1965) (Figure 3.5-1).

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3.5.2.1.1 Seismicity and Major Faults

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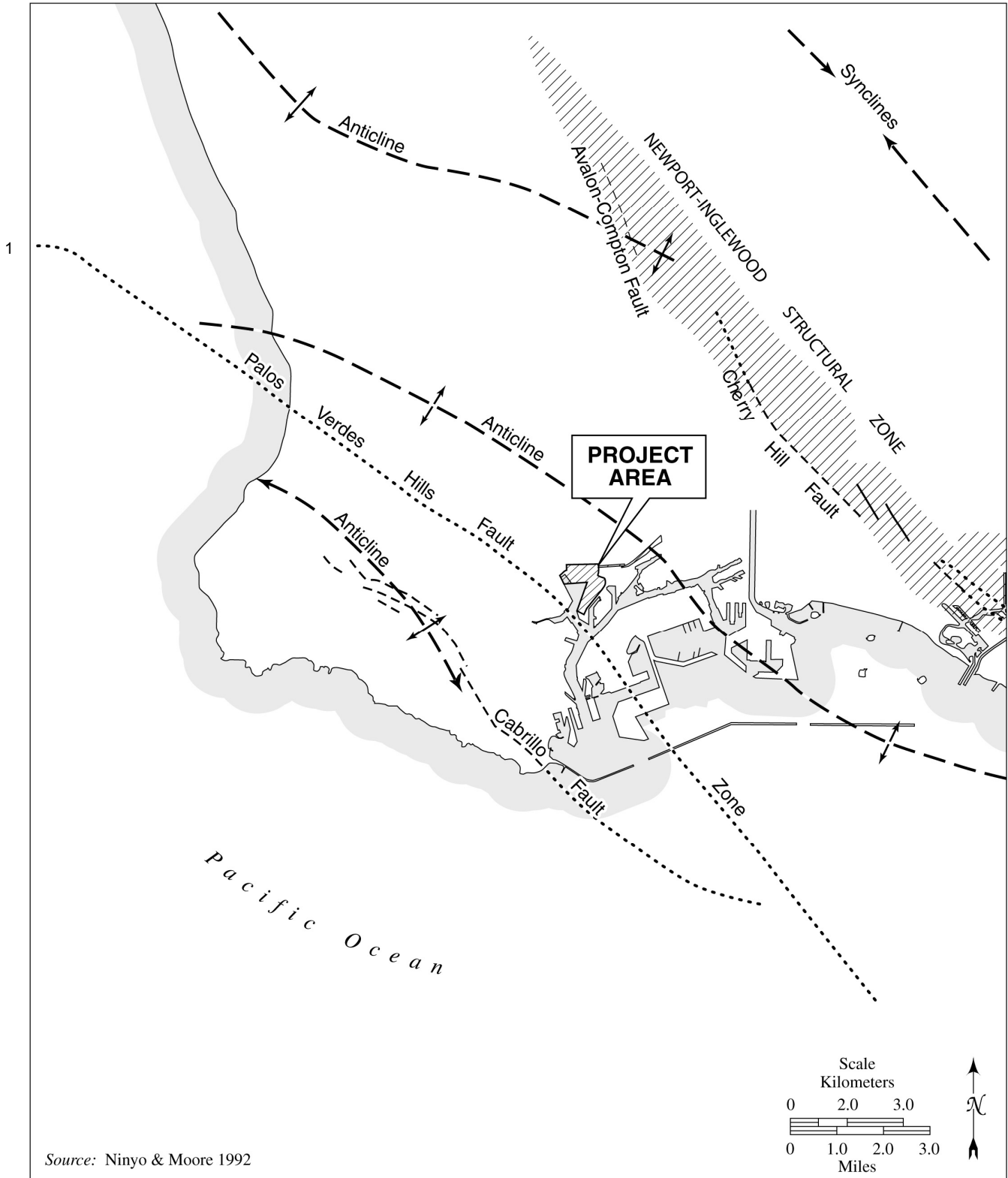
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An earthquake is classified by the magnitude of wave movement (related to the amount of energy released), which traditionally has been quantified using the Richter scale. This is a logarithmic scale, wherein each whole number increase in Richter magnitude (M) represents a tenfold increase in the wave magnitude generated by an earthquake. A Richter magnitude 8.0 earthquake is not twice as large as a M4.0 earthquake; it is 10,000 times larger (i.e., 10^4 , or $10 \times 10 \times 10 \times 10$). Damage typically begins at M5.0.



Source: Ninyo & Moore 1992

Figure 3.5-1. Local Faults and Geologic Structures – West Los Angeles Basin

1 Earthquakes of M6.0 to 6.9 are classified as moderate; those between 7.0 and 7.9 are
2 classified as major; and those of 8.0 or greater are classified as great.

3 Southern California is recognized as one of the most seismically active areas in the
4 United States. The region has been subjected to at least 52 major earthquakes, of
5 magnitude 6 or greater, since 1796. Ground motion in the region is generally the
6 result of sudden movements of large blocks of the earth's crust along faults. Great
7 earthquakes, like the 1857 San Andreas Fault earthquake (see Table 3.5-1), are quite
8 rare in Southern California. Earthquakes of magnitude 7.8 or greater occur at the rate
9 of about two or three per 1,000 years, corresponding to a 6 to 9 percent probability in
10 30 years. However, the probability of a magnitude 7.0 or greater earthquake in
11 Southern California before 2024 is 85 percent (Working Group on California
12 Earthquake Probabilities 1995).

13 Seismic analyses generally include discussions of maximum credible and maximum
14 probable earthquakes. A maximum credible earthquake (MCE) is the largest event a
15 fault is believed to be capable of generating. The probability of occurrence is not
16 considered in this characterization. The maximum probable earthquake (MPE) is the
17 largest earthquake to have occurred on a given fault within the last 200 years, or is an
18 earthquake that ruptures 10 percent of the total length of the fault. In addition, the Port
19 of Los Angeles (Port) uses a combination of probabilistic and deterministic seismic
20 hazard assessment for seismic design. Probabilistic hazard assessments are required to
21 define two-level design events, including the Operational Level Earthquake (OLE),
22 which is the peak horizontal firm ground acceleration with a 50 percent probability of
23 exceedance in 50 years, and the Contingency Level Earthquake (CLE), which is the
24 peak ground acceleration with a 10 percent probability of exceedance in 50 years.

25 **3.5.2.1.2 Faults**

26 Segments of the active Palos Verdes Fault cross the Los Angeles Harbor in the
27 vicinity of the West Basin portion of the Port (Figure 3.5-1 - Palos Verdes).
28 Although well constrained in the channel areas of the Harbor, such as at the
29 intersection of the West Basin and the Southwest Slip, the onshore location of the
30 fault zone in the West Basin area is not well defined. However, current data depicted
31 in Figure 3.5-1 suggest the fault most likely crosses north-northwest across Berths
32 121-132 and immediately southwest of Berths 136-147. Recent studies indicate that
33 the MCE for the Palos Verdes Fault is Richter magnitude 7.25, with a recurrence
34 interval of 900 years and peak ground accelerations in the Port area of 0.28g and
35 0.52g, for the OLE and CLE, respectively (EMI 2001, McNeilan et al. 1996).

36 Numerous other active faults and fault zones are located within the general region,
37 such as the Newport-Inglewood, San Pedro, Whittier-Elsinore, Santa Monica,
38 Hollywood, Raymond, San Fernando, Sierra Madre, Cucamonga, San Jacinto, and
39 San Andreas faults. Table 3.5-2 presents potentially hazardous faults and anticipated
40 earthquake magnitudes in the Los Angeles Basin area.

41 Active faults, such as those noted above, are typical of Southern California.
42 Therefore, it is reasonable to expect a strong ground motion seismic event during the
43 lifetime of any proposed project in the region.

Table 3.5-1. Known Earthquakes with Richter Magnitude Greater than 5.5 in the Los Angeles Basin Area

<i>Fault Name</i>	<i>Date</i>	<i>Richter Magnitude</i>
Palos Verdes Fault	*	*
San Pedro Basin Fault	*	*
Santa Monica-Raymond Fault	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	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
<i>Note:</i> * No known earthquakes within the last 200 years.		
<i>Source:</i> Ninyo & Moore (1992); U.S. Geological Survey/Caltech (1992, 1994).		

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Table 3.5-2. Hazardous Faults and Bedrock Accelerations — Los Angeles Basin Area

<i>Fault Name</i>	<i>Distance in Miles</i>	<i>Richter Magnitude (Ziony 1985)</i>	<i>Maximum Credible Earthquake Magnitude (Greensfelder 1974)</i>	<i>Duration in seconds (Bolt 1973)</i>
Palos Verdes Fault	<1	6.4-6.6	7.25*	26
Newport-Inglewood Structural Zone	5	6.5-6.7	7	26
San Pedro Basin Fault	15	6.3-6.6	no data	18
Whittier-Elsinore Fault Zone	22	6.4-6.7	7.5	16
Santa Monica-Raymond Fault	23	6.2-6.6	7.5	15
San Fernando-Cucamonga Fault	31	6.4-6.5	6.5	14
San Jacinto Fault	57	6.4-7.0	7.5	22
San Andreas Fault	53	7.2-8.1	8.25	28
<i>Source:</i> Ninyo & Moore (1992), *EMI (2001)				

2 Numerous active faults located off site are capable of generating earthquakes in the
3 proposed Project area (Tables 3.5-1 and 3.5-2). Most noteworthy, due to its
4 proximity to the site, is the Newport-Inglewood Fault, which has generated
5 earthquakes of magnitudes ranging from 4.7 to 6.3 Richter scale (LAHD 1991a).
6 Large events could occur on more distant faults in the general area, but because of
7 the greater distance from the site, earthquakes generated on these faults may be
8 considered less significant with respect to ground accelerations.

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1 In 1974, the California Division of Mines and Geology (CDMG) was designated by
2 the Alquist-Priolo Act to delineate those faults deemed active and likely to rupture
3 the ground surface. No faults within the area of the Port are currently zoned under
4 the Alquist-Priolo Act; however, there is evidence that the Palos Verdes Fault, which
5 lies beneath the West Basin, may be active and ground rupture cannot be ruled out
6 (Fischer et al. 1987; McNeilan et al. 1996).

7 **3.5.2.1.3 Liquefaction**

8 Liquefaction is defined as the transformation of a granular material from a solid state
9 into a liquefied state as a consequence of increased pore pressure, which results in the
10 loss of grain-to-grain contact. Seismic groundshaking is capable of providing the
11 mechanism for liquefaction, usually in fine-grained, loose to medium dense, saturated
12 sands and silts. The effects of liquefaction may be excessive if total and/or differential
13 settlement of structures occurs on liquefiable soils.

14 Natural drainages at Port berths have been backfilled with undocumented fill
15 materials. Dredged materials from the harbor area were spread across lower
16 Wilmington from 1905 until 1910 or 1911 (Ludwig 1927). In addition, the natural
17 alluvial deposits below the site generally are unconsolidated, soft, and saturated.
18 Groundwater is present at depths as shallow as 2 to 6 feet beneath the site. These
19 conditions are conducive to liquefaction.

20 Some authors (Tinsley and Youd 1985; Topozada et al. 1988; Davis et al. 1982) have
21 indicated that the liquefaction potential in the Harbor area during a major earthquake on
22 either the San Andreas or Newport-Inglewood fault is high. The proposed Project site is
23 identified as an area susceptible to liquefaction in the City of Los Angeles General Plan,
24 Safety Element because of the presence of recent alluvial deposits and groundwater less
25 than 30 feet below ground surface (City of Los Angeles 1996). Other authors (e.g., Pyke
26 1990) indicate that the overall probability of widespread liquefaction of uncompacted
27 hydraulic fills and major damage in the Port is judged to be relatively low. However,
28 even minor damage resulting from liquefaction can be very significant in terms of loss of
29 functionality and repair costs (Pyke 1990).

30 **3.5.2.1.4 Tsunamis**

31 Tsunamis are gravity waves of long wavelength generated by a sudden disturbance in
32 a body of water. Typically, oceanic tsunamis are the result of sudden vertical
33 movement along a fault rupture in the ocean floor, submarine landslides or
34 subsidence, or volcanic eruption, where the sudden displacement of water sets off
35 transoceanic waves with wavelengths of up to 125 miles (200 km) and with periods
36 generally from 5 to 60 minutes. The trough of the tsunami wave arrives first leading
37 to the classic retreat of water from the shore as the ocean level drops. This is
38 followed by the arrival of the crest of the wave which can run up on the shore in the
39 form of bores or surges in shallow water or simple rising and lowering of the water
40 level in relatively deeper water such as in harbor areas.

41 Tsunamis are a relatively common natural hazard, although most of the events are
42 small in amplitude and not particularly damaging. However, in the event of a large

1 submarine earthquake or landslide, coastal flooding may be caused by either run-up
2 of broken tsunamis in the form of bores and surges or by relatively dynamic flood
3 waves. In the process of bore/surge-type run-up, the onshore flow (up to tens of feet
4 per second) can cause tremendous dynamic loads on the structures onshore in the
5 form of impact forces and drag forces, in addition to hydrostatic loading. The
6 subsequent drawdown of the water after run-up exerts the often crippling opposite
7 drags on the structures and washes loose/broken properties and debris to sea; the
8 floating debris brought back on the next onshore flow have been found to be a
9 significant cause of extensive damage after successive run-up and drawdown. As has
10 been shown historically, the potential loss of human life in the process can be great if
11 such events occur in populated areas.

12 Abrupt sea level changes associated with tsunamis in the past have reportedly caused
13 damage to moored vessels within the outer portions of the Los Angeles Harbor. The
14 Chilean Earthquake of May 1960, for example, caused local damages of over \$1
15 million and Harbor closure. One person drowned at Cabrillo Beach and one was
16 injured. Small craft moorings in the Harbor area, especially in the Cerritos Channel,
17 where a seiche occurred, were seriously damaged. Hundreds of small boats broke
18 loose from their moorings, 40 sank, and about 200 were damaged. Gasoline from
19 damaged boats caused a major spill in the Harbor waters and created a fire hazard.
20 Currents of up to 8 knots and a 6-ft (1.8-m) rise of water in a few minutes were
21 observed in the West Basin. The maximum water level fluctuations recorded by
22 gauges were 5.0 ft (1.5 m) at Port Berth 60 (near Pilot Station) and 5.8 ft (1.8 m) in
23 Long Beach Harbor (National Geophysical Data Center 1993).

24 Until recently, projected tsunami run-ups along the western U.S. were based on
25 farfield events, such as submarine earthquakes or landslides occurring at great
26 distances from the U.S., as described above for the Chilean Earthquake of May 1960.
27 Based on such distant sources, tsunami-generated wave heights of between 6.5 ft (2
28 m) and 8 ft (2.4m) above mean lower low water (MLLW), at 100-year intervals, and
29 between 10 ft (3 m) and 11 ft (3.4 m), at 500-year intervals, were projected, including
30 the effects of astronomical tides (Houston 1980). MLLW is the benchmark from
31 which infrastructure (e.g., wharf and berth heights) is measured in the Port. These
32 runup estimates by Houston (1980) were used for the tsunami analysis contained in
33 the Deep Draft Navigation Improvements EIR/EIS in September 1992 (USACE and
34 LAHD 1992).

35 However, more recent studies (e.g., Synolakis et al. 1997; Borrero et al. 2001;
36 Borrero et al. 2005a) have projected larger tsunami run-ups based on near-field
37 events, such as earthquakes or submarine landslides occurring in proximity to the
38 California coastline. Offshore faults present a larger local tsunami hazard than
39 previously thought, posing a direct threat to nearshore facilities. For example, one of
40 the largest such features, the Catalina Fault, lies directly underneath Catalina Island,
41 located only 22 miles (35 km) from the Port. Simulations of tsunamis generated by
42 uplift on this fault suggest waves in the Port in excess of 12 ft (3.7 m), with an arrival
43 time within 20 minutes (Legg et al. 2003; Borrero et al. 2005b). These simulations
44 were based on rare events, representing worst-case scenarios.

45 In addition, landslide derived tsunamis are now perceived as a viable local tsunami
46 hazard. Such tsunamis can potentially be more dangerous, due to the lack of warning

1 for such an event. This mechanism is illustrated by an earthquake in 1998, centered
2 onshore Papua-New Guinea, which appears to have created an offshore landslide that
3 caused tsunami inundation heights in excess of 33 ft (10 m), claiming more than 2,500
4 lives. In a study modeling potential tsunami generation by local offshore earthquakes,
5 Legg et al. (2004), considers the relative risk of tsunamis from a large catastrophic
6 submarine landslide (likely generated by a seismic event) in offshore southern
7 California versus fault-generated tsunamis. The occurrence of a large submarine
8 landslide appears quite rare by comparison with the tectonic faulting events. Although
9 many submarine landslides have been mapped off the Southern California shore, few
10 appear to be of the scale necessary to generate a catastrophic tsunami. Of two large
11 landslides that appear to be of this magnitude, Legg et al. (2004) indicated that one
12 landslide is over 100,000 years old and the other landslide approximately 7,500 year
13 old. In contrast, the recurrence of 3 to 20 ft (1 to 6 m) fault movements on offshore
14 faults would be several hundred to several thousand years. Consequently, the study
15 concludes that the most likely direct cause of most of the local tsunamis in Southern
16 California is tectonic movement during large offshore earthquakes.

17 Based on these recent studies (e.g., Synolakis et al. 1997; Borrero et al. 2001), the
18 California State Lands Commission (CSLC) has developed tsunami run-up projections
19 for the Ports of Los Angeles and Long Beach of 8.0 ft (2.4 m) and 15.0 ft (4.6 m) above
20 mean sea level (MSL), at 100- and 500-year intervals, respectively, as a part of their
21 Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS) (CSLC
22 2004). However, these projections do not incorporate consideration of the localized
23 landfill configurations, bathymetric features, and the interaction of the diffraction,
24 reflection, and refraction of the tsunami wave propagation within the Los
25 Angeles/Long Beach Port Complex in its predictions of tsunami wave heights.

26 Most recently, a model has been developed specifically for the Los Angeles/Long
27 Beach Port Complex that incorporates consideration of the localized landfill
28 configurations, bathymetric features, and the interaction of the diffraction, reflection,
29 and refraction of tsunami wave propagation, in the predictions of tsunami wave
30 heights (Moffatt and Nichol 2007, see Appendix J). The Port Complex model uses a
31 methodology similar to the above studies to generate a tsunami wave from several
32 different potential sources, including local earthquakes, remote earthquakes, and
33 local submarine landslides. This model indicates that a reasonable maximum source
34 for future tsunami events at the proposed Project site would either be a magnitude 7
35 earthquake on the Santa Catalina Fault or a submarine landslide along the nearby
36 Palos Verdes Peninsula.

37 The Port Complex model predicts tsunami wave heights of 1.3 to 5.3 ft (0.4 to 1.6 m)
38 above MSL at the proposed Project site. The areas of highest anticipated water levels
39 are the northwest section of West Basin (Berths 134 and 135), where maximum water
40 levels of 4.6 to 5.3 ft (1.4 to 1.6 m) above MSL could occur. The area of lowest
41 anticipated tsunami-induced water levels, under this scenario, is the southeast portion
42 of West Basin (Berths 145 to 147), where water levels of 1.3 to 2.0 ft (0.4 to 0.6 m)
43 above MSL is possible.

3.5.2.1.5 Seiches

Seiches are seismically induced water waves that surge back and forth in an enclosed basin and may be expected in the harbor as a result of earthquakes. Any significant wave front could cause damage to seawalls and docks, and could breach sea walls at the proposed Project site. Modern shoreline protection techniques are designed to resist seiche damage. The Los Angeles/Long Beach Port Complex model referred to above considered impacts from tsunamis and seiches. In each case, impacts from a tsunami were equal to or more severe than those from a seiche. As a result, the impact discussion below refers primarily to tsunamis as this will be considered the worst case of potential impacts.

3.5.2.1.6 Subsidence

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

Subsidence in the Los Angeles-Long Beach Harbor area was first observed in 1928. It has affected the majority of the harbor area. Based on extensive studies by the City of Long Beach and the California Division of Oil and Gas and Geothermal Resources, it has been determined that most of the subsidence was the result of oil and gas production from the Wilmington Oil Field following its discovery in 1936.

The proposed Project area experienced maximum cumulative subsidence of approximately 1.6 feet (0.5 m), from 1928 to 1970 (Allen 1973). Today, water injection continues to be maintained at rates greater than the total volume of produced substances, including oil, gas, and water, to prevent further reservoir compaction and subsidence (City of Long Beach 2006).

3.5.2.1.7 Landslides

Generally, a landslide is defined as the downward and outward movement of loosened rock or earth down a hillside or slope. Landslides can occur either very suddenly or slowly, and frequently accompany other natural hazards such as earthquakes, floods, or wildfires. Most landslides are single events, but more than a third are associated with heavy rains or the melting of winter snows. Landslides can also be triggered by ocean wave action or induced by the undercutting of slopes during construction, improper artificial compaction, or saturation from sprinkler systems or broken water pipes. In areas on hillsides where the ground cover has been destroyed, landslides are probable because there is nothing to hold the soil. Immediate dangers from landslides include destruction of property and possible fatalities from rocks, mud, and water sliding downhill or downstream. Other dangers include broken electrical, water, gas, and sewage lines. The proposed Project site is relatively flat and paved, and no known or probable bedrock landslide areas have been identified (City of Los Angeles 1996).

3.5.2.1.8 Expansive Soils

Expansive soils generally result from specific clay minerals that expand when saturated and shrink in volume when dry. These expansive clay minerals are common in the geologic units in the adjacent Palos Verdes Peninsula. Clay minerals in geologic units at the proposed Project area could be expansive, and previously imported fill soils could be expansive as well.

3.5.2.1.9 Mineral Resources

The northern portion of the proposed Project site, in the vicinity of the proposed Harry Bridges Boulevard Landscaped Area, is located within the Wilmington Oil Field, a broad, asymmetric anticline broken by a series of transverse normal faults that have created seven major oil-producing zones, from which production began in 1936 (Mayuga 1970). The field is approximately 11 miles long and 3 miles wide, covering approximately 13,500 acres. The Wilmington Oil Field produced 84.4 million barrels of oil from January 1998 through October 2002, making it the 6th largest producing oil field in the state (California Department of Conservation 2002). Numerous oil wells were formerly present on the proposed Project site. All of these wells have been abandoned in accordance with California Division of Oil and Gas and Geothermal Resources specifications.

The proposed Project site is located primarily on dredged fill material. According to the CDMG, the proposed Project site is located in a Mineral Resource Zone (MRZ) area classified as “MRZ-1,” which is defined as an area where adequate information indicates that no significant mineral deposits (i.e., aggregate deposits) are present or where it is judged that little likelihood exists for their presence (CDMG 1987).

3.5.3 Applicable Regulations

3.5.3.1 Geologic Hazards

Geologic resources and geotechnical hazards in the proposed Project vicinity are governed primarily by the City of Los Angeles. The conservation and safety elements of the City of Los Angeles General Plan contain policies for the protection of geologic features and avoidance of geologic hazards (City of Los Angeles 1996, 2001b). Local grading ordinances establish detailed procedures for excavation and earthwork required during construction in backland areas. In addition, City of Los Angeles building codes and building design standards for the Port establish requirements for construction of aboveground structures (City of Los Angeles 2002b). Most local jurisdictions rely on the 1997 California Uniform Building Code (UBC) as a basis of seismic design. However, with respect to wharf construction, LAHD standards and specifications would be applied to the design of the proposed Project. The LAHD must comply with regulations of the Alquist-Priolo Act, which regulates development near active faults to mitigate the hazard of a surface fault rupture.

1 The MOTEMS were approved by the California Building Standards Commission on
2 January 19, 2005 and are codified as part of California Code of Regulations, Title 24,
3 Part 2, Marine Oil Terminals, Chapter 31F. These standards apply to all existing
4 marine oil terminals in California and include criterion for inspection, structural
5 analysis and design, mooring and berthing, geotechnical considerations, fire, piping,
6 and mechanical and electrical systems. MOTEMS became effective on January 6,
7 2006 (CSLC 2005). The process of developing the MOTEMS has produced parallel
8 guidelines and recommended provisions. The Seismic Design Guidelines for Port
9 Structures, published in 2001 by the Port International Navigation Association
10 (PIANC) uses text virtually identical to that found in the MOTEMS. The language
11 for the PIANC and the MOTEMS is derived from the Naval Facilities Engineering
12 Service Center Technical Report (TR-2103-SHR), Seismic Criteria for California
13 Marine Oil Terminals (CSLC 2004).

14 **3.5.3.2 Mineral Resources**

15 Excavations and construction in the immediate vicinity of abandoned oil wells is
16 regulated in accordance with standards and procedures as set forth by the California
17 Department of Conservation Division of Oil, Gas, and Geothermal Resources
18 (DOGGR). If any structure is to be located over or in proximity to a previously
19 abandoned well, the well may require re-abandonment. Public Resources Code,
20 section 3208.1, authorizes the State Oil and Gas Supervisor to order re-abandonment
21 of any previously abandoned well when construction of any structure over or in
22 proximity to the well could result in a hazard.

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

31 The distinction between these categories is important for land use considerations.
32 The presence of known mineral resources, which are of regional significance and
33 possibly unique to that particular area, could potentially result in non-approval or
34 changes to a given project if it were determined that those mineral resources would
35 no longer be available for extraction and consumptive use. To be considered
36 significant for the purpose of mineral land classification, a mineral deposit, or a
37 group of mineral deposits that can be mined as a unit, must meet marketability and
38 threshold value criteria adopted by the California State Mining and Geology Board.
39 The criteria vary for different minerals depending on the following: (1) whether the
40 minerals are strategic or non-strategic, (2) the uniqueness or rarity of the minerals,
41 and (3) the commodity-type category (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
45 mining, reclamation, and related land use activities. Local governments are required
46 to incorporate the report and maps into their general plans and consider the
47 information when making land use decisions.

3.5.4 Impacts and Mitigation Measures

3.5.4.1 Methodology

Geological impacts have been evaluated in two ways: (1) impacts of the proposed Project on the local geologic environment; and (2) impacts of geohazards on components of the proposed Project, that may result in substantial damage to structures or infrastructure or expose people to substantial risk of injury. Impacts would be considered significant if the proposed Project meets any of the significance criteria listed in section 3.5.4.2.

3.5.4.1.1 CEQA Baseline

Section 15125 of the CEQA Guidelines requires EIRs to include a description of the physical environmental conditions in the vicinity of a project that exist at the time of the NOP. These environmental conditions would normally constitute the baseline physical conditions by which the CEQA lead agency determines whether an impact is significant. For purposes of this Draft EIS/EIR, the CEQA Baseline for determining the significance of potential impacts under CEQA is December 2003. CEQA Baseline conditions are described in Table 2-2 of Section 2.4.

The CEQA Baseline represents the setting at a fixed point in time, with no project growth over time, and differs from the “No Project” Alternative (discussed in Section 2.5.1) in that the No Project Alternative addresses what is likely to happen at the site over time, starting from the baseline conditions. The No Project Alternative allows for growth at the proposed Project site that would occur without any required additional approvals.

3.5.4.1.2 No Federal Action/NEPA Baseline

For purposes of this Draft EIS/EIR, the evaluation of significance under NEPA is defined by comparing the proposed Project or other alternative to the No Federal Action scenario. The No Federal Action/NEPA Baseline condition for determining significance of impacts coincides with the “No Federal Action” condition, which is defined by examining the full range of construction and operational activities the applicant could implement and is likely to implement absent permits from the USACE. Therefore, the No Federal Action/NEPA Baseline would not include any dredging, filling of the Northwest Slip, wharf construction or upgrades, or crane replacement. The No Federal Action/NEPA Baseline would include construction and operation of all upland elements (existing lands) for backlands or other purposes. The upland elements are assumed to include:

- Adding 57 acres or existing land for backland area and an on-dock rail yard;
- Constructing a 500-space parking lot for union workers;
- Demolishing the existing administration building and constructing a new LEED certified administration building and other terminal buildings;

- 1 • Adding new lighting and replacing existing lighting, fencing, paving, and
- 2 utilities on the backlands;
- 3 • Relocating the Pier A rail yard and constructing the new on-dock rail yard;
- 4 • Widening and realigning Harry Bridges Boulevard; and
- 5 • Developing the Harry Bridges Buffer Area.

6 Unlike the CEQA Baseline, which is defined by conditions at a point in time, the No
7 Federal Action/NEPA Baseline is not bound by statute to a “flat” or “no growth”
8 scenario; therefore, the USACE may project increases in operations over the life of a
9 project to properly analyze the No Federal Action/NEPA Baseline condition.
10 Normally, any ultimate permit decision would focus on direct impacts to the aquatic
11 environment, as well as indirect and cumulative impacts in the uplands determined to
12 be within the scope of federal control and responsibility. Significance of the
13 proposed Project or alternative is defined by comparing the proposed Project or
14 alternative to the No Federal Action/NEPA Baseline (i.e., the increment). The No
15 Federal Action/NEPA Baseline conditions are described in Table 2-2 of Section 2.4.

16 The No Federal Action/NEPA Baseline also differs from the “No Project” Alternative,
17 where the Port would take no further action to construct and develop additional
18 backlands (other than the 176 acres that currently exist). Under this alternative, no
19 construction impacts would occur. However, forecasted increases in cargo throughput
20 would still occur as greater operational efficiencies are made.

21 **3.5.4.2 Thresholds of Significance**

22 The following significance criteria are based on the Los Angeles CEQA Thresholds
23 (City of Los Angeles 2006) and are the basis for determining the significance of
24 impacts associated with geology resulting from development of the proposed Project.

25 Geologic hazard impacts are considered significant if the proposed Project causes or
26 accelerates hazards that would result in substantial damage to structures or infrastructure,
27 or exposes people to substantial risk of injury. Because the region is considered to be
28 geologically active, most projects are exposed to some risk from geologic hazards, such
29 as earthquakes. Geologic impacts are therefore considered significant only if the
30 proposed Project would result in substantial damage to structures or infrastructure, or
31 expose people to substantial risk of injury from:

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

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

35 **GEO-3** Land subsidence/settlement;

36 **GEO-4** Expansive soils;

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

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

2 In addition, a project would normally have a significant impact on landform
3 alteration or mineral resources if:

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

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

11 See section 3.13 (Water Quality) for significance criteria related to erosion.

12 **3.5.4.3 Impacts and Mitigation Measures**

13 The assessment of impacts is based on regulatory controls and on the assumptions
14 that the proposed Project and all alternatives would include the following:

- 15 • The Port will design and construct backland improvements in accordance with
16 Los Angeles Building Code, Sections 91.000 through 91.7016 of the Los
17 Angeles Municipal Code, to minimize impacts associated with seismically
18 induced geohazards. Sections 91.000 through 91.7016 of the Los Angeles
19 Municipal Code regulate construction in backland areas of the Port. These
20 building codes and criteria provide requirements for construction, grading,
21 excavations, use of fill, and foundation work, including type of materials, design,
22 procedures, etc. These codes are intended to limit the probability of occurrence
23 and the severity of consequences from geological hazards. Necessary permits,
24 plan checks, and inspections are also specified. The Los Angeles Municipal
25 Code also incorporates structural seismic requirements of the California Uniform
26 Building Code, which classifies almost all of coastal California (including the
27 Project site) within Seismic Zone 4, on a scale of 1 to 4, with 4 being most
28 severe. The Project engineers shall review the Project plans for compliance with
29 the appropriate standards in the building codes.
- 30 • The Port will design and construct wharf improvements in accordance with
31 MOTEMS and LAHD standards, to minimize impacts associated with
32 seismically induced geohazards. Such construction shall include, but not be
33 limited to, completion of site-specific geotechnical investigations regarding
34 construction and foundation engineering. Measures pertaining to temporary
35 construction conditions, such as maximum temporary slope gradient, will be
36 incorporated into the design. A licensed geologist or engineer will monitor
37 construction to verify that construction occurs in concurrence with proposed
38 Project design.

3.5.4.3.1 Proposed Project

3.5.4.3.1.1 Construction Impacts

Seismicity

Impact GEO-1a: Seismic activity along the Palos Verdes Fault Zone, or other regional faults, could 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 2025).

There would be a minor increase in the exposure of people and property to seismic hazards relating to current and future baseline conditions. The proposed Project area lies in the vicinity of the Palos Verdes Fault Zone. Strands of the fault may pass beneath the perimeter and immediately west of the proposed Project area, in the vicinity of Berths 131/132 and 147 (Figure 3.5-1). Strong-to-intense ground shaking, surface rupture, and liquefaction could occur in these areas, due to the location of the fault beneath the proposed Project area and the presence of water-saturated hydraulic fill. With the exception of ground rupture, similar seismic impacts could occur due to earthquakes on other regional faults. Earthquake-related hazards, such as liquefaction, ground rupture, ground acceleration, and ground shaking cannot be avoided in the Los Angeles region and in particular in the harbor area where the Palos Verdes Fault is present and hydraulic and alluvial fill is pervasive.

The Los Angeles Building Code, Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, regulates construction in backland areas of the Port. These building codes and criteria provide requirements for construction, grading, excavations, use of fill, and foundation work, including type of materials, design, procedures, etc. These codes are intended to limit the probability of occurrence and the severity of consequences from geological hazards, such as earthquakes. Necessary permits, plan checks, and inspections are also specified. The Los Angeles Municipal Code also incorporates structural seismic requirements of the California Uniform Building Code, which classifies almost all of coastal California (including the proposed Project site) within Seismic Zone 4, on a scale of 1 to 4, with 4 being most severe. The proposed Project engineers would review the proposed Project plans for compliance with the appropriate standards in the building codes.

With respect to existing wharfs, seismic upgrades would be completed, resulting in beneficial impacts. With respect to new wharf construction, it would be designed per the MOTEMS to protect against seismic hazards that could occur. These regulations have recently been drafted by the CSLC and adopted as State law. LAHD standards and specifications would be applied to the seismic design of the proposed Project.

Design objectives for both wharf and backland areas are for the proposed Project to maintain operation following an OLE and to survive without collapse and provide public safety following a CLE. At the lower-level OLE, structures are expected to suffer minor, nonstructural damage and resume operations immediately after an

1 earthquake. At the higher-level CLE, structural damage is permissible as long as
2 public safety is not jeopardized.

3 However, as discovered during the 1971 San Fernando earthquake and the 1994
4 Northridge earthquake, existing building codes are often inadequate to completely protect
5 engineered structures from hazards associated with liquefaction, ground rupture, and
6 large ground accelerations. Consequently, designing new facilities based on existing
7 building codes may not prevent significant damage to structures from a major or great
8 earthquake on the underlying Palos Verdes Fault or any other regional fault. In addition,
9 projects in construction phases are especially susceptible to earthquake damage due to
10 temporary conditions, such as temporary slopes and unfinished structures, which are
11 typically not in a condition to withstand intense ground shaking.

12 **CEQA Impact Determination**

13 As discussed above, seismic activity along the Palos Verdes Fault Zone, or other
14 regional faults, could produce fault rupture, seismic ground shaking, liquefaction, or
15 other seismically induced ground failure. Seismic hazards are common to the Los
16 Angeles region and are not increased by the proposed Project. However, because the
17 proposed Project area is potentially underlain by strands of the active Palos Verdes
18 Fault and liquefaction-prone hydraulic fill, there is a substantial risk of seismic
19 impacts. Seismic upgrades would be completed on existing wharves, resulting in
20 beneficial impacts. However, because construction of new wharves, buildings, and
21 related infrastructure would occur over an extended period (through 2025), increased
22 exposure of people and property during construction to seismic hazards from a major
23 or great earthquake cannot be precluded, even with incorporation of modern
24 construction engineering and safety standards. Therefore, impacts due to seismically
25 induced ground failure are significant and unavoidable under CEQA.

26 *Mitigation Measures*

27 There are no mitigation measures available that would reduce impacts below
28 significance associated with seismically induced ground failure.

29 *Residual Impacts*

30 Design and construction in accordance with applicable laws and regulations pertaining
31 to seismically induced ground movement would minimize structural damage in the
32 event of an earthquake. However, increased exposure of people and property during
33 construction to seismic hazards from a major or great earthquake cannot be precluded
34 even with incorporation of modern construction engineering and safety standards.
35 Therefore, impacts due to seismically induced ground failure would remain significant
36 and unavoidable.

37 **NEPA Impact Determination**

38 The proposed Project would include seismic upgrade of wharves, including construction
39 of new concrete piles for seismic renovation, resulting in beneficial seismic related
40 impacts. The proposed Project also would include the creation of a 10-acre (4.0-ha) fill,
41 as well as construction of new wharves and dikes, which would be susceptible to

1 seismically induced ground shaking, fault rupture, and liquefaction. Therefore, beneficial
2 impacts would be offset by adverse impacts.

3 Seismic hazards are common to the Los Angeles region and are not increased by the
4 proposed Project. However, because the proposed Project area is potentially
5 underlain by strands of the active Palos Verdes Fault and liquefaction-prone
6 hydraulic fill, there is a substantial risk of seismic impacts. Because construction
7 would occur over an extended period (through 2025), increased exposure of people
8 and property during construction to seismic hazards from a major or great earthquake
9 cannot be precluded, even with incorporation of modern construction engineering and
10 safety standards. Therefore, impacts due to seismically induced ground failure are
11 significant and unavoidable under NEPA.

12 *Mitigation Measures*

13 There are no mitigation measures available that would reduce impacts below
14 significance associated with seismically induced ground failure.

15 *Residual Impacts*

16 Design and construction in accordance with applicable laws and regulations
17 pertaining to seismically induced ground movement would minimize structural
18 damage in the event of an earthquake. However, increased exposure of people and
19 property during construction to seismic hazards from a major or great earthquake
20 cannot be precluded even with incorporation of modern construction engineering and
21 safety standards. Therefore, impacts due to seismically induced ground failure would
22 remain significant and unavoidable.

23 *Tsunami Runup*

24 **Impact GEO-2a:** Construction on the proposed Project within the Port area would
25 expose people and structures to substantial risk involving tsunamis or seiches.

26 Local or distant seismic activity and/or offshore landslides could result in the
27 occurrence of tsunamis or seiches within the proposed Project area and vicinity. Due to
28 the historic occurrence of earthquakes and tsunamis along the Pacific Rim, placement
29 of any development on or near the shore in Southern California, including the proposed
30 Project site, would always involve some measure of risk of impacts from a tsunami or
31 seiche. Although relatively rare, should a large tsunami or seiche occur, it would be
32 expected to cause some amount of damage and possibly injuries to most on or near-
33 shore locations. As a result, this is considered by LAHD as the average, or normal
34 condition for most on- and near-shore locations in Southern California. Therefore, a
35 proposed Project tsunami or seiche related impact would be one that would exceed this
36 normal condition and cause substantial damage and/or substantial injuries. For reasons
37 explained below, under a theoretical maximum worst-case scenario, the proposed
38 Project would likely expose people or property to substantial damage or substantial
39 injuries in the event of a tsunami or seiche. Therefore, impacts would be significant.

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

13 The Port is subject to diurnal tides, meaning two high tides and two low tides during
14 a 24-hour day. The average of the lowest water level during low tide periods each
15 day is typically set as a benchmark of 0 ft (0 m) and is defined as Mean Lower Low
16 Water level (MLLW). For purposes of this discussion, all proposed Project
17 structures and land surfaces are expressed as height above (or below) MLLW. The
18 mean sea level (MSL) in the Port is +2.8 ft (0.86 m) above MLLW (NOAA 2005).
19 This height reflects the arithmetic mean of hourly heights observed over the National
20 Tidal Datum Epoch (19 years) and therefore reflects the mean of both high and low
21 tides in the Port. The recently developed Port Complex model described in Section
22 3.5.2 above predicts tsunami wave heights with respect to MSL, rather than MLLW,
23 and therefore can be considered a reasonable average condition under which a
24 tsunami might occur. The Port MSL of +2.82 ft (0.86 m) must be considered in
25 comparing projected tsunami run-up (i.e., amount of wharf overtopping and flooding)
26 to proposed wharf height and topographic elevations, which are measured with
27 respect to MLLW.

28 Generalized modeling completed by Borrero et al., (2005a) indicates that a large
29 submarine landslide off the southern tip of the Palos Verdes Peninsula could result in
30 13 ft (4 m) of runup in the Port of Los Angeles and Port of Long Beach. Such runup
31 may inundate the proposed Project site and potentially cause up to \$36 billion direct,
32 indirect, and induced losses in the Port areas.

33 Most recently and more definitively, a model has been developed specifically for the
34 Los Angeles/Long Beach Port Complex that incorporates consideration of the
35 localized landfill configurations, bathymetric features, and the interaction of the
36 diffraction, reflection, and refraction of tsunami wave propagation, in the predictions
37 of tsunami wave heights (Moffatt and Nichol 2007, see Appendix J). Based on this
38 study, a reasonable worst-case scenario for generation of a tsunami or seiche in the
39 San Pedro Bay Ports predicts tsunami wave heights of 1.3 to 5.3 ft (0.4 to 1.6 m)
40 above MSL at the proposed Project site, under both earthquake and landslide
41 scenarios. Incorporating the Port MSL of +2.82 ft (0.86 m), the model predicts
42 tsunami wave heights of 4.1 to 8.1 ft (0.8 to 2.4 m) above MLLW at the proposed
43 Project site. Because the proposed Project site elevation ranges from 10 to 15 ft (3.0
44 to 4.6 m) above MLLW, localized tsunami-induced flooding would not occur.

45 While the analysis above considers a reasonable worst-case seismic scenario based
46 on a maximum seismic event, with respect to MSL, a theoretical maximum worst-

1 case wave action from a tsunami would result if the single highest tide predicted over
2 the next 40 years at the San Pedro Bay Ports was present at the time of the seismic
3 event. The single highest tide predicted over the next 40 years is 7.3 ft (2.2 m) above
4 MLLW. This condition is expected to occur less than 1 percent of the time over this
5 40-year period. If that very rare condition were to coincide with a maximum tsunami
6 event, the model predicts tsunami wave heights of 8.6 to 12.6 ft (2.6 to 3.8 m) above
7 MLLW at the proposed Project site. Because the proposed Project site elevation
8 ranges from 10 to 15 ft (3.0 to 4.5 m) above MLLW, localized tsunami-induced
9 flooding up to 2.6 ft (0.8 m) is possible. To determine the extent of potential impacts
10 due to tsunami-induced flooding, Port structural engineers have determined that Port
11 reinforced concrete or steel structures designed to meet California earthquake
12 protocols incorporated into MOTEMS would be expected to survive complete
13 inundation in the event of a tsunami (personal communication, Yin, P., P.E., Senior
14 Structural Engineer, Los Angeles Harbor Department 2006). However, substantial
15 infrastructure damage and/or injury to personnel would occur as a result of complete
16 site inundation.

17 ***Tsunami Probability***

18 As previously discussed, there is a potential for tsunami-induced flooding under the
19 theoretical maximum worst-case scenario. However, the likelihood of a large
20 tsunami is very low during construction of the proposed Project.

21 The most likely worst-case tsunami scenario was based partially on a magnitude 7.6
22 earthquake on the offshore Santa Catalina Fault. The recurrence interval for a
23 magnitude 7.5 earthquake along an offshore fault in the Southern California
24 Continental Borderland is about 10,000 years. Similarly, the recurrence interval of a
25 magnitude 7.0 earthquake is about 5,000 years and the recurrence interval of a
26 magnitude 6.0 earthquake is about 500 years. However, there is no certainty that any
27 of these earthquake events would result in a tsunami, since only about 10 percent of
28 earthquakes worldwide result in a tsunami. In addition, available evidence indicates
29 that tsunamigenic landslides would be extremely infrequent and occur less often than
30 large earthquakes. This suggests recurrence intervals for such landslide events would
31 be longer than the 10,000-year recurrence interval estimated for a magnitude 7.5
32 earthquake (Moffatt & Nichol 2007).

33 **CEQA Impact Determination**

34 Designing new facilities based on existing building codes may not prevent substantial
35 damage to structures from coastal flooding. In addition, projects in construction
36 phases are especially susceptible to damage due to temporary conditions, such as
37 unfinished structures, which are typically not in a condition to withstand coastal
38 flooding. Impacts due to tsunamis and seiches are typical for the entire California
39 coastline and would not be increased by construction of the proposed Project.
40 However, because the proposed Project elevation is located within 10 to 15 feet (3 to
41 4.6 m) above MLLW, there is a substantial risk of coastal flooding due to tsunamis
42 and seiches. As a result, impacts during the construction phase would be significant
43 and unavoidable under CEQA.

Mitigation Measures

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 will 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.

Such procedures shall be included in any bid specifications for construction or operations personnel, with a copy of such bid specifications to be provided to LAHD, including a completed copy of its operations emergency response plan prior to commencement of construction activities and/or operations.

Residual Impacts

Emergency planning and coordination between the Terminal operator and LAHD, as outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-site personnel during a tsunami. However, even with incorporation of emergency planning and construction in accordance with current City and State regulations, substantial damage and/or injury would occur in the event of a tsunami or seiche. Therefore, residual impacts would remain significant and unavoidable.

NEPA Impact Determination

The proposed Project would include seismic upgrade of wharves, including construction of new concrete piles, resulting in beneficial seismic related impacts. The proposed Project also would include the creation of a 10-acre (4.0-ha) fill, as well as the construction of new wharves and dikes, which would be susceptible to tsunamis and seiches. Therefore, beneficial impacts would be offset by adverse impacts. There is a substantial risk of coastal flooding of wharves and associated backland areas due to tsunamis and seiches. Because construction would occur over an extended period (through 2025), increased exposure of people and property during construction to seismically induced tsunamis or seiches from a major or great earthquake cannot be precluded. Impacts due to tsunamis and seiches are significant and unavoidable under NEPA.

Mitigation Measures

Mitigation Measure GEO-1 shall be applied to the NEPA project impact determination to reduce tsunami and seiche related impacts.

Residual Impacts

Emergency planning and coordination between the Terminal operator and the LAHD, as outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-site personnel during a tsunami. However, even with incorporation of emergency planning and construction in accordance with current City and State regulations, substantial damage and injury would occur in the event of a tsunami or seiche. Therefore, residual impacts would remain significant and unavoidable.

Subsidence/Settlement

Impact GEO-3a: Construction 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 in the vicinity of the proposed Project, due to previous oil extraction in the Port area, has been mitigated and is not anticipated to adversely impact the proposed Project. However, in the absence of proper engineering, proposed structures could be cracked and warped as a result of saturated, unconsolidated/compressible sediments. However, during Project design, the Project engineer would evaluate the settlement potential in all areas where structures are proposed.

The settlement potential of existing onshore soils would be evaluated 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. Recommendations of the engineer would be incorporated into the design specifications for the proposed Project, consistent with City design guidelines, including Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, in conjunction with criteria established by LAHD and Caltrans. Recommendations for soils subject to settlement typically include overexcavation and recompaction 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.

The settlement potential associated with creation of a 10-acre (4.0-ha) fill in the Northwest Slip would similarly be evaluated through a site-specific geotechnical investigation, which includes sampling of sediments to be placed as fill, as well as sampling of the substrate (harbor bottom sediments) on which the fill would be placed. Laboratory analysis of samples would be conducted, under the supervision of a geotechnical engineer, to determine soil compressibility. Recommendations of the engineer would be incorporated into the design specifications for the proposed Project, consistent with City design guidelines, including Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, in conjunction with criteria established by LAHD and Caltrans. Recommendations for sediments subject to settlement typically include placement of excess sediments above final anticipated grade in order to surcharge (or compress) the underlying, newly placed sediments. When geotechnical instrumentation indicates that sufficient compaction has been achieved in the area of newly-place fill, the overburden soil would then be removed and construction would commence. Such geotechnical engineering would substantially reduce the potential for soil settlement and would ensure that construction of the 10-acre (4.0-ha) fill would not result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

CEQA Impact Determination

Settlement impacts in backland areas would be less than significant under CEQA, as the project would be designed and constructed in compliance with the recommendations of the geotechnical engineer, consistent with Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, and in conjunction with criteria established by LAHD and Caltrans, and would not result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

Mitigation Measures

As subsidence impacts would be less than significant, no mitigation measures are necessary.

Residual Impacts

With implementation of Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, resulting in no required mitigation, the residual impacts would be less than significant under CEQA.

NEPA Impact Determination

The federal portions of the proposed Project would be limited to wharf and in-water construction activities, including construction of new concrete piles for seismic renovation, the creation of a 10-acre (4.0 ha) fill, new wharf construction, and channel deepening. Settlement impacts associated with creation of the 10-acre (4.0 ha) fill would be less than significant under NEPA, with implementation standard geotechnical engineering, including incorporation of Sections 91.000 through 91.7016 of the Los Angeles Municipal Code and criteria established by LAHD and Caltrans, and would not result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

Mitigation Measures

As subsidence impacts would be less than significant, no mitigation measures are necessary.

Residual Impacts

With implementation of standard geotechnical engineering, resulting in no required mitigation, the residual impacts would be less than significant under NEPA.

Expansive Soils

Impact GEO-4a: Construction 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 in the vicinity of the Berths 136-147 area and may be present in dredged or imported soils used for proposed Project grading. Expansive

1 soils beneath the proposed Project's foundations could result in cracking and distress of
2 foundations. Existing structures built on these sediments could be cracked and warped
3 by such settlement. However, during the proposed Project design phase, the proposed
4 Project engineer would evaluate the expansion potential associated with on-site soils.
5 The soil expansion potential would be evaluated through a site-specific geotechnical
6 investigation, which includes subsurface soil sampling, laboratory analysis of samples
7 collected to determine soil expansion potential, and an evaluation of the laboratory
8 testing results, by a geotechnical engineer. Recommendations of the engineer would be
9 incorporated into the design specifications for the proposed Project, consistent with
10 City design guidelines, including Sections 91.000 through 91.7016 of the Los Angeles
11 Municipal Code, in conjunction with criteria established by LAHD. Recommendations
12 for soils subject to expansion typically include overexcavation and replacement of
13 expansive soils with sandy, non-expansive soils, which would allow for construction of
14 a conventional slab-on-grade; construction of post-tensioning concrete slabs, which can
15 accommodate movement of underlying expansive soils; or alternatively, installation of
16 concrete or steel foundation piles through the expansion prone soils, to a depth of non-
17 expansive soils. Such geotechnical engineering would substantially reduce the
18 potential for soil expansion and damage to overlying structures.

19 **CEQA Impact Determination**

20 Expansive soil impacts in backland areas would be less than significant under CEQA
21 as the Project would be designed and constructed in compliance with the
22 recommendations of the geotechnical engineer, consistent with implementation of
23 Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, and in
24 conjunction with criteria established by LAHD and would not result in substantial
25 damage to structures or infrastructure, or expose people to substantial risk of injury.

26 *Mitigation Measures*

27 As expansive soil impacts would be less than significant, no mitigation measures are
28 necessary.

29 *Residual Impacts*

30 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
31 Municipal Code resulting in no required mitigation, the residual impacts would be
32 less than significant under CEQA.

33 **NEPA Impact Determination**

34 The federal portions of the proposed Project would be limited to wharf and in-water
35 construction activities, including construction of new concrete piles for seismic
36 renovation, the creation of a 10-acre (4.0 ha) fill, new wharf construction, and
37 channel deepening. Expansive soil may be present in dredged or imported soils used
38 for filling the 10-acre (4.0-ha) Northwest Slip. Use of expansive soils beneath the
39 proposed Project's foundations could result in cracking and distress of foundations.
40 However, expansive soil impacts in backland areas would be less than significant
41 under NEPA with implementation of standard geotechnical engineering and Sections
42 91.000 through 91.7016 of the Los Angeles Municipal Code, in conjunction with

1 criteria established by LAHD and would not result in substantial damage to structures
2 or infrastructure, or expose people to substantial risk of injury.

3 *Mitigation Measures*

4 As expansive soil impacts would be less than significant, no mitigation measures are
5 necessary.

6 *Residual Impacts*

7 With implementation of standard geotechnical engineering and Sections 91.000
8 through 91.7016 of the Los Angeles Municipal Code, less than significant residual
9 impacts would occur under NEPA.

10 *Landslides and Mudslides*

11 **Impact GEO-5a: Construction of the proposed Project would not result**
12 **in or expose people or property to a substantial risk of landslides or**
13 **mudslides.**

14 The topography in the vicinity of the proposed Project site is flat and not subject to
15 landslides or mudflows.

16 **CEQA Impact Determination**

17 As the topography in the vicinity of the proposed Project site is flat and not subject to
18 landslides or mudflows, no impacts would occur under CEQA.

19 *Mitigation Measures*

20 As landslide and mudslide impacts would not occur, no mitigation measures are
21 necessary.

22 *Residual Impacts*

23 With no mitigation required, no residual impacts would occur under CEQA.

24 **NEPA Impact Determination**

25 As the topography in the vicinity of the proposed Project site is flat and not subject to
26 landslides or mudflows, no impacts would occur under NEPA.

27 *Mitigation Measures*

28 As landslide and mudslide impacts would not occur, no mitigation measures are
29 necessary.

1 *Residual Impacts*

2 With no mitigation required, no residual impacts would occur under NEPA.

3 *Unstable Soil Conditions*

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

7 Natural alluvial and estuarine deposits, as well as artificial fill consisting of dredged
8 deposits or imported soils, may be encountered during excavations for utility pipeline
9 relocation or for construction of retaining walls, manholes, and other structures.
10 Groundwater is locally present at depths as shallow as 12 feet (4 m). Excavations
11 may locally be completed to this depth, such as for underground utility construction
12 or vehicle maintenance pits. Materials near and below the shallow groundwater table
13 would be relatively fluid, requiring implementation of standard engineering practices
14 regarding saturated, collapsible soils, such as dredging, dewatering wells, and other
15 special handling procedures to facilitate excavation. For example, dewatering wells
16 would locally increase the depth to groundwater, thus reducing the potential for
17 collapsible soils. Various types of temporary shoring would also be used to stabilize
18 excavations with saturated, collapsible soils. Such engineering practices would be
19 implemented where necessary.

20 See section 3.6 (Groundwater and Soils) regarding potential soil and/or groundwater
21 contamination in construction excavations.

22 **CEQA Impact Determination**

23 Due to implementation of standard engineering practices regarding saturated,
24 collapsible soils, people and structures would not be exposed to substantial adverse
25 effects from the proposed Project, and impacts associated with shallow groundwater
26 would be less than significant under CEQA.

27 *Mitigation Measures*

28 As impacts associated with collapsible soils would be less than significant, no
29 mitigation measures are required.

30 *Residual Impacts*

31 Due to implementation of standard engineering practices regarding saturated,
32 collapsible soils resulting in no required mitigation, the residual impacts would be
33 less than significant under CEQA.

34 **NEPA Impact Determination**

35 The federal portion of the proposed Project would be limited to wharf and in-water
36 construction activities, including construction of new concrete piles for seismic

1 renovation, the creation of a 10-acre (4.0 ha) fill, new wharf construction, and channel
2 deepening. Due to implementation of standard engineering practices regarding
3 saturated, collapsible soils, people and structures would not be exposed to substantial
4 adverse effects from the proposed Project and impacts associated with shallow
5 groundwater would be less than significant under NEPA.

6 *Mitigation Measures*

7 As impacts associated with collapsible soils would be less than significant, no
8 mitigation measures are required.

9 *Residual Impacts*

10 With implementation of standard engineering practices regarding saturated, collapsible
11 soils, there would be less than significant residual impacts under NEPA.

12 *Prominent Geologic and Topographic Features*

13 **Impact GEO-7a: Construction of the proposed Project would not result**
14 **in one or more distinct and prominent geologic or topographic features**
15 **being destroyed, permanently covered, or materially and adversely**
16 **modified.**

17 Since the proposed Project area is relatively flat and paved, with no prominent geologic
18 or topographic features, proposed Project construction would not result in any distinct
19 and prominent geologic or topographic features being destroyed, permanently covered, or
20 materially and adversely modified.

21 **CEQA Impact Determination**

22 As the topography in the vicinity of the proposed Project site is flat and does not
23 contain prominent geologic or topographic features, no impacts would occur under
24 CEQA.

25 *Mitigation Measures*

26 As impacts due to removal of prominent geologic or topographic features would not
27 occur, no mitigation measures are necessary.

28 *Residual Impacts*

29 With no mitigation required, no residual impacts would occur under CEQA.

30 **NEPA Impact Determination**

31 As the topography in the vicinity of the proposed Project site is flat and does not contain
32 prominent geologic or topographic features, no impacts would occur under NEPA.

1 *Mitigation Measures*

2 As impacts related to removal of prominent geologic or topographic features would
3 not occur, no mitigation measures are necessary.

4 *Residual Impacts*

5 With no mitigation required, no residual impacts would occur under NEPA.

6 *Mineral Resources*

7 **Impact GEO-8a: Although the northern portion of the proposed Project**
8 **site is underlain by the Wilmington Oil Field, construction of the**
9 **proposed Project would not result in the permanent loss of availability**
10 **of any mineral resource of regional, statewide, or local significance.**

11 With respect to aggregate potential, the proposed Project site is located in MRZ-1,
12 which is defined as an area where adequate information indicates that no significant
13 mineral deposits are present or where it is judged that little likelihood exists for their
14 presence. However, with respect to petroleum resources, the northern portion of the
15 proposed Project site is located within the Wilmington Oil Field.

16 **CEQA Impact Determination**

17 Proposed Project construction would preclude oil and gas drilling from within proposed
18 Project boundaries; however, petroleum reserves beneath the site could be accessed
19 from remote locations, using directional (or slant) drilling techniques. Therefore, the
20 proposed Project would not result in the permanent loss of availability of a known
21 mineral resource that would be of future value to the region and the residents of the
22 state. Mineral resource impacts would be less than significant under CEQA.

23 *Mitigation Measures*

24 As impacts associated with mineral resources would be less than significant, no
25 mitigation measures are required.

26 *Residual Impacts*

27 With no mitigation required, the residual impacts are less than significant under
28 CEQA.

29 **NEPA Impact Determination**

30 In-water construction would preclude oil and gas drilling from within proposed
31 Project boundaries; however, petroleum reserves beneath the site could be accessed
32 from remote locations, using directional (or slant) drilling techniques. Therefore, the
33 proposed Project would not result in the permanent loss of availability of a known
34 mineral resource that would be of future value to the region and the residents of the
35 state and less than significant mineral resource impacts would occur under NEPA.

Mitigation Measures

As impacts associated with mineral resources would be less than significant, no mitigation measures are required.

Residual Impacts

With no mitigation required, the residual impacts would be less than significant under NEPA.

3.5.4.3.1.2 Operations Impacts

Seismicity

Impact GEO-1b: Seismic activity along the Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure that would expose people and structures to substantial risk during the operations period (through 2038).

There would be a minor increase in the exposure of people and property to seismic hazards relating to current and future baseline conditions. The proposed Project area lies in the vicinity of the Palos Verdes Fault Zone. Strands of the fault may pass beneath the perimeter and immediately west of the proposed Project area, in the vicinity of Berths 131/132 and 147 (Figure 3.5-1). Strong-to-intense ground shaking, surface rupture, and liquefaction could occur in these areas, due to the location of the fault beneath the proposed Project area and the presence of water-saturated hydraulic fill. With the exception of ground rupture, similar seismic impacts could occur due to earthquakes on other regional faults. Earthquake-related hazards, such as liquefaction, ground rupture, ground acceleration, and ground shaking cannot be avoided in the Los Angeles region and in particular in the harbor area where the Palos Verdes Fault is present and hydraulic and alluvial fill is pervasive.

As discussed with respect to existing wharfs, seismic upgrades would benefit structures and infrastructure at the proposed Project site. However, as discovered during the 1971 San Fernando earthquake and the 1994 Northridge earthquake, existing building codes are often inadequate to completely protect engineered structures from hazards associated with liquefaction, ground rupture, and large ground accelerations. Consequently, designing new facilities based on existing building codes may not prevent significant damage to structures from a major or great earthquake on the underlying Palos Verdes Fault or any other regional fault.

CEQA Impact Determination

As discussed above, seismic activity along the Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure. Seismic hazards are common to the Los Angeles region and are not increased by the proposed Project. However, because the proposed Project area is potentially underlain by strands of the active Palos Verdes

1 Fault and liquefaction-prone hydraulic fill, there is a substantial risk of seismic impacts.
2 Increased exposure of people and property during operations to seismic hazards from a
3 major or great earthquake cannot be precluded, even with incorporation of modern
4 construction engineering and safety standards. Therefore, impacts due to seismically
5 induced ground failure are significant and unavoidable under CEQA.

6 *Mitigation Measures*

7 There are no mitigation measures available that would reduce impacts below
8 significance associated with seismically induced ground failure.

9 *Residual Impacts*

10 Design and construction in accordance with applicable laws and regulations
11 pertaining to seismically induced ground movement would minimize structural
12 damage in the event of an earthquake. However, increased exposure of people and
13 property during operations to seismic hazards from a major or great earthquake
14 cannot be precluded even with incorporation of modern construction engineering and
15 safety standards. Therefore, impacts due to seismically induced ground failure would
16 remain significant and unavoidable.

17 **NEPA Impact Determination**

18 The federal portions of the proposed Project would include seismic upgrade of
19 existing wharves including construction of new concrete piles, resulting in beneficial
20 seismic related impacts. The proposed Project also would include the creation of a
21 10-acre (4.0-ha) fill and the construction of new wharves and dikes, which would be
22 susceptible to seismically induced ground shaking, fault rupture, and liquefaction
23 during operations. Therefore, beneficial impacts would be offset by adverse impacts.

24 Seismic hazards are common to the Los Angeles region and are not increased by the
25 proposed Project. However, because the proposed Project area is potentially underlain
26 by strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill, there
27 is a substantial risk of seismic impacts. Increased exposure of people and property
28 during operations to seismic hazards from a major or great earthquake cannot be
29 precluded, even with incorporation of modern construction engineering and safety
30 standards. Therefore, impacts due to seismically induced ground failure are significant
31 and unavoidable under NEPA.

32 *Mitigation Measures*

33 There are no mitigation measures available that would reduce impacts below
34 significance associated with seismically induced ground failure.

35 *Residual Impacts*

36 Design and construction in accordance with applicable laws and regulations pertaining to
37 seismically induced ground movement would minimize structural damage in the event of
38 an earthquake. However, increased exposure of people and property during operations to
39 seismic hazards from a major or great earthquake cannot be precluded even with

1 incorporation of modern construction engineering and safety standards. Therefore,
2 impacts due to seismically induced ground failure would remain significant and
3 unavoidable.

4 ***Tsunamis and Seiches***

5 **Impact GEO-2b: Proposed Project operations within the Port area**
6 **would expose people and structures to substantial risk involving**
7 **tsunamis or seiches. Local or distant seismic activity and/or offshore**
8 **landslides could result in the occurrence of tsunamis or seiches within**
9 **the proposed Project area and vicinity.**

10 The discussion of **Impact GEO-2a**, above, sets forth the probability and anticipated
11 magnitude of a tsunami at the proposed Project site. As discussed for **Impact GEO-**
12 **2a**, designing new facilities based on existing building codes may not prevent
13 substantial damage to structures from coastal flooding. Impacts due to seismically
14 induced tsunamis and seiches are typical for the entire California coastline and would
15 not be increased by operation of the proposed Project. However, because the
16 proposed Project elevation is located within 10 to 15 feet (3 to 4.6 m) above MLLW,
17 there is a substantial risk of coastal flooding in the event of a tsunami and seiche.

18 For on-site personnel, the risk of tsunami or seiches is a part of any ocean-shore
19 interface and hence personnel working at the proposed Project berths cannot avoid
20 some risk of exposure. Similarly, berth infrastructure and cargo/containers would be
21 subject to some risk of exposure. Although initial tsunami induced run-up would
22 potentially cause substantial injury and damage to infrastructure and cargo, the
23 drawdown of the water after run-up exerts the often crippling opposite drags on the
24 persons and structures and washes loose/broken properties and debris to sea. The
25 floating debris brought back on the next onshore flow has been found to be a
26 significant cause of extensive damage after successive run-up and drawdown.
27 Similarly, for tanker vessels, the risk of tsunami or seiches is a part of any ocean-
28 shore interface and hence vessels in transit or at berth cannot avoid some risk of
29 exposure. A tanker vessel destined for the proposed Project berths (or any berth in
30 the Port for that matter) would be under its own power and have one or more tugs in
31 attendance. Under this circumstance, the vessel would likely be able to maneuver to
32 avoid damage as it would with any ocean wave. The exposure of a tsunami or seiche
33 to a vessel in transit to or from the proposed Project berth, and the associated risk, is
34 no different than for any other vessel entering the Port Complex.

35 Port engineers have indicated that currents moving over 5 meters per second (m/s)
36 could potentially render a ship out of control (personal communication, Captain
37 James Morgan 2006). Modeling indicates that tsunami related currents created as a
38 result of a large earthquake on the Santa Catalina Fault or submarine landslide off the
39 coast of the nearby Palos Verdes Peninsula would not create currents in the Port in
40 excess of 5 m/s. Highest anticipated current speeds of 2 m/s would occur in the
41 vicinity of Pier 400 and the entrance to the main channel. Currents in the vicinity of
42 the Vincent Thomas Bridge (approximately ¼ mile south of the proposed Project
43 area) would be approximately 0.9 m/s (Moffatt and Nichol (2007)).

1 A tanker vessel docked at one of the proposed Project berths would be subject to the
2 rising and falling of the water levels and the accompanying currents during a tsunami
3 or seiche. Two scenarios could arise. Either the vessel would stay secured to the berth
4 and ride out the tsunami or the motion during a tsunami would cause the mooring lines
5 of the vessel to break free and the vessel would be set adrift. In the first scenario, the
6 energy of the tsunami wave would be transmitted through the vessel that is moored at
7 berth and into the wharf. Forces transmitted through the vessel would be transferred to
8 the fendering system of the wharf and then to the wharf structure.

9 The existing wharf fendering systems are designed with the assumption that, under a
10 normal docking scenario, a berthing vessel will contact only one fender. For such
11 scenarios, each fender is designed to absorb the berthing energy of the entire vessel.
12 During a tsunami occurrence, the wave is assumed to move the vessel against more
13 than one of the existing fenders, so that the vessel would be contacting a minimum of
14 four to five fenders, often simultaneously. In such cases, the forces experienced by
15 each fender during a tsunami are often less than the standard docking forces that the
16 fendering system is designed, because more than one fender would absorb these forces
17 at the same time. Therefore, substantial damage is not expected to the vessel or the
18 wharf in the event that a tsunami was to strike while a vessel was secured at a berth.

19 Under the second scenario, a vessel set adrift in the Port area could have more serious
20 consequences from the potential of collision, including a potential hull breach and
21 possible fuel spill. This scenario is examined in section 3.7, Hazards and Hazardous
22 Materials.

23 **CEQA Impact Determination**

24 Designing new facilities based on existing building codes may not prevent substantial
25 damage to structures from coastal flooding. Impacts due to seismically induced
26 tsunamis and seiches are typical for the entire California coastline and would not be
27 increased by construction of the proposed Project. However, because the proposed
28 Project elevation is located within 10 to 15 feet (3 to 4.6 m) above MLLW, there is a
29 substantial risk of coastal flooding due to tsunamis and seiches. As described above,
30 impacts from the theoretical maximum worst-case wave action would be significant
31 and unavoidable for the site under CEQA.

32 *Mitigation Measures*

33 **Mitigation Measure GEO-1** shall be applied to the CEQA project impact
34 determination to reduce tsunami and seiche related impacts.

35 *Residual Impacts*

36 Emergency planning and coordination between the Terminal operator and LAHD, as
37 outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-
38 site personnel during a tsunami. However, even with incorporation of emergency
39 planning and construction in accordance with current City and State regulations,
40 substantial damage and/or injury could occur in the event of a tsunami or seiche.
41 Therefore, residual impacts would remain significant and unavoidable.

NEPA Impact Determination

There is a substantial risk of coastal flooding of wharves and associated backland areas due to tsunamis and seiches. The federal portions of the proposed project would result in new wharf construction, channel deepening and a 10-acre (4 ha) increase in backlands, which contribute to increased operational area and activities. Because operations would occur over an extended period (through at least 2038), increased exposure of people and property during operations to seismically induced tsunamis or seiches from a major or great earthquake cannot be precluded. As described above, impacts from the theoretical maximum worst-case wave action would be significant and unavoidable for the site under NEPA.

Mitigation Measures

Mitigation Measure GEO-1 shall be applied to the NEPA project impact determination to reduce tsunami and seiche related impacts.

Residual Impacts

Emergency planning and coordination between the Terminal operator and the LAHD, as outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-site personnel during a tsunami. However, even with incorporation of emergency planning and construction in accordance with current City and State regulations, substantial damage and injury could occur in the event of a tsunami or seiche. Therefore, residual impacts would remain significant and unavoidable.

Subsidence/Settlement

Impact GEO-3b: 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.

As discussed for **Impact GEO-3a**, subsidence in the proposed Project vicinity, due to previous oil extraction in the Port area, has been mitigated and is not anticipated to adversely impact the proposed Project. However, in the absence of proper engineering, proposed structures could be cracked and warped during proposed Project operations as a result of saturated, unconsolidated/compressible sediments. However, during the proposed Project design phase, the proposed Project engineer would evaluate the settlement potential in all areas where structures are proposed. The settlement potential would be evaluated during the construction phase, as discussed for **Impact GEO-3a**, to reduce the potential for soil settlement.

CEQA Impact Determination

Settlement impacts in backland areas would be less than significant under CEQA, as the Project would be designed and constructed in compliance with the recommendations of the geotechnical engineer, consistent with implementation of Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, and in conjunction with criteria established by LAHD and Caltrans, and would not result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

1 *Mitigation Measures*

2 As subsidence impacts would be less than significant, no mitigation measures are
3 necessary.

4 *Residual Impacts*

5 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
6 Municipal Code, resulting in no required mitigation, the residual impacts would be
7 less than significant under CEQA.

8 **NEPA Impact Determination**

9 New wharf construction, channel deepening, and the proposed 10-acre (4-ha) fill that
10 would increase backlands that contribute to additional operational area and activities
11 are proposed under this alternative. Settlement impacts associated with these actions
12 would be less than significant under NEPA, as these activities would not result in
13 substantial damage to structures or infrastructure, or expose people to substantial risk
14 of injury with implementation of standard geotechnical engineering and Sections
15 91.000 through 91.7016 of the Los Angeles Municipal Code, in conjunction with
16 criteria established by LAHD and Caltrans.

17 *Mitigation Measures*

18 As settlement/subsidence impacts would be less than significant, no mitigation
19 measures are necessary.

20 *Residual Impacts*

21 With implementation of standard geotechnical engineering, resulting in no required
22 mitigation, the residual impacts would be less than significant under NEPA.

23 ***Expansive Soils***

24 **Impact GEO-4b: Operation of the proposed Project would not result in
25 substantial damage to structures or infrastructure, or expose people to
26 substantial risk of injury from soil expansion.**

27 As described in **Impact GEO-4a**, expansive soil may be present in the vicinity of the
28 Berths 136-147 area and may be present in dredged or imported soils used for proposed
29 Project grading. Use of expansive soils beneath proposed Project foundations could
30 result in cracking and distress of foundations during proposed Project operations.
31 However, during the design phase, the proposed Project engineer would evaluate the
32 expansion potential associated with on-site soils, as described in **Impact GEO-4a**, to
33 reduce the potential for soil expansion and damage to overlying structures.

CEQA Impact Determination

Expansive soil impacts in backland areas would be less than significant under CEQA as the Project would be designed and constructed in compliance with the recommendations of the geotechnical engineer, consistent with Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, and in conjunction with criteria established by LAHD, and would not result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

Mitigation Measures

As expansive soil impacts would be less than significant, no mitigation measures are necessary.

Residual Impacts

With no mitigation required, the residual impacts would be less than significant under CEQA, in conjunction with criteria established by LAHD.

NEPA Impact Determination

The federal portions of the proposed Project would be limited to wharf and in-water construction activities. Expansive soil may be present in dredged or imported soils used for filling the 10-acre (4.0-ha) Northwest Slip. Use of expansive soils beneath the proposed Project's foundations could result in cracking and distress of foundations. However, expansive soil impacts in backland areas would be less than significant under NEPA, as these activities would not result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury with implementation of standard geotechnical engineering and Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, in conjunction with criteria established by LAHD.

Mitigation Measures

As expansive soil impacts would be less than significant, no mitigation measures are necessary.

Residual Impacts

With implementation of standard geotechnical engineering and Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, there would be less than significant residual impacts under NEPA.

Landslides and Mudslides

Impact GEO-5b: Operation of the proposed Project would not result in or expose people or property to a substantial risk of landslides or mudslides.

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

1 **CEQA Impact Determination**

2 As the topography in the vicinity of the proposed Project site is flat and not subject to
3 landslides or mudflows, no impacts would occur under CEQA.

4 *Mitigation Measures*

5 As landslide and mudslide impacts would not occur, no mitigation measures are
6 necessary under CEQA.

7 *Residual Impacts*

8 With no mitigation required, there would be no residual impacts under CEQA.

9 **NEPA Impact Determination**

10 As the topography in the vicinity of the proposed Project site is flat and not subject to
11 landslides or mudflows, no impacts would occur under NEPA.

12 *Mitigation Measures*

13 As landslide and mudslide impacts would not occur, no mitigation measures are
14 necessary.

15 *Residual Impacts*

16 With no mitigation required, there would be no residual impacts under NEPA.

17 ***Unstable Soil Conditions***

18 **Impact GEO-6b: Collapsible soils would have no impact on proposed
19 Project operations and would not expose people or structures to
20 substantial risk.**

21 No excavations would be completed as a part of proposed Project operations;
22 therefore, onsite soils would not be subject to collapse or caving.

23 **CEQA Impact Determination**

24 Excavations would not be completed as a part of proposed Project operations;
25 therefore, impacts associated with collapsible soils would not occur under CEQA.

26 *Mitigation Measures*

27 As impacts associated with collapsible soils would not occur, no mitigation measures
28 are required.

1 *Residual Impacts*

2 With no mitigation required, there would be no residual impacts associated with
3 collapsible soils under CEQA.

4 **NEPA Impact Determination**

5 The federal portions of the proposed Project would be limited to wharf and in-water
6 construction activities including construction of new concrete piles for seismic
7 renovation, the creation of a 10-acre (4.0 ha) fill, new wharf construction, and channel
8 deepening. Backland excavations would not be completed as a part of proposed
9 Project operations; therefore, impacts associated with collapsible soils would not occur
10 under NEPA.

11 *Mitigation Measures*

12 As impacts associated with collapsible soils would not occur, no mitigation measures
13 are required under NEPA.

14 *Residual Impacts*

15 With no mitigation required, there would be no residual impacts under NEPA.

16 ***Prominent Geologic and Topographic Features***

17 **Impact GEO-7b: Operation of the proposed Project would not result in one
18 or more distinct and prominent geologic or topographic features being
19 destroyed, permanently covered, or materially and adversely modified.**

20 Since the proposed Project area is relatively flat and paved, with no prominent
21 geologic or topographic features, proposed Project operations would not result in any
22 distinct and prominent geologic or topographic features being destroyed, permanently
23 covered, or materially and adversely modified.

24 **CEQA Impact Determination**

25 As the topography in the vicinity of the proposed Project site is flat and does not
26 contain prominent geologic or topographic features, no impacts would occur under
27 CEQA.

28 *Mitigation Measures*

29 As impacts due to removal of prominent geologic or topographic features would not
30 occur, no mitigation measures are necessary.

31 *Residual Impacts*

32 With no mitigation required, there would be no residual impacts under CEQA.

1 **NEPA Impact Determination**

2 As the topography in the vicinity of the proposed Project site is flat and does not contain
3 prominent geologic or topographic features, no impacts would occur under NEPA.

4 *Mitigation Measures*

5 As impacts related to removal of prominent geologic or topographic features would
6 not occur, no mitigation measures are necessary.

7 *Residual Impacts*

8 With no mitigation required, there would be no residual impacts under NEPA.

9 ***Mineral Resources***

10 **Impact GEO-8b: Although the northern portion of the proposed Project**
11 **site is underlain by the Wilmington Oil Field, operation of the proposed**
12 **Project would not result in the permanent loss of availability of any**
13 **mineral resource of regional, statewide, or local significance.**

14 With respect to aggregate potential, the proposed Project site is located in MRZ-1,
15 which is defined as an area where adequate information indicates that no significant
16 mineral deposits are present or where it is judged that little likelihood exists for their
17 presence. However, with respect to petroleum resources, the northern portion of the
18 proposed Project site is located within the Wilmington Oil Field.

19 **CEQA Impact Determination**

20 Proposed Project operations would preclude oil and gas drilling from within proposed
21 Project boundaries; however, petroleum reserves beneath the site could be accessed
22 from remote locations, using directional (or slant) drilling techniques. Therefore, the
23 proposed Project would not result in the permanent loss of availability of a known
24 mineral resource that would be of future value to the region and the residents of the
25 state. Mineral resource impacts would be less than significant under CEQA.

26 *Mitigation Measures*

27 As impacts associated with mineral resources would be less than significant, no
28 mitigation measures are required.

29 *Residual Impacts*

30 With no mitigation required, the residual impacts are less than significant under CEQA.

31 **NEPA Impact Determination**

32 Operations from the NEPA project components would preclude oil and gas drilling
33 from within the proposed Project's boundaries; however, petroleum reserves beneath
34 the site could be accessed from remote locations, using directional (or slant) drilling

1 techniques. Therefore, proposed Project operations would not result in the permanent
2 loss of availability of a known mineral resource that would be of future value to the
3 region and the residents of the state and less than significant mineral resource impacts
4 would occur under NEPA.

5 *Mitigation Measures*

6 As impacts associated with mineral resources would be less than significant, no
7 mitigation measures are required.

8 *Residual Impacts*

9 With no mitigation required, the residual impacts would be less than significant under
10 NEPA.

11 **3.5.4.3.2 Alternatives**

12 **3.5.4.3.2.1 Alternative 1 – No Project Alternative**

13 ***3.5.4.3.2.1.1 Construction Impacts***

14 ***Seismicity***

15 **Impact GEO-1a: Seismic activity along the Palos Verdes Fault Zone, or**
16 **other regional faults, would not expose people and structures to**
17 **substantial risk.**

18 Under the No Project Alternative (Alternative 1), no development would occur
19 within the proposed Project area. Earthquake-related hazards at the proposed Project
20 site are the same under the No Project Alternative as those described above for the
21 proposed Project. However, because no new developments would occur, this
22 alternative would not result in or expose people to construction related geologic
23 impacts, including seismicity.

24 **CEQA Impact Determination**

25 As discussed with respect to the proposed Project, seismic activity along the Palos
26 Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic
27 ground shaking, liquefaction, or other seismically induced ground failure. However,
28 because the No Project alternative involves no construction, impacts due to
29 seismically induced ground failure would not occur under CEQA.

30 *Mitigation Measures*

31 No mitigation measures are required.

1 *Residual Impacts*

2 Residual impacts would not occur.

3 **NEPA Impact Determination**

4 Under this alternative, no development would occur within the in-water area (i.e., no
5 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
6 construction related impacts under NEPA are not applicable.

7 *Mitigation Measures*

8 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
9 required.

10 *Residual Impacts*

11 Residual impacts would not occur.

12 ***Tsunamis and Seiches***

13 **Impact GEO-2a: Tsunamis and seiches would not expose people and**
14 **structures to substantial risk.**

15 Under this alternative, no development would occur within the proposed Project area.
16 Tsunami- and seiche-related hazards at the proposed Project site are the same under
17 the No Project Alternative as those described above for the proposed Project.
18 However, because no new developments would occur, this alternative would not
19 result in or expose people to construction related geologic impacts, including
20 tsunamis and seiches.

21 **CEQA Impact Determination**

22 As discussed with respect to the proposed Project, the Port would potentially be
23 subject to inundation by a large tsunami as a result of an offshore earthquake or
24 landslide. However, because the No Project alternative involves no construction,
25 impacts due to tsunamis and seiches would not occur under CEQA.

26 *Mitigation Measures*

27 No mitigation measures are required.

28 *Residual Impacts*

29 Residual impacts would not occur.

NEPA Impact Determination

Under this alternative, no development would occur within the in-water area (i.e., no dredging, filling of the Northwest Slip, or new wharf construction). Therefore, construction related impacts under NEPA are not applicable.

Mitigation Measures

Due to No Federal Action, mitigation is not applicable. No mitigation measures are required.

Residual Impacts

Residual impacts would not occur.

Subsidence/Settlement**Impact GEO-3a: Subsidence/settlement would not expose people and structures to substantial risk.**

Under this alternative, no development would occur within the proposed Project area. Because no new developments would occur, this alternative would not result in or expose people to construction related geologic impacts, including subsidence/settlement.

CEQA Impact Determination

Because the No Project alternative involves no construction, impacts due to subsidence/settlement would not occur under CEQA.

Mitigation Measures

No mitigation measures are required.

Residual Impacts

Residual impacts would not occur.

NEPA Impact Determination

Under this alternative, no development would occur within the in-water area (i.e., no dredging, filling of the Northwest Slip, or new wharf construction). Therefore, construction related impacts under NEPA are not applicable.

Mitigation Measures

Due to No Federal Action, mitigation is not applicable. No mitigation measures are required.

1 *Residual Impacts*

2 Residual impacts would not occur.

3 ***Expansive Soils***

4 **Impact GEO-4a: Expansive soil would not expose people and structures**
5 **to substantial risk.**

6 Under this alternative, no development would occur within the proposed Project area.
7 Because no new developments would occur, this alternative would not result in or
8 expose people to construction related geologic impacts, including expansive soils.

9 **CEQA Impact Determination**

10 Because the No Project alternative involves no construction, impacts due to
11 expansive soils would not occur under CEQA.

12 *Mitigation Measures*

13 No mitigation measures are required.

14 *Residual Impacts*

15 Residual impacts would not occur.

16 **NEPA Impact Determination**

17 Under this alternative, no development would occur within the in-water area (i.e., no
18 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
19 construction related impacts under NEPA are not applicable.

20 *Mitigation Measures*

21 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
22 required.

23 *Residual Impacts*

24 Residual impacts would not occur.

25 ***Landslides and Mudslides***

26 **Impact GEO-5a: Landslides and mudslides would not expose people**
27 **and structures to substantial risk.**

28 Under this alternative, no development would occur within the proposed Project area.
29 Because no new developments would occur, this alternative would not result in or expose
30 people to construction related geologic impacts, including landslides and mudslides.

CEQA Impact Determination

Because the No Project alternative involves no construction, impacts due to landslides and mudslides would not occur under CEQA.

Mitigation Measures

No mitigation measures are required.

Residual Impacts

Residual impacts would not occur.

NEPA Impact Determination

Under this alternative, no development would occur within the in-water area (i.e., no dredging, filling of the Northwest Slip, or new wharf construction). Therefore, construction related impacts under NEPA are not applicable.

Mitigation Measures

Due to No Federal Action, mitigation is not applicable. No mitigation measures are required.

Residual Impacts

Residual impacts would not occur.

Unstable Soil Conditions**Impact GEO-6a: Unstable soil conditions would not expose people and structures to substantial risk.**

Under this alternative, no development would occur within the proposed Project area. Because no new developments would occur, this alternative would not result in or expose people to construction related geologic impacts, including unstable soil conditions.

CEQA Impact Determination

Because the No Project alternative involves no construction, impacts due to unstable soil conditions would not occur under CEQA.

Mitigation Measures

No mitigation measures are required.

Residual Impacts

Residual impacts would not occur.

1 **NEPA Impact Determination**

2 Under this alternative, no development would occur within the in-water area (i.e., no
3 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
4 construction related impacts under NEPA are not applicable.

5 *Mitigation Measures*

6 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
7 required.

8 *Residual Impacts*

9 Residual impacts would not occur.

10 ***Prominent Geologic and Topographic Features***

11 **Impact GEO-7a: The No Project Alternative would not result in one or
12 more distinct and prominent geologic or topographic features being
13 destroyed, permanently covered, or materially and adversely modified.**

14 Under this alternative, no development would occur within the proposed Project area.
15 Because no new developments would occur, this alternative would not result in any
16 distinct and prominent geologic or topographic features being destroyed, permanently
17 covered, or materially and adversely modified.

18 **CEQA Impact Determination**

19 Because the No Project alternative involves no construction, impacts associated with
20 potential removal of prominent geologic or topographic features would not occur
21 under CEQA.

22 *Mitigation Measures*

23 No mitigation measures are required.

24 *Residual Impacts*

25 Residual impacts would not occur.

26 **NEPA Impact Determination**

27 Under this alternative, no development would occur within the in-water area (i.e., no
28 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
29 construction related impacts under NEPA are not applicable.

30 *Mitigation Measures*

31 No mitigation measures are required.

1 *Residual Impacts*

2 Due to No Federal Action, mitigation is not applicable. Residual impacts would not
3 occur.

4 ***Mineral Resources***

5 **Impact GEO-8a: The No Project Alternative would not result in the**
6 **permanent loss of availability of any mineral resource of regional,**
7 **statewide, or local significance.**

8 Under this alternative, no development would occur within the proposed Project area.
9 Because no new developments would occur, this alternative would not result in the
10 permanent loss of availability of any mineral resource of regional, statewide, or local
11 significance.

12 **CEQA Impact Determination**

13 Because the No Project alternative involves no construction, impacts associated with
14 potential loss of availability of any mineral resource of regional, statewide, or local
15 significance would not occur under CEQA.

16 *Mitigation Measures*

17 No mitigation measures are required.

18 *Residual Impacts*

19 Residual impacts would not occur.

20 **NEPA Impact Determination**

21 Under this alternative, no development would occur within the in-water area (i.e., no
22 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
23 construction related impacts under NEPA are not applicable.

24 *Mitigation Measures*

25 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
26 required.

27 *Residual Impacts*

28 Residual impacts would not occur.

3.5.4.3.2.1.2 Operation Impacts

Seismicity

Impact GEO-1b: Seismic activity along the Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure that would expose people and structures to substantial risk.

Earthquake-related hazards at the project site are the same under the No Project Alternative as those described above for the proposed Project. Under this alternative, no development would occur within the Project area. There would be no seismic retrofits to the wharf structures, resulting in no beneficial impacts, as described for the proposed Project. Cargo ships that currently berth and load/unload at the terminal would continue to do so and operations are projected to increase over the CEQA baseline (See Tables 2-2 and 2-4). This alternative would result in a maximum container terminal of 176 acres with a maximum throughput of 1,697,000 TEUs (907,487 containers) per year. Approximately 250 vessel calls per year would be expected by 2025. Therefore, this alternative would continue to expose people to substantial risks associated with the geologic environment, although impacts would be less than those described for the proposed Project, as less development and infrastructure would be susceptible to seismically induced ground failure.

CEQA Impact Determination

As discussed with respect to the proposed Project, seismic activity along the Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure. Seismic hazards are common to the Los Angeles region and are not increased by the No Project Alternative. However, because the site is potentially underlain by strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill, there is a substantial risk of seismic impacts. Continued exposure of people and property during operations to seismic hazards from a major or great earthquake cannot be precluded, even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure are significant and unavoidable under CEQA.

Mitigation Measures

There are no mitigation measures available that would reduce impacts below significance associated with seismically induced ground failure.

Residual Impacts

Impacts due to seismically induced ground failure under this Alternative would be significant and unavoidable, which is the same as the proposed Project.

NEPA Impact Determination

Under this alternative, no development would occur within the in-water area (i.e., no dredging, filling of the Northwest Slip, or new wharf construction). Therefore, operations related impacts under NEPA are not applicable.

Mitigation Measures

Due to No Federal Action, mitigation is not applicable. No mitigation measures are required.

Residual Impacts

Residual impacts would not occur.

Tsunamis and Seiches

Impact GEO-2b: Operations under the No Project Alternative within the Port area would expose people and structures to substantial risk involving tsunamis or seiches. Local or distant seismic activity and/or offshore landslides could result in the occurrence of tsunamis or seiches in the West Basin area.

Risks of seismically induced tsunamis and seiches are typical for the entire California coastline and would not be increased by the No Project Alternative. As this alternative would result in a maximum container terminal of 176 acres with a maximum throughput of 1,697,000 TEUs (907,487 containers) per year and approximately 250 vessel calls by 2025, this alternative would continue to expose people to substantial risks associated with tsunamis and seiches. However, impacts would be less than those described for the proposed Project, as less development and infrastructure would be susceptible to seismically induced ground failure.

As discussed for **Impact GEO-2a** for the proposed Project, existing buildings and infrastructure may be subject to substantial damage from coastal flooding as a result of a large tsunami or seiche. Because the West Basin elevation is located within 10 to 15 feet (3 to 4.6 m) above MLLW, there is a substantial risk of coastal flooding due to tsunamis and seiches.

The risk to tanker vessels would be the same under the No Project Alternative as that described above for the proposed Project. Additionally, for the same reasons described for the proposed Project, substantial damage is not expected to a vessel or the wharf in the event that a tsunami was to strike while a vessel was secured at a berth.

CEQA Impact Determination

The No Project alternative would continue to expose people and property to flooding from tsunamis and seiches. Therefore, impacts due to tsunamis and seiches are significant and unavoidable under CEQA.

1 *Mitigation Measures*

2 Mitigation measures are not applicable to Alternative 1 during No Project operations,
3 as this alternative would not involve approval of new uses at Berths 136-147.

4 *Residual Impacts*

5 As there are no applicable mitigation measures, impacts would remain significant
6 under CEQA.

7 **NEPA Impact Determination**

8 Under this alternative, no development would occur within the in-water area (i.e., no
9 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
10 operations related impacts under NEPA are not applicable.

11 *Mitigation Measures*

12 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
13 required.

14 *Residual Impacts*

15 Residual impacts would not occur.

16 ***Subsidence/Settlement***

17 **Impact GEO-3b: Operations under the No Project Alternative 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 As discussed for **Impact GEO-3a**, subsidence in the vicinity of West Basin, due to
21 previous oil extraction in the Port area, has been mitigated and is not anticipated to
22 adversely impact the site. Because construction would not occur in association with
23 the No Project Alternative, impacts related to cracking and warping of structures
24 during operations as a result of saturated, unconsolidated/compressible sediments
25 would not occur.

26 **CEQA Impact Determination**

27 As subsidence in the vicinity of West Basin, due to previous oil extraction in the Port
28 area, has been mitigated and is not anticipated to adversely impact the site, impacts
29 would be less than significant from past actions. There would be no additional soil
30 settlement impacts during operations under CEQA, as there would be no new
31 construction under this alternative.

1 *Mitigation Measures*

2 As subsidence impacts would be less than significant, no mitigation measures are
3 necessary.

4 *Residual Impacts*

5 With no mitigation required, there would be no residual impacts, as there would be
6 no new construction under this alternative.

7 **NEPA Impact Determination**

8 Under this alternative, no development would occur within the in-water area (i.e., no
9 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
10 operations related impacts under NEPA are not applicable.

11 *Mitigation Measures*

12 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
13 required.

14 *Residual Impacts*

15 Residual impacts would not occur

16 ***Expansive Soils***

17 **Impact GEO-4b: Operations under the No Project Alternative would not**
18 **result in substantial damage to structures or infrastructure, or expose**
19 **people to substantial risk of injury from soil expansion.**

20 Because construction would not occur in association with the No Project Alternative,
21 impacts related to cracking and warping of structures during operations as a result of
22 expansive soils would not occur.

23 **CEQA Impact Determination**

24 Due to a lack of new construction, soil expansion impacts would not occur during
25 operations under this alternative.

26 *Mitigation Measures*

27 As expansive soil impacts would be less than significant, no mitigation measures are
28 necessary.

29 *Residual Impacts*

30 With no mitigation required, there would be no residual impacts, as there would be
31 no new construction under this alternative.

1 **NEPA Impact Determination**

2 Under this alternative, no development would occur within the in-water area (i.e., no
3 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
4 operations related impacts under NEPA are not applicable.

5 *Mitigation Measures*

6 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
7 required.

8 *Residual Impacts*

9 Residual impacts would not occur

10 ***Landslides and Mudslides***

11 **Impact GEO-5b: Operations under the No Project Alternative would not**
12 **result in or expose people or property to a substantial risk of landslides**
13 **or mudslides.**

14 The topography in the vicinity of the site is flat and not subject to landslides or
15 mudflows.

16 **CEQA Impact Determination**

17 As the topography in the vicinity of the site is flat and not subject to landslides or
18 mudflows, no impacts would occur under CEQA.

19 *Mitigation Measures*

20 As landslide and mudslide impacts would not occur, no mitigation measures are
21 necessary.

22 *Residual Impacts*

23 With no mitigation required, there would be no residual impacts under CEQA.

24 **NEPA Impact Determination**

25 Under this alternative, no development would occur within the in-water area (i.e., no
26 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
27 operations related impacts under NEPA are not applicable.

28 *Mitigation Measures*

29 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
30 required.

1 *Residual Impacts*

2 Residual impacts would not occur

3 ***Unstable Soil Conditions***

4 **Impact GEO-6b: Collapsible soils would have no impact on operations**
5 **under the No Project Alternative and would not expose people or**
6 **structures to substantial risk.**

7 No excavations would be completed as a part of operations under the No Project
8 Alternative; therefore, onsite soils would not be subject to collapse or caving.

9 **CEQA Impact Determination**

10 As excavations would not be completed as a part of operations under the No Project
11 Alternative, impacts associated with collapsible soils would not occur under CEQA.

12 *Mitigation Measures*

13 As impacts associated with collapsible soils would not occur, no mitigation measures
14 are required.

15 *Residual Impacts*

16 With no mitigation required, there would be no residual impacts associated with
17 collapsible soils under CEQA.

18 **NEPA Impact Determination**

19 Under this alternative, no development would occur within the in-water area (i.e., no
20 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
21 operations related impacts under NEPA are not applicable.

22 *Mitigation Measures*

23 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
24 required.

25 *Residual Impacts*

26 Residual impacts would not occur

27 ***Prominent Geologic and Topographic Features***

28 **Impact GEO-7b: Operations under the No Project Alternative would not**
29 **result in one or more distinct and prominent geologic or topographic**

1 **features being destroyed, permanently covered, or materially and**
2 **adversely modified.**

3 Since the West Basin area is relatively flat and paved, with no prominent geologic or
4 topographic features, operations under the No Project Alternative would not result in
5 any distinct and prominent geologic or topographic features being destroyed,
6 permanently covered, or materially and adversely modified.

7 **CEQA Impact Determination**

8 As the topography in the vicinity of the site is flat and does not contain prominent
9 geologic or topographic features, no impacts would occur under CEQA.

10 *Mitigation Measures*

11 As impacts due to removal of prominent geologic or topographic features would not
12 occur, no mitigation measures are necessary.

13 *Residual Impacts*

14 With no mitigation required, there would be no residual impacts under CEQA.

15 **NEPA Impact Determination**

16 Under this alternative, no development would occur within the in-water area (i.e., no
17 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
18 operations related impacts under NEPA are not applicable.

19 *Mitigation Measures*

20 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
21 required.

22 *Residual Impacts*

23 Residual impacts would not occur.

24 ***Mineral Resources***

25 **Impact GEO-8b: Although the northern portion of the site is underlain**
26 **by the Wilmington Oil Field, operations of the No Project Alternative**
27 **would not result in the permanent loss of availability of any mineral**
28 **resource of regional, statewide, or local significance.**

29 With respect to aggregate potential, the West Basin is located in MRZ-1, which is
30 defined as an area where adequate information indicates that no significant mineral
31 deposits are present or where it is judged that little likelihood exists for their
32 presence. However, with respect to petroleum resources, the northern portion of the
33 site is located within the Wilmington Oil Field.

CEQA Impact Determination

Operation of the No Project Alternative would preclude oil and gas drilling from within the proposed Project boundaries; however, petroleum reserves beneath the site could be accessed from remote locations, using directional (or slant) drilling techniques. Therefore, the No Project Alternative would not result in the permanent loss of availability of a known mineral resource of regional, state, or local significance that would be of future value to the region and the residents of the state. Mineral resource impacts are less than significant under CEQA.

Mitigation Measures

As mineral resources impacts would be less than significant, no mitigation measures are necessary.

Residual Impacts

With no mitigation required, residual impacts would be less than significant.

NEPA Impact Determination

Under this alternative, no development would occur within the in-water area (i.e., no dredging, filling of the Northwest Slip, or new wharf construction). Therefore, operations related impacts under NEPA are not applicable.

Mitigation Measures

Due to No Federal Action, mitigation is not applicable. No mitigation measures are required.

Residual Impacts

Residual impacts would not occur

3.5.4.3.2.2 Alternative 2 – Reduced Project: proposed Project without the 10-Acre Fill

3.5.4.3.2.2.1 Construction Impacts

Seismicity

Impact GEO-1a: Seismic activity along the Palos Verdes Fault Zone, or other regional faults, could 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 2015).

CEQA Impact Determination

Seismic impacts for the Reduced Project Alternative (Alternative 2) would be similar but less than those described for the proposed Project, because the 10-acre (4.0 ha) fill and 400-foot (122 m) Berth 136 wharf extension would not occur, thus resulting in less infrastructure susceptible to seismically induced ground failure. In all other respects, **Impact GEO-1a** would be the same as the proposed Project. As with the proposed Project, seismic activity along the Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure. Seismic hazards are common to the Los Angeles region and are not increased by this alternative. However, because the site is potentially underlain by strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill, there is a substantial risk of seismic impacts. Seismic upgrades would be completed on existing wharves, resulting in beneficial impacts. However, because construction of new wharves, buildings, and related infrastructure would occur over an extended period (through 2015), increased exposure of people and property during construction to seismic hazards from a major or great earthquake cannot be precluded, even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure are significant and unavoidable under CEQA.

Mitigation Measures

There are no mitigation measures available that would reduce impacts below significance associated with seismically induced ground failure.

Residual Impacts

Design and construction in accordance with applicable laws and regulations pertaining to seismically induced ground movement would minimize structural damage in the event of an earthquake. However, increased exposure of people and property during construction to seismic hazards from a major or great earthquake cannot be precluded even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure would remain significant and unavoidable.

NEPA Impact Determination

With respect to the No Federal Action/NEPA Baseline, in-water construction impacts would be similar but less than those described for the proposed Project because the 10-acre (4.0 ha) fill and 400-foot (122 m) Berth 136 wharf extension would not occur, thus resulting in less infrastructure susceptible to seismically induced ground failure. Alternative 2 would include seismic upgrades of existing wharves, resulting in beneficial seismic related impacts. Alternative 2 also would include the construction of new wharves and dikes, which would be susceptible to seismically induced ground shaking, fault rupture, and liquefaction. Therefore, beneficial impacts would be offset by adverse impacts.

Seismic hazards are common to the Los Angeles region and are not increased by Alternative 2. However, because the West Basin area is potentially underlain by

1 strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill, there is a
2 substantial risk of seismic impacts. Because construction would occur over an
3 extended period (through 2015), increased exposure of people and property during
4 construction to seismic hazards from a major or great earthquake cannot be precluded,
5 even with incorporation of modern construction engineering and safety standards.
6 Therefore, impacts due to seismically induced ground failure are significant and
7 unavoidable under NEPA.

8 *Mitigation Measures*

9 There are no mitigation measures available that would reduce impacts below
10 significance associated with seismically induced ground failure.

11 *Residual Impacts*

12 Design and construction in accordance with applicable laws and regulations
13 pertaining to seismically induced ground movement would minimize structural
14 damage in the event of an earthquake. However, increased exposure of people and
15 property during construction to seismic hazards from a major or great earthquake
16 cannot be precluded even with incorporation of modern construction engineering and
17 safety standards. Therefore, impacts due to seismically induced ground failure would
18 remain significant and unavoidable.

19 *Tsunami Runup*

20 **Impact GEO-2a: Alternative 2 construction within the Port area would**
21 **expose people and structures to substantial risk involving tsunamis or**
22 **seiches. Local or distant seismic activity and/or offshore landslides**
23 **could result in the occurrence of tsunamis or seiches within West Basin**
24 **and vicinity.**

25 CEQA Impact Determination

26 Tsunami/seiche impacts would be similar but less than those described for the proposed
27 Project, because the 10-acre (4.0 ha) fill and 400-foot (122 m) Berth 136 wharf extension
28 would not occur, thus resulting in less infrastructure susceptible to inundation. In all
29 other respects, **Impact GEO-2a** would be the same as the proposed Project. Therefore,
30 impacts during the construction phase of Alternative 2 would be significant and
31 unavoidable under CEQA.

32 *Mitigation Measures*

33 **Mitigation Measure GEO-1** shall be applied to the CEQA project impact
34 determination to reduce tsunami and seiche related impacts. Residual Impacts

35 Emergency planning and coordination between the Terminal operator and LAHD, as
36 outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-
37 site personnel during a tsunami. However, even with incorporation of emergency
38 planning and construction in accordance with current City and State regulations,

1 substantial damage and/or injury could occur in the event of a tsunami or seiche.
2 Therefore, residual impacts would remain significant and unavoidable.

3 **NEPA Impact Determination**

4 With respect to the No Federal Action/NEPA Baseline, in-water construction impacts
5 would be similar but less than those described for the proposed Project, because the
6 10-acre (4.0 ha) fill and 400-foot (122 m) Berth 136 wharf extension would not
7 occur, thus resulting in less infrastructure susceptible to inundation. In all other
8 respects, **Impact GEO-2a** would be the same as the proposed Project. Therefore,
9 impacts during the construction phase of Alternative 2 due to tsunamis and seiches
10 would be significant and unavoidable under NEPA.

11 *Mitigation Measures*

12 **Mitigation Measure GEO-1** shall be applied to the NEPA project impact determination
13 to reduce tsunami and seiche related impacts.

14 *Residual Impacts*

15 Emergency planning and coordination between the Terminal operator and the LAHD, as
16 outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-site
17 personnel during a tsunami. However, even with incorporation of emergency planning
18 and construction in accordance with current City and State regulations, substantial
19 damage and injury could occur in the event of a tsunami or seiche. Therefore, residual
20 impacts would remain significant and unavoidable.

21 *Subsidence/Settlement*

22 **Impact GEO-3a: Alternative 2 construction would not result in**
23 **substantial damage to structures or infrastructure, or expose people to**
24 **substantial risk of injury from subsidence/soil settlement.**

25 **CEQA Impact Determination**

26 Construction impacts would be similar but less than those described for the proposed
27 Project, because the 10-acre (4.0-ha) fill would not occur, thus resulting in less area
28 susceptible to subsidence/settlement. In all other respects, **Impact GEO-3a** would be the
29 same as the proposed Project. Impacts in backland areas would be less than significant
30 under CEQA as Alternative 2 would be designed and constructed in compliance with the
31 recommendations of the geotechnical engineer, consistent with Sections 91.000 through
32 91.7016 of the Los Angeles Municipal Code, and in conjunction with criteria established
33 by LAHD and Caltrans, and would not result in substantial damage to structures or
34 infrastructure, or expose people to substantial risk of injury.

35 *Mitigation Measures*

36 As subsidence impacts would be less than significant, no mitigation measures are
37 necessary.

1 *Residual Impacts*

2 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
3 Municipal Code resulting in no required mitigation, the residual impacts would be
4 less than significant under CEQA.

5 **NEPA Impact Determination**

6 The federal portion of Alternative 2 would be limited to wharf renovation and
7 channel deepening activities. Because subsidence/settlement impacts relate primarily
8 to proposed backland improvements and Alternative 2 does not include the 10-acre
9 (4-ha) fill, no impacts would occur under NEPA.

10 *Mitigation Measures*

11 As no subsidence impacts would occur, no mitigation measures are necessary.

12 *Residual Impacts*

13 With no mitigation required, there would be no residual impacts under NEPA.

14 ***Expansive Soils***

15 **Impact GEO-4a: Alternative 2 construction would not result in**
16 **substantial damage to structures or infrastructure, or expose people to**
17 **substantial risk of injury from soil expansion.**

18 **CEQA Impact Determination**

19 Construction impacts would be similar but less than those described for the proposed
20 Project, because the 10-acre (4.0-ha) fill would not occur, thus resulting in less area
21 susceptible to expansive soils. In all other respects, **Impact GEO-4a** would be the
22 same as the proposed Project. Expansive soil impacts in backland areas would be
23 less than significant under CEQA as Alternative 2 would be designed and constructed
24 in compliance with the recommendations of the geotechnical engineer, consistent
25 with Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, and in
26 conjunction with criteria established by LAHD, and would not result in substantial
27 damage to structures or infrastructure, or expose people to substantial risk of injury.

28 *Mitigation Measures*

29 As expansive soil impacts would be less than significant, no mitigation measures are
30 necessary.

31 *Residual Impacts*

32 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
33 Municipal Code, resulting in no required mitigation, the residual impacts would be
34 less than significant under CEQA.

1 **NEPA Impact Determination**

2 The federal portion of Alternative 2 would be limited to wharf renovation and
3 channel deepening activities. Because expansive soil impacts relate primarily to
4 proposed backland improvements and Alternative 2 does not include the 10-acre (4-
5 ha) fill, no impacts would occur under NEPA.

6 *Mitigation Measures*

7 As expansive soil impacts would not occur, no mitigation measures are necessary.

8 *Residual Impacts*

9 With no mitigation required, there would be no residual impacts under NEPA.

10 ***Landslides and Mudslides***

11 **Impact GEO-5a: Alternative 2 construction would not result in or expose**
12 **people or property to a substantial risk of landslides or mudslides.**

13 **CEQA Impact Determination**

14 As the topography in the vicinity of the Alternative 2 site is flat and not subject to
15 landslides or mudflows, no impacts would occur under CEQA.

16 *Mitigation Measures*

17 As landslide and mudslide impacts would not occur, no mitigation measures are
18 necessary.

19 *Residual Impacts*

20 With no mitigation required, there would be no residual impacts under CEQA.

21 **NEPA Impact Determination**

22 As the topography in the vicinity of the Alternative 2 site is flat and not subject to
23 landslides or mudflows, no impacts would occur under NEPA.

24 *Mitigation Measures*

25 As landslide and mudslide impacts would not occur, no mitigation measures are
26 necessary.

27 *Residual Impacts*

28 With no mitigation required, there would be no residual impacts under NEPA.

Unstable Soil Conditions

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

CEQA Impact Determination

Construction impacts would be similar but less than those described for the proposed Project, because the 10-acre (4.0 ha) fill and 400-foot (122 m) Berth 136 wharf extension would not occur, thus resulting in less area susceptible to unstable soil conditions. In all other respects, **Impact GEO-6a** would be the same as the proposed Project. Impacts associated with shallow groundwater would be less than significant under CEQA due to implementation of standard engineering practices regarding saturated, collapsible soils.

Mitigation Measures

As impacts associated with collapsible soils would be less than significant, no mitigation measures are required.

Residual Impacts

The residual impacts would be less than significant under CEQA.

NEPA Impact Determination

The federal portion of Alternative 2 would be limited to wharf renovation and channel deepening activities. Because collapsible soil impacts relate primarily to proposed backland improvements and Alternative 2 does not include the 10-acre (4-ha) fill, no impacts would occur under NEPA.

Mitigation Measures

As impacts associated with collapsible soils would not occur, no mitigation measures are required.

Residual Impacts

With no mitigation required, there would be no residual impacts under NEPA.

Prominent Geologic and Topographic Features

Impact GEO-7a: Alternative 2 construction would not result in one or more distinct and prominent geologic or topographic features being destroyed, permanently covered, or materially and adversely modified.

1 **CEQA Impact Determination**

2 As the topography in the vicinity of the Alternative 2 site is flat and does not contain
3 prominent geologic or topographic features, no impacts would occur under CEQA.

4 *Mitigation Measures*

5 As impacts due to removal of prominent geologic or topographic features would not
6 occur, no mitigation measures are necessary.

7 *Residual Impacts*

8 With no mitigation required, there would be no residual impacts under CEQA.

9 **NEPA Impact Determination**

10 As the topography in the vicinity of the Alternative 2 site is flat and does not contain
11 prominent geologic or topographic features, no impacts would occur under NEPA.

12 *Mitigation Measures*

13 As impacts related to removal of prominent geologic or topographic features would
14 not occur, no mitigation measures are necessary.

15 *Residual Impacts*

16 With no mitigation required, there would be no residual impacts under NEPA.

17 ***Mineral Resources***

18 **Impact GEO-8a: Although the northern portion of West Basin is underlain
19 by the Wilmington Oil Field, Alternative 2 site construction would not
20 result in the permanent loss of availability of any mineral resource of
21 regional, statewide, or local significance.**

22 With respect to aggregate potential, the Alternative 2 site is located in MRZ-1, which
23 is defined as an area where adequate information indicates that no significant mineral
24 deposits are present or where it is judged that little likelihood exists for their
25 presence. However, with respect to petroleum resources, the northern portion of the
26 Alternative 2 site is located within the Wilmington Oil Field.

27 **CEQA Impact Determination**

28 Alternative 2 construction would preclude oil and gas drilling from within
29 Alternative 2 boundaries; however, petroleum reserves beneath the site could be
30 accessed from remote locations, using directional (or slant) drilling techniques.
31 Therefore, Alternative 2 would not result in the permanent loss of availability of a
32 known mineral resource of regional, state, or local significance that would be of
33 future value to the region and the residents of the state. Mineral resource impacts are
34 less than significant under CEQA.

1 *Mitigation Measures*

2 As impacts associated with mineral resources would be less than significant, no
3 mitigation measures are required.

4 *Residual Impacts*

5 With no mitigation required, the residual impacts are less than significant under
6 CEQA.

7 **NEPA Impact Determination**

8 The federal portion of Alternative 2 would be limited to wharf renovation and
9 channel deepening activities, which would preclude oil and gas drilling from within
10 site boundaries. However, petroleum reserves beneath the site could be accessed
11 from remote locations, using directional (or slant) drilling techniques. Therefore,
12 Alternative 2 would not result in the permanent loss of availability of a known
13 mineral resource that would be of future value to the region and the residents of the
14 state, and less than significant mineral resource impacts would occur under NEPA.

15 *Mitigation Measures*

16 As impacts associated with mineral resources would be less than significant, no
17 mitigation measures are required.

18 *Residual Impacts*

19 With no mitigation required, the residual impacts would be less than significant under
20 NEPA.

21 ***3.5.4.3.2.2.2 Operations Impacts***

22 ***Seismicity***

23 **Impact GEO-1b: Seismic activity along the Palos Verdes Fault Zone, or**
24 **other regional faults, could produce fault rupture, seismic ground**
25 **shaking, liquefaction, or other seismically induced ground failure that**
26 **would expose people and structures to substantial risk during the**
27 **operations period (through 2038).**

28 **CEQA Impact Determination**

29 Seismic impacts would be similar but less than those described for the proposed Project,
30 because the 10-acre (4.0 ha) fill and 400-foot (122 m) Berth 136 wharf extension would
31 not occur, thus resulting in less infrastructure susceptible to seismically induced ground
32 failure. In all other respects, **Impact GEO-1b** would be the same as the proposed
33 Project. As with the proposed Project, seismic activity along the Palos Verdes Fault
34 Zone, or other regional faults, could produce fault rupture, seismic ground shaking,
35 liquefaction, or other seismically induced ground failure. Seismic hazards are common

1 to the Los Angeles region and are not increased by the Alternative 2. However, because
2 the Alternative 2 site is potentially underlain by strands of the active Palos Verdes Fault
3 and liquefaction-prone hydraulic fill, there is a substantial risk of seismic impacts.
4 Increased exposure of people and property during operations to seismic hazards from a
5 major or great earthquake cannot be precluded, even with incorporation of modern
6 construction engineering and safety standards. Therefore, impacts due to seismically
7 induced ground failure are significant and unavoidable under CEQA.

8 *Mitigation Measures*

9 There are no mitigation measures available that would reduce impacts below
10 significance associated with seismically induced ground failure.

11 *Residual Impacts*

12 Design and construction in accordance with applicable laws and regulations
13 pertaining to seismically induced ground movement would minimize structural
14 damage in the event of an earthquake. However, increased exposure of people and
15 property during operations to seismic hazards from a major or great earthquake
16 cannot be precluded even with incorporation of modern construction engineering and
17 safety standards. Therefore, impacts due to seismically induced ground failure would
18 remain significant and unavoidable.

19 **NEPA Impact Determination**

20 Construction impacts would be similar but less than those described for the proposed
21 Project because the 10-acre (4.0-ha) fill and 400-foot (122 m) Berth 136 wharf
22 extension would not occur, thus resulting in less infrastructure susceptible to
23 seismically induced ground failure. In all other respects, **Impact GEO-1b** would be
24 the same as the proposed Project. The federal portion of Alternative 2 would include
25 seismic upgrades of existing wharves, resulting in beneficial seismic related impacts.
26 Alternative 2 would also include the construction of new wharves and dikes, which
27 would be susceptible to seismically induced ground shaking, fault rupture, and
28 liquefaction. Therefore, beneficial impacts would be offset by adverse impacts.

29 Seismic hazards are common to the Los Angeles region and are not increased by
30 Alternative 2. However, because the Alternative 2 area is potentially underlain by
31 strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill, there is
32 a substantial risk of seismic impacts. Increased exposure of people and property
33 during operations to seismic hazards from a major or great earthquake cannot be
34 precluded, even with incorporation of modern construction engineering and safety
35 standards. Therefore, impacts due to seismically induced ground failure are
36 significant and unavoidable under NEPA.

37 *Mitigation Measures*

38 There are no mitigation measures available that would reduce impacts below
39 significance associated with seismically induced ground failure.

Residual Impacts

Design and construction in accordance with applicable laws and regulations pertaining to seismically induced ground movement would minimize structural damage in the event of an earthquake. However, increased exposure of people and property during operations to seismic hazards from a major or great earthquake cannot be precluded even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure would remain significant and unavoidable.

Tsunamis and Seiches

Impact GEO-2b: Alternative 2 operations within the Port area would expose people and structures to substantial risk involving tsunamis or seiches. Local or distant seismic activity and/or offshore landslides could result in the occurrence of tsunamis or seiches within the Alternative 2 area and vicinity.

CEQA Impact Determination

Tsunami/seiche impacts would be similar but less than those described for the proposed Project, because the 10-acre (4.0-ha) fill and 400-foot (122 m) Berth 136 wharf extension would not occur, thus resulting in less infrastructure susceptible to inundation. In all other respects, **Impact GEO-2b** would be the same as the proposed Project. Therefore, impacts during the operations phase of Alternative 2 would be significant and unavoidable under CEQA.

Mitigation Measures

Mitigation Measure GEO-1 shall be applied to the CEQA project impact determination to reduce tsunami and seiche related impacts.

Residual Impacts

Emergency planning and coordination between the Terminal operator and LAHD, as outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-site personnel during a tsunami. However, even with incorporation of emergency planning and construction in accordance with current City and State regulations, substantial damage and/or injury could occur in the event of a tsunami or seiche. Therefore, residual impacts would remain significant and unavoidable.

NEPA Impact Determination

Operation impacts would be similar but less than those described for the proposed Project, because the 10-acre (4.0-ha) fill and 400-foot (122 m) Berth 136 wharf extension would not occur, thus resulting in less infrastructure susceptible to inundation. In all other respects, **Impact GEO-1b** would be the same as the proposed Project. Therefore, impacts due to tsunami and seiches during the operations phase are significant and unavoidable under NEPA.

1 *Mitigation Measures*

2 **Mitigation Measure GEO-1** shall be applied to the NEPA project impact
3 determination to reduce tsunami and seiche related impacts.

4 *Residual Impacts*

5 Emergency planning and coordination between the Terminal operator and the LAHD,
6 as outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to
7 on-site personnel during a tsunami. However, even with incorporation of emergency
8 planning and construction in accordance with current City and State regulations,
9 substantial damage and injury could occur in the event of a tsunami or seiche.
10 Therefore, residual impacts would remain significant and unavoidable.

11 *Subsidence/Settlement*

12 **Impact GEO-3b: Alternative 2 operation would not result in substantial**
13 **damage to structures or infrastructure, or expose people to substantial**
14 **risk of injury from subsidence/soil settlement.**

15 **CEQA Impact Determination**

16 Subsidence/settlement impacts during operations would be similar but less than those
17 described for the proposed Project, because the 10-acre (4.0 ha) fill would not occur,
18 thus resulting in less area susceptible to settlement. In all other respects, **Impact**
19 **GEO-3b** would be the same as the proposed Project. Settlement impacts in backland
20 areas would be less than significant under CEQA, as Alternative 2 would be designed
21 and constructed in compliance with the recommendations of the geotechnical
22 engineer, consistent with Sections 91.000 through 91.7016 of the Los Angeles
23 Municipal Code, and in conjunction with criteria established by LAHD and Caltrans,
24 and would not result in substantial damage to structures or infrastructure, or expose
25 people to substantial risk of injury.

26 *Mitigation Measures*

27 As subsidence impacts would be less than significant, no mitigation measures are
28 necessary.

29 *Residual Impacts*

30 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
31 Municipal Code, the residual impacts would be less than significant under CEQA.

32 **NEPA Impact Determination**

33 The federal portion of Alternative 2 would be limited to wharf renovation and
34 dredging activities. Because subsidence/settlement impacts relate primarily to
35 proposed backland improvements and Alternative 2 does not include the 10-acre (4-
36 ha) fill, no impacts would occur under NEPA.

Mitigation Measures

As no subsidence impacts would occur, no mitigation measures are necessary.

Residual Impacts

With no mitigation required, there would be no residual impacts under NEPA.

Expansive Soils

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

CEQA Impact Determination

Operations impacts would be similar but less than those described for the proposed Project, because the 10-acre (4.0-ha) fill would not occur, thus resulting in less area susceptible to soil expansion. In all other respects, **Impact GEO-4b** would be the same as the proposed Project. Expansive soil impacts in backland areas would be less than significant under CEQA, as Alternative 2 would be designed and constructed in compliance with the recommendations of the geotechnical engineer, consistent with Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, and in conjunction with criteria established by LAHD, and would not result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

Mitigation Measures

As expansive soil impacts would be less than significant, no mitigation measures are necessary.

Residual Impacts

With implementation of Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, the residual impacts would be less than significant under CEQA.

NEPA Impact Determination

The federal portions of Alternative 2 would be limited to wharf renovation and channel deepening activities. Because expansive soil impacts relate primarily to proposed backland improvements, and Alternative 2 does not include the 10-acre (4 ha) fill, no impacts would occur under NEPA.

Mitigation Measures

As expansive soil impacts would not occur, no mitigation measures are necessary.

1 *Residual Impacts*

2 With no mitigation required, there would be no residual impacts under NEPA.

3 ***Landslides and Mudslides***

4 **Impact GEO-5b: Alternative 2 operations would not result in or expose**
5 **people or property to a substantial risk of landslides or mudslides.**

6 **CEQA Impact Determination**

7 As the topography in the vicinity of the Alternative 2 site is flat and not subject to
8 landslides or mudflows, no impacts would occur under CEQA.

9 *Mitigation Measures*

10 As landslide and mudslide impacts would not occur, no mitigation measures are
11 necessary.

12 *Residual Impacts*

13 With no mitigation required, there would be no residual impacts under CEQA.

14 **NEPA Impact Determination**

15 As the topography in the vicinity of the Alternative 2 site is flat and not subject to
16 landslides or mudflows, no impacts would occur under NEPA.

17 *Mitigation Measures*

18 As landslide and mudslide impacts would not occur, no mitigation measures are
19 necessary.

20 *Residual Impacts*

21 With no mitigation required, there would be no residual impacts under NEPA.

22 ***Unstable Soil Conditions***

23 **Impact GEO-6b: Collapsible soils would have no impact on Alternative 2**
24 **operations and would not expose people or structures to substantial risk.**

25 **CEQA Impact Determination**

26 As excavations would not be completed as a part of Alternative 2 operations, impacts
27 associated with collapsible soils would not occur under CEQA.

1 *Mitigation Measures*

2 As impacts associated with collapsible soils would not occur, no mitigation measures
3 are required.

4 *Residual Impacts*

5 With no mitigation required, there would be no residual impacts under CEQA.

6 **NEPA Impact Determination**

7 Because collapsible soil impacts relate primarily to proposed backland improvements
8 and Alternative 2 does not include the 10-acre (4-ha) fill, no impacts would occur
9 under NEPA.

10 *Mitigation Measures*

11 As impacts associated with collapsible soils would not occur, no mitigation measures
12 are required.

13 *Residual Impacts*

14 With no mitigation required, there would be no residual impacts under NEPA.

15 ***Prominent Geologic and Topographic Features***

16 **Impact GEO-7b: Alternative 2 operations would not result in one or
17 more distinct and prominent geologic or topographic features being
18 destroyed, permanently covered, or materially and adversely modified.**

19 **CEQA Impact Determination**

20 As the topography in the vicinity of the Alternative 2 site is flat and does not contain
21 prominent geologic or topographic features, no impacts would occur under CEQA.

22 *Mitigation Measures*

23 As impacts due to removal of prominent geologic or topographic features would not
24 occur, no mitigation measures are necessary.

25 *Residual Impacts*

26 With no mitigation required, there would be no residual impacts under CEQA.

27 **NEPA Impact Determination**

28 As the topography in the vicinity of the Alternative 2 site is flat and does not contain
29 prominent geologic or topographic features, no impacts would occur under NEPA.

1 *Mitigation Measures*

2 As impacts related to removal of prominent geologic or topographic features would
3 not occur, no mitigation measures are necessary.

4 *Residual Impacts*

5 With no mitigation required, there would be no residual impacts under NEPA.

6 ***Mineral Resources***

7 **Impact GEO-8b: Although the northern portion of the Alternative 2 site**
8 **is underlain by the Wilmington Oil Field, Alternative 2 operations would**
9 **not result in the permanent loss of availability of any mineral resource**
10 **of regional, statewide, or local significance.**

11 With respect to aggregate potential, the Alternative 2 site is located in MRZ-1, which
12 is defined as an area where adequate information indicates that no significant mineral
13 deposits are present or where it is judged that little likelihood exists for their
14 presence. However, with respect to petroleum resources, the northern portion of the
15 Alternative 2 site is located within the Wilmington Oil Field.

16 **CEQA Impact Determination**

17 Alternative 2 operations would preclude oil and gas drilling from within Alternative 2
18 boundaries; however, petroleum reserves beneath the site could be accessed from remote
19 locations, using directional (or slant) drilling techniques. Therefore, Alternative 2 would
20 not result in the permanent loss of availability of a known mineral resource of regional,
21 state, or local significance that would be of future value to the region and the residents of
22 the state. Mineral resource impacts are less than significant under CEQA.

23 *Mitigation Measures*

24 As impacts associated with mineral resources would be less than significant, no
25 mitigation measures are required.

26 *Residual Impacts*

27 With no mitigation required, the residual impacts are less than significant under
28 CEQA.

29 **NEPA Impact Determination**

30 Wharf renovation/construction and dredging activities would preclude oil and gas drilling
31 from within Alternative 2 boundaries. However, petroleum reserves beneath the site
32 could be accessed from remote locations, using directional (or slant) drilling techniques.
33 Therefore, Alternative 2 operations would not result in the permanent loss of availability
34 of a known mineral resource that would be of future value to the region and the residents
35 of the state and less than significant mineral resource impacts would occur under NEPA.

Mitigation Measures

As impacts associated with mineral resources would be less than significant, no mitigation measures are required.

Residual Impacts

With no mitigation required, the residual impacts would be less than significant under NEPA.

3.5.4.3.2.3 Alternative 3 – Reduced Wharf

3.5.4.3.2.3.1 Construction Impacts

Seismicity

Impact GEO-1a: Seismic activity along the Palos Verdes Fault Zone, or other regional faults, could 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 2015).

CEQA Impact Determination

Construction impacts of the Reduced Wharf Alternative (Alternative 3) would be similar but less than those identified for the proposed Project because the 400-foot Berth 136 wharf extension and 705-foot wharf at Berths 145-147 would not be constructed and the 10-acre (4.0 ha) Northwest Slip would not be filled, thus resulting in less infrastructure susceptible to seismically induced ground failure. In all other respects, **Impact GEO-1a** would be the same as the proposed Project. As with the proposed Project, seismic activity along the Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure. Seismic hazards are common to the Los Angeles region and are not increased by this alternative. However, because the site is potentially underlain by strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill, there is a substantial risk of seismic impacts. Seismic upgrades would be completed on existing wharves, resulting in beneficial impacts. However, because construction of buildings and related infrastructure would occur over an extended period (through 2015), increased exposure of people and property during construction to seismic hazards from a major or great earthquake cannot be precluded, even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure are significant and unavoidable under CEQA.

Mitigation Measures

There are no mitigation measures available that would reduce impacts below significance associated with seismically induced ground failure.

Residual Impacts

Design and construction in accordance with applicable laws and regulations pertaining to seismically induced ground movement would minimize structural damage in the event of an earthquake. However, increased exposure of people and property during construction to seismic hazards from a major or great earthquake cannot be precluded even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure would remain significant and unavoidable.

NEPA Impact Determination

As the Reduced Wharf Alternative would only include minimal in-water construction activities (i.e., deepening navigation channels and wharf seismic improvements), potential impacts would be similar to, but less severe than those described for the proposed Project under the NEPA analysis. Seismic hazards are common to the Los Angeles region and are not increased by Alternative 3. Seismic upgrade of existing wharves would result in beneficial seismic related impacts. However, because the West Basin area is potentially underlain by strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill, there is a substantial risk of seismic impacts. Because construction would occur over an extended period (through 2015), increased exposure of people and property during construction to seismic hazards from a major or great earthquake cannot be precluded, even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure are significant and unavoidable under NEPA.

Mitigation Measures

There are no mitigation measures available that would reduce impacts below significance associated with seismically induced ground failure.

Residual Impacts

Design and construction in accordance with applicable laws and regulations pertaining to seismically induced ground movement would minimize structural damage in the event of an earthquake. However, increased exposure of people and property during construction to seismic hazards from a major or great earthquake cannot be precluded even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure would remain significant and unavoidable.

Tsunami Runup

Impact GEO-2a: Alternative 3 construction within the Port area would expose people and structures to substantial risk involving tsunamis or seiches. Local or distant seismic activity and/or offshore landslides could result in the occurrence of tsunamis or seiches within West Basin and vicinity.

CEQA Impact Determination

Construction impacts of this alternative would be similar but less than those identified for the proposed Project because the 400-foot Berth 136 wharf extension and 705-foot wharf at Berths 145-147 would not be constructed and the 10-acre (4.0-ha) Northwest Slip would not be filled, thus resulting in less infrastructure susceptible to inundation. In all other respects, **Impact GEO-2a** would be the same as the proposed Project. Therefore, impacts during the construction phase would be significant and unavoidable under CEQA.

Mitigation Measures

Mitigation Measure GEO-1 shall be applied to the CEQA project impact determination to reduce tsunami and seiche related impacts.

Residual Impacts

Emergency planning and coordination between the Terminal operator and LAHD, as outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-site personnel during a tsunami. However, even with incorporation of emergency planning and construction in accordance with current City and State regulations, substantial damage and/or injury could occur in the event of a tsunami or seiche. Therefore, residual impacts would remain significant and unavoidable.

NEPA Impact Determination

As the Reduced Wharf Alternative would only include minimal in-water construction activities (i.e., deepening navigation channels and wharf seismic improvements), potential impacts would be similar to, but less than those described for the proposed Project under the NEPA analysis. In all other respects, **Impact GEO-2a** would be the same as the proposed Project. Therefore, impacts due to tsunamis and seiches during the construction phase would be significant and unavoidable under NEPA.

Mitigation Measures

Mitigation Measure GEO-1 shall be applied to the NEPA project impact determination to reduce tsunami and seiche related impacts.

Residual Impacts

Emergency planning and coordination between the Terminal operator and the LAHD, as outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-site personnel during a tsunami. However, even with incorporation of emergency planning and construction in accordance with current City and State regulations, substantial damage and injury could occur in the event of a tsunami or seiche. Therefore, residual impacts would remain significant and unavoidable.

1 ***Subsidence/Settlement***

2 **Impact GEO-3a: Alternative 3 construction would not result in**
3 **substantial damage to structures or infrastructure, or expose people to**
4 **substantial risk of injury from subsidence/soil settlement.**

5 **CEQA Impact Determination**

6 Construction impacts of this alternative would be similar but less than those
7 identified for the proposed Project because the 10-acre (4.0-ha) Northwest Slip would
8 not be filled, thus resulting in less area susceptible to subsidence/settlement. In all
9 other respects, **Impact GEO-3a** would be the same as the proposed Project. Impacts
10 in backland areas would be less than significant under CEQA, as Alternative 3 would
11 be designed and constructed in compliance with the recommendations of the
12 geotechnical engineer, consistent with Sections 91.000 through 91.7016 of the Los
13 Angeles Municipal Code, and in conjunction with criteria established by LAHD and
14 Caltrans, and would not result in substantial damage to structures or infrastructure, or
15 expose people to substantial risk of injury.

16 ***Mitigation Measures***

17 As subsidence impacts would be less than significant, no mitigation measures are
18 necessary.

19 ***Residual Impacts***

20 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
21 Municipal Code, the residual impacts would be less than significant under CEQA.

22 **NEPA Impact Determination**

23 The federal portions of Alternative 3 construction would be limited to wharf
24 renovation and dredging activities. Because subsidence/settlement impacts relate
25 primarily to proposed backland improvements and Alternative 3 does not include the
26 10-acre (4-ha) fill, no impacts would occur under NEPA.

27 ***Mitigation Measures***

28 As no subsidence impacts would occur, no mitigation measures are necessary.

29 ***Residual Impacts***

30 With no mitigation required, there would be no residual impacts under NEPA.

31 ***Expansive Soils***

32 **Impact GEO-4a: Alternative 3 construction would not result in**
33 **substantial damage to structures or infrastructure, or expose people to**
34 **substantial risk of injury from soil expansion.**

CEQA Impact Determination

1
2 Construction impacts of this alternative would be similar but less than those
3 identified for the proposed Project, as the 10-acre (4.0-ha) Northwest Slip would not
4 be filled, thus resulting in less area susceptible to expansive soils. In all other
5 respects, **Impact GEO-4a** would be the same as the proposed Project. Expansive
6 soil impacts in backland areas would be less than significant under CEQA as
7 Alternative 3 would be designed and constructed in compliance with the
8 recommendations of the geotechnical engineer, consistent with Sections 91.000
9 through 91.7016 of the Los Angeles Municipal Code, and in conjunction with criteria
10 established by LAHD, and would not result in substantial damage to structures or
11 infrastructure, or expose people to substantial risk of injury.

Mitigation Measures

12
13 As expansive soil impacts would be less than significant, no mitigation measures are
14 necessary.

Residual Impacts

15
16 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
17 Municipal Code, the residual impacts would be less than significant under CEQA.

NEPA Impact Determination

18
19 The federal portions of Alternative 3 construction would be limited to wharf and in-
20 water activities, including new concrete piles for seismic renovation and channel
21 deepening. Because expansive soil impacts relate primarily to proposed backland
22 improvements and Alternative 3 does not include the 10-acre (4-ha) fill, no impacts
23 would occur under NEPA.

Mitigation Measures

24
25 As expansive soil impacts would not occur, no mitigation measures are necessary.

Residual Impacts

26
27 With no mitigation required, there would be no residual impacts under NEPA.

Landslides and Mudslides

28
29 **Impact GEO-5a: Alternative 3 construction would not result in or expose**
30 **people or property to a substantial risk of landslides or mudslides.**

CEQA Impact Determination

31
32 As the topography in the vicinity of the Alternative 3 site is flat and not subject to
33 landslides or mudflows, no impacts would occur under CEQA.

1 *Mitigation Measures*

2 As landslide and mudslide impacts would not occur, no mitigation measures are
3 necessary.

4 *Residual Impacts*

5 With no mitigation required, there would be no residual impacts under CEQA.

6 **NEPA Impact Determination**

7 As the topography in the vicinity of the Alternative 3 site is flat and not subject to
8 landslides or mudflows, no impacts would occur under NEPA.

9 *Mitigation Measures*

10 As landslide and mudslide impacts would not occur, no mitigation measures are
11 necessary.

12 *Residual Impacts*

13 With no mitigation required, there would be no residual impacts under NEPA.

14 ***Unstable Soil Conditions***

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

18 **CEQA Impact Determination**

19 Construction impacts of this alternative would be similar but less than those
20 identified for the proposed Project because the 400-foot Berth 136 wharf extension
21 and 705-foot wharf at Berths 145-147 would not be constructed and the 10-acre (4.0
22 ha) Northwest Slip would not be filled, thus resulting in less infrastructure
23 susceptible to unstable soil conditions. In all other respects, **Impact GEO-6a** would
24 be the same as the proposed Project. Therefore, impacts associated with shallow
25 groundwater would be less than significant under CEQA due to implementation of
26 standard engineering practices regarding saturated, collapsible soils.

27 *Mitigation Measures*

28 As impacts associated with collapsible soils would be less than significant, no
29 mitigation measures are required.

30 *Residual Impacts*

31 With no mitigation required, the residual impacts would be less than significant under
32 CEQA.

NEPA Impact Determination

The federal portions of Alternative 3 construction would be limited to wharf and in-water construction activities including new concrete piles for seismic renovation and channel deepening. Because collapsible soil impacts relate primarily to proposed backland improvements and Alternative 3 does not include the 10-acre (4-ha) fill, no impacts would occur under NEPA.

Mitigation Measures

As impacts associated with collapsible soils would not occur, no mitigation measures are required.

Residual Impacts

With no mitigation required, there would be no residual impacts under NEPA.

Prominent Geologic and Topographic Features

Impact GEO-7a: Alternative 3 construction would not result in one or more distinct and prominent geologic or topographic features being destroyed, permanently covered, or materially and adversely modified.

CEQA Impact Determination

As the topography in the vicinity of the Alternative 3 site is flat and does not contain prominent geologic or topographic features, no impacts would occur under CEQA.

Mitigation Measures

As impacts due to removal of prominent geologic or topographic features would not occur, no mitigation measures are necessary.

Residual Impacts

With no mitigation required, there would be no residual impacts under CEQA.

NEPA Impact Determination

As the topography in the vicinity of the Alternative 3 project site is flat and does not contain prominent geologic or topographic features, no impacts would occur under NEPA.

Mitigation Measures

As impacts related to removal of prominent geologic or topographic features would not occur, no mitigation measures are necessary.

1 *Residual Impacts*

2 With no mitigation required, there would be no residual impacts under NEPA.

3 ***Mineral Resources***

4 **Impact GEO-8a: Although the northern portion of West Basin is**
5 **underlain by the Wilmington Oil Field, Alternative 3 site construction**
6 **would not result in the permanent loss of availability of any mineral**
7 **resource of regional, statewide, or local significance.**

8 With respect to aggregate potential, the Alternative 3 site is located in MRZ-1, which
9 is defined as an area where adequate information indicates that no significant mineral
10 deposits are present or where it is judged that little likelihood exists for their
11 presence. However, with respect to petroleum resources, the northern portion of the
12 Alternative 3 site is located within the Wilmington Oil Field.

13 **CEQA Impact Determination**

14 Alternative 3 construction would preclude oil and gas drilling from within project
15 boundaries; however, petroleum reserves beneath the site could be accessed from
16 remote locations, using directional (or slant) drilling techniques. Therefore,
17 Alternative 3 would not result in the permanent loss of availability of a known
18 mineral resource that would be of future value to the region and the residents of the
19 state. Mineral resource impacts are less than significant under CEQA.

20 ***Mitigation Measures***

21 As impacts associated with mineral resources would be less than significant, no
22 mitigation measures are required.

23 *Residual Impacts*

24 With no mitigation required, the residual impacts are less than significant under
25 CEQA.

26 **NEPA Impact Determination**

27 In-water construction for wharf renovation and channel deepening would preclude oil
28 and gas drilling from within Alternative 3 site boundaries; however, petroleum
29 reserves beneath the site could be accessed from remote locations using directional
30 (or slant) drilling techniques. Therefore, Alternative 3 would not result in the
31 permanent loss of availability of a known mineral resource that would be of future
32 value to the region and the residents of the state and less than significant mineral
33 resource impacts would occur under NEPA.

Mitigation Measures

As impacts associated with mineral resources would be less than significant, no mitigation measures are required.

Residual Impacts

With no mitigation required, the residual impacts are less than significant under NEPA.

3.5.4.3.2.3.2 Operations Impacts

Seismicity

Impact GEO-1b: Seismic activity along the Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure that would expose people and structures to substantial risk during the operations period (through 2038).

CEQA Impact Determination

Operations impacts of this alternative would be similar but less than those identified for the proposed Project because the 400-foot Berth 136 wharf extension and 705-foot wharf at Berths 145-147 would not be constructed and the 10-acre (4.0 ha) Northwest Slip would not be filled, thus resulting in less infrastructure susceptible to seismically induced ground failure. In all other respects, **Impact GEO-1b** would be the same as the proposed Project. As with the proposed Project, seismic activity along the Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure. Seismic hazards are common to the Los Angeles region and are not increased by Alternative 3. However, because the Alternative 3 site is potentially underlain by strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill, there is a substantial risk of seismic impacts. Increased exposure of people and property during operations to seismic hazards from a major or great earthquake cannot be precluded, even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure are significant and unavoidable under CEQA.

Mitigation Measures

There are no mitigation measures available that would reduce impacts below significance associated with seismically induced ground failure.

Residual Impacts

Design and construction in accordance with applicable laws and regulations pertaining to seismically induced ground movement would minimize structural damage in the event of an earthquake. However, increased exposure of people and property during operations to seismic hazards from a major or great earthquake

1 cannot be precluded even with incorporation of modern construction engineering and
2 safety standards. Therefore, impacts due to seismically induced ground failure would
3 remain significant and unavoidable.

4 **NEPA Impact Determination**

5 As the federal portions of the Reduced Wharf Alternative would only include
6 minimal in-water construction activities (i.e., deepening navigation channels and
7 wharf seismic improvements), potential operations impacts would be similar to, but
8 less severe than those described for the proposed Project under the NEPA analysis.
9 In all other respects, **Impact GEO-1b** would be the same as the proposed Project.
10 Seismic upgrade of existing wharves would result in beneficial seismic related
11 impacts. Seismic hazards are common to the Los Angeles region and are not
12 increased by Alternative 3. However, because the Alternative 3 area is potentially
13 underlain by strands of the active Palos Verdes Fault and liquefaction-prone
14 hydraulic fill, there is a substantial risk of seismic impacts. Increased exposure of
15 people and property during operations to seismic hazards from a major or great
16 earthquake cannot be precluded, even with incorporation of modern construction
17 engineering and safety standards. Therefore, impacts due to seismically induced
18 ground failure are significant and unavoidable under NEPA.

19 ***Mitigation Measures***

20 There are no mitigation measures available that would reduce impacts below
21 significance associated with seismically induced ground failure.

22 ***Residual Impacts***

23 Design and construction in accordance with applicable laws and regulations
24 pertaining to seismically induced ground movement would minimize structural
25 damage in the event of an earthquake. However, increased exposure of people and
26 property during operations to seismic hazards from a major or great earthquake
27 cannot be precluded even with incorporation of modern construction engineering and
28 safety standards. Therefore, impacts due to seismically induced ground failure would
29 remain significant and unavoidable.

30 ***Tsunamis and Seiches***

31 **Impact GEO-2b: Alternative 3 operations within the Port area would**
32 **expose people and structures to substantial risk involving tsunamis or**
33 **seiches. Local or distant seismic activity and/or offshore landslides**
34 **could result in the occurrence of tsunamis or seiches within the**
35 **Alternative 3 area and vicinity.**

36 **CEQA Impact Determination**

37 Impacts as a result of operations of this alternative would be similar but less than
38 those identified for the proposed Project because the 400-foot Berth 136 wharf
39 extension and 705-foot wharf at Berths 145-147 would not be constructed and the 10-

1 acre (4.0 ha) Northwest Slip would not be filled, thus resulting in less infrastructure
2 susceptible to inundation. In all other respects, **Impact GEO-2b** would be the same
3 as the proposed Project. Therefore, impacts during the operations phase of
4 Alternative 3 would be significant and unavoidable under CEQA.

5 *Mitigation Measures*

6 **Mitigation Measure GEO-1** shall be applied to the CEQA project impact
7 determination to reduce tsunami and seiche related impacts.

8 *Residual Impacts*

9 Emergency planning and coordination between the Terminal operator and LAHD, as
10 outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-
11 site personnel during a tsunami. However, even with incorporation of emergency
12 planning and construction in accordance with current City and State regulations,
13 substantial damage and/or injury could occur in the event of a tsunami or seiche.
14 Therefore, residual impacts would remain significant and unavoidable.

15 **NEPA Impact Determination**

16 As the federal portions of the Reduced Wharf Alternative would only include
17 minimal in-water construction activities (i.e., deepening navigation channels and
18 wharf seismic improvements) and not the 10-acre (4-ha) fill, potential operations
19 impacts would be similar to, but less severe than those described for the proposed
20 Project under the NEPA analysis. In all other respects, **Impact GEO-2b** would be
21 the same as the proposed Project. Therefore, impacts during the operations phase due
22 to tsunamis and seiches would be significant and unavoidable under NEPA.

23 *Mitigation Measures*

24 **Mitigation Measure GEO-1** shall be applied to the NEPA project impact
25 determination to reduce tsunami and seiche related impacts.

26 *Residual Impacts*

27 Emergency planning and coordination between the Terminal operator and the LAHD,
28 as outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to
29 on-site personnel during a tsunami. However, even with incorporation of emergency
30 planning and construction in accordance with current City and State regulations,
31 substantial damage and injury could occur in the event of a tsunami or seiche.
32 Therefore, residual impacts would remain significant and unavoidable.

33 ***Subsidence/Settlement***

34 **Impact GEO-3b: Alternative 3 operations would not result in substantial**
35 **damage to structures or infrastructure, or expose people to substantial**
36 **risk of injury from subsidence/soil settlement.**

1 **CEQA Impact Determination**

2 Operations impacts of this alternative would be similar but less than those identified
3 for the proposed Project because the 10-acre (4.0 ha) Northwest Slip would not be
4 filled, thus resulting in less area susceptible to settlement. In all other respects,
5 **Impact GEO-3b** would be the same as the proposed Project. Settlement impacts in
6 backland areas would be less than significant under CEQA as Alternative 3 would be
7 designed and constructed in compliance with the recommendations of the
8 geotechnical engineer, consistent with Sections 91.000 through 91.7016 of the Los
9 Angeles Municipal Code, and in conjunction with criteria established by LAHD and
10 Caltrans, and would not result in substantial damage to structures or infrastructure, or
11 expose people to substantial risk of injury.

12 *Mitigation Measures*

13 As subsidence impacts would be less than significant, no mitigation measures are
14 necessary.

15 *Residual Impacts*

16 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
17 Municipal Code, the residual impacts would be less than significant under CEQA.

18 **NEPA Impact Determination**

19 The federal portions of Alternative 3 would be limited to wharf renovation and
20 channel deepening activities. Because subsidence/settlement impacts relate primarily
21 to proposed backland improvements and Alternative 3 does not include the 10-acre
22 (4-ha) fill, no impacts would occur under NEPA.

23 *Mitigation Measures*

24 As no subsidence impacts would occur, no mitigation measures are necessary.

25 *Residual Impacts*

26 With no mitigation required, there would be no residual impacts under NEPA.

27 ***Expansive Soils***

28 **Impact GEO-4b: Alternative 3 operations would not result in substantial**
29 **damage to structures or infrastructure, or expose people to substantial**
30 **risk of injury from soil expansion.**

31 **CEQA Impact Determination**

32 Operations impacts of this alternative would be similar but less than those identified for
33 the proposed Project because the 10-acre (4.0-ha) Northwest Slip would not be filled,
34 thus resulting in less area susceptible to soil expansion. In all other respects, **Impact**
35 **GEO-4b** would be the same as the proposed Project. Expansive soil impacts in backland

1 areas would be less than significant under CEQA, as Alternative 3 would be designed
2 and constructed in compliance with the recommendations of the geotechnical engineer,
3 consistent with Sections 91.000 through 91.7016 of the Los Angeles Municipal Code,
4 and in conjunction with criteria established by LAHD, and would not result in substantial
5 damage to structures or infrastructure, or expose people to substantial risk of injury.

6 *Mitigation Measures*

7 As expansive soil impacts would be less than significant, no mitigation measures are
8 necessary.

9 *Residual Impacts*

10 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
11 Municipal Code, the residual impacts would be less than significant under CEQA.

12 **NEPA Impact Determination**

13 The federal portions of Alternative 3 would be limited to wharf renovation and
14 channel deepening activities. Because expansive soil impacts relate primarily to
15 proposed backland improvements and Alternative 3 does not include the 10-acre (4-
16 ha) fill, no impacts would occur under NEPA.

17 *Mitigation Measures*

18 As expansive soil impacts would not occur, no mitigation measures are necessary.

19 *Residual Impacts*

20 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
21 Municipal Code, there would be no residual impacts under NEPA.

22 ***Landslides and Mudslides***

23 **Impact GEO-5b: Alternative 3 operations would not result in or expose**
24 **people or property to a substantial risk of landslides or mudslides.**

25 **CEQA Impact Determination**

26 As the topography in the vicinity of the Alternative 3 site is flat and not subject to
27 landslides or mudflows, no impacts would occur under CEQA.

28 *Mitigation Measures*

29 As landslide and mudslide impacts would not occur, no mitigation measures are
30 necessary.

1 *Residual Impacts*

2 With no mitigation required, there would be no residual impacts under CEQA.

3 **NEPA Impact Determination**

4 As the topography in the vicinity of the Alternative 3 site is flat and not subject to
5 landslides or mudflows, no impacts would occur under NEPA.

6 *Mitigation Measures*

7 As landslide and mudslide impacts would not occur, no mitigation measures are
8 necessary.

9 *Residual Impacts*

10 With no mitigation required, there would be no residual impacts under NEPA.

11 ***Unstable Soil Conditions***

12 **Impact GEO-6b: Collapsible soils would have no impact on Alternative 3**
13 **operations and would not expose people or structures to substantial risk.**

14 **CEQA Impact Determination**

15 As excavations would not be completed as a part of Alternative 3 operations, impacts
16 associated with collapsible soils would not occur under CEQA.

17 *Mitigation Measures*

18 As impacts associated with collapsible soils would not occur, no mitigation measures
19 are required.

20 *Residual Impacts*

21 With no mitigation required, there would be no residual impacts under CEQA.

22 **NEPA Impact Determination**

23 The federal portions of Alternative 3 would be limited to wharf renovation and
24 channel deepening activities. Because collapsible soil impacts relate primarily to
25 proposed backland improvements and Alternative 3 does not include the 10-acre (4-
26 ha) fill, no impacts would occur under NEPA.

27 *Mitigation Measures*

28 As impacts associated with collapsible soils would not occur, no mitigation measures
29 are required.

1 *Residual Impacts*

2 With no mitigation required, there would be no residual impacts under NEPA.

3 ***Prominent Geologic and Topographic Features***

4 **Impact GEO-7b: Alternative 3 operations would not result in one or**
5 **more distinct and prominent geologic or topographic features being**
6 **destroyed, permanently covered, or materially and adversely modified.**

7 **CEQA Impact Determination**

8 As the topography in the vicinity of the Alternative 3 site is flat and does not contain
9 prominent geologic or topographic features, no impacts would occur under CEQA.

10 *Mitigation Measures*

11 As impacts due to removal of prominent geologic or topographic features would not
12 occur, no mitigation measures are necessary.

13 *Residual Impacts*

14 With no mitigation required, there would be no residual impacts under CEQA.

15 **NEPA Impact Determination**

16 As the topography in the vicinity of the Alternative 3 site is flat and does not contain
17 prominent geologic or topographic features, no impacts would occur under NEPA.

18 *Mitigation Measures*

19 As impacts related to removal of prominent geologic or topographic features would
20 not occur, no mitigation measures are necessary.

21 *Residual Impacts*

22 With no mitigation required, there would be no residual impacts under NEPA.

23 ***Mineral Resources***

24 **Impact GEO-8b: Although the northern portion of the Alternative 3 site**
25 **is underlain by the Wilmington Oil Field, operations would not result in**
26 **the permanent loss of availability of any mineral resource of regional,**
27 **statewide, or local significance.**

28 With respect to aggregate potential, the Alternative 3 site is located in MRZ-1, which
29 is defined as an area where adequate information indicates that no significant mineral
30 deposits are present or where it is judged that little likelihood exists for their

1 presence. However, with respect to petroleum resources, the northern portion of the
2 Alternative 3 site is located within the Wilmington Oil Field.

3 **CEQA Impact Determination**

4 Alternative 3 operations would preclude oil and gas drilling from within site
5 boundaries; however, petroleum reserves beneath the site could be accessed from
6 remote locations, using directional (or slant) drilling techniques. Therefore, Alternative
7 3 would not result in the permanent loss of availability of a known mineral resource of
8 regional, state, or local significance that would be of future value to the region and the
9 residents of the state. Mineral resource impacts are less than significant under CEQA.

10 *Mitigation Measures*

11 As impacts associated with mineral resources would be less than significant, no
12 mitigation measures are required.

13 *Residual Impacts*

14 With no mitigation required, the residual impacts would be less than significant under
15 CEQA.

16 **NEPA Impact Determination**

17 The federal portions of Alternative 3 would be limited to wharf renovation and
18 channel deepening activities, which would preclude oil and gas drilling from within
19 the project boundaries. However, petroleum reserves beneath the site could be
20 accessed from remote locations, using directional (or slant) drilling techniques.
21 Therefore, Alternative 3 operations would not result in the permanent loss of
22 availability of a known mineral resource that would be of future value to the region
23 and the residents of the state and less than significant mineral resource impacts would
24 occur under NEPA.

25 *Mitigation Measures*

26 As impacts associated with mineral resources would be less than significant, no
27 mitigation measures are required.

28 *Residual Impacts*

29 With no mitigation required, the residual impacts would be less than significant.

3.5.4.3.2.4 Alternative 4 – Omni Terminal

3.5.4.3.2.4.1 Construction Impacts

Seismicity

Impact GEO-1a: Seismic activity along the Palos Verdes Fault Zone, or other regional faults, could 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 2015).

CEQA Impact Determination

Seismic impacts of the Omni Terminal Alternative (Alternative 4) would be similar but less than those identified for the proposed Project, as no new rail yard, 10-acre (4-ha) fill, wharf construction, and associated dredging would occur, thus resulting in less infrastructure susceptible to seismically induced ground failure. In all other respects, **Impact GEO-1a** would be the same as the proposed Project. As for the proposed Project, seismic activity along the Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure. Seismic hazards are common to the Los Angeles region and are not increased by this alternative. However, because the site is potentially underlain by strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill, there is a substantial risk of seismic impacts. Because new construction of buildings and related infrastructure would occur over an extended period (through 2015), increased exposure of people and property during construction to seismic hazards from a major or great earthquake cannot be precluded, even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure are significant and unavoidable under CEQA.

Mitigation Measures

There are no mitigation measures available that would reduce impacts below significance associated with seismically induced ground failure.

Residual Impacts

Design and construction in accordance with applicable laws and regulations pertaining to seismically induced ground movement would minimize structural damage in the event of an earthquake. However, increased exposure of people and property during construction to seismic hazards from a major or great earthquake cannot be precluded even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure would remain significant and unavoidable.

1 **NEPA Impact Determination**

2 Under this alternative, no development would occur within the in-water area (i.e., no
3 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
4 impacts under NEPA are not applicable.

5 *Mitigation Measures*

6 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
7 required.

8 *Residual Impacts*

9 Residual impacts would not occur

10 ***Tsunamis and Seiches***

11 **Impact GEO-2a: Alternative 4 construction within the Port area would**
12 **expose people and structures to substantial risk involving tsunamis or**
13 **seiches. Local or distant seismic activity and/or offshore landslides**
14 **could result in the occurrence of tsunamis or seiches within West Basin**
15 **and vicinity.**

16 **CEQA Impact Determination**

17 Under this alternative, no new rail yard, 10-acre (4-ha) fill, wharf construction and
18 associated dredging would occur, thus resulting in less infrastructure that is
19 susceptible to inundation from tsunamis/seiches. In all other respects, **Impact GEO-**
20 **2a** would be the same as the proposed Project. Therefore, impacts during the
21 construction phase would be significant and unavoidable under CEQA.

22 *Mitigation Measures*

23 **Mitigation Measure GEO-1** shall be applied to the CEQA project impact
24 determination to reduce tsunami and seiche related impacts.

25 *Residual Impacts*

26 Emergency planning and coordination between the Terminal operator and LAHD, as
27 outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-
28 site personnel during a tsunami. However, even with incorporation of emergency
29 planning and construction in accordance with current City and State regulations,
30 substantial damage and/or injury could occur in the event of a tsunami or seiche.
31 Therefore, residual impacts would remain significant and unavoidable.

32 **NEPA Impact Determination**

33 Under this alternative, no development would occur within the in-water area (i.e., no
34 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
35 impacts under NEPA are not applicable.

1 *Mitigation Measures*

2 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
3 required.

4 *Residual Impacts*

5 Residual impacts would not occur

6 ***Subsidence/Settlement***

7 **Impact GEO-3a: Alternative 4 construction would not result in**
8 **substantial damage to structures or infrastructure, or expose people to**
9 **substantial risk of injury from subsidence/soil settlement.**

10 **CEQA Impact Determination**

11 Under this alternative, no 10-acre (4-ha) fill or new rail yard construction would
12 occur, thus resulting in less infrastructure that is susceptible to subsidence/settlement.
13 In all other respects, **Impact GEO-3a** would be the same as the proposed Project.
14 Impacts in backland areas would be less than significant under CEQA as Alternative
15 4 would be designed and constructed in compliance with the recommendations of the
16 geotechnical engineer, consistent, with Sections 91.000 through 91.7016 of the Los
17 Angeles Municipal Code, and in conjunction with criteria established by LAHD and
18 Caltrans, and would not result in substantial damage to structures or infrastructure, or
19 expose people to substantial risk of injury.

20 *Mitigation Measures*

21 As subsidence impacts would be less than significant, no mitigation measures are
22 necessary.

23 *Residual Impacts*

24 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
25 Municipal Code, the residual impacts would be less than significant under CEQA.

26 **NEPA Impact Determination**

27 Under this alternative, no development would occur within the in-water area (i.e., no
28 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
29 impacts under NEPA are not applicable.

30 *Mitigation Measures*

31 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
32 required.

1 *Residual Impacts*

2 Residual impacts would not occur

3 ***Expansive Soils***

4 **Impact GEO-4a: Alternative 4 construction would not result in**
5 **substantial damage to structures or infrastructure, or expose people to**
6 **substantial risk of injury from soil expansion.**

7 **CEQA Impact Determination**

8 Under this alternative no new rail yard construction or 10-acre (4-ha) fill would
9 occur, thus resulting in less infrastructure that is susceptible to expansive soils. In all
10 other respects, **Impact GEO-4a** would be the same as the proposed Project.
11 Expansive soil impacts in backland areas would be less than significant under CEQA
12 as Alternative 4 would be designed and constructed in compliance with the
13 recommendations of the geotechnical engineer, consistent with Sections 91.000
14 through 91.7016 of the Los Angeles Municipal Code, and in conjunction with criteria
15 established by LAHD, and would not result in substantial damage to structures or
16 infrastructure, or expose people to substantial risk of injury.

17 *Mitigation Measures*

18 As expansive soil impacts would be less than significant, no mitigation measures are
19 necessary.

20 *Residual Impacts*

21 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
22 Municipal Code, the residual impacts would be less than significant under CEQA.

23 **NEPA Impact Determination**

24 Under this alternative, no development would occur within the in-water area (i.e., no
25 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
26 impacts under NEPA are not applicable.

27 *Mitigation Measures*

28 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
29 required.

30 *Residual Impacts*

31 Residual impacts would not occur

1 *Landslides and Mudslides*

2 **Impact GEO-5a: Alternative 4 construction would not result in or expose**
3 **people or property to a substantial risk of landslides or mudslides.**

4 **CEQA Impact Determination**

5 As the topography in the vicinity of the Alternative 4 site is flat and not subject to
6 landslides or mudflows, no impacts would occur under CEQA.

7 *Mitigation Measures*

8 As landslide and mudslide impacts would not occur, no mitigation measures are
9 necessary.

10 *Residual Impacts*

11 With no mitigation required, there would be no residual impacts under CEQA.

12 **NEPA Impact Determination**

13 Under this alternative, no development would occur within the in-water area (i.e., no
14 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
15 impacts under NEPA are not applicable.

16 *Mitigation Measures*

17 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
18 required.

19 *Residual Impacts*

20 Residual impacts would not occur

21 ***Unstable Soil Conditions***

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

25 See section 3.6 (Groundwater and Soils) regarding potential soil and/or groundwater
26 contamination in construction excavations.

27 **CEQA Impact Determination**

28 Under this alternative, no new rail yard construction and 10-acre (4-ha) fill would
29 occur, thus resulting in less infrastructure that is susceptible to unstable soil
30 conditions. In all other respects, **Impact GEO-6a** would be the same as the proposed
31 Project. Therefore, impacts associated with shallow groundwater would be less than

1 significant under CEQA due to implementation of standard engineering practices
2 regarding saturated, collapsible soils.

3 *Mitigation Measures*

4 As impacts associated with collapsible soils would be less than significant, no
5 mitigation measures are required.

6 *Residual Impacts*

7 With no mitigation required, the residual impacts would be less than significant under
8 CEQA.

9 **NEPA Impact Determination**

10 Under this alternative, no development would occur within the in-water area (i.e., no
11 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
12 impacts under NEPA are not applicable.

13 *Mitigation Measures*

14 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
15 required.

16 *Residual Impacts*

17 Residual impacts would not occur.

18 ***Prominent Geologic and Topographic Features***

19 **Impact GEO-7a: Alternative 4 construction would not result in one or**
20 **more distinct and prominent geologic or topographic features being**
21 **destroyed, permanently covered, or materially and adversely modified.**

22 **CEQA Impact Determination**

23 As the topography in the vicinity of the Alternative 4 site is flat and does not contain
24 prominent geologic or topographic features, no impacts would occur under CEQA.

25 *Mitigation Measures*

26 As impacts due to removal of prominent geologic or topographic features would not
27 occur, no mitigation measures are necessary.

28 *Residual Impacts*

29 With no mitigation required, there would be no residual impacts under CEQA.

NEPA Impact Determination

Under this alternative, no development would occur within the in-water area (i.e., no dredging, filling of the Northwest Slip, or new wharf construction). Therefore, impacts under NEPA are not applicable.

Mitigation Measures

Due to No Federal Action, mitigation is not applicable. No mitigation measures are required.

Residual Impacts

Residual impacts would not occur

Mineral Resources

Impact GEO-8a: Although the northern portion of West Basin is underlain by the Wilmington Oil Field, Alternative 4 site construction would not result in the permanent loss of availability of any mineral resource of regional, statewide, or local significance.

With respect to aggregate potential, the Alternative 4 site is located in MRZ-1, which is defined as an area where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence. However, with respect to petroleum resources, the northern portion of the Alternative 4 site is located within the Wilmington Oil Field.

CEQA Impact Determination

Construction would preclude oil and gas drilling from within Alternative 4 boundaries; however, petroleum reserves beneath the site could be accessed from remote locations, using directional (or slant) drilling techniques. Therefore, Alternative 4 would not result in the permanent loss of availability of a known mineral resource that would be of future value to the region and the residents of the state. Mineral resource impacts are less than significant under CEQA.

Mitigation Measures

As impacts associated with mineral resources would be less than significant, no mitigation measures are required.

Residual Impacts

With no mitigation required, the residual impacts are less than significant under CEQA.

1 **NEPA Impact Determination**

2 Under this alternative, no development would occur within the in-water area (i.e., no
3 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
4 impacts under NEPA are not applicable.

5 *Mitigation Measures*

6 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
7 required.

8 *Residual Impacts*

9 Residual impacts would not occur

10 ***3.5.4.3.2.4.2 Operations Impacts***

11 ***Seismicity***

12 **Impact GEO-1b: Seismic activity along the Palos Verdes Fault Zone, or**
13 **other regional faults, could produce fault rupture, seismic ground**
14 **shaking, liquefaction, or other seismically induced ground failure that**
15 **would expose people and structures to substantial risk during the**
16 **operations period (through 2038).**

17 **CEQA Impact Determination**

18 Under this alternative, no new wharf construction and associated dredging would
19 occur, thus resulting in less infrastructure that is susceptible to seismically induced
20 ground failure during operations. In all other respects, **Impact GEO-1b** would be the
21 same as the proposed Project. As with the proposed Project, seismic activity along the
22 Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic
23 ground shaking, liquefaction, or other seismically induced ground failure. Seismic
24 hazards are common to the Los Angeles region and are not increased by Alternative 4.
25 However, because the site is potentially underlain by strands of the active Palos Verdes
26 Fault and liquefaction-prone hydraulic fill, there is a substantial risk of seismic impacts.
27 Increased exposure of people and property during operations to seismic hazards from a
28 major or great earthquake cannot be precluded, even with incorporation of modern
29 construction engineering and safety standards. Therefore, impacts due to seismically
30 induced ground failure are significant and unavoidable under CEQA.

31 *Mitigation Measures*

32 There are no mitigation measures available that would reduce impacts below
33 significance associated with seismically induced ground failure.

Residual Impacts

Design and construction in accordance with applicable laws and regulations pertaining to seismically induced ground movement would minimize structural damage in the event of an earthquake. However, increased exposure of people and property during operations to seismic hazards from a major or great earthquake cannot be precluded even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure would remain significant and unavoidable.

NEPA Impact Determination

Under this alternative, no development would occur within the in-water area (i.e., no dredging, filling of the Northwest Slip, or new wharf construction). Therefore, impacts under NEPA are not applicable.

Mitigation Measures

Due to No Federal Action, mitigation is not applicable. No mitigation measures are required.

Residual Impacts

Residual impacts would not occur

Tsunamis and Seiches

Impact GEO-2b: Alternative 4 operations within the Port area would expose people and structures to substantial risk involving tsunamis or seiches. Local or distant seismic activity and/or offshore landslides could result in the occurrence of tsunamis or seiches within the project area and vicinity.

CEQA Impact Determination

Under this alternative, no new wharf or rail yard construction and associated dredging or 10-acre (4-ha) fill would occur, thus resulting in less infrastructure that is susceptible to inundation during operations. In all other respects, **Impact GEO-2b** would be the same as for the proposed Project. Therefore, impacts during the operations phase would be significant and unavoidable under CEQA.

Mitigation Measures

Mitigation Measure GEO-1 shall be applied to the CEQA project impact determination to reduce tsunami and seiche related impacts.

1 *Residual Impacts*

2 Emergency planning and coordination between the Terminal operator and LAHD, as
3 outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-
4 site personnel during a tsunami. However, even with incorporation of emergency
5 planning and construction in accordance with current City and State regulations,
6 substantial damage and/or injury could occur in the event of a tsunami or seiche.
7 Therefore, residual impacts would remain significant and unavoidable.

8 **NEPA Impact Determination**

9 Under this alternative, no development would occur within the in-water area (i.e., no
10 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
11 impacts under NEPA are not applicable.

12 *Mitigation Measures*

13 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
14 required.

15 *Residual Impacts*

16 Residual impacts would not occur

17 ***Subsidence/Settlement***

18 **Impact GEO-3b: Alternative 4 operations would not result in substantial**
19 **damage to structures or infrastructure, or expose people to substantial**
20 **risk of injury from subsidence/soil settlement.**

21 **CEQA Impact Determination**

22 Under this alternative, no new rail yard construction or 10-acre fill would occur, thus
23 resulting in less infrastructure that is susceptible to subsidence/settlement during
24 operations. In all other respects, **Impact GEO-3b** would be the same as the proposed
25 Project. Settlement impacts in backland areas would be less than significant under
26 CEQA, as Alternative 4 would be designed and constructed in compliance with the
27 recommendations of the geotechnical engineer, consistent with Sections 91.000
28 through 91.7016 of the Los Angeles Municipal Code, and in conjunction with criteria
29 established by LAHD and Caltrans, and would not result in substantial damage to
30 structures or infrastructure, or expose people to substantial risk of injury.

31 *Mitigation Measures*

32 As subsidence impacts would be less than significant, no mitigation measures are
33 necessary.

1 *Residual Impacts*

2 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
3 Municipal Code, the residual impacts would be less than significant under CEQA.

4 **NEPA Impact Determination**

5 Under this alternative, no development would occur within the in-water area (i.e., no
6 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
7 impacts under NEPA are not applicable.

8 *Mitigation Measures*

9 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
10 required.

11 *Residual Impacts*

12 Residual impacts would not occur

13 ***Expansive Soils***

14 **Impact GEO-4b: Alternative 4 operations would not result in substantial**
15 **damage to structures or infrastructure, or expose people to substantial**
16 **risk of injury from soil expansion.**

17 **CEQA Impact Determination**

18 Under this alternative, no new rail yard construction or 10-acre (4-ha) fill would
19 occur, thus resulting in less infrastructure that is susceptible to soil expansion during
20 operations. In all other respects, **Impact GEO-4b** would be the same as the
21 proposed Project. Expansive soil impacts in backland areas would be less than
22 significant under CEQA, as Alternative 4 would be designed and constructed in
23 compliance with the recommendations of the geotechnical engineer, consistent with
24 Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, and in
25 conjunction with criteria established by LAHD, and would not result in substantial
26 damage to structures or infrastructure, or expose people to substantial risk of injury.

27 *Mitigation Measures*

28 As expansive soil impacts would be less than significant, no mitigation measures are
29 necessary.

30 *Residual Impacts*

31 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
32 Municipal Code, the residual impacts would be less than significant under CEQA.

1 **NEPA Impact Determination**

2 Under this alternative, no development would occur within the in-water area (i.e., no
3 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
4 impacts under NEPA are not applicable.

5 *Mitigation Measures*

6 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
7 required.

8 *Residual Impacts*

9 Residual impacts would not occur

10 ***Landslides and Mudslides***

11 **Impact GEO-5b: Alternative 4 operations would not result in or expose**
12 **people or property to a substantial risk of landslides or mudslides.**

13 **CEQA Impact Determination**

14 As the topography in the vicinity of the Alternative 4 site is flat and not subject to
15 landslides or mudflows, no impacts would occur under CEQA.

16 *Mitigation Measures*

17 As landslide and mudslide impacts would not occur, no mitigation measures are
18 necessary.

19 *Residual Impacts*

20 With no mitigation required, there would be no residual impacts under CEQA.

21 **NEPA Impact Determination**

22 Under this alternative, no development would occur within the in-water area (i.e., no
23 dredging, filling of the Northwest Slip, or new wharf construction). Therefore, impacts
24 under NEPA are not applicable.

25 *Mitigation Measures*

26 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
27 required.

28 *Residual Impacts*

29 Residual impacts would not occur

1 ***Unstable Soil Conditions***

2 **Impact GEO-6b: Collapsible soils would have no impact on Alternative 4**
3 **operations and would not expose people or structures to substantial risk.**

4 **CEQA Impact Determination**

5 As excavations would not be completed as a part of Alternative 4 operations, impacts
6 associated with collapsible soils would not occur under CEQA.

7 ***Mitigation Measures***

8 As impacts associated with collapsible soils would not occur, no mitigation measures
9 are required.

10 ***Residual Impacts***

11 With no mitigation required, there would be no residual impacts under CEQA.

12 **NEPA Impact Determination**

13 Under this alternative, no development would occur within the in-water area (i.e., no
14 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
15 impacts under NEPA are not applicable.

16 ***Mitigation Measures***

17 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
18 required.

19 ***Residual Impacts***

20 Residual impacts would not occur

21 ***Prominent Geologic and Topographic Features***

22 **Impact GEO-7b: Alternative 4 operations would not result in one or**
23 **more distinct and prominent geologic or topographic features being**
24 **destroyed, permanently covered, or materially and adversely modified.**

25 **CEQA Impact Determination**

26 As the topography in the vicinity of the Alternative 4 site is flat and does not contain
27 prominent geologic or topographic features, no impacts would occur under CEQA.

28 ***Mitigation Measures***

29 As impacts due to removal of prominent geologic or topographic features would not
30 occur, no mitigation measures are necessary.

1 *Residual Impacts*

2 With no mitigation required, there would be no residual impacts under CEQA.

3 **NEPA Impact Determination**

4 Under this alternative, no development would occur within the in-water area (i.e., no
5 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
6 impacts under NEPA are not applicable.

7 *Mitigation Measures*

8 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
9 required.

10 *Residual Impacts*

11 Residual impacts would not occur

12 ***Mineral Resources***

13 **Impact GEO-8b: Although the northern portion of the Alternative 4 site**
14 **is underlain by the Wilmington Oil Field, operations would not result in**
15 **the permanent loss of availability of any mineral resource of regional,**
16 **statewide, or local significance.**

17 With respect to aggregate potential, the Alternative 4 site is located in MRZ-1, which
18 is defined as an area where adequate information indicates that no significant mineral
19 deposits are present or where it is judged that little likelihood exists for their
20 presence. However, with respect to petroleum resources, the northern portion of the
21 Alternative 4 site is located within the Wilmington Oil Field.

22 **CEQA Impact Determination**

23 Alternative 4 operations would preclude oil and gas drilling from within site
24 boundaries; however, petroleum reserves beneath the site could be accessed from
25 remote locations, using directional (or slant) drilling techniques. Therefore,
26 Alternative 4 would not result in the permanent loss of availability of a known
27 mineral resource that would be of future value to the region and the residents of the
28 state. Mineral resource impacts are less than significant under CEQA.

29 *Mitigation Measures*

30 As impacts associated with mineral resources would be less than significant, no
31 mitigation measures are required.

32 *Residual Impacts*

33 With no mitigation required, the residual impacts are less than significant under CEQA.

NEPA Impact Determination

Under this alternative, no development would occur within the in-water area (i.e., no dredging, filling of the Northwest Slip, or new wharf construction). Therefore, impacts under NEPA are not applicable.

Mitigation Measures

Due to No Federal Action, mitigation is not applicable. No mitigation measures are required.

Residual Impacts

Residual impacts would not occur

3.5.4.3.2.5 Alternative 5 – Landside Terminal Improvements

3.5.4.3.2.5.1 Construction Impacts

Seismicity

Impact GEO-1a: Seismic activity along the Palos Verdes Fault Zone, or other regional faults, could 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 2015).

CEQA Impact Determination

Under the Landside Terminal Improvements Alternative (Alternative 5), no new wharf construction, associated dredging, or 10-acre (4-ha) fill would occur, thus resulting in less infrastructure susceptible to seismically induced ground failure. In all other respects, **Impact GEO-1a** would be the same as the proposed Project. As with the proposed Project, seismic activity along the Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure. Seismic hazards are common to the Los Angeles region and are not increased by this alternative. However, because the site is potentially underlain by strands of the active Palos Verdes Fault and liquefaction-prone hydraulic fill, there is a substantial risk of seismic impacts. Seismic upgrades would be completed on existing wharves, resulting in beneficial impacts. However, because construction of new wharves, buildings, and related infrastructure would occur over an extended period (through 2015), increased exposure of people and property during construction to seismic hazards from a major or great earthquake cannot be precluded, even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure are significant and unavoidable under CEQA.

1 *Mitigation Measures*

2 There are no mitigation measures available that would reduce impacts below
3 significance associated with seismically induced ground failure.

4 *Residual Impacts*

5 Design and construction in accordance with applicable laws and regulations
6 pertaining to seismically induced ground movement would minimize structural
7 damage in the event of an earthquake. However, increased exposure of people and
8 property during construction to seismic hazards from a major or great earthquake
9 cannot be precluded even with incorporation of modern construction engineering and
10 safety standards. Therefore, impacts due to seismically induced ground failure would
11 remain significant and unavoidable.

12 **NEPA Impact Determination**

13 Under this alternative, no development would occur within the in-water area (i.e., no
14 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
15 impacts under NEPA are not applicable.

16 *Mitigation Measures*

17 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
18 required.

19 *Residual Impacts*

20 Residual impacts would not occur

21 ***Tsunamis and Seiches***

22 **Impact GEO-2a: Alternative 5 construction within the Port area would**
23 **expose people and structures to substantial risk involving tsunamis or**
24 **seiches. Local or distant seismic activity and/or offshore landslides**
25 **could result in the occurrence of tsunamis or seiches within West Basin**
26 **and vicinity.**

27 **CEQA Impact Determination**

28 Under this alternative, no new wharf construction and associated dredging would occur,
29 thus resulting in less infrastructure that is susceptible to inundation from
30 tsunamis/seiches. In all other respects, **Impact GEO-2a** would be the same as the
31 proposed Project. Therefore, impacts during the construction phase would be significant
32 and unavoidable under CEQA.

Mitigation Measures

Mitigation Measure GEO-1 shall be applied to the CEQA impact determination to reduce tsunami and seiche related impacts.

Residual Impacts

Emergency planning and coordination between the Terminal operator and LAHD, as outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-site personnel during a tsunami. However, even with incorporation of emergency planning and construction in accordance with current City and State regulations, substantial damage and/or injury could occur in the event of a tsunami or seiche. Therefore, residual impacts would remain significant and unavoidable.

NEPA Impact Determination

Under this alternative, no development would occur within the in-water area (i.e., no dredging, filling of the Northwest Slip, or new wharf construction). Therefore, impacts under NEPA are not applicable.

Mitigation Measures

Due to No Federal Action, mitigation is not applicable. No mitigation measures are required.

Residual Impacts

Residual impacts would not occur

Subsidence/Settlement

Impact GEO-3a: Alternative 5 construction 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 this alternative, 10-acre (4-ha) fill would not occur, thus resulting in less area that is susceptible to subsidence/settlement. In all other respects, **Impact GEO-3a** would be the same as the proposed Project. Impacts in backland areas would be less than significant under CEQA as Alternative 5 would be designed and constructed in compliance with the recommendations of the geotechnical engineer, consistent with Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, and in conjunction with criteria established by LAHD and Caltrans, and would not result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

1 *Mitigation Measures*

2 As subsidence impacts would be less than significant, no mitigation measures are
3 necessary.

4 *Residual Impacts*

5 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
6 Municipal Code, the residual impacts would be less than significant under CEQA.

7 **NEPA Impact Determination**

8 Under this alternative, no development would occur within the in-water area (i.e., no
9 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
10 impacts under NEPA are not applicable.

11 *Mitigation Measures*

12 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
13 required.

14 *Residual Impacts*

15 Residual impacts would not occur

16 *Expansive Soils*

17 **Impact GEO-4a: Alternative 5 construction would not result in**
18 **substantial damage to structures or infrastructure, or expose people to**
19 **substantial risk of injury from soil expansion.**

20 **CEQA Impact Determination**

21 Under this alternative, the 10-acre (4-ha) fill would not occur, thus resulting in less area
22 that is susceptible to expansive soils. In all other respects, **Impact GEO-4a** would be the
23 same as the proposed Project. Expansive soil impacts in backland areas would be less
24 than significant under CEQA, as Alternative 5 would be designed and constructed in
25 compliance with the recommendations of the geotechnical engineer, consistent with
26 Sections 91.000 through 91.7016 of the Los Angeles Municipal Code, and in conjunction
27 with criteria established by LAHD, and would not result in substantial damage to
28 structures or infrastructure, or expose people to substantial risk of injury.

29 *Mitigation Measures*

30 As expansive soil impacts would be less than significant, no mitigation measures are
31 necessary.

1 *Residual Impacts*

2 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
3 Municipal Code, the residual impacts would be less than significant under CEQA.

4 **NEPA Impact Determination**

5 Under this alternative, no development would occur within the in-water area (i.e., no
6 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
7 impacts under NEPA are not applicable.

8 *Mitigation Measures*

9 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
10 required.

11 *Residual Impacts*

12 Residual impacts would not occur

13 ***Landslides and Mudslides***

14 **Impact GEO-5a: Alternative 5 construction would not result in or expose**
15 **people or property to a substantial risk of landslides or mudslides.**

16 **CEQA Impact Determination**

17 As the topography in the vicinity of the Alternative 5 site is flat and not subject to
18 landslides or mudflows, no impacts would occur under CEQA.

19 *Mitigation Measures*

20 As landslide and mudslide impacts would not occur, no mitigation measures are
21 necessary.

22 *Residual Impacts*

23 With no mitigation required, there would be no residual impacts under CEQA.

24 **NEPA Impact Determination**

25 Under this alternative, no development would occur within the in-water area (i.e., no
26 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
27 impacts under NEPA are not applicable.

28 *Mitigation Measures*

29 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
30 required.

1 *Residual Impacts*

2 Residual impacts would not occur

3 ***Unstable Soil Conditions***

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

7 **CEQA Impact Determination**

8 Under this alternative, the 10-acre (4-ha) fill would not occur, thus resulting in less area
9 that is susceptible to unstable soil conditions. In all other respects, **Impact GEO-6a**
10 would be the same as the proposed Project. Therefore, impacts associated with shallow
11 groundwater would be less than significant under CEQA due to implementation of
12 standard engineering practices regarding saturated, collapsible soils.

13 *Mitigation Measures*

14 As impacts associated with collapsible soils would be less than significant, no
15 mitigation measures are required.

16 *Residual Impacts*

17 With no mitigation required, the residual impacts would be less than significant under
18 CEQA.

19 **NEPA Impact Determination**

20 Under this alternative, no development would occur within the in-water area (i.e., no
21 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
22 impacts under NEPA are not applicable.

23 *Mitigation Measures*

24 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
25 required.

26 *Residual Impacts*

27 Residual impacts would not occur

28 ***Prominent Geologic and Topographic Features***

29 **Impact GEO-7a: Alternative 5 construction would not result in one or**
30 **more distinct and prominent geologic or topographic features being**
31 **destroyed, permanently covered, or materially and adversely modified.**

CEQA Impact Determination

As the topography in the vicinity of the Alternative 5 site is flat and does not contain prominent geologic or topographic features, no impacts would occur under CEQA.

Mitigation Measures

As impacts due to removal of prominent geologic or topographic features would not occur, no mitigation measures are necessary.

Residual Impacts

With no mitigation required, there would be no residual impacts under CEQA.

NEPA Impact Determination

Under this alternative, no development would occur within the in-water area (i.e., no dredging, filling of the Northwest Slip, or new wharf construction). Therefore, impacts under NEPA are not applicable.

Mitigation Measures

Due to No Federal Action, mitigation is not applicable. No mitigation measures are required.

Residual Impacts

Residual impacts would not occur

Mineral Resources

Impact GEO-8a: Although the northern portion of West Basin is underlain by the Wilmington Oil Field, Alternative 5 site construction would not result in the permanent loss of availability of any mineral resource of regional, statewide, or local significance.

With respect to aggregate potential, the Alternative 5 site is located in MRZ-1, which is defined as an area where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence. However, with respect to petroleum resources, the northern portion of the Alternative 5 site is located within the Wilmington Oil Field.

CEQA Impact Determination

Construction would preclude oil and gas drilling from within Alternative 5 boundaries; however, petroleum reserves beneath the site could be accessed from remote locations, using directional (or slant) drilling techniques. Therefore, 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. Mineral resource impacts are less than significant under CEQA.

1 *Mitigation Measures*

2 As impacts associated with mineral resources would be less than significant, no
3 mitigation measures are required.

4 *Residual Impacts*

5 With no mitigation required, the residual impacts are less than significant under CEQA.

6 **NEPA Impact Determination**

7 Under this alternative, no development would occur within the in-water area (i.e., no
8 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
9 impacts under NEPA are not applicable.

10 *Mitigation Measures*

11 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
12 required.

13 *Residual Impacts*

14 Residual impacts would not occur

15 **3.5.4.3.2.5.2 Operations Impacts**

16 ***Seismicity***

17 **Impact GEO-2b: Seismic activity along the Palos Verdes Fault Zone, or**
18 **other regional faults, could produce fault rupture, seismic ground**
19 **shaking, liquefaction, or other seismically induced ground failure that**
20 **would expose people and structures to substantial risk during the**
21 **operations period (through 2038).**

22 **CEQA Impact Determination**

23 Under this alternative, no new wharf construction, associated dredging, or 10-acre (4-ha)
24 fill would occur, thus resulting in less infrastructure that is susceptible to seismically
25 induced ground failure during operations. In all other respects, **Impact GEO-2b** would
26 be the same as the proposed Project. As with the proposed Project, seismic activity along
27 the Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic
28 ground shaking, liquefaction, or other seismically induced ground failure. Seismic
29 hazards are common to the Los Angeles region and are not increased by Alternative 5.
30 However, because the site is potentially underlain by strands of the active Palos Verdes
31 Fault and liquefaction-prone hydraulic fill, there is a substantial risk of seismic impacts.
32 Increased exposure of people and property during operations to seismic hazards from a
33 major or great earthquake cannot be precluded, even with incorporation of modern
34 construction engineering and safety standards. Therefore, impacts due to seismically
35 induced ground failure are significant and unavoidable under CEQA.

Mitigation Measures

There are no mitigation measures available that would reduce impacts below significance associated with seismically induced ground failure.

Residual Impacts

Design and construction in accordance with applicable laws and regulations pertaining to seismically induced ground movement would minimize structural damage in the event of an earthquake. However, increased exposure of people and property during operations to seismic hazards from a major or great earthquake cannot be precluded even with incorporation of modern construction engineering and safety standards. Therefore, impacts due to seismically induced ground failure would remain significant and unavoidable.

NEPA Impact Determination

Under this alternative, no development would occur within the in-water area (i.e., no dredging, filling of the Northwest Slip, or new wharf construction). Therefore, impacts under NEPA are not applicable.

Mitigation Measures

Due to No Federal Action, mitigation is not applicable. No mitigation measures are required.

Residual Impacts

Residual impacts would not occur

Tsunamis and Seiches

Impact GEO-2b: Alternative 5 operations within the Port area would expose people and structures to substantial risk involving tsunamis or seiches. Local or distant seismic activity and/or offshore landslides could result in the occurrence of tsunamis or seiches within the project area and vicinity.

CEQA Impact Determination

Tsunami/seiche impacts would be similar but less than those described for the proposed Project because no new wharf construction and associated dredging or 10-acre (4-ha) fill would occur, thus resulting in less infrastructure susceptible to inundation. In all other respects, **Impact GEO-2b** would be the same as the proposed Project. Therefore, impacts during the operations phase would be significant and unavoidable under CEQA.

1 *Mitigation Measures*

2 **Mitigation Measure GEO-1** shall be applied to the CEQA project impact
3 determination to reduce tsunami and seiche related impacts.

4 *Residual Impacts*

5 Emergency planning and coordination between the Terminal operator and LAHD, as
6 outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-
7 site personnel during a tsunami. However, even with incorporation of emergency
8 planning and construction in accordance with current City and State regulations,
9 substantial damage and/or injury could occur in the event of a tsunami or seiche.
10 Therefore, residual impacts would remain significant and unavoidable.

11 **NEPA Impact Determination**

12 Under this alternative, no development would occur within the in-water area (i.e., no
13 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
14 impacts under NEPA are not applicable.

15 *Mitigation Measures*

16 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
17 required.

18 *Residual Impacts*

19 Residual impacts would not occur

20 ***Subsidence/Settlement***

21 **Impact GEO-3b: Alternative 5 operations would not result in substantial**
22 **damage to structures or infrastructure, or expose people to substantial**
23 **risk of injury from subsidence/soil settlement.**

24 **CEQA Impact Determination**

25 Under this alternative the 10-acre (4-ha) fill would not occur, thus resulting in less
26 area that is susceptible to subsidence/settlement during operations. In all other
27 respects, **Impact GEO-3b** would be the same as the proposed Project. Settlement
28 impacts in backland areas would be less than significant under CEQA as Alternative
29 5 would be designed and constructed in compliance with the recommendations of the
30 geotechnical engineers, consistent with implementation of Sections 91.000 through
31 91.7016 of the Los Angeles Municipal Code, and in conjunction with criteria
32 established by LAHD and Caltrans, and would not result in substantial damage to
33 structures or infrastructure, or expose people to substantial risk of injury.

1 *Mitigation Measures*

2 As subsidence/settlement impacts would be less than significant, no mitigation
3 measures are necessary.

4 *Residual Impacts*

5 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
6 Municipal Code, the residual impacts would be less than significant under CEQA.

7 **NEPA Impact Determination**

8 Under this alternative, no development would occur within the in-water area (i.e., no
9 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
10 impacts under NEPA are not applicable.

11 *Mitigation Measures*

12 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
13 required.

14 *Residual Impacts*

15 Residual impacts would not occur

16 ***Expansive Soils***

17 **Impact GEO-4b: Alternative 5 operations would not result in substantial**
18 **damage to structures or infrastructure, or expose people to substantial**
19 **risk of injury from soil expansion.**

20 **CEQA Impact Determination**

21 Under this alternative the 10-acre (4-ha) fill would not occur, thus resulting in less
22 area that is susceptible to soil expansion during operations. In all other respects,
23 **Impact GEO-4b** would be the same as the proposed Project. Expansive soil impacts
24 in backland areas would be less than significant under CEQA as Alternative 5 would
25 be designed and constructed in compliance with the recommendations of the
26 geotechnical engineers, consistent with Sections 91.000 through 91.7016 of the Los
27 Angeles Municipal Code, and in conjunction with criteria established by LAHD, and
28 would not result in substantial damage to structures or infrastructure, or expose
29 people to substantial risk of injury.

30 *Mitigation Measures*

31 As expansive soil impacts would be less than significant, no mitigation measures are
32 necessary.

1 *Residual Impacts*

2 With implementation of Sections 91.000 through 91.7016 of the Los Angeles
3 Municipal Code, the residual impacts would be less than significant under CEQA.

4 **NEPA Impact Determination**

5 Under this alternative, no development would occur within the in-water area (i.e., no
6 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
7 impacts under NEPA are not applicable.

8 *Mitigation Measures*

9 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
10 required.

11 *Residual Impacts*

12 Residual impacts would not occur

13 ***Landslides and Mudslides***

14 **Impact GEO-5b: Alternative 5 operations would not result in or expose**
15 **people or property to a substantial risk of landslides or mudslides.**

16 **CEQA Impact Determination**

17 As the topography in the vicinity of the Alternative 5 site is flat and not subject to
18 landslides or mudflows, no impacts would occur under CEQA.

19 *Mitigation Measures*

20 As landslide and mudslide impacts would not occur, no mitigation measures are
21 necessary.

22 *Residual Impacts*

23 With no mitigation required, there would be no residual impacts under CEQA.

24 **NEPA Impact Determination**

25 Under this alternative, no development would occur within the in-water area (i.e., no
26 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
27 impacts under NEPA are not applicable.

28 *Mitigation Measures*

29 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
30 required.

1 *Residual Impacts*

2 Residual impacts would not occur

3 ***Unstable Soil Conditions***

4 **Impact GEO-6b: Collapsible soils would have no impact on Alternative 5**
5 **operations and would not expose people or structures to substantial risk.**

6 **CEQA Impact Determination**

7 As excavations would not be completed as a part of Alternative 5 operations, impacts
8 associated with collapsible soils would not occur under CEQA.

9 *Mitigation Measures*

10 As impacts associated with collapsible soils would not occur, no mitigation measures
11 are required.

12 *Residual Impacts*

13 With no mitigation required, there would be no residual impacts under CEQA.

14 **NEPA Impact Determination**

15 Under this alternative, no development would occur within the in-water area (i.e., no
16 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
17 impacts under NEPA are not applicable.

18 *Mitigation Measures*

19 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
20 required.

21 *Residual Impacts*

22 Residual impacts would not occur

23 ***Prominent Geologic and Topographic Features***

24 **Impact GEO-7b: Alternative 5 operations would not result in one or**
25 **more distinct and prominent geologic or topographic features being**
26 **destroyed, permanently covered, or materially and adversely modified.**

27 **CEQA Impact Determination**

28 As the topography in the vicinity of the Alternative 5 site is flat and does not contain
29 prominent geologic or topographic features, no impacts would occur under CEQA.

1 *Mitigation Measures*

2 As impacts due to removal of prominent geologic or topographic features would not
3 occur, no mitigation measures are necessary.

4 *Residual Impacts*

5 With no mitigation required, there would be no residual impacts under CEQA.

6 **NEPA Impact Determination**

7 Under this alternative, no development would occur within the in-water area (i.e., no
8 dredging, filling of the Northwest Slip, or new wharf construction). Therefore,
9 impacts under NEPA are not applicable.

10 *Mitigation Measures*

11 Due to No Federal Action, mitigation is not applicable. No mitigation measures are
12 required.

13 *Residual Impacts*

14 Residual impacts would not occur

15 *Mineral Resources*

16 **Impact GEO-8b: Although the northern portion of the Alternative 5 site**
17 **is underlain by the Wilmington Oil Field, operations would not result in**
18 **the permanent loss of availability of any mineral resource of regional,**
19 **statewide, or local significance.**

20 With respect to aggregate potential, the Alternative 5 site is located in MRZ-1, which
21 is defined as an area where adequate information indicates that no significant mineral
22 deposits are present or where it is judged that little likelihood exists for their
23 presence. However, with respect to petroleum resources, the northern portion of the
24 Alternative 5 site is located within the Wilmington Oil Field.

25 **CEQA Impact Determination**

26 Alternative 5 operations would preclude oil and gas drilling from within site
27 boundaries; however, petroleum reserves beneath the site could be accessed from
28 remote locations, using directional (or slant) drilling techniques. Therefore,
29 Alternative 5 would not result in the permanent loss of availability of a known
30 mineral resource of future value to the region and the residents of the state. Mineral
31 resource impacts are less than significant under CEQA.

Mitigation Measures

As impacts associated with mineral resources would be less than significant, no mitigation measures are required.

Residual Impacts

With no mitigation required, the residual impacts are less than significant under CEQA.

NEPA Impact Determination

Under this alternative, no development would occur within the in-water area (i.e., no dredging, filling of the Northwest Slip, or new wharf construction). Therefore, impacts under NEPA are not applicable.

Mitigation Measures

Due to No Federal Action, mitigation is not applicable. No mitigation measures are required.

Residual Impacts

Residual impacts would not occur

3.5.4.3.3 Summary of Impact determinations

The following Table 3.5-3 summarizes the CEQA and NEPA impact determinations of the proposed Project and its alternatives related to Geology, as described in the detailed discussion in Sections 3.5.4.3.1 and 3.5.4.3.2. This table is meant to allow easy comparison between the potential impacts of the proposed Project and its alternatives with respect to this resource. Identified potential impacts may be based on Federal, State, or City of Los Angeles significance criteria, Port criteria, and the scientific judgment of the report preparers.

For each type of potential impact, the table describes the impact, notes the CEQA and NEPA impact determinations, describes any applicable mitigation measures, and notes the residual impacts (i.e.: the impact remaining after mitigation). All impacts, whether significant or not, are included in this table. Note that impact descriptions for each of the Alternatives are the same as for the proposed Project, unless otherwise noted.

Table 3.5-3: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives

<i>Alternative</i>	<i>Environmental Impacts*</i>	<i>Impact Determination</i>	<i>Mitigation Measures</i>	<i>Residual Impacts after Mitigation</i>
3.5 Geology				
Proposed Project	GEO-1a: Seismic activity along the Palos Verdes Fault Zone, or other regional faults, could 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 2025).	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact	No mitigation measures are available to reduce below significance No mitigation measures are available to reduce below significance	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact
	GEO-2a: Project construction within the Port area would expose people and structures to substantial risk involving tsunamis or seiches. Local or distant seismic activity and/or offshore landslides could result in the occurrence of tsunamis or seiches within the proposed Project area and vicinity.	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact	GEO-1 (Emergency Response Planning) GEO-1	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact
	GEO-3a: Project construction 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 impact NEPA: Less than significant impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Less than significant impact
	GEO-4a: Project construction 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 impact NEPA: Less than significant impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Less than significant impact
	GEO-5a: Project construction would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-6a: Shallow groundwater, which would cause unstable collapsible soils, may be encountered during excavation, but would not expose people or structures to substantial risk.	CEQA: Less than significant impact NEPA: Less than significant impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Less than significant impact

Table 3.5-3: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives (continued)

<i>Alternative</i>	<i>Environmental Impacts*</i>	<i>Impact Determination</i>	<i>Mitigation Measures</i>	<i>Residual Impacts after Mitigation</i>
3.5 Geology (continued)				
Proposed Project (continued)	GEO-7a: Project construction would not result in one or more distinct and prominent geologic or topographic features being destroyed, permanently covered, or materially and adversely modified.	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-8a: Although the northern portion of the proposed Project site is underlain by the Wilmington Oil Field, Project construction would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.	CEQA: Less than significant impact NEPA: Less than significant impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Less than significant impact
	GEO-1b: Seismic activity along the Palos Verdes Fault Zone, or other regional faults, could produce fault rupture, seismic ground shaking, liquefaction, or other seismically induced ground failure that would expose people and structures to substantial risk during the operations period (through 2038).	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact	No mitigation measures are available to reduce below significance No mitigation measures are available to reduce below significance	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact
	GEO-2b: Project operations within the Port area would expose people and structures to substantial risk involving tsunamis or seiches. Local or distant seismic activity and/or offshore landslides could result in the occurrence of tsunamis or seiches within the proposed Project area and vicinity.	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact	GEO-1 GEO-1	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact
	GEO-3b: Project operation 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 impact NEPA: Less than significant impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Less than significant impact
	GEO-4b: Project operation 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 impact NEPA: Less than significant impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Less than significant impact

Table 3.5-3: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives (continued)

<i>Alternative</i>	<i>Environmental Impacts*</i>	<i>Impact Determination</i>	<i>Mitigation Measures</i>	<i>Residual Impacts after Mitigation</i>
3.5 Geology (continued)				
Proposed Project (continued)	GEO-5b: Project operation would not result in or expose people or property to a substantial risk of landslides or mudflows.	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-6b: Collapsible soils would have less than significant impact on proposed Project operations and would not expose people or structures to substantial risk.	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-7b: Project operations would not result in one or more distinct and prominent geologic or topographic features being destroyed, permanently covered, or materially and adversely modified.	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-8b: Although the northern portion of the proposed Project site is underlain by the Wilmington Oil Field, Project operations would not result in the permanent loss of availability of a known mineral resource of regional, statewide, or local significance.	CEQA: Less than significant impact NEPA: Less than significant impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Less than significant impact
Alternative 1 (No Project)	No development would occur under Alternative 1, therefore there are no construction impacts under CEQA or NEPA for GEO-1a, GEO-2a, GEO-3a, GEO-4a, GEO-5a, GEO-6a, GEO-7a and GEO-8a.	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-1b	CEQA: Significant and unavoidable impact NEPA: Not applicable	No mitigation measures are available to reduce below significance Mitigation not required	CEQA: Significant and unavoidable impact NEPA: Not applicable
	GEO-2b	CEQA: Significant and unavoidable impact NEPA: Not applicable	No mitigation measures are available to reduce below significance Mitigation not required	CEQA: Significant and unavoidable impact NEPA: Not applicable
	GEO-3b	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable

**Table 3.5-3: Summary Matrix of Potential Impacts and Mitigation Measures for Geology
Associated with the Proposed Project and Alternatives (continued)**

<i>Alternative</i>	<i>Environmental Impacts*</i>	<i>Impact Determination</i>	<i>Mitigation Measures</i>	<i>Residual Impacts after Mitigation</i>
3.5 Geology (continued)				
Alternative 1 (continued)	GEO-4b	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-5b	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-6b	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-7b	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-8b	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
Alternative 2	GEO-1a	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact	No mitigation measures are available to reduce below significance No mitigation measures are available to reduce below significance	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact
	GEO-2a	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact	GEO-1 GEO-1	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact
	GEO-3a	CEQA: Less than significant impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: No impact
	GEO-4a	CEQA: Less than significant impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: No impact

Table 3.5-3: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives (continued)

<i>Alternative</i>	<i>Environmental Impacts*</i>	<i>Impact Determination</i>	<i>Mitigation Measures</i>	<i>Residual Impacts after Mitigation</i>
3.5 Geology (continued)				
Alternative 2 (continued)	GEO-5a	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-6a	CEQA: Less than significant impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: No impact
	GEO-7a	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-8a	CEQA: Less than significant impact NEPA: Less than significant impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Less than significant impact
	GEO-1b	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact	No mitigation measures are available to reduce below significance No mitigation measures are available to reduce below significance	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact
	GEO-2b	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact	GEO-1 GEO-1	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact
	GEO-3b	CEQA: Less than significant impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: No impact

**Table 3.5-3: Summary Matrix of Potential Impacts and Mitigation Measures for Geology
Associated with the Proposed Project and Alternatives (continued)**

<i>Alternative</i>	<i>Environmental Impacts*</i>	<i>Impact Determination</i>	<i>Mitigation Measures</i>	<i>Residual Impacts after Mitigation</i>
3.5 Geology (continued)				
Alternative 2 (continued)	GEO-4b	CEQA: Less than significant impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: No impact
	GEO-5b	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-6b	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-7b	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-8b	CEQA: Less than significant impact NEPA: Less than significant impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Less than significant impact
Alternative 3	GEO-1a	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact	No mitigation measures are available to reduce below significance No mitigation measures are available to reduce below significance	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact
	GEO-2a	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact	GEO-1 GEO-1	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact
	GEO-3a	CEQA: Less than significant impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: No impact

**Table 3.5-3: Summary Matrix of Potential Impacts and Mitigation Measures for Geology
Associated with the Proposed Project and Alternatives (continued)**

<i>Alternative</i>	<i>Environmental Impacts*</i>	<i>Impact Determination</i>	<i>Mitigation Measures</i>	<i>Residual Impacts after Mitigation</i>
3.5 Geology (continued)				
Alternative 3 (continued)	GEO-4a	CEQA: Less than significant impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: No impact
	GEO-5a	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-6a	CEQA: Less than significant impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: No impact
	GEO-7a	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-8a	CEQA: Less than significant impact NEPA: Less than significant impact	Mitigation not required Mitigation not required	CEQA: Less than significant NEPA: Less than significant impact
	GEO-1b	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact	No mitigation measures are available to reduce below significance No mitigation measures are available to reduce below significance	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact
	GEO-2b	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact	GEO-1 GEO-1	CEQA: Significant and unavoidable impact NEPA: Significant and unavoidable impact
	GEO-3b	CEQA: Less than significant impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: No impact

**Table 3.5-3: Summary Matrix of Potential Impacts and Mitigation Measures for Geology
Associated with the Proposed Project and Alternatives (continued)**

<i>Alternative</i>	<i>Environmental Impacts*</i>	<i>Impact Determination</i>	<i>Mitigation Measures</i>	<i>Residual Impacts after Mitigation</i>
3.5 Geology (continued)				
Alternative 3 (continued)	GEO-4b	CEQA: Less than significant impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: No impact
	GEO-5b	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-6b	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-7b	CEQA: No impact NEPA: No impact	Mitigation not required Mitigation not required	CEQA: No impact NEPA: No impact
	GEO-8b	CEQA: Less than significant impact NEPA: Less than significant impact	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Less than significant impact
Alternative 4	GEO-1a	CEQA: Significant and unavoidable impact NEPA: Not applicable	No mitigation measures are available to reduce below significance Mitigation not required	CEQA: Significant and unavoidable impact NEPA: Not applicable
	GEO-2a	CEQA: Significant and unavoidable impact NEPA: Not applicable	GEO-1 Mitigation not required	CEQA: Significant and unavoidable impact NEPA: Not applicable
	GEO-3a	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
	GEO-4a	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable

Table 3.5-3: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives (continued)

<i>Alternative</i>	<i>Environmental Impacts*</i>	<i>Impact Determination</i>	<i>Mitigation Measures</i>	<i>Residual Impacts after Mitigation</i>
3.5 Geology (continued)				
Alternative 4 (continued)	GEO-5a	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-6a	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
	GEO-7a	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-8a	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
	GEO-1b	CEQA: Significant and unavoidable impact NEPA: Not applicable	No mitigation measures are available to reduce below significance Mitigation not required	CEQA: Significant and unavoidable impact NEPA: Not applicable
	GEO-2b	CEQA: Significant and unavoidable impact NEPA: Not applicable	GEO-1 Mitigation not required	CEQA: Significant and unavoidable impact NEPA: Not applicable
	GEO-3b	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
	GEO-4b	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
	GEO-5b	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-6b	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable

**Table 3.5-3: Summary Matrix of Potential Impacts and Mitigation Measures for Geology
Associated with the Proposed Project and Alternatives (continued)**

<i>Alternative</i>	<i>Environmental Impacts*</i>	<i>Impact Determination</i>	<i>Mitigation Measures</i>	<i>Residual Impacts after Mitigation</i>
3.5 Geology (continued)				
Alternative 4 (continued)	GEO-7b	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-8b	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
Alternative 5	GEO-1a	CEQA: Significant and unavoidable impact NEPA: Not applicable	No mitigation measures are available to reduce below significance Mitigation not required	CEQA: Significant and unavoidable impact NEPA: Not applicable
	GEO-2a	CEQA: Significant and unavoidable impact NEPA: Not applicable	GEO-1 Mitigation not required	CEQA: Significant and unavoidable impact NEPA: Not applicable
	GEO-3a	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
	GEO-4a	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
	GEO-5a	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-6a	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
	GEO-7a	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-8a	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable

Table 3.5-3: Summary Matrix of Potential Impacts and Mitigation Measures for Geology Associated with the Proposed Project and Alternatives (continued)

<i>Alternative</i>	<i>Environmental Impacts*</i>	<i>Impact Determination</i>	<i>Mitigation Measures</i>	<i>Residual Impacts after Mitigation</i>
3.5 Geology (continued)				
Alternative 5 (continued)	GEO-1b	CEQA: Significant and unavoidable impact NEPA: Not applicable	No mitigation measures are available to reduce below significance Mitigation not required	CEQA: Significant and unavoidable impact NEPA: Not applicable
	GEO-2b	CEQA: Significant and unavoidable impact NEPA: Not applicable	GEO-1 Mitigation not required	CEQA: Significant and unavoidable impact NEPA: Not applicable
	GEO-3b	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
	GEO-4b	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
	GEO-5b	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-6b	CEQA No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-7b	CEQA: No impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: No impact NEPA: Not applicable
	GEO-8b	CEQA: Less than significant impact NEPA: Not applicable	Mitigation not required Mitigation not required	CEQA: Less than significant impact NEPA: Not applicable
* Unless otherwise noted, all impact descriptions for each of the Alternatives are the same as those described for the Proposed Project.				

3.5.4.4 Mitigation Monitoring

In instances where the **GEO-1** Emergency Response Planning Mitigation Measure is necessary, 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 will be prepared to act in the event of a large seismic event.

GEO-2: Construction on the proposed Project within the Port area would expose people and structures to substantial risk involving tsunamis or seiches	
Mitigation Measure	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 will 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	Such procedures shall be included in any bid specifications for construction or operations personnel, with a copy of such bid specifications to be provided to LAHD, including a completed copy of its operations emergency response plan prior to commencement of construction activities and/or operations. 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
Responsible Parties	LAHD
Residual Impacts	Significant after mitigation.

3.5.5 Significant Unavoidable Adverse Impacts

Design and construction in accordance with applicable laws and regulations pertaining to seismically induced ground movement would minimize structural damage in the event of an earthquake. However, increased exposure of people and property during construction and operation to seismic hazards from a major or great earthquake cannot be precluded, even with incorporation of modern construction engineering and safety standards. Emergency planning and coordination between the Terminal operator and the LAHD, as outlined in **Mitigation Measure GEO-1**, would contribute in reducing injuries to on-site personnel during a tsunami. However, even with incorporation of emergency planning and construction in accordance with current City and State regulations, substantial damage and injury could occur in the event of a tsunami or seiche. Therefore, potential impacts due to seismically induced ground failure or in the event of a tsunami or seiche would remain significant for the proposed Project and its alternatives.

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