SECTION 3.5
Geology, Soils, and Paleontological Resources

3.5.1 Introduction

This section evaluates the potential for the proposed program to result in adverse impacts related to geologic, seismic, and soils hazards. The analysis is based on review of available geologic and geotechnical reports and maps of the program area and vicinity, including site-specific investigations conducted within some of the areas, relevant regulations, and a discussion of the methodology and thresholds used to determine whether the proposed program would result in significant impacts. Additionally, *Los Cerritos Wetlands Restoration Program: Paleontological Resources Assessment* was prepared in support of this PEIR and addresses the potential for the proposed program to result in significant impacts to paleontological resources (ESA, 2019). This section analyzes the potential for both program-level and cumulative environmental impacts. All information sources used are included as citations within the text; sources are listed in Section 3.5.7, *References*.

3.5.2 Environmental Setting

Figure 2-1, *Regional Location*, and Figure 2-2, *Project Site and Local Vicinity*, in Chapter 2, *Project Description*, show the program area, which is comprised of four program areas (North, Central, Isthmus, and South), made up of 17 individual sites. Relative to geologic, soils, and paleontological resources information, the North and Central Areas have been extensively investigated in support of the Los Cerritos Wetlands Oil Consolidation and Restoration Project EIR (State Clearinghouse No. 2016041083).

3.5.2.1 Topography and Drainage

The regional area that includes the program area was once a tidal salt marsh; consequentially, the topography of the program area is relatively flat (KCG 2016a). Regionally, the topography surrounding the program area gradually slopes to the southwest, although local drainage on individual sites can vary. A more detailed discussion of drainage is provided in Section 3.8, *Hydrology and Water Quality*. The San Gabriel River flows southwest in between the Isthmus and South Areas; the Los Cerritos Channel flows southwest along the north side of the North Area. Steamshovel Slough is a remnant channel that flows west into the Los Cerritos Channel. The Haynes Cooling Channel parallels the San Gabriel River in the South Area. Elevations range from about 20 feet above mean sea level (MSL) along the northern border of the Central Area and about 25 feet in the eastern portion of the Southern Area to about 8 feet below MSL in the northern portion of the Southern Area.

3.5.2.2 Regional and Local Geology

Regional Geology

The program area is located in the Peninsular geomorphic province[1] that includes the Los Angeles Basin characterized by a series of mountain ranges separated by long valleys, formed from faults branching from the San Andreas Fault. Past research suggests that over the past 20,000 years, the Rio Hondo, San Gabriel, and Santa Ana Rivers have moved back and forth across the coastal flood plains in Los Angeles and Orange County, depositing geologically recent alluvial materials (KCG 2016a). The coastal portion of the floodplain is bound by a line of elongated folded low hills and faults. This portion of the basin is dominated by the northwest-trending Newport-Inglewood Structural Zone, which diagonally crosses the program area as the Newport-Inglewood Fault Zone shown in **Figure 3.5-1**, *Regional Faults*, and **Figure 3.5-2**, *Newport-Inglewood Fault Zone*. The topography of the program area is generally flat with elevations of less than 100 feet; however, geologic uplifts have occurred, which have interrupted the plain in different areas and resulted in prominent folds and hills. These distinguishable uplifts are oriented in a northwest-southeast direction, along the Newport-Inglewood Fault Zone (City of Long Beach 1973).

Local Geology

Fill

Artificial fill is present in all of the program areas and consists of modern surficial deposits of fill resulting from human construction, landfills, reclamation, or oil and gas production activities, which includes engineered and non-engineered fill.[2] Details of artificial fill materials, where known, are discussed below.

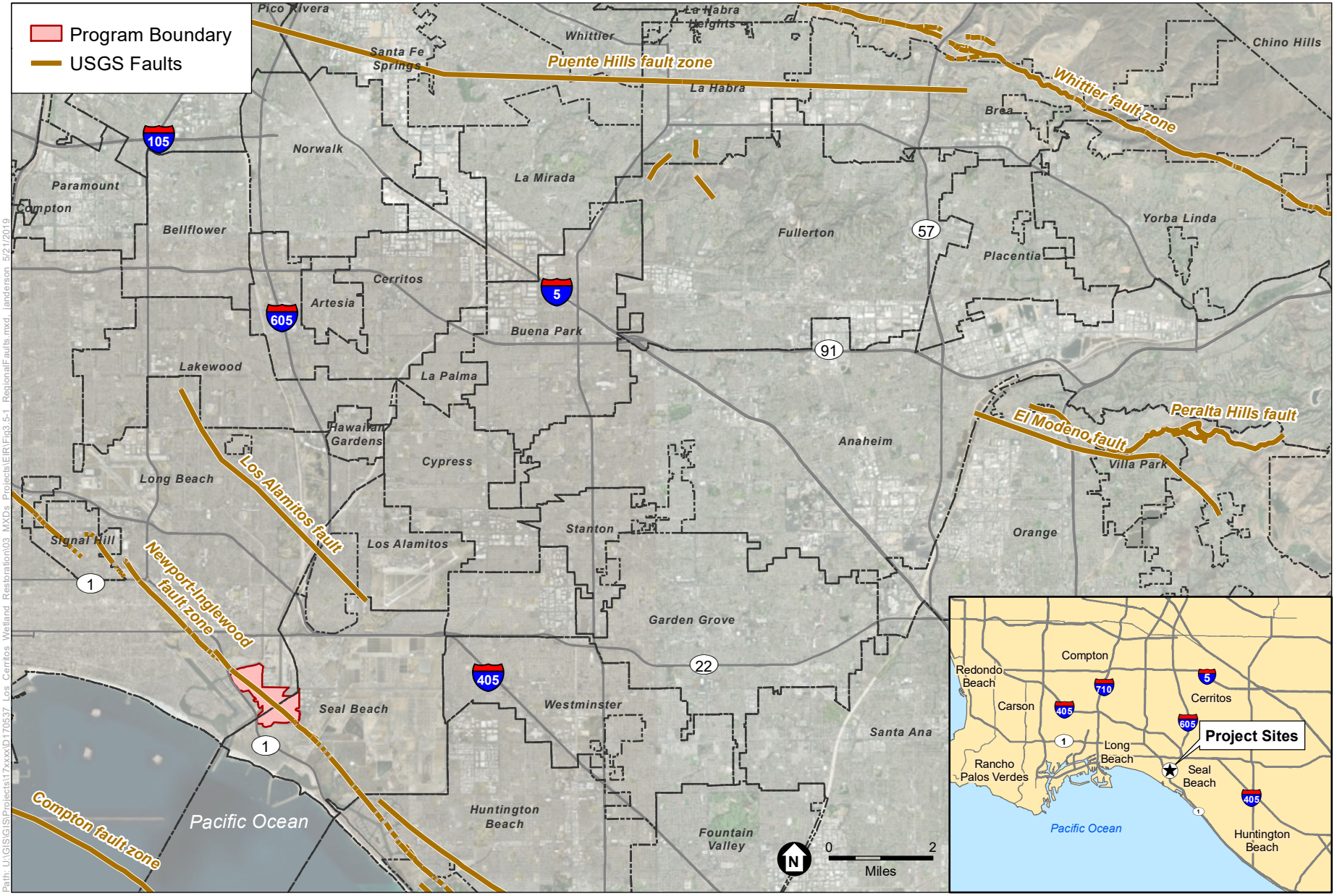
According to Saucedo et al. (2016), artificial fill is present over most of the entire program area, likely placed during development of the oil field, construction of the nearby marina, and channelization of the San Gabriel River. The artificial fill consists of sediments that have been removed from one location and transported to another by humans. Artificial fill may contain modern debris such as asphalt, wood, bricks, concrete, metal, glass, plastic, and even plant material.

Oil Production Wells and Produced Water Injection Wells

The Seal Beach Oil Field has been in active oil and natural gas production since the 1920s. Active, idle, and plugged oil and natural gas production wells and produced water injection wells are located throughout most of the program area, as shown on **Figure 3.5-3**, *Oil Production and Injection Wells*. As a part of the oil extraction process, saline water is also extracted. This produced water is returned back into the oil production zones using injection wells to prevent subsidence. The oil and produced water injection wells have well pads at the well heads and older oil wells have adjacent sumps as discussed below.

[1] A geomorphic province is an area that possesses similar bedrock, structure, history, and age. California has 11 geomorphic provinces (CGS 2002).

[2] Non-engineered fill is undocumented or poorly documented fill consisting of uncertain materials placed with uncertain consolidation procedures.



SOURCE: ESRI; USGS 2009

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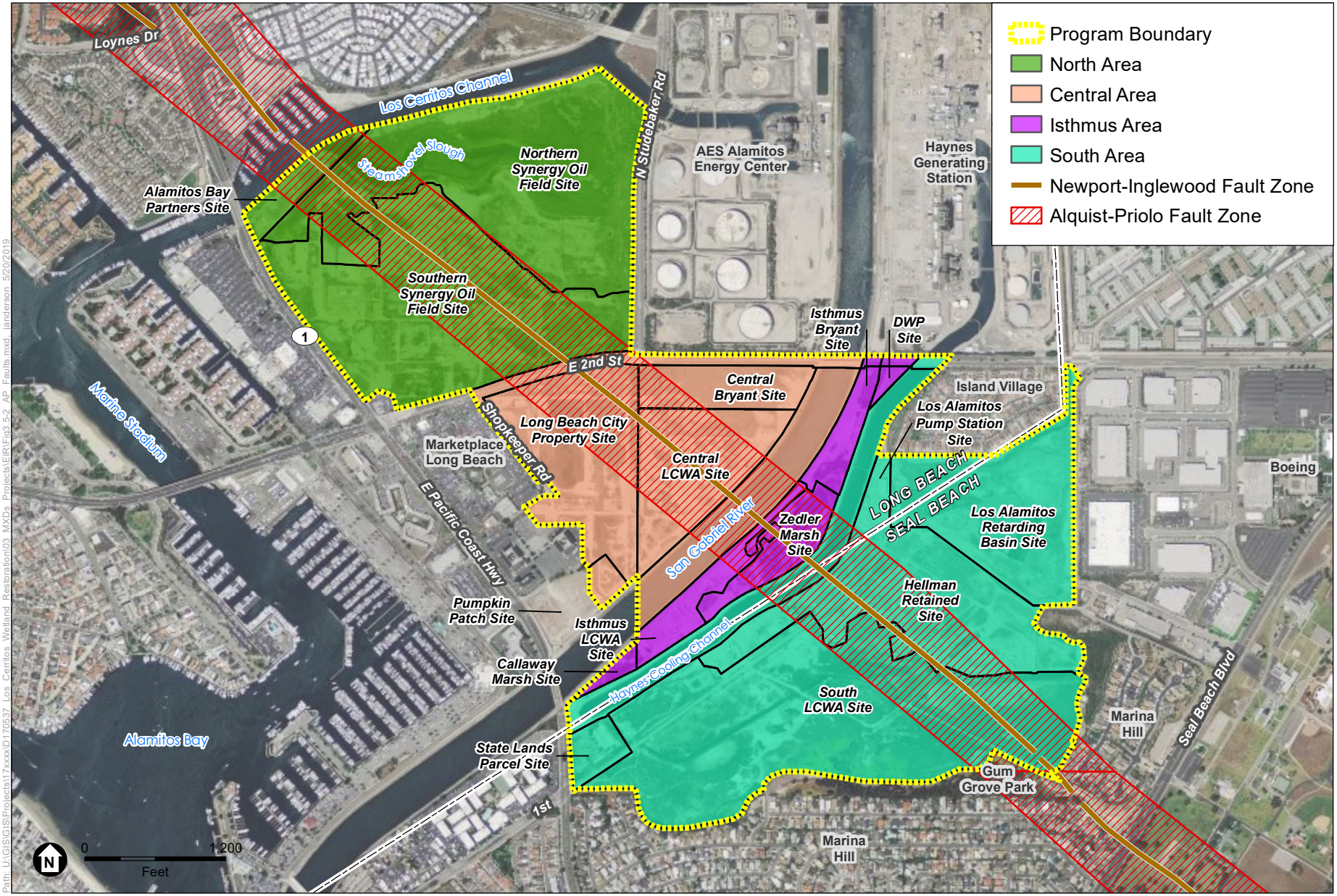
Figure 3.5-1
Regional Faults

ESA

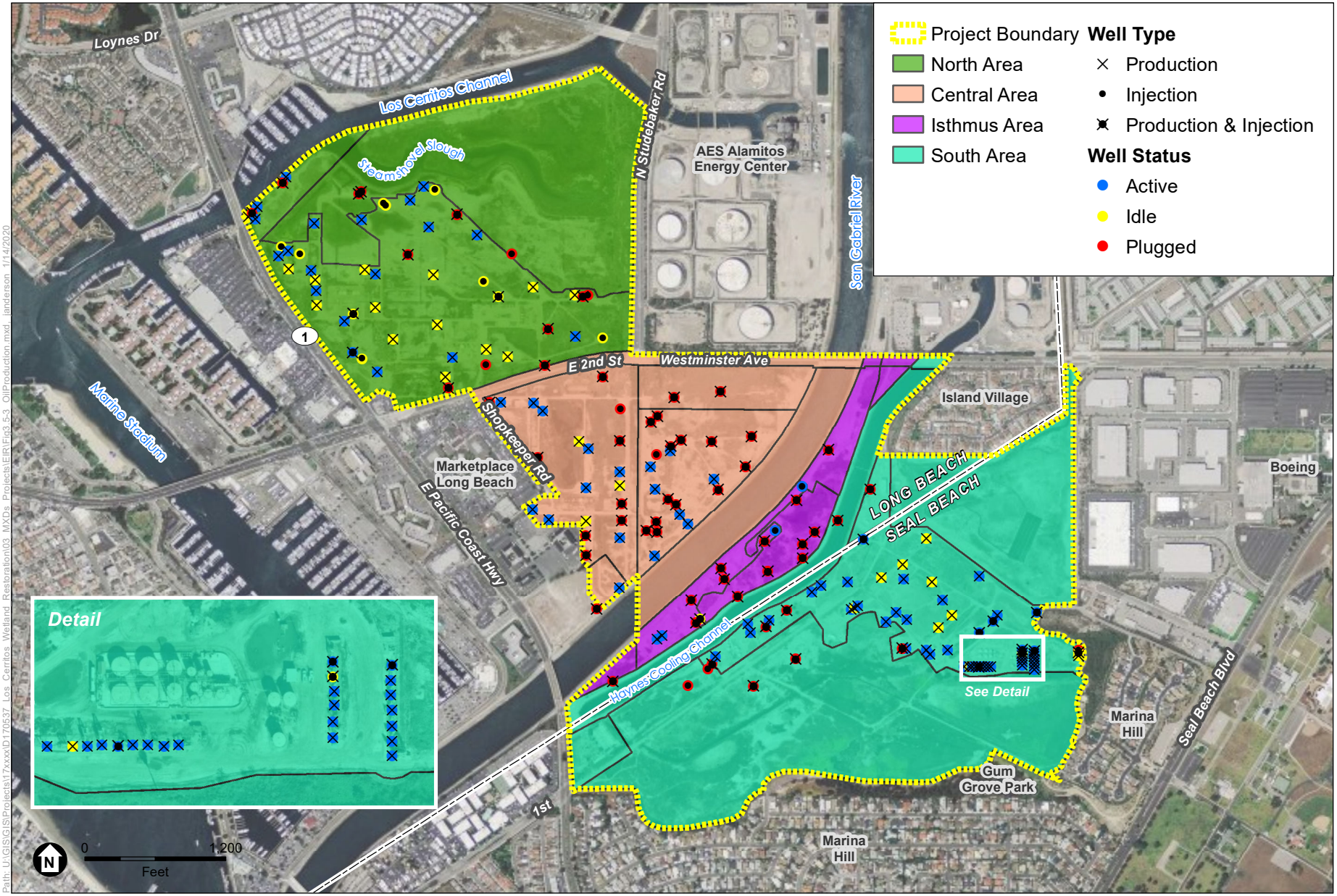


SOURCE: Mapbox, LCWA, California Department of Conservation 2001

Los Cerritos Wetlands Restoration Plan Draft Program EIR

Figure 3.5-2
Newport-Inglewood Fault Zone

ESA



SOURCE: Mapbox; LCWA; California Department of Conservation, 2019.

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Figure 3.5-3

Oil Production and Injection Wells

ESA

Oil Well Sumps

The locations and status of known oil well sumps, along with known landfills, within the program area are shown on **Figure 3.5-4**, *Landfill Areas and Oil Production Sumps*. Note that most older wells had adjacent sumps; most of the oil wells shown on Figure 3.5-3 are assumed to have adjacent sumps, even if not documented. Early oil production used unlined settlement ponds, known as sumps, dug into the earth (Geosyntec, 2017). Oil extracted from wells was diverted into the sumps, and heavy material was allowed to settle out before the economic light portion was recovered for processing. The heavy petroleum sludge built up on the bottom of sumps and to some extent slowed the migration of organic compounds into the soil, but halos of contamination are commonly found around former sumps, even where visible petroleum material was removed.

Landfills

Several locations within the program area are known to have been used as landfills that received a variety of waste materials, often poorly documented (Geosyntec, 2017). The sections below describe the known landfill areas.

Closed Landfill on Synergy Oil Field Site in Northern Area

During the 1960s, a northeast portion of the Synergy Oil Field site in the North Area was used as a municipal landfill identified as the Studebaker/Loynes Disposal Site or City Dump and Salvage #4 (Rincon 2015a, 2015b). This landfill is no longer operational, and has a closed status as of mid-April 1980. This landfill was located on a narrow strip in the northeastern portion of the Synergy Oil Field site as shown in Figure 3.5-3 and extended off-site to the north. The landfill waste included approximately 160,000 cubic yards of waste materials consisting of household and commercial refuse, inert solid materials, and street sweepings, placed in a previously existing depression area, compacted, and covered with clean soil in conformance with slope and final cover requirements. The maximum depth to refuse is estimated to be up to 25 feet.

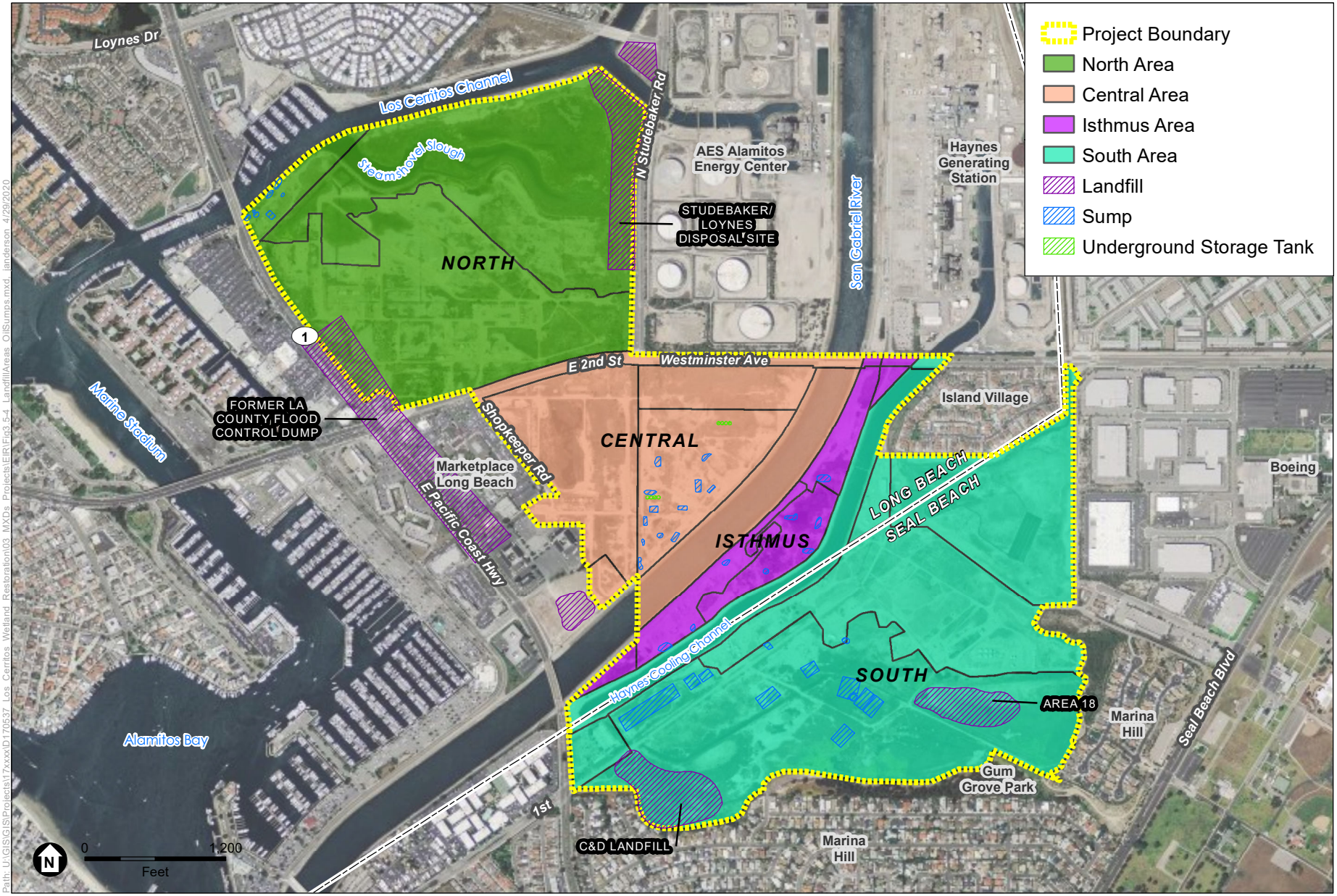
In addition, the former LA County Flood Control Dump may have extended onto the southwestern corner of the Synergy Oil Field site, as shown in Figure 3.5-4. The records are unclear as to its precise location, extent, or depth. This landfill was reportedly used to dispose of vegetation growing along the banks of the San Gabriel River.

City Property Site in Central Area

The Phase I assessment indicated the City Property site is covered with fill materials and modern surficial deposits (Rincon 2015b); however, specific details about the nature and depth of the fill materials or native soils are undocumented. None of the nearby documented landfills are known to extend onto the City Property site.

C&D Landfill in Southern Area

The C&D landfill is located in the southwest corner of the South LCWA site (see Figure 3.5-4), as delineated by with borings and trenching (Geosyntec, 2017; Anchor, 2006). The waste consists of construction materials and other debris. In addition, some crude oil was noted along the southwestern portion of this landfill area.



SOURCE: Mapbox; LCWA; Withee Malcolm Architects, LLP; Rincon, 2015; Geosyntec, 2017; Kinnetic, 2012
NOTE: The oil wells shown on Figure 3.5-3 also typically have adjacent sumps.

Los Cerritos Wetlands Restoration Plan Draft Program EIR

Figure 3.5-4

Landfill Areas and Oil Production Sumps

ESA

Area 18 in Southern Area

Area 18 is located in the eastern portion of the South LCWA site (see Figure 3.5-4) (Geosyntec, 2017). Stockpiled and buried materials consisted of asphalt-like materials consisting of "tank bottom sludge" – heavy petroleum material removed from the bottom of tanks or sumps, which was been mixed with sand or other aggregate and used for improvised road paving.

Native Materials

Young Alluvial Fan Deposits

The shallowest native materials in the program area are Young Alluvial Fan Deposits of Holocene to Late Pleistocene age (less than 126,000 years ago), consisting of poorly consolidated clay, sand, gravel, and cobbles (Saucedo et al. 2016). These sediments were eroded from higher elevations, carried by flooding streams and debris flows, and deposited at lower elevations. These deposits are mapped to the northeast of the program area and along the length of the San Gabriel River and its low-lying floodplain. As such, the Young Alluvial Fan Deposits underlie artificial fill where present within the program area.

In the North Area, the alluvial deposits consist of Holocene (present to 11,000 years ago) alluvial silty sand, sandy silt, sand, and some clayey silt to depths of over 1,000 feet (Rincon 2015a, 2015b). On the Central Area, the alluvial soils consist of Holocene unconsolidated discontinuous layers of sand and silt sand with lesser amounts of silt and clay (EEI, 1989). Native soils in other portions of the program area are likely similar.

Old Paralic Deposits

The San Gabriel River cuts through late to middle Pleistocene (11,700–781,000 years ago) Old Paralic Deposits mapped on the slightly elevated areas to the northwest and southeast of the program area that underlie alluvial deposits (Saucedo et al. 2016). The Old Paralic Deposits consist of reddish-brown siltstone, sandstone, and conglomerate deposited in beach, estuary, and terrestrial environments. They rest on wave-cut platforms that have been preserved by regional uplift. Paralic means interfingered marine and continental sediments.

Deeper Units

Beneath the above-summarized units are various units of sandstone, shale, and siltstone of varying thicknesses. Some of the deeper sandstone units are the oil-producing units for the Seal Beach Oil Field. The proposed program would not encounter these deeper units.

3.5.2.3 Seismicity and Faults

This section characterizes the region's existing faults, describes historical earthquakes, estimates the likelihood of future earthquakes, and describes probable groundshaking effects.

Earthquake Terminology and Concepts

Earthquake Mechanisms and Fault Activity

Faults are planar features within the earth's crust that have formed to release strain caused by the dynamic movements of the earth's major tectonic plates. An earthquake on a fault is produced when these strains overcome the inherent strength of the earth's crust, and the rock ruptures. The

rupture causes seismic waves that propagate through the earth's crust, producing the groundshaking effect known as an earthquake. The rupture also causes variable amounts of slip along the fault, which may or may not be visible at the earth's surface.

Geologists commonly use the age of offset rocks as evidence of fault activity—the younger the displaced rocks, the more recently earthquakes have occurred. To evaluate the likelihood that a fault would produce an earthquake, geologists examine the magnitude and frequency of recorded earthquakes and evidence of past displacement along a fault. The California Geological Survey (CGS) defines an active fault as one that has had surface displacement within Holocene time (within the last 11,000 years; the U.S. Geological Survey (USGS) uses within the last 15,000 years). A Quaternary fault is defined as a fault that has shown evidence of surface displacement during the Quaternary period (the last 1.6 million years), unless direct geologic evidence demonstrates inactivity for all of the Holocene or longer. This definition does not mean that a fault lacking evidence of surface displacement is necessarily inactive. The term "sufficiently active" is also used to describe a fault if there is some evidence that Holocene displacement has occurred on one or more of its segments or branches (CGS 2007).

Earthquake Magnitude

When an earthquake occurs along a fault, its size can be determined by measuring the energy released during the event. A network of seismographs records the amplitude and frequency of the seismic waves that an earthquake generates. The Richter magnitude (ML) of an earthquake represents the highest amplitude measured by the seismograph at a distance of 100 kilometers from the epicenter. Richter magnitudes vary logarithmically with each whole-number step, representing a tenfold increase in the amplitude of the recorded seismic waves and 32 times the amount of energy released. While Richter magnitude was historically the primary measure of earthquake magnitude, seismologists now use Moment Magnitude (Mw) as the preferred way to express the size of an earthquake. The Mw scale is related to the physical characteristics of a fault, including the rigidity of the rock, the size of fault rupture, and the style of movement or displacement across the fault. Although the formulae of the scales are different, they both contain a similar continuum of magnitude values, except that Mw can reliably measure larger earthquakes and do so from greater distances.

Peak Ground Acceleration

A common measure of ground motion at any particular site during an earthquake is the peak ground acceleration (PGA). The PGA for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. PGA is expressed as the percentage of the acceleration due to gravity (g), which is approximately 980 centimeters per second squared. In terms of automobile acceleration, one "g" of acceleration is equivalent to the motion of a car traveling 328 feet from rest in 4.5 seconds. For comparison purposes, the maximum PGA value recorded during the 1994 Northridge earthquake in the vicinity of the epicenter exceeded 1 g in several areas. Unlike measures of magnitude, which provide a single measure of earthquake energy, PGA varies from place to place and is dependent on the distance from the epicenter and the character of the underlying geology (e.g., hard bedrock, soft sediments, or artificial fills).

Modified Mercalli Intensity Scale

The Modified Mercalli Intensity Scale assigns an intensity value based on the observed effects of groundshaking produced by an earthquake. Unlike measures of earthquake magnitude and PGA, the Modified Mercalli Intensity Scale is qualitative in nature in that it is based on actual observed effects rather than measured values. Similar to PGA, Modified Mercalli values for an earthquake at any one place can vary depending on the earthquake's magnitude, the distance from its epicenter, the focus of its energy, and the type of geologic material. The Modified Mercalli values for intensity range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X can cause moderate to significant structural damage. Because the Modified Mercalli scale is a measure of groundshaking effects, intensity values can be correlated to a range of average PGA values, as shown in **Table 3.5-1**, *Modified Mercalli Intensity Scale*.

TABLE 3.5-1
MODIFIED MERCALLI INTENSITY SCALE

Intensity Value	Intensity Description	Average Peak Ground Acceleration[a]
I	Not felt	< 0.0017 g
II	Felt by people sitting or on upper floors of buildings	0.0017 to 0.014 g
III	Felt by almost all indoors. Hanging objects swing. Vibration like passing of light trucks. May not be recognized as an earthquake.	0.0017 to 0.014 g
IV	Vibration felt like passing of heavy trucks. Stopped cars rock. Hanging objects swing. Windows, dishes, doors rattle. Glasses clink. In the upper range of IV, wooden walls and frames creak.	0.014 to 0.039 g
V (Light)	Felt outdoors. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing. Pictures move. Pendulum clocks stop.	0.035 to 0.092 g
VI (Moderate)	Felt by all. People walk unsteadily. Many frightened. Windows crack. Dishes, glassware, knickknacks, and books fall off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster, adobe buildings, and some poorly built masonry buildings cracked. Trees and bushes shake visibly.	0.092 to 0.18 g
VII (Strong)	Difficult to stand or walk. Noticed by drivers of cars. Furniture broken. Damage to poorly built masonry buildings. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices, unbraced parapets and porches. Some cracks in better masonry buildings. Waves on ponds.	0.18 to 0.34 g
VIII (Very Strong)	Steering of cars affected. Extensive damage to unreinforced masonry buildings, including partial collapse. Fall of some masonry walls. Twisting, falling of chimneys and monuments. Wood-frame houses moved on foundations if not bolted; loose partition walls thrown out. Tree branches broken.	0.34 to 0.65 g
IX (Violent)	General panic. Damage to masonry buildings ranges from collapse to serious damage unless modern design. Wood-frame structures rack, and, if not bolted, shifted off foundations. Underground pipes broken.	0.65 to 1.24 g
X (Very Violent)	Poorly built structures destroyed with their foundations. Even some well-built wooden structures and bridges heavily damaged and needing replacement. Water thrown on banks of canals, rivers, lakes, etc.	> 1.24 g
XI (Very Violent)	Few, if any, masonry structures remain standing. Bridges destroyed. Rails bent greatly. Underground pipelines completely out of service.	> 1.24 g
XII (Very Violent)	Damage nearly total. Practically all works of construction are damaged greatly or destroyed. Large rock masses displaced. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown into the air.	> 1.24 g

NOTES:

[a] Value is expressed as a fraction of the acceleration due to gravity (g). Gravity (g) is 9.8 meters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

SOURCES: ABAG, 2016; CGS, 2003.

Faults and Historical Earthquake Activity

The program area is located in a seismically active region of California. The Los Angeles Basin contains both active and potentially active. Throughout the program area, there is the potential for damage resulting from movement along any one of a number of the active faults. The Working Group on California Earthquake Probabilities (WGCEP), comprised of the USGS, the CGS, and the Southern California Earthquake Center, evaluated the probability of one or more earthquakes of Mw 6.7 or higher occurring in the State of California over the next 30 years (WGCEP 2015). WGCEP estimated that the Los Angeles region areas as a whole has a 60 percent chance of experiencing an earthquake of Mw 6.7 or higher over the next 30 years; among the various active faults in the region, the southern San Andreas Fault is the most likely to cause such an event.

Several active and potentially active faults have been mapped within or close to the program area. The approximate locations of the major faults in the region and their geographic relationship to the program area region are shown in Figure 3.5-1. The closer view of the Newport-Inglewood Fault Zone, which diagonally crosses the program area, as shown in Figure 3.5-2.

Local Fault

In addition to being shown in Figure 3.5-1, the local fault's location in relation to the program area is shown in detail in Figure 3.5-2.

Newport-Inglewood Fault Zone

The northwest-trending Newport-Inglewood Fault dominates the geologic structure of the coast line from Newport Beach to north of the Long Beach area. As a result of the fault movement in the area, a number of elongated hills are present in the area including the Dominguez Hills and Signal Hill. The 1933 Mw 6.4 Long Beach earthquake occurred along the Newport-Inglewood fault offshore from Huntington Beach (KCG 2016a). The program area is bisected by the Newport-Inglewood Fault (KCG 2016b; Honegger 2016). The fault has a 0.71 to 0.95 percent probability of generating an earthquake with a magnitude equal to or greater than 6.7 over the next 30 years (WGCEP 2015).

Regional Faults

San Andreas Fault Zone

The San Andreas Fault Zone is a major structural feature in the region and forms a boundary between the North American and Pacific tectonic plates (Bryant and Lundberg 2002). The San Andreas Fault is a major northwest-trending, right-lateral,[3] strike-slip[4] fault. The fault extends for about 600 miles from the Gulf of California in the south to Cape Mendocino in the north. The San Andreas is not a single fault trace but rather a system of active faults that diverges from the main fault south of the City of San Jose, California. The San Andreas Fault has produced numerous large earthquakes, including the 1906 San Francisco earthquake. That event had an estimated ML 8.3 or Mw 7.8 (WGCEP 2008a, 2008b) and was associated with up to 21 feet of displacement and widespread ground failure (Lawson 1908). The San Andreas Fault

[3] To an observer straddling a right-lateral fault, the right-hand block or plate would move towards the observer.

[4] A strike-slip fault creates vertical (or nearly vertical) fractures (i.e., the blocks primarily move horizontally).

Zone has a 19 percent probability of generating an earthquake in the Southern California region with a magnitude equal to or greater than 6.7 Mw over the next 30 years (WGCEP 2015). The San Andreas Fault is located approximately 50 miles northwest of the program area.

Whittier Fault Zone

The Whittier Fault is approximately 25 miles in length; its nearest communities are Yorba Linda, Hacienda Heights and Whittier (Caltech 2016a). The Whittier Fault has a 1.29 percent probability of generating an earthquake with a magnitude equal to or greater than 6.7 Mw over the next 30 years (WGCEP 2015). The Whittier Fault is approximately 15 miles from the program area.

Compton Fault Zone

The Compton Fault is a large, concealed blind thrust fault that extends northwest-southeast for approximately 25 miles beneath the western edge of the Los Angeles metropolitan region. Unlike most faults, which rupture to the surface in large earthquakes, near-surface deformation above blind thrust faults is accommodated by folding, rather than faulting. The Compton Fault is active and has generated at least six large-magnitude earthquakes (Mw 7.0 to 7.4) during the past 14,000 years (Leon et al. 2009). The Compton Fault has a 0.60 to 0.67 percent probability of generating an earthquake with a magnitude equal to or greater than 6.7 over the next 30 years (WGCEP 2015). The Compton Fault is located approximately 2.5 miles southwest of the program area.

Puente Hills Fault Zone

The Puente Hills Fault is a blind thrust fault extending more than 25 miles in the northern Los Angeles Basin from downtown Los Angeles east to Brea in northern Orange County. The fault consists of three distinct geometric segments: Los Angeles, Santa Fe Springs, and Coyote Hills. The Puente Hills Fault generated the 1987 Mw 6.0 Whittier Narrows earthquake southeast of Los Angeles (Shaw et al. 2002). Subsections 1 and 0 of the Puente Hills Fault have a 0.95 to 0.96 percent probability of generating an earthquake with a magnitude equal to or greater than 6.7 over the next 30 years (WGCEP 2015). The Puente Hills fault is located approximately 12 miles north of the program area.

Palos Verdes Fault Zone

The Palos Verdes Fault is approximately 50 miles in length and has two main branches: the Cabrillo Fault and the Redondo Canyon Fault. The Palos Verdes Fault passes through the cities of San Pedro, Palos Verdes Estates, Torrance and Redondo Beach (Caltech 2016b), and is located approximately 9 miles southwest of the program area. The Palos Verdes Fault has a 3.03 percent probability of generating an earthquake with a magnitude equal to or greater than 6.7 over the next 30 years (WGCEP 2015).

Los Alamitos Fault

The Los Alamitos Fault, more recently called the Compton-Los Alamitos Fault is located about 3 miles north of the program area. Recent research on the Compton-Los Alamitos Fault concluded that some movement occurred during the 1933 Long Beach earthquake, meaning that this fault is considered active (Yeats and Verdugo 2010). Earthquake probabilities have not yet been estimated.

3.5.2.4 Geologic Hazards

Based on the geologic data reviewed during preparation of this PEIR, the potential geologic hazards at the program area include erosion and expansive soil. These geologic hazards are discussed below. Liquefaction, landslides, and lateral spreading, while possible without seismic shaking, are more commonly triggered by a seismic event, as discussed further below in seismic hazards.

Erosion

Erosion is the wearing away of soil and rock by processes such as mechanical or chemical weathering, mass wasting, and the action of water and wind. Excessive soil erosion can eventually damage infrastructure such as pipelines, wellheads, building foundations, and roadways. In general, granular soils with relatively low cohesion and soils located on steep topography have a higher potential for erosion. As previously discussed, the program area is relatively flat, resulting in a relatively low potential for soil erosion. In addition, erosion potential is typically further reduced or eliminated once the soil is graded and covered with hardscape or vegetation, or other slope protection measures, including habitat restoration.

Expansive Soils

Expansive soils are subject to volume changes from changes in moisture content: swelling with increases in moisture; shrinkage with decreases in moisture. The shrinking and swelling can damage foundations and other infrastructure. The geotechnical investigation of the alluvial materials on the Pumpkin Patch site, located adjacent and southwest of the Long Beach City Property site, concluded that the materials have a low to moderate expansion potential (KCG 2016a). It is assumed this condition may also apply to areas within the program area.

Subsidence and Collapse

When oil and/or groundwater is extracted from the subsurface, subsidence of the overlying land surface can occur. Collapse is also typically associated with shallow groundwater withdrawal. Subsidence is usually associated with severe, long-term withdrawal in excess of recharge that eventually leads to overdraft of the aquifer. As oil and/or groundwater is pumped out, water and/or oil is removed from the soil pore spaces leading to a reduction in soil strength. The subsurface conditions more conducive to subsidence include clay or organic-rich soils. Sand- and gravel-rich soils are less prone to subsidence because the larger grains comprise a skeleton less dependent on water pressure for support. The subsidence can result in damage to infrastructure such as buildings or pipelines, or can result in a decrease in the volume of available aquifer storage. This is the reason the produced water pumped from the subsurface along with oil production is purposely injected back into the same depth interval to prevent subsidence.

In the regional area that includes the program area, historical subsidence was previously associated with oil production and the groundwater pumped out along with the oil. Generally, subsidence in the Long Beach area was concentrated in the Long Beach Harbor area (Wilmington oil field, located south and west of the program area) and lessened with distance away from the Wilmington area. It has been estimated that north and east of the main Long Beach Harbor area,

this subsidence averaged a few tenths of a foot over a period of about 20 years and was generally uniform across wide areas (KCG 2016b). As previously noted, the injection of produced water back into oil production zones has arrested regional subsidence.

However, there is the potential for subsidence on former landfill areas. There are landfilled areas on the Synergy Oil Field and C&D Landfill. The degree of compaction at the former landfills is unknown. Because of the unknown level of compaction of the fill at the former landfills and shallow groundwater table, potential site-specific subsidence risks are considered to be moderate to high (KCG 2016a).

3.5.2.5 Seismic Hazards

Seismic hazards are generally classified into two categories: primary seismic hazards (surface fault rupture and groundshaking) and secondary seismic hazards (liquefaction and other types of seismically induced ground failure, along with seismically induced landslides).

Surface Fault Rupture

Seismically induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude, sense, and nature of fault rupture can vary for different faults or even along different strands of the same fault. Although future earthquakes could occur anywhere along the length of an active fault, only regional strike-slip earthquakes of magnitude 6.0 or greater are likely to be associated with significant surface fault rupture and offset (CDMG and USGS 1996). It is also important to note that unmapped subsurface fault traces could experience unexpected and unpredictable earthquake activity and fault rupture. The highest potential for surface faulting is along existing fault traces that have had Holocene displacement. As previously discussed, the active Newport-Inglewood Fault is mapped through the program area, as shown in Figure 3.5-2.

Seismic Groundshaking

As discussed above, it is estimated that a major earthquake has a 60 percent chance of affecting the Los Angeles Region in the next 30 years and would produce strong groundshaking throughout the region. Earthquakes on active or potentially active faults, depending on magnitude and distance from the program area, could produce a range of groundshaking intensities at the program area. Historically, earthquakes have caused strong groundshaking and damage in the Los Angeles Basin. For example, the Mw 6.4 Long Beach earthquake in March 1933 produced very damaging groundshaking from Long Beach to the industrial section south of Los Angeles (Hauksson and Gross 1991) and is believed to have occurred on the Newport-Inglewood Fault offshore from Huntington Beach (KCG 2016a); however, disregarding local variations in ground conditions, the intensity of shaking at different locations within the area can generally be expected to decrease with distance from an earthquake source.

The primary tool that seismologists use to describe groundshaking hazard is a probabilistic seismic hazard assessment (PSHA). The PSHA for the State of California takes into consideration the range of possible earthquake sources (including such worst-case scenarios as described above) and estimates their characteristic magnitudes to generate a probability map for groundshaking.

The PSHA maps depict PGA values that have a 10 percent probability of being exceeded in 50 years (i.e., a 1 in 475 chance of occurring each year). Use of this probability level allows engineers to design structures to withstand ground motions that have a 90 percent chance of not occurring in the next 50-year interval, thus making buildings safer than if they were designed only for the ground motions that are expected within the next 50 years.

The geotechnical studies for the Synergy Oil Field and Pumpkin Patch sites provided the USGS estimates for the PGAs ranging from 0.603g to 0.604g (KCG 2016a, 2016b). The PGA for the Isthmus and South Areas is expected to be in the same range. According to Table 3.5-1, this would correlate to a Modified Mercalli ground shaking intensity of level VIII, very strong shaking.

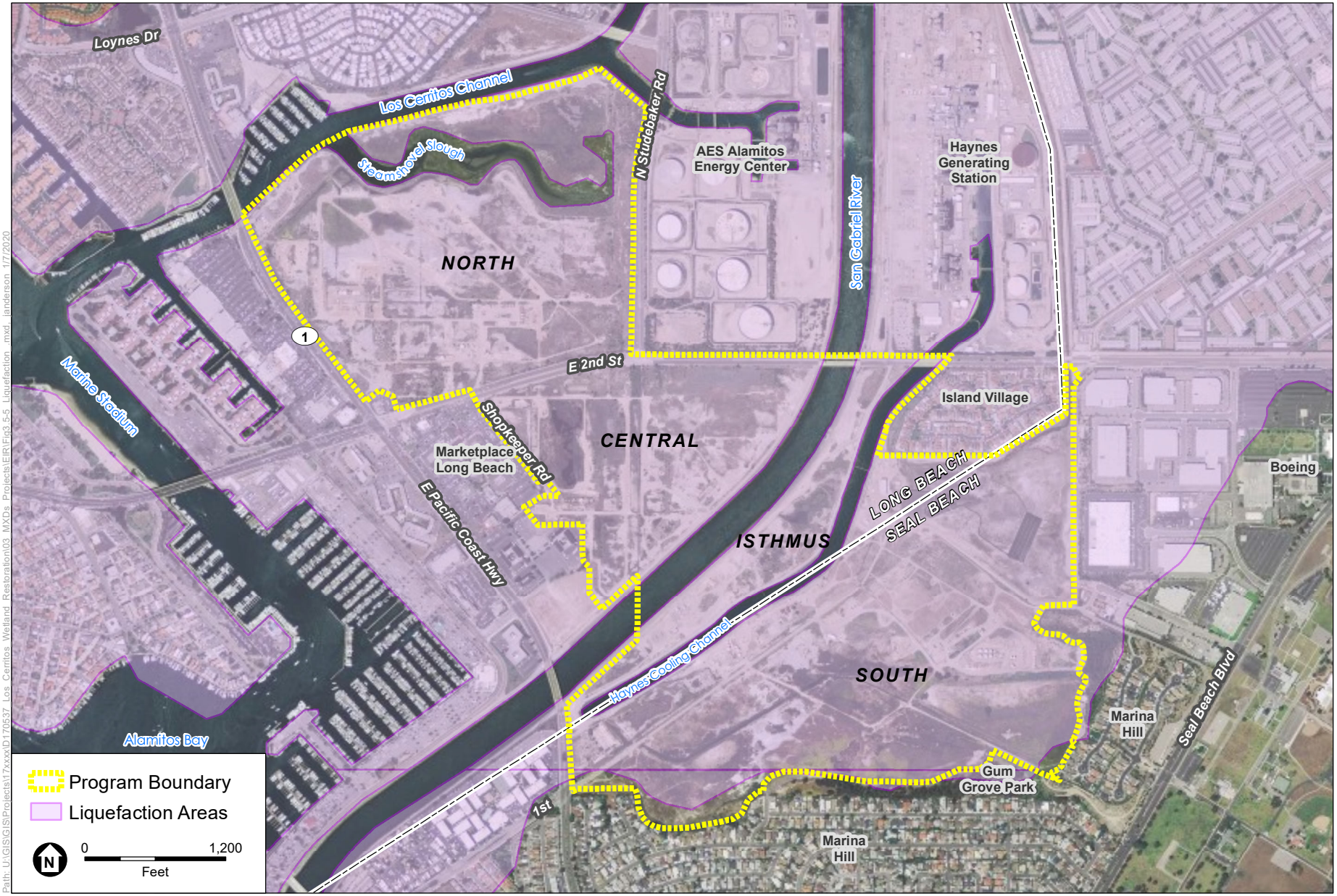
Liquefaction and Lateral Spreading

Liquefaction is the rapid loss of shear strength experienced in saturated, predominantly granular soils below the groundwater level during strong earthquake groundshaking and occurs due to an increase in pore water pressure. Liquefaction-induced lateral spreading is defined as the finite, lateral displacement of gently sloping ground as a result of pore-pressure buildup or liquefaction in a shallow underlying deposit during an earthquake (VT 2013). The occurrence of this phenomenon is dependent on many complex factors, including the intensity and duration of groundshaking, particle-size distribution, and density of the soil.

The potential damaging effects of liquefaction include differential settlement, loss of ground support for foundations, ground cracking, heaving and cracking of structure slabs due to sand boiling, and buckling of deep foundations due to ground settlement. Dynamic settlement (i.e., pronounced consolidation and settlement from seismic shaking) may also occur in loose, dry sands above the water table, resulting in settlement of and possible damage to overlying structures. In general, a relatively high potential for liquefaction exists in loose, sandy soils that are within 50 feet of the ground surface and are saturated (below the groundwater table). Lateral spreading can move blocks of soil, placing strain on levees and roads that can lead to ground failure.

Figure 3.5-5, *Liquefaction Potential in Program Area*, displays the relative liquefaction hazard potential in the vicinity of the proposed program; the entire area encompassing the entire program area is entirely within a liquefaction susceptible zone (CGS, 1998). For the locations where levees and roads would be constructed, during a 7.0-magnitude earthquake with a PGA of 0.601 g, an estimate of up to 1.3 to 2.7 inches of seismic settlement due to liquefaction and lateral spreading could occur at the Pumpkin Patch site (KCG 2016a). This earthquake scenario represents the (worst-case) design-level earthquake and ground acceleration to be used for liquefaction analysis, as per ASCE/SEI 7-16, (see Section 3.5.3, *Regulatory Framework, California Building Code*).

Lateral spreading is characterized by horizontal displacement of surficial soil layers as a consequence of liquefaction of deeper granular soil layers. Lateral spreading usually occurs on sites with sloping ground surfaces located near bodies of water such as lakes, rivers and oceans. Due to the gently sloping ground throughout the program area, lateral spreading is unlikely to occur during a design maximum earthquake event.



SOURCE: Mapbox, LCWA, City of Long Beach, City of Seal Beach; CGS

Los Cerritos Wetlands Restoration Plan Draft Program EIR

Figure 3.5-5

Liquefaction Potential in Program Area

ESA

Earthquake-Induced Settlement

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur as a result of the relatively rapid rearrangement, compaction, and settling of subsurface materials, particularly loose, uncompacted, and variable sandy sediments. Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different rates). Areas are susceptible to differential settlement if underlain by compressible sediments, such as poorly engineered artificial fill or the waste material in the former landfill at the Synergy Oil Field, Pumpkin Patch, or C&D sites (KCG 2016a).

Landslides and Ground Cracking

Earthquake motions can induce substantial stresses on slopes and can cause earthquake-induced landslides or ground cracking if the slope fails. Earthquake-induced landslides can occur in areas with steep slopes that are susceptible to strong ground motion during an earthquake. Landslides can also be non-seismically induced; non-seismically induced landslide can be caused by the force of gravity on steep unstable slopes, by construction activities that disturb soil conditions and create unstable slopes, and by water leaks or breaks in pipelines or pumps.

Based on a review of aerial photographs and available geotechnical reports and topographic conditions, no landslides are present in the program area. The City of Long Beach concluded that slope instability as a major problem within the City, since its slopes are generally neither high nor steep (City of Long Beach 1975). Given the relatively flat nature of the program area, the potential for landslides would be considered low.

3.5.2.6 Paleontological Resources

Literature Search

The literature search was completed through the Natural History Museum of Los Angeles County (LACM) on May 28, 2019 (McLeod 2019). The database search returned no known localities within the program area; however, a number of vertebrate fossil localities are known in southern Los Angeles from sedimentary deposits similar to those present at depth in the program area (McLeod 2019). The closest locality (LACM 3757) is approximately 1.2 miles northwest of the program area, where numerous fossil specimens were collected from older Pleistocene-aged alluvium at an unknown depth. This locality produced specimens of eagle ray (*Myliobatis*), skate (*Rhinobatoidea*), white shark (*Carcharodon*), blue shark (*Prionace*), requiem shark (*Carcharhinidae*), surfperch (*Damalichthys* and *Rhacochilus*), croaker (*Genyonemus*), pond turtle (*Emys*), diving duck (*Chendytes*), loon (*Gavia*), dog (*Canis*), sea otter (*Enhydra*), horse (*Equus*), camel (*Hemiauchenia*), and pocket gopher (*Thomomys*) (McLeod 2019). To the west of LACM 3757, another locality, LACM 6746, produced a fossil mammoth (*Mammuthus*), at a shallow but unstated depth (McLeod 2019). Approximately 2.3 miles west of the program area, LACM 2031 produced specimens of fossil bison (*Bison antiquus*) (McLeod 2109). Further to the northwest, 3.18 miles northwest of the program area, LACM 7393 produced specimens of camel (Camelidae) at a depth of 8.5 feet below ground surface (McLeod 2109).

Field Survey

On December 15 and 16, 2016, a pedestrian survey was conducted for accessible portions of the Synergy and City property sites[5] Rieboldt 2016). All accessible parts of the undeveloped areas that had at least some ground visibility were surveyed in systematic parallel transects spaced 10 to 12 meters (33 to 40 feet) apart. Special attention was paid to any graded areas and to rodent burrows that offered a better view of the underlying sediment. The purpose of this survey was to confirm the accuracy of the geologic mapping and to identify whether any previous ground-disturbing activities had brought any paleontological resources to the surface. In this way, the survey could identify areas within the local area that could potentially contain paleontological resources. No paleontological resources were observed during the field survey. Where exposed, the surveyor noted that the sediments within the program area are consistent with the Artificial Fill mapped by Saucedo et al. (2016).

Paleontological Sensitivity Analysis

The review of the scientific literature and geologic mapping, as well as the database search from LACM, were used to assign paleontological potentials to the geologic units present at the surface and at depth in the program area, following the Society of Vertebrate Paleontology (SVP) Guidelines (2010). The geologic units are listed below in order of paleontological sensitivity (no potential to high potential):

- **Artificial Fill** – present at the surface across the program area; no paleontological potential. Artificial fill was deposited by human activity and will not preserve significant fossils; however, fill likely overlies native sediments present at the surface around the program area such as older alluvium or old shallow marine deposits that have high paleontological potential.
- **Estuarine deposits (Qpe)** – potentially present in the subsurface underlying artificial fill in the program area; low paleontological potential. Estuarine deposits are too young to preserve fossils; however, estuarine deposits likely overlie older sediments such as older alluvium or old shallow marine deposits that have high paleontological potential.
- **Young alluvium, unit 2 (Qya_2)** – present at the surface to the north of the program area, may underlie artificial fill or estuarine deposits in the program area; low-to-high paleontological potential, increasing with depth. A wide variety of Ice Age fossils have been found in older alluvial sediments across southern California, as reviewed above, including multiple specimens known from the vicinity of the program area (McLeod 2019). The exact depth at which the transition from low to high potential occurs is unknown in the program area, but depths of 5-10 feet below ground surface are common in the region (McLeod 2019).
- **Old shallow marine deposits (Qom)** – present at the surface in the southern-most program area; high paleontological potential. Pleistocene-aged marine deposits are well known to preserve a wide variety of marine invertebrate and vertebrate fossils, as well as occasional terrestrial fossils. Likely to be present underlying artificial fill at an undetermined depth throughout the program area.

[5] The remaining sites have not been surveyed for paleontological resources.

Summary

The program area consists of artificial fill, estuarine deposits, young alluvium, and old shallow marine deposits. Artificial fill and estuarine deposits have no or low paleontological sensitivity, respectively. However, they overlie young alluvium and old shallow marine deposits at an undetermined depth, which have low-to-high or high paleontological sensitivity, respectively. Therefore, the program area is considered to have low-to-high paleontological potential, increasing with depth. While the exact depth of the artificial fill overlying the majority of the program area is unknown and may vary across the program area, 5 feet below ground surface is used as a conservative estimate of the transition from low to high potential since there have been fossil discoveries in the region from a similar depth.

3.5.3 Regulatory Framework

The proposed program shall be required to comply with the following laws, statutes, regulations, codes, and policies, which are defined as standard conditions for the proposed program.

3.5.3.1 Federal

Earthquake Hazards Reduction Act

Established by the U.S. Congress when it passed the Earthquake Hazards Reduction Act of 1977, the purpose of the National Earthquake Hazards Reduction Program (NEHRP) is to "reduce the risks to life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards and reduction program." The principle behind NEHRP is that earthquake-related losses can be reduced through improved design and construction methods and practices, land use controls and redevelopment, prediction techniques and early-warning systems, coordinated emergency preparedness plans, and public education and involvement programs. There are four federal agencies that can contribute to earthquake mitigation efforts; they have been designated as NEHRP agencies and are as follows: the Federal Emergency Management Agency (FEMA), the National Institute of Standards and Technology (NIST), the National Science Foundation (NSF), and the USGS.

Hazardous Liquid Pipeline Safety Act

The Hazardous Liquid Pipeline Safety Act of 1979 authorized the U.S. Department of Transportation (USDOT) to regulate pipeline transportation of hazardous liquids, including crude oil, petroleum products, anhydrous ammonia and carbon dioxide. The Pipeline and Hazardous Materials Safety Administration (PHMSA), created in 2004 by USDOT, has the following responsibilities:

- Analyze pipeline safety and accident data;
- Evaluate which safety standards need improvement and where new rulemakings are needed;
- Set and enforce regulations and standards for the design, construction, operation, maintenance, or abandonment of pipelines by pipeline companies;
- Educate operators, states, and communities on how to keep pipelines safe;

- Facilitate research and development into better pipeline technologies;
- Train state and federal pipeline inspectors; and
- Administer grants to states and localities for pipeline inspections, damage prevention, and emergency response.

The requirements of the Hazardous Liquid Pipeline Safety Act are implemented by Department of Conservation's California Geologic Energy Management Division (CalGEM) [formerly known as the Division of Oil, Gas, and Geothermal Resources (DOGGR)], as discussed further below and include the design and operation of oil pipelines in seismically active areas. The federal- and State-level regulations cover route selection, regulatory processes, design, site preparation, pipe stringing, trenching, bending, welding, coating, lowering and backfilling, testing, and site restoration.

3.5.3.2 State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to protect structures for human occupancy from the hazard of surface faulting. In accordance with the act, the State Geologist has established regulatory zones—called earthquake fault zones—around the surface traces of active faults, and has published maps showing these zones. Buildings for human occupancy cannot be constructed across surface traces of faults that are determined to be active. Because many active faults are complex and consist of more than one branch that may experience ground surface rupture, earthquake fault zones extend approximately 200 to 500 feet on either side of the mapped fault trace. This act applies to this proposed program because the active Newport-Inglewood Fault passes through the program area.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act was passed in 1990 following the Loma Prieta earthquake to reduce threats to public health and safety and to minimize property damage caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones, and cities, counties, and other local permitting agencies to regulate certain development projects within these zones. For projects that would locate structures for human occupancy within designated Zones of Required Investigation, the Seismic Hazards Mapping Act requires project applicants to perform a site-specific geotechnical investigation to identify the potential site-specific seismic hazards and corrective measures, as appropriate, prior to receiving building permits. The *CGS Guidelines for Evaluating and Mitigating Seismic Hazards* (Special Publication 117A) provides guidance for evaluating and mitigating seismic hazards (CGS 2008). The CGS is in the process of producing official maps based on USGS topographic quadrangles. To date, the CGS has completed delineations for the USGS quadrangles in which project components are proposed and the program area is within a seismic hazard zone. Therefore, the proposed program is subject to the act.

California Building Code

The California Building Code (CBC), which is codified in Title 24 of the California Code of Regulations, Part 2, was promulgated to safeguard the public health, safety, and general welfare

by establishing minimum standards related to structural strength, means of egress to facilities (entering and exiting), and general stability of buildings. The purpose of the CBC is to regulate and control the design, construction, quality of materials, use/occupancy, location, and maintenance of all buildings and structures within its jurisdiction. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under State law, all building standards must be centralized in Title 24 or they are not enforceable. The provisions of the CBC apply to the construction, alteration, movement, replacement, location, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The 2016 edition of the CBC is based on the 2015 International Building Code (IBC) published by the International Code Council, which replaced the Uniform Building Code (UBC). The code is updated triennially, and the 2016 edition of the CBC was published by the California Building Standards Commission on July 1, 2016, and took effect starting January 1, 2017. The 2016 CBC contains California amendments based on the American Society of Civil Engineers (ASCE) Minimum Design Standard ASCE/SEI 7-16, Minimum Design Loads for Buildings and Other Structures, provides requirements for general structural design and includes means for determining earthquake loads[6] as well as other loads (such as wind loads) for inclusion into building codes. Seismic design provisions of the building code generally prescribe minimum lateral forces applied statically to the structure, combined with the gravity forces of the dead and live loads of the structure, which the structure then must be designed to withstand. The prescribed lateral forces are generally smaller than the actual peak forces that would be associated with a major earthquake. Consequently, structures should be able to (1) resist minor earthquakes without damage; (2) resist moderate earthquakes without structural damage but with some nonstructural damage; and (3) resist major earthquakes without collapse, but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a structure designed in accordance with the seismic requirements of the CBC should not collapse in a major earthquake.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients, all of which are used to determine a seismic design category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site; SDC ranges from A (very small seismic vulnerability) to E/F (very high seismic vulnerability and near a major fault). Seismic design specifications are determined according to the SDC in accordance with CBC Chapter 16. CBC Chapter 18 covers the requirements of geotechnical investigations (Section 1803), excavation, grading, and fills (Section 1804), load-bearing of soils (Section 1806), as well as foundations (Section 1808), shallow foundations (Section 1809), and deep foundations (Section 1810). For Seismic Design Categories D, E, and F, Chapter 18 requires analysis of slope instability, liquefaction, and surface rupture attributable to faulting or lateral spreading, plus an evaluation of lateral pressures on basement and retaining walls, liquefaction and soil strength loss,

[6] A load is the overall force to which a structure is subjected in supporting a weight or mass, or in resisting externally applied forces. Excess load or overloading may cause structural failure.

and lateral movement or reduction in foundation soil-bearing capacity. It also addresses measures to be considered in structural design, which may include ground stabilization, selecting appropriate foundation type and depths, selecting appropriate structural systems to accommodate anticipated displacements, or any combination of these measures. The potential for liquefaction and soil strength loss must be evaluated for site-specific peak ground acceleration magnitudes and source characteristics consistent with the design earthquake ground motions.

Requirements for geotechnical investigations are included in Appendix J, CBC Section J104, Engineered Grading Requirements. As outlined in Section J104, applications for a grading permit are required to be accompanied by plans, specifications, and supporting data consisting of a soils engineering report and engineering geology report. Additional requirements for subdivisions requiring tentative and final maps and for other specified types of structures are in California Health and Safety Code Sections 17953 to 17955 and in 2013 CBC Section 1802. Testing of samples from subsurface investigations is required, such as from borings or test pits. Studies must be done as needed to evaluate slope stability, soil strength, position and adequacy of load-bearing soils, the effect of moisture variation on load-bearing capacity, compressibility, liquefaction, differential settlement, and expansiveness.

The design of the visitor center is required to comply with CBC requirements, which would make the proposed program consistent with the CBC.

NPDES Construction General Permit

Construction associated with the proposed program would disturb more than one acre of land surface affecting the quality of stormwater discharges into waters of the U.S. The proposed program would, therefore, be subject to the *NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ). The Construction General Permit regulates discharges of pollutants in stormwater associated with construction activity to waters of the U.S. from construction sites that disturb one acre or more of land surface, or that are part of a common plan of development or sale that disturbs more than one acre of land surface. The permit regulates stormwater discharges associated with construction or demolition activities, such as clearing and excavation; construction of buildings; and linear underground projects, including installation of water pipelines and other utility lines.

The Construction General Permit requires that construction sites be assigned a Risk Level of 1 (low), 2 (medium), or 3 (high), based both on the sediment transport risk at the site and the receiving waters risk during periods of soil exposure (e.g., grading and site stabilization). The sediment risk level reflects the relative amount of sediment that could potentially be discharged to receiving water bodies and is based on the nature of the construction activities and the location of the site relative to receiving water bodies. The receiving waters risk level reflects the risk to the receiving waters from the sediment discharge. Depending on the risk level, the construction projects could be subject to the following requirements:

- Effluent standards;
- Good site management “housekeeping;”

- Non-stormwater management;
- Erosion and sediment controls;
- Run-on and runoff controls;
- Inspection, maintenance, and repair; or
- Monitoring and reporting requirements.

The Construction General Permit requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes specific best management practices (BMPs) designed to prevent sediment and pollutants from contacting stormwater from moving off-site into receiving waters. The BMPs fall into several categories, including erosion control, sediment control, waste management and good housekeeping, and are intended to protect surface water quality by preventing the off-site migration of eroded soil and construction-related pollutants from the construction area. Routine inspection of all BMPs is required under the provisions of the Construction General Permit. In addition, the SWPPP is required to contain a visual monitoring program, a chemical monitoring program for non-visible pollutants, and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

The SWPPP must be prepared before the construction begins. The SWPPP must contain a site map(s) that delineates the construction work area, existing and proposed buildings, parcel boundaries, roadways, stormwater collection and discharge points, general topography both before and after construction, and drainage patterns across the program area. The SWPPP must list BMPs and the placement of those BMPs that the applicant would use to protect stormwater runoff. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment. Examples of typical construction BMPs include scheduling or limiting certain activities to dry periods, installing sediment barriers such as silt fence and fiber rolls, and maintaining equipment and vehicles used for construction. Non-stormwater management measures include installing specific discharge controls during certain activities, such as paving operations, vehicle and equipment washing and fueling. The Construction General Permit also sets post-construction standards (i.e., implementation of BMPs to reduce pollutants in stormwater discharges from the site following construction).

In the North, Central, and Isthmus Areas, the Construction General Permit is implemented and enforced by the Los Angeles Regional Water Quality Control Board (RWQCB), which administers the stormwater permitting program. The South Area is under the jurisdiction of the Santa Ana RWQCB. Dischargers are required to electronically submit a notice of intent (NOI) and permit registration documents (PRDs) in order to obtain coverage under this Construction General Permit. Dischargers are responsible for notifying the RWQCBs of violations or incidents of non-compliance, as well as for submitting annual reports identifying deficiencies of the BMPs and how the deficiencies were corrected. The risk assessment and SWPPP must be prepared by a State Qualified SWPPP Developer and implementation of the SWPPP must be overseen by a State Qualified SWPPP Practitioner. A Legally Responsible Person, who is legally authorized to sign and certify PRDs, is responsible for obtaining coverage under the permit.

California Geologic Energy Management Division

All California oil and gas wells (development and prospect wells), enhanced-recovery wells, water-disposal wells, service wells (i.e., structure, observation, temperature observation wells), core-holes, and gas-storage wells, onshore and offshore (within 3 nautical miles of the coastline), located on state and private lands, are permitted, drilled, operated, maintained, plugged, and abandoned under requirements and procedures administered by the CalGEM.

Regulations pertaining to oil and natural gas production are summarized in the CalGEM Publication No. PRC10, California Statutes and Regulations for Conservation of Oil, Gas, & Geothermal Resources, dated January 2017. Regulations for the installation and abandonment of oil and natural gas wells are in 14 CCR 1712 through 1724.10. Environmental protection regulations for oil and natural gas well installations, operations, and abandonments are in 14 CCR 1750 through 1789.

California Pipeline Safety Act of 1981

The California Pipeline Safety Act of 1981, codified in California Government Code Sections 50001–51298.5, applies to pipelines that carry hazardous liquids (e.g., crude oil) and authorizes the State Fire Marshal to implement the federal Hazardous Liquid Pipeline Safety Act, as summarized above. This Act imposes additional specific safety requirements on intrastate pipelines carrying hazardous liquids, including a time schedule for conformance to federal regulations, hydrostatic testing requirements, pipeline maps, contingency plans, and pipeline incident reporting.

3.5.3.3 Local

Orange County Drainage Area Management Plan (DAMP) and Orange County MS4 Permit

The Orange County Drainage Area Management Plan (DAMP), is the principal policy, programmatic guidance, and planning document for the Orange County Stormwater Program (the Program), a municipal regulatory compliance initiative focused on the management and protection of Orange County's streams, rivers, creeks and coastal waters. The participants in this program include the County, the Orange County Flood Control District, and the cities of Orange County, including Seal Beach. The stormwater program was initiated in 1990 as a cooperative local government response to requirements stemming from the Clean Water Act regulations and the NPDES permitting program. In response to those regulations, the County of Orange, the Orange County Flood Control District and the incorporated cities of Orange County (collectively referred to as Permittees) have obtained, renewed and complied with NPDES Stormwater Permits from the Santa Ana and San Diego Regional Water Quality Control Boards. For the Seal Beach area, the current permit is R8-2009-0030 NPDES No. CAS618030, as amended by Order No. R8-2010-0062.

The NPDES Permit includes (1) a requirement to effectively prohibit non-storm water discharges into municipal storm sewers; and (2) controls to reduce the discharge of pollutants from municipal storm drains to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods, and such other provisions as the Administrator or the state determines appropriate for the control of such pollutants.

The DAMP includes the Model Construction Program, which requires the following:

- Apply for local grading or building permit
- Submit Notice of Intent (NOI) for General Permit Coverage
- Comply with grading or building permit and local ordinances
- Prepare and implement SWPPP
- Submit Notice of Termination (NOT)

The DAMP summarizes Best Management Practices (BMPs), as summarized below:

- Sediments from areas disturbed by construction shall be retained on-site using an effective combination of erosion and sediment controls to the maximum extent practicable, and stockpiles of soil shall be properly contained to minimize sediment transport from the site to streets, drainage facilities or adjacent properties via runoff, vehicle tracking, or wind.
- Appropriate BMPs for construction-related materials, wastes, spills or residues shall be implemented and retained on-site to minimize transport from the site to streets, drainage facilities, or adjoining property by wind or runoff.

Construction BMPs

Construction contractors must select, install and maintain appropriate BMPs on all construction projects. BMPs must be installed in accordance with an industry recommended standard, or in accordance with the Construction General Permit (previously described under State Regulations).

Dry Season Requirements (May 1 through September 30)

The DAMP also provides seasonal requirements, as summarized below.

A. Wind erosion BMPs (dust control) shall be implemented.

B. Sediment control BMPs shall be installed and maintained at all operational storm drain inlets.

C. BMPs to control off-site sediment tracking shall be implemented and maintained.

D. Appropriate waste management and materials pollution control BMPs shall be implemented to prevent the contamination of stormwater by wastes and construction materials.

E. Appropriate non-stormwater BMPs shall be implemented to prevent the contamination of stormwater from construction activities.

F. There shall be a "weather triggered" action plan and the ability to deploy standby sediment control BMPs as needed to completely protect the exposed portions of the site within 48 hours of a predicted storm event (a predicted storm event is defined as a forecasted, 50% chance of rain).

G. Sufficient materials needed to install standby sediment control BMPs (at the site perimeter, site slopes and operational inlets within the site) necessary to prevent sediment discharges from exposed portions of the site shall be stored on-site. Areas that have already been protected from erosion using physical stabilization or established vegetation stabilization BMPs as described in item H below are not considered to be "exposed" for purposes of this requirement.

H. Deployment of permanent erosion control BMPs (physical or vegetation) should commence as soon as practical on slopes that are completed for any portion of the site. Standby BMP materials should not be relied upon to prevent erosion of slopes that have been completed.

Wet Season Requirements (October 1 through April 30)

In addition to the Dry Season Requirements:

A. Where appropriate sediment control BMPs shall be implemented at the site perimeter, at all operational storm drain inlets and at all non-active slopes, to provide sufficient protection for storms likely to occur during the rainy season.

B. Adequate physical or vegetation erosion control BMPs (temporary or permanent) shall be installed and established for all completed slopes prior to the start of the rainy season. These BMPs must be maintained throughout the rainy season. If a selected BMP fails, it must be repaired and improved, or replaced with an acceptable alternate as soon as it is safe to do so. The failure of a BMP may indicate that the BMP, as installed, was not adequate for the circumstances in which it was used. Repairs or replacements must result in a more robust BMP, or additional BMPs should be installed to provide adequate protection.

C. The amount of exposed soil allowed at one time shall not exceed that which can be adequately protected by deploying standby erosion control and sediment control BMPs prior to a predicted rainstorm.

D. A disturbed area that is not completed but that is not being actively graded (non-active area) shall be fully protected from erosion with temporary or permanent BMPs (erosion and sediment control). The ability to deploy standby BMP materials is not sufficient for these areas. Erosion and sediment control BMPs must actually be deployed. This includes all building pads, unfinished roads and slopes.

E. Sufficient materials needed to install standby erosion and sediment control BMPs necessary to completely protect the exposed portions of the site from erosion and to prevent sediment discharges shall be stored on-site. Areas that have already been protected from erosion using permanent physical stabilization or established vegetation stabilization BMPs are not considered to be "exposed" for purposes of this requirement.

Seal Beach Grading and Stormwater Pollution Prevention Implementation Manual

The Seal Beach Grading and Stormwater Pollution Prevention Implementation Manual) is a compilation of rules, procedures, and interpretations necessary to carry out the provisions of the City of Seal Beach Grading Ordinance. The requirements relevant to the program are summarized as follows:

- **Grading Permit Application**: The applicant shall submit a complete grading permit/plan check application package including all the items and contents listed on the City application form unless otherwise specified by the Director: Incomplete applications will not be accepted.
- Prior to issuance of a grading permit, written clearance may be required from other City departments and divisions and may be required from other agencies. Depending on-site conditions and location, written clearance or permits may be required from, but not limited to, the following agencies:
  - California Regional Water Quality Control Board/NPDES

  - California Department of Fish and Game
  - California Division of Industrial Safety
  - Orange County Fire Marshal (fuel modification)
  - Orange County Human Services Agency (Vector Control)
  - California Coastal Commission

- **Preliminary Grading Permit**: The plans shall include a vicinity map of the site; property limits; accurate contours; drainage details to a minimum of fifteen feet (15') beyond property limits; details (plan and section) of all surface and subsurface drainage devices; location of any existing buildings, structures, or trees; and a SWPPP which depicts short-and long-term structural and non-structural Best Management Practices (BMP) in compliance with NPDES Construction General Permit.
- **Precise Grading Permit**: The plans shall include the following in addition to the above items listed for Preliminary Grading Permits: footprint or allowable building area of all proposed structures including appurtenances; setback distances between structures and top and toe of slopes; detailed finish grade and finish floor elevations; flowlines for typical lot drainage; details for building footing and side yard swale relationship; all proposed concrete flatwork and/or driveways.
- **Preliminary Soil Report**: Soil engineering reports shall be required for all projects for which a grading permit is required. The preliminary soil engineering report shall include information and data regarding the nature, distribution, and the physical and chemical properties of existing soils; conclusions as to adequacy of the site for the proposed grading; recommendations for general and corrective grading procedures; foundation and pavement design criteria and shall provide other recommendations, as necessary, commensurate with the project grading and development;
- **Preliminary Engineering Geology Report**: Engineering geology reports shall be required for all developments on hillside sites where geologic conditions are considered to have a substantial effect on existing and/or future site stability. This requirement may be extended to other sites suspected of being adversely affected by faulting. The preliminary engineering geology report shall include a comprehensive description of the site topography and geology; an opinion as to the adequacy of the proposed development from an engineering geologic standpoint; an opinion as to the extent that instability on adjacent properties may adversely affect the property; a description of the field investigation and findings; conclusions regarding the effect of geologic conditions on the proposed development; and specific recommendations for plan modification, corrective grading, and/or special techniques and systems to facilitate a safe and stable development, and shall provide other recommendations as necessary, commensurate with the project grading and development. The preliminary engineering geology report may be combined with the soil engineering report.

Seal Beach Municipal Code

Chapter 5.55 Oil and Gas Production

5.55.075 Permit Requirement. It shall be unlawful and a nuisance for any person hereafter to conduct any drilling operations for a well hole or hereafter to drill and produce any oil and gas well or well hole in the surface or subsurface of the city from any drill site without first having applied for and obtained from the city council an oil/gas production permit. (Ord. 1515).

5.55.090 Operation Standards. Drilling shall be conducted in accordance with the following operation standards:

I. The operation of any oil and gas well and production therefrom drilled pursuant to an oil/gas production permit shall be in accordance with the rules and regulations of the Division of Oil and Gas of the state, or any successor agency or body thereto.

5.55.095 Additional Standards.

E. Private roads for ingress and egress to and from the drill site shall be surfaced with gravel and maintained in good condition at all times during drilling and production operations. No signs shall be erected on the drill site except those required by law or permitted by this code.

F. Within 90 days after the completion of drilling operations or abandonment of further drilling, the derrick and all drilling equipment, including temporary tanks, shall be removed from the drill site. Well abandonment shall be in accordance with the requirements of the Division of Oil and Gas of the state. Upon such well abandonment, the permittee shall restore the property as nearly as possible to its original condition and shall remove all concrete foundations, oil-soaked soil, and debris; all holes or depressions shall be filled to the natural surface.

J. All drilling and production equipment installed or operated upon any controlled drill site shall be so constructed, operated, and maintained that no noise, vibration, odor, or other harmful or annoying substances of effects therefrom which can be eliminated or diminished by the use of modern and approved types of equipment silencers or greater care shall ever be permitted to result from operations on any controlled drill site to the injury or annoyance of persons in the vicinity of such controlled drill site. Proven technological and mechanical improvements in methods of drilling and production and in the type of equipment used therefor shall be adopted from time to time, as the same become available if the use of such equipment, improvements, and methods will reduce noise, vibration, odors, or the harmful effects of annoying substances. The use of equipment in any controlled drill site, which equipment causes noise or vibration, shall at all times be subject to the approval of the city council, and the city council may amend any permit and require the permittee to abate any noise or vibration which constitutes a nuisance and is detrimental to persons or property in the vicinity where such equipment is being operated.

5.55.105 Subsidence.

A. The city engineer shall, from time to time make such tests and observations as deemed appropriate to determine if any adverse effect upon the surface of the city is occasioned or is in danger of being occasioned by reason of the removal of oil, gas, or other hydrocarbon substances from the subsurface of the city pursuant to a well, no part of which is located within the city, but which drains a subterranean oil or gas pool, part of which is in the city. Upon determining the existence of such adverse effect or danger, the city engineer may order the immediate suspension of further production from such well or wells as may be located entirely or partly within the city, and, in the event of such an order, production on such well shall be suspended by the permittee or other operator immediately upon receiving notice of such order. The permittee or other person lawfully producing oil or gas, or oil and gas, or any other hydrocarbon substances from any such well may appeal to the city council. The city council may, upon good cause being shown by the permittee or such other person, vacate or modify the order of the city engineer, or if no part of the well is in the city, the city council may direct the city attorney to immediately commence such actions or proceedings as may be necessary for the abatement, removal, and

enjoining of further drilling operations which adversely affect property within the city in the manner provided by law and to take such other action and to apply to any court having jurisdiction to grant such relief as will restrain or enjoin any person from drilling or producing any such well.

B. Notwithstanding any other provision of this chapter, the city council may require an applicant for a final exploratory area or oil/gas production permit to submit a plan for water injection or other plan for secondary recovery and to eliminate any possibility of subsidence or other possible damage to property within the city. (Ord. 1515)

Chapter 9.20 Storm Water Management Program

9.20.015 Controls for Water Quality Management.

A. New Development and Significant Redevelopment.

1. All new development and significant redevelopment within the city shall be undertaken in accordance with:

   a. The DAMP, including without limitation the development project guidance.

   b. Any conditions and requirements established by the responsible city department, which are reasonably related to the reduction or elimination of pollutants in storm water runoff from the project site.

2. Prior to the issuance by the city of a grading permit, building permit or nonresidential plumbing permit for any new development or significant redevelopment, the responsible city department shall review the project plans and impose terms, conditions and requirements on the project in accordance with this chapter.

Chapter 9.50 Grading

9.50.015 Grading Permit Requirement. No person shall perform any of the following activities without first obtaining from the city engineer, and maintaining in full force and effect, a grading permit:

A. Grading or land disturbing or land filling on existing grade that is preparatory to grading.

B. Clearing, brushing and grubbing.

C. Construction of pavement surfacing in excess of 2,499 square feet on existing grade for the purpose of a road or parking lot. This provision does not include resurfacing or maintenance of existing paved surfaces.

D. Alteration of an existing watercourse, channel or revetment by means of excavation, fill placement or installation of rock protection or structural improvements. (Ord. 1515)

Chapter 9.60 Building Code

Section 101 General

101.4.1 Building Code. The provisions of the California Building Code as adopted and amended by City of Seal Beach shall apply to all buildings and structures other than those meeting the scoping limitations contained in the California Residential Code.

101.4.7 Fire Code. The mandatory provisions of the California Fire Code as adopted and amended by City of Seal Beach shall apply to all new and existing buildings, structures and premises.

9.60.020.010 Building Code Adopted by Reference and Amended.

9.60.020.010.10 California Building Code Adopted by Reference.

Chapters 1 through 35 and Appendices F, I, and J of 2016 California Building Code, Title 24 Part 2 of California Code of Regulations, as published by the California Building Standards Commission, are hereby adopted by reference pursuant to the provisions of Sections 50022.1 through 50022.10 of the Government Code of the State of California as though fully set forth herein, and made a part of the Seal Beach Municipal Code with the same force and effect as though set out herein in full, including all of the regulations, revisions, conditions and terms contained therein except that those certain sections thereof which are necessary to meet local conditions as hereinafter set forth in Section 9.60.020.010.20 of this Code are hereby repealed, added or amended to read as set forth therein.

Seal Beach General Plan

Topic 2: Hazardous Materials

Policy 2S. Minimize changes in hydrology and pollutant loading, re-quire incorporation of control, including structural and non-structural BMPs to mitigate the projected increases in pollutant loads and flows, ensure that post-development runoff rates and velocities from a site have no significant adverse impact on downstream erosion and stream habitat, minimize the quantity of storm water directed to impermeable surfaces and the MS4s, and maximize the percentage of permeable surfaces to allow more percolation of storm water into the ground.

Policy 2T. Preserve wetlands, riparian corridors, and buffer zones and establish reasonable limits on the clearing of vegetation from the project site.

Policy 2U. Encourage the use of water quality wetlands, biofiltration swales, watershed-scale retrofits, etc. where such measures are likely to be effective and technically and economically feasible.

Policy 2V. Provide for appropriate permanent measures to reduce storm water pollutant loads in storm water from the development site.

Topic 3: Geologic Hazards

Policy 3A. Require a soils and geology report to be prepared and filed for all development projects as specified in the City's Municipal Code.

Policy 3C. Require supervision by a state licensed soils engineer for grading operations which require a grading permit.

Policy 3D. Maintain and enforce protection measures which address control of runoff and erosion by vegetation management, control of access, and site planning for new development and major remodels, including directing runoff to the street and compliance with setbacks.

Policy 3J. Maintain the present City practice of adopting the latest edition of the Uniform Building Code (as amended and published by the International Conference of Building Officials at approximate three-year intervals) because it in-corporates the latest accepted standards for seismic design that reflect advances in technology and understanding of hazards.

Policy 3N. Determine the liquefaction potential of a site prior to development and require that specific measures be taken, as necessary, to reduce damage in an earthquake.

Policy 3O. Promote the collection of relevant studies on fault location and history of fault displacement and liquefaction for future refinement of the geological information within and around the City.

Southeast Area Development and Improvement Plan and Draft Southeast Area Specific Plan

Approved in 1977, the Southeast Area Development and Improvement Plan (SEADIP) was the first planned development district in the City. The SEADIP document was intended to guide land use and development in an area that was experiencing a period of rapid growth. The 1977 SEADIP included the following planning goals and objectives relevant to geology, seismicity, and soils:

Environmental Consideration, page 15: Seismic safety will be ensured by meeting the requirements of the Seismic Safety Element and the Alquist-Priolo Act, which will ultimately govern the actual development capability of the affected lands.

The SEADIP includes updates, revisions, and additions of the ordinance history through 2006. The additions through 2006 include narrative discussion of "The Wetlands" and "The Buffers," which would include the restoration area. Relative to geology, seismicity, and soil, the narrative is largely permit, process, phasing, and financially oriented.

In July 2016, the City circulated a draft of the Southeast Area Specific Plan (SEASP) 2060, which is a planning document for the program area, including re-designating land uses for the program area (City of Long Beach 2016). It is anticipated that the SEASP 2060 will be completed and issued in its final form within the lifetime of the proposed program. The portions relevant to geology, seismicity, and soils are provided below.

Chapter 5, Development Standards, Section 5.10, Wetland Buffers

Be designed, where necessary, to help minimize the effects of erosion, sedimentation, and pollution arising from urban, industrial and agricultural activities; however, to the extent possible, erosion, sedimentation, and pollution control problems should be dealt with at the source, not in the wetland or buffer area.

Chapter 8, Infrastructure, Section 8.1.2, Storm Drains

Any new projects in the SEASP 2060 area will have to comply with the MS4 Permit for the City and include stormwater LID BMPs. Such features will ensure any increases in runoff from proposed land use changes will be sustainably managed and that the 85th percentile, 24-hour storm event will be treated through a variety of LID features. The 85th percentile storm event is

measured by rainfall depth; for example, if the 85th percentile storm event equals 0.5 inch, then 85 percent of all rainfall events will be equal to 0.5 inch or less of precipitation.

The use of LID features will be consistent with the prescribed hierarchy of treatment provided in the permit: infiltration, evapotranspiration, harvest/reuse, and biotreatment. For areas of the site where LID features are not feasible or that do not meet the feasibility criteria, treatment control BMPs with biotreatment enhancement design features must be used.

Typical water quality BMPs for new development in mixed-use areas include stormwater planters (raised or at grade), cisterns and reuse distribution systems (primarily for landscaping), proprietary detention/biotreatment flow-through systems, and subterranean infiltration systems. Since increased density is anticipated in mixed-use areas, the majority of the proposed features should be located within the landscaping along the perimeter of the project, adjacent to the buildings, or in some cases, within the buildings themselves.

Long Beach Storm Water Management Program

The LARWQCB issued the City its own NPDES permit (NPDES Permit No. 99-060; CAS004003/CI 8052). As part of its Report of Waste Discharge submitted for its NPDES permit, the City included among other programs, a stormwater management program. In accordance with the objectives of the federal Clean Water Act and the State Porter-Cologne Water Quality Control Act, the Long Beach Storm Water Management Program contains elements, practices, and activities to reduce or eliminate pollutants in stormwater to the maximum extent practicable (City of Long Beach 2001). In accordance with this program, Long Beach Municipal Code (LBMC) Chapter 18.95 includes requirements relating to development planning and construction, including source control BMPs. Additional requirements include treatment control BMPs and requirements regarding erosion control, peak runoff, and BMP maintenance for projects located adjacent to or directly discharging to environmentally sensitive areas. Post-construction structural or treatment control BMPs designed to mitigate (infiltrate or treat) the volume of runoff produced from a 0.75-inch storm event prior to its discharge to a stormwater conveyance system are also required for these specific projects. In addition, in accordance LBMC Chapter 8.96, construction projects are required to prepare a SWPPP that will incorporate construction site BMPs.

Given the potential for the proposed project to contribute pollutant loads to stormwater flows during construction and operation of proposed uses, the project is subject to the requirements of the NPDES permits and municipal code requirements.

Long Beach MS4 Permit

The City of Long Beach is covered under the Long Beach MS4 Permit: Waste Discharge Requirements for Municipal Separate Storm Sewer System Discharges from the City; Order No. R4-2014-0024.

According to the MS4 Permit, new development projects are as follows:

- Industrial parks

- Parking lots 5,000 square feet (sf) or more of impervious surface area or with 25 or more parking spaces;
- All development projects equal to 1 acre or greater of disturbed area and adding more than 10,000 sf of impervious surface area;

According to the MS4 Permit, redevelopment projects are as follows:

- Land-disturbing activity that results in the creation or addition or replacement of 5,000 sf or more of impervious surface area on an already developed site for development categories/project thresholds.
- Where redevelopment results in an alteration to more than 50 percent of impervious surfaces of a previously existing development, and the existing development was not subject to post-construction stormwater quality control requirements, the entire project must be mitigated.
- Where redevelopment results in an alteration of less than 50 percent of impervious surfaces of a previously existing development, and the existing development was not subject to post-construction stormwater quality control requirements, only the alteration must be mitigated, and not the entire development.

The MS4 Permit lists conditions for various specific discharge categories, including landscape irrigation using potable water, landscape using reclaimed or recycled water, and street/sidewalk wash water. Conditions are also required for exempt MS4 discharges. Table 9 of the MS4 Permit lists source control BMPs pertaining to pollutant-generating activities to be implemented at commercial and industrial facilities.

The MS4 permit requires the City to develop and implement the Long Beach Storm Water Management Program and the Long Beach Low Impact Development (LID) Manual described below.

Long Beach Low Impact Development Manual

The City adopted Low Impact Development (LID) regulations for the purpose of:

- Encouraging the beneficial use of rainwater and urban runoff;
- Reducing stormwater/urban runoff while improving water quality;
- Reducing off-site runoff and providing increased groundwater recharge;
- Reducing erosion and hydrologic impacts downstream; and
- Enhancing the recreational and aesthetic values in our communities.

This LID objective of controlling and maintaining flow rate is addressed through land development and stormwater management techniques that imitate the natural hydrology (or movement of water) found on the site. Using site design and BMPs that allow for storage and retention, infiltration, filtering and flowrate adjustments achieve this objective.

These regulations apply to all development and redevelopment in the City, with some exceptions. The following LID regulations specifically apply to slopes and channels to prevent erosion:

1. Slopes must be protected from erosion by safely conveying runoff from the tops of slopes.
2. Slopes must be vegetated with first consideration given to native or drought-tolerant species.
3. Utilize natural drainage systems to the maximum extent practicable, but minimize runoff discharge to the maximum extent practicable.
4. Stabilize permanent channel crossings.
5. Install energy dissipaters, such as rock riprap, at the outlets of storm drains, culverts, conduits, or channels that discharge into unlined channels.

By identifying the locations and sources of off-site drainage, the volume of water running onto the site may be estimated and factored into the siting and sizing of on-site BMPs. Vegetated swales or storm drains may be used to intercept, divert, and convey off-site drainage through or around a site to prevent flooding or erosion that might otherwise occur (City of Long Beach 2013). The above-described Long Beach Storm Water Management Program requires that each project prepare and implement a project-specific LID Plan.

Long Beach Municipal Code

Chapter 8.96. Stormwater and Runoff Pollution Control. This chapter reinforces the requirements of the Federal Clean Water Act and the State Porter Cologne Act (including Construction General Permit requirements) within the City.

Chapter 12: Oil Production Regulations.

Section 18.04.010. Building permits are required for any attempt to erect, construct, enlarge, alter, repair, remodel, move, remove, improve, convert or demolish any building or part of a building or structure, or change the character or occupancy or use of any building or structure, or part of a building or structure. Building permits must be obtained from the City Building Official.

Chapter 18.04: Permits. This chapter describes various permit requirements within the City.

Section 18.04.010. Building permits are required for any attempt to erect, construct, enlarge, alter, repair, remodel, move, remove, improve, convert or demolish any building or part of a building or structure, or change the character or occupancy or use of any building or structure, or part of a building or structure. Building permits must be obtained from the City Building Official.

Grading permits are required for grading and import or export any earth materials to or from any grading site. Grading permits must be obtained from the City Building Official. Any grading project involving more than 100 cubic yards of excavation and involving an excavation in excess of five feet in vertical depth at its deepest point measured from the original ground surface shall be done by a State of California licensed contractor who is licensed to perform the work described herein. A separate permit shall be required for each grading site. One permit may include the entire grading operation at that site, however.

No permit shall be issued for projects located within a special (fault) studies zone established under Chapter 7.5, Division 2, of the California Public Resources Code unless

it can be demonstrated through accepted geologic seismic studies that the proposed structure will be located in a safe manner and not over or astraddle the trace of an active fault. Acceptable geologic seismic studies shall meet the criteria as set forth in rules and regulations established by the Building Official to ensure that such studies are based on sufficient geologic data to determine the location or nonexistence of the active fault trace on a site. Prior to approval of a project, a geologic report defining and delineating any hazard of surface fault rupture shall be required. If the City finds that no undue hazard of this kind exists, the geologic report on such hazard may be waived, with approval of the State Geologist.

Chapter 18.40: Building Code. This chapter describes the reinforcement of the CBC within the City with the exception of some sections of the Code.

Chapter 18.68: Earthquake Hazard Regulations. This chapter defines a systematic procedure for identifying and assessing earthquake generated hazards associated with certain existing structures within the City and to develop a flexible, yet uniform and practical procedure for correcting or reducing those hazards to tolerable hazard levels. This chapter includes minimum standards for structural seismic resistance established to reduce the risk of life loss or injury.

City of Long Beach General Plan

Seismic Safety Element—1988

Advance Planning Recommendations—Land Use

- Priority should be given to low risk type projects such as low rise buildings and open space in areas of known seismic hazards.
- Density is a seismic safety consideration in that higher occupancy results in greater risk exposure to more people should an earthquake occur. Therefore, from a seismic safety perspective, lower densities are often preferred.
- Hazardous activities, such as petroleum operations, should be buffered to the extent possible from other types of land uses. The isolation of activities would serve to lessen exposure of such operations to the general public.

Immediate Action Recommendations—Structure and Design

- The siting and design recommendations, as specified in Table 6 of the General Plan, should be seriously considered for implementation. Special siting and design studies must be completed for specified structural types in specified Seismic Response Zones.
- No structures for human occupancy defined as "project" within the Alquist-Priolo Special Studies Zones Act and essential facilities and hazardous facilities involving sufficient quantities of toxic or explosive materials presenting a danger to the public safety if released and located with the delineated Caution Zones shall be approved without geologic and earthquake hazard reports. These reports should be completed in accordance with the "guidelines to Geologic/Seismic Reports," as provided by the State Division of Mines and Geology, and/or in accordance with the policies and criteria of the State Mining and Geology Board with reference to the Alquist-Priolo Geologic Hazards Zones Act.
- No structure for human occupancy shall be permitted to be placed across the trace of an active fault, i.e., the Newport-Inglewood Fault.

Public Safety Element

Advance Planning Recommendations

- New development should be responsive to seismic considerations (see Seismic Safety Element).

Conservation Element

Soil Management Goals

- To minimize those activities which will have a critical or detrimental effect on geologically unstable areas and soils subject to erosion.
- To continue to monitor areas subject to siltation and deposition of soils which could have a detrimental effect upon water quality and the marine biosphere.

3.5.3.4 Paleontological Resources

City of Seal Beach General Plan

The Cultural Resources Element of the City of Seal Beach General Plan describes methods for protecting historical, archaeological, and paleontological resources. The element also includes local policies to guide implementation of cultural resource preservation beyond the protection afforded by applicable federal, state, and local laws. Future development within the City of Seal Beach is subject to these policies and laws to preserve known and unknown sites and properties of a cultural and historic nature. The following goals and policies are applicable to paleontological resources:

> **Goal 1:** Preserve and protect historical, archaeological, and paleontological resources.
>
> > **Policy 1:** Balance the benefits of development with the project's potential impacts to existing cultural resources.

The Cultural Resources Element requires assessment of development proposals for potential impacts to significant paleontological resources pursuant to CEQA Guidelines Section 15064.5. If a project involves earthwork, a study must be conducted by a professional paleontologist to determine if paleontological assets are present and if the project will significantly impact the resources. If significant impacts are identified, the project must either be modified to avoid impacting the materials or require measures to mitigate the impacts.

City of Long Beach

The City of Long Beach General Plan does not include goals and polices related to paleontological resources.

Society for Vertebrate Paleontology Guidelines

The SVP Guidelines (SVP, 2010) outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation. Most practicing professional vertebrate paleontologists adhere closely to the SVP's assessment,

mitigation, and monitoring requirements as specifically provided in its standard guidelines. Most state regulatory agencies with paleontological resource-specific Laws, Ordinances, Regulations, and Standards (LORS) accept and use the professional standards set forth by the SVP.

As defined by the SVP (2010:11), significant nonrenewable paleontological resources are:

> *Fossils and fossiliferous deposits, here defined as consisting of identifiable vertebrate fossils, large or small, uncommon invertebrate, plant, and trace fossils, and other data that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, and/or biochronologic information. Paleontological resources are considered to be older than recorded human history and/or older than middle Holocene (i.e., older than about 5,000 radiocarbon years).*

A geologic unit known to contain significant fossils is considered to be "sensitive" to adverse impacts if there is a high probability that earth-moving or ground-disturbing activities in that rock unit will either directly or indirectly disturb or destroy fossil remains. Paleontological sites indicate that the containing sedimentary rock unit or formation is fossiliferous. The limits of the entire rock formation, both areal and stratigraphic, therefore define the scope of the paleontological potential in each case (SVP, 2010).

Fossils are contained within surficial sediments or bedrock, and are therefore not observable or detectable unless exposed by erosion or human activity. In summary, paleontologists cannot know either the quality or quantity of fossils prior to natural erosion or human-caused exposure. As a result, even in the absence of surface fossils, it is necessary to assess the sensitivity of rock units based on their known potential to produce significant fossils elsewhere within the same geologic unit (both within and outside of the study area), a similar geologic unit, or based on whether the unit in question was deposited in a type of environment that is known to be favorable for fossil preservation. Monitoring by experienced paleontologists greatly increases the probability that fossils will be discovered during ground-disturbing activities and that, if these remains are significant, successful mitigation and salvage efforts may be undertaken in order to prevent adverse impacts to these resources.

Paleontological Resources Significance Criteria

Numerous paleontological studies have developed criteria for the assessment of significance for fossil discoveries (e.g., Eisentraut and Cooper, 2002; Murphey and Daitch, 2007; Scott and Springer, 2003, etc.). In general, these studies assess fossils as significant if one or more of the following criteria apply:

1. The fossils provide information on the evolutionary relationships and developmental trends among organisms, living or extinct;
1. The fossils provide data useful in determining the age(s) of the rock unit or sedimentary stratum, including data important in determining the depositional history of the region and the timing of geologic events therein;
2. The fossils provide data regarding the development of biological communities or interaction between paleobotanical and paleozoological biotas;
3. The fossils demonstrate unusual or spectacular circumstances in the history of life; or

4. The fossils are in short supply and/or in danger of being depleted or destroyed by the elements, vandalism, or commercial exploitation, and are not found in other geographic locations.

In summary, significant paleontological resources are determined to be fossils or assemblages of fossils that are unique, unusual, rare, uncommon, or diagnostically important (Eisentraut and Cooper, 2002; Murphey and Daitch, 2007; Scott and Springer, 2003). Significant fossils can include remains of large to very small aquatic and terrestrial vertebrates or remains of plants and animals previously not represented in certain portions of the stratigraphy. Assemblages of fossils that might aid stratigraphic correlation, particularly those offering data for the interpretation of tectonic events, geomorphologic evolution, and paleoclimatology are also critically important (Scott and Springer, 2003; Scott et al., 2004).

3.5.4 Significance Thresholds and Methodology

This section describes the impact analysis relating to geology, soils, and paleontological resources for the proposed program. It describes the methods and applicable thresholds used to determine the impacts of the proposed program.

3.5.4.1 Significance Thresholds

For the purposes of this Program Environmental Impact Report (PEIR) and consistency with Appendix G of the CEQA Guidelines, the proposed program would have a significant impact on geology and soils if it would:

a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

   i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;

   ii) Strong seismic ground shaking;

   iii) Seismic-related ground failure, including liquefaction;

   iv) Landslides;

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

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property;[7]

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

f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

[7] The CBC, based on the IBC and the now-defunct UBC, no longer includes a Table 18-1-B. Instead, CBC Section 1803.5.3 describes the criteria for analyzing expansive soils.

As detailed in the NOP/IS (refer to Appendix A of this PEIR), the proposed program would result in no impacts to thresholds "a-iv", "c" and "e." Although not required, evaluation of the proposed program's impact to thresholds "a-iv", "c" and "e" were conducted in this section.

3.5.4.2 Methodology

This impact section assesses potential impacts related to geology, soils, and paleontological resources based on the potential for the proposed program to adversely change those conditions or expose facilities or people or the environment to adverse impacts, using existing site conditions as a baseline for comparison. Information for this assessment of impacts relative to geology, soils, and paleontological resources is based on a review of literature research (geologic, seismic, soils, and paleontological resources reports and maps), information from seismic and paleontological databases, and the General Plans for the cities of Seal Beach and Long Beach. This information was used to identify potential impacts to workers, the public, or the environment.

For purposes of this analysis, construction activities would include the excavation, grading, and movement of fill and soil to restore habitat; removal or raising of some existing oil production facilities (wells, piping, and associated infrastructure); and construction of a visitor center, trails, and access roads. These construction activities would occur at various times spread out over time across the entire program area. Operations activities would include the operational phases of the restored habitat, visitors center, and trails. In addition, the operations activities include the post-treatment monitoring activities conducted to verify that habitat restoration objectives have been achieved.

The plugging and relocation of oil wells and associated infrastructure on the Northern and Southern Synergy Oil Field sites, Long Beach City Property site, and the Pumpkin Patch site were evaluated in the Los Cerritos Wetlands Oil Consolidation and Restoration Project EIR (State Clearinghouse Number 2016041083), and are not repeated or analyzed within this PEIR. In addition, the plugging and relocation of oil wells and associated infrastructure, if any, on the Hellman Retained site, Isthmus LCWA Site, or the Alamitos Bay Partners site are not proposed at this time, but are anticipated to occur in the long-term when production falls to below economic levels. As proposed in the Termination of Oil and Gas Lease and Grant of Easement agreement between Signal Hill Petroleum, Inc., and the LCWA, Signal Hill Petroleum, Inc. would relocate or modify aboveground pipelines and utilities on the Central LCWA site and remediate soils that have been impacted by oil operations to accommodate the restoration. Thus, restoration in the near-term would include pipeline relocation, but not well relocation. Additionally, outside of this agreement, existing Signal Hill Petroleum, Inc. wells would be protected in place by proposing to raise the wells. When the owner/operators of those oil operations within the program area elect to change or close those operations, the changes would be analyzed under separate CEQA documents. The change or closure procedures and impacts analysis would be similar to those described and analyzed within this PEIR.

The proposed program would be regulated by the various laws, regulations, and policies summarized in the Regulatory Framework. Compliance by the proposed program with applicable federal, state, and local laws and regulations is assumed in this analysis, and local and state

agencies would be expected to continue to enforce applicable requirements to the extent that they do so now. Note that compliance with many of the regulations is a condition of permit approval.

A significant impact would occur if, after considering the program features described in Chapter 2, *Project Description*, of this PEIR, and the required compliance with regulatory requirements, a significant impact would still occur. For those impacts considered to be significant, mitigation measures are proposed to reduce the identified impacts.

As stated in Chapter 1, *Introduction*, on March 8, 2019, the Los Cerritos Wetlands Authority sent a Notice of Preparation to responsible, trustee, and federal agencies, as well as to organizations, and individuals potentially interested in the proposed program to identify the relevant environmental issues that should be addressed in the PEIR. No issues related to geology and soils were identified.

3.5.5 Program Impacts and Mitigation Measures

Impact GEO-1a: The proposed program would result in a significant impact if the proposed program would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault.

As discussed above in Section 3.5.2, *Environmental Setting*, the Newport-Inglewood Fault Zone is designated by the state as an Alquist-Priolo Earthquake Fault Zone (i.e., on a state-recognized active fault trace) that crosses the program area, as shown in Figure 3.5-2. In the event of an earthquake along the Newport-Inglewood Fault Zone, fault rupture could occur on the program area.

Construction

Construction activities would be temporary, and thus, are not anticipated to exacerbate the exposure of people or structures to substantial adverse effects involving fault rupture. Therefore, relative to fault rupture, impacts during construction would be less than significant.

Operation

Portions of the program area, including levees, berms and flood walls, trails, and restored ecosystem area would be located within the Newport-Inglewood Fault Zone and could be exposed to fault rupture. These proposed program components do not include aboveground structures that could be damaged by fault rupture during operation; the proposed visitor center on the State Lands Parcel site and not within the fault zone (see Figure 3.5-2). Damage to levees, berms and flood walls, trails, and the restored ecosystem area would consist only of earth movement, which would not expose people to risks because people would not be inside collapsing buildings or under bridges. The levees, berms and flood walls, and trails could be relatively easily restored and repaired, if damaged. Further, restored areas would not contain large amounts of people during operation. The trails would only be open to the public for specific daytime hours and in limited areas, thereby limiting the use and presence of persons on-site.

Finally, some pipelines for the Signal Hill Petroleum operations in the Central Area would be relocated from their present locations. As summarized above in Section 3.5.3, *Regulatory Framework, The California Pipeline Safety Act of 1981*, codified in California Government Code Sections 50001–51298.5, all oil pipelines are required to be designed to accommodate some movement in the event of an earthquake. In addition, all oil pipelines have safety shutoff systems that close pipeline sections in the event of a loss of pressure due to a leak or break, thus minimizing spillage. Note that Signal Hill Petroleum has also committed to updating their Spill Prevention and Response Plan. Therefore, based on compliance with existing regulations, the proposed uses, limited hours of use, and anticipated number of people visiting the site, exposure of people to fault rupture impacts on the program area during operation would be unlikely, and impacts would be less than significant.

The operation of the oil fields includes the extraction of oil and associated produced water. However, the proposed program would not exacerbate the potential for earthquakes because the proposed program does not include changes to the existing injection and extraction of oil and produced water. Impacts would be less than significant.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

Less than Significant

Impact GEO-1b: The proposed program would result in a significant impact if the proposed program would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.

The region will likely experience a large regional earthquake within the operational life of the proposed program. There is a potential for strong to very strong intensity ground shaking at the program area that would be associated with such an earthquake. The intensity of such an event would depend on the causative fault and the distance to the epicenter, the magnitude, the duration of shaking, and the nature of the geologic materials on which the proposed program components would be constructed. Intense ground shaking and high ground accelerations would affect the entire program area. The primary and secondary effects of ground shaking could damage levees, berms and flood walls, trails, the visitor center, and modified infrastructure and utilities; and place people and/or the environment at risk.

Construction

Construction activities would be temporary, and thus, are not anticipated to exacerbate the exposure of people or structures to substantial adverse effects involving seismic shaking. Therefore, relative to seismic shaking, impacts during construction would be less than significant.

Operation

Portions of the program area, including levees, berms and flood walls, trails, and restored ecosystem area would be located within or close to the Newport-Inglewood Fault Zone and could be exposed to seismic shaking. With the exception of the visitor center, the program components do not include aboveground structures that could be damaged by seismic shaking during operation. Damage to levees, berms and flood walls, trails, and the restored ecosystem area would consist only of earth movement, which would not expose people to risks because people would not be inside collapsing buildings or under bridges. The levees, berms and flood walls, trails could be easily restored and repaired. Further, restored areas would not contain large amounts of people during operation. The trail would only be open to the public for specific daytime hours and in limited areas, thereby limiting the use and presence of persons on-site. Therefore, based on the proposed uses, limited hours of use and anticipated number of people visiting the site, exposure of people to seismic shaking impacts on the program area during operation would be unlikely, and impacts would be less than significant.

With regard to the visitor center on the State Lands Parcel site in the South Area, the structure would be required to comply with the CBC since the structure would be occupied by people. The structural elements of the visitor center would be required to undergo appropriate project level design-level geotechnical evaluations prior to final design and construction. Implementing the regulatory requirements of the CBC and local ordinances, and ensuring that all buildings and structures are constructed in compliance with the law is the responsibility of the project engineers and building officials. As described in Section 3.5.3, *Regulatory Framework*, the CBC describes required standards for the construction, alteration, movement, replacement, location, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California. The standards include earthquake design requirements that determine the seismic design category and then describe the structural design requirements. The geotechnical engineer, as a registered professional with the State of California, is required to comply with the CBC and local codes while applying standard engineering practice and the appropriate standard of care for the particular region in California, which, in the case of the visitor center, would be the City of Seal Beach. The California Professional Engineers Act (Building and Professions Code Sections 6700–6799), and the Codes of Professional Conduct, as administered by the California Board of Professional Engineers and Land Surveyors, provides the basis for regulating and enforcing engineering practice in California. The local building officials are typically with the local jurisdiction (i.e., the City of Seal Beach) and are responsible for inspections and ensuring CBC and local code compliance prior to approval of the building permit. As discussed above, the geotechnical investigations would include recommendations to address geotechnical issues, including seismic shaking. With compliance with the regulatory requirements and the implementation of geotechnical design recommendations as required by the CBC, impacts relative to seismic shaking would be less than significant.

As discussed in Section 2.7, *Program Characteristics*, of Chapter 2, *Project Description*, of this PEIR, oil wells and associated pipelines would be plugged or phased out over time. As described in Section 3.5.3, *Regulatory Framework*, the construction, operation, and removal or plugging of oil and natural gas wells, storage facilities, and pipelines would be under the permitting, design

specifications, and inspection jurisdiction of CalGEM, as summarized in the CalGEM Publication No. PRC10, *California Statutes and Regulations for Conservation of Oil, Gas, & Geothermal Resources*. Similar to the CBC, the registered professionals designing, constructing, operating, and plugging wells, pipelines, and associated infrastructure are required to comply with CalGEM regulations. The removal of wells and associated infrastructure would reduce the exposure of wells and infrastructure to seismic shaking. With compliance with the regulatory requirements and the removal of wells and infrastructure, impacts relative to seismic shaking would be less than significant.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

Less than Significant

Impact GEO-1c: The proposed program would result in a significant impact if the proposed program would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction, lateral spreading, and landslides.

As previously discussed, the region will likely experience a large regional earthquake within the operational life of the proposed program. There is a potential for strong to very strong intensity ground shaking at the program area that would be associated with such an earthquake. Seismic shaking can result in seismic-induced ground failures, such as liquefaction, lateral spreading, and landslides. The intensity of such an event would depend on the causative fault and the distance to the epicenter, the magnitude, the duration of shaking, and the nature of the geologic materials on which the proposed program components would be constructed. Intense ground shaking and high ground accelerations would affect the entire program area. The primary and secondary effects of ground shaking could damage levees, berms and flood walls, trails, the visitor center, and modified infrastructure and utilities; and place people and/or the environment at risk.

As discussed above in Section 3.5.2, *Environmental Setting*, the program area has a relatively flat topography. Based on a review of aerial photographs and available geotechnical reports and topographic conditions, no landslides are present on or at a location that could impact the program area. The proposed program facilities would not alter the topography so substantially as to introduce the potential for landslides to occur on-site. Therefore, construction and operational impacts pertaining to landslides would be less than significant and landslides are not discussed further.

Construction

Construction activities would be temporary, and thus, are not anticipated to exacerbate the exposure of people or structures to substantial adverse effects involving seismic-induced ground

failures, such as liquefaction and lateral spreading. Therefore, relative to liquefaction and lateral spreading, impacts during construction would be less than significant.

Operation

Portions of the program area, including levees, berms and flood walls, trails, and restored ecosystem area would be located within or close to the Newport-Inglewood Fault Zone and could be exposed to seismic shaking that may result in seismic-induced ground failures, such as liquefaction and lateral spreading. With the exception of the visitor center, the proposed program components do not include aboveground structures that could be damaged by liquefaction and lateral spreading during operation. Damage to levees, berms and flood walls, trails, and the restored ecosystem area would consist only of earth movement, which would not expose people to risks because people would not be inside collapsing buildings or under bridges. The levees, berms and flood walls, trails could be easily restored and repaired. Further, restored areas would not contain large amounts of people during operation. The trail would only be open to the public for specific daytime hours and in limited areas, thereby limiting the use and presence of persons on-site. Therefore, based on the proposed uses, limited hours of use, and anticipated number of people visiting the site, exposure of people to liquefaction and lateral spreading impacts on the program area during operation would be unlikely, and impacts would be less than significant.

With regard to the visitor center on the State Lands Parcel site in the South Area, the structure would be required to comply with the CBC since the structure would be occupied by people. As discussed in Section 3.5.3, *Regulatory Framework*, and in Impact GEO-1b, the structural elements of the visitor center would be required to undergo appropriate design-level geotechnical evaluations prior to final design, permitting, and construction. Implementing the regulatory requirements of the CBC and local ordinances, and ensuring that all buildings and structures are constructed in compliance with the law is the responsibility of the project engineers and building officials and the geotechnical engineer, as a registered professional with the State of California, is required to comply with the CBC and local codes while applying standard engineering practice and the appropriate standard of care. As discussed above, the geotechnical investigations would include recommendations to address geotechnical issues, including liquefaction and lateral spreading. With compliance with the regulatory requirements and the implementation of geotechnical design recommendations as required by the CBC, impacts relative to liquefaction and lateral spreading would be less than significant.

As discussed in Section 2.7, *Program Characteristics*, in Chapter 2, *Project Description*, of this PEIR, and above in Impact GEO-1b, oil wells and associated pipelines would be plugged or phased out over time throughout the program area. As described in Section 3.5.3, *Regulatory Framework*, the construction, operation, and removal or plugging of oil and natural gas wells, storage facilities, and pipelines would be under the permitting, design specifications, and inspection jurisdiction of CalGEM, as summarized in the CalGEM Publication No. PRC10, *California Statutes and Regulations for Conservation of Oil, Gas, & Geothermal Resources*. Similar to the CBC, the registered professionals designing, constructing, operating, and plugging wells, pipelines, and associated infrastructure are required to comply with CalGEM regulations. The removal of wells and associated infrastructure would reduce the exposure of wells and infrastructure to liquefaction and lateral spreading. With compliance with the regulatory

requirements and the removal of wells and infrastructure, impacts relative to liquefaction and lateral spreading would be less than significant.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

Less than Significant

Impact GEO-2: The proposed program would result in a significant impact if the proposed program would result in substantial soil erosion or the loss of topsoil.

Program construction would involve localized ground disturbance activities (e.g., grading, excavation, construction of berms, flood walls, and the visitor center, and the raising, removal or plugging of wells and pipelines). The ground disturbing activities could result in erosion or the loss of topsoil.

As discussed in Chapter 2, *Project Description*, of this PEIR, the program goals and objectives are the restoration of wetland habitat. Consequently, unless certain soils are contaminated from the previous oil operations such that removal and disposal is required, all topsoil would be kept on-site and reused to restore the wetlands habitat. Therefore, there would be no loss of topsoil, resulting in no impact, and the loss of topsoil is not discussed further.

Construction

Because the overall footprint of construction activities would exceed 1 acre, the proposed program would be required to comply with the *NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities* (Order 2009-0009-DWQ, NPDES No. CAS000002; as amended by Orders 2010-0014-DWQ and 2012-006-DWQ) (Construction General Permit), the *Seal Beach Grading and Stormwater Pollution Prevention Implementation Manual*, and the *Long Beach Storm Water Management Program Manual*, all of which are described above in Section 3.5.3, *Regulatory Framework*. These state and local requirements were developed to ensure that stormwater is managed and erosion is controlled on construction sites. The Construction General Permit requires preparation and implementation of a SWPPP, which requires applications of BMPs to control run-on and runoff from construction work sites. The BMPs would include, but would not be limited to, physical barriers to prevent erosion and sedimentation, construction of sedimentation basins, limitations on work periods during storm events, use of infiltration swales, protection of stockpiled materials, and a variety of other measures that would substantially reduce or prevent erosion from occurring during construction. The Seal Beach and Long Beach storm water programs, similar to the SWPPP, require implementation of temporary construction and permanent post-construction erosion control measures for construction sites of all sizes. The applicable erosion control ordinances restrict grading activities during winter months and require preparation of an erosion control plan prior to issuance of building permits. With compliance with the regulations discussed above,

impacts associated with soil erosion during construction would be less than significant for all proposed program components.

Although much of the program area is within disturbed areas, the construction activities would be purposely designed to retain and restore what topsoil there is and reuse that soil to restore the ecosystem. As discussed in Chapter 2, *Project Description*, of this PEIR, soil would be rearranged for habitat restoration. No topsoil would be exported off-site unless the topsoil has been contaminated with petroleum hydrocarbons above action levels requiring off-site disposal (see Section 3.7, *Hazards and Hazardous Materials*, of this PEIR, for discussion of contaminated materials). Therefore, there would be no impacts related to the loss of topsoil.

Operation

The proposed program would restore the wetland habitat and tidal connection, which would increase the amount of water moving within the program area with the tides, and could in turn cause erosion. In a healthy and properly functioning marsh system, tidal channels deposit or scour in response to the size of the tidal prism that the channels convey. When the tidal prism (the volume of water moving during a tidal cycle) increases, tidal channels scour to accommodate the additional flow. Since the proposed program would increase the tidal prism by allowing the tides to flood the marshplain to the south of the slough, the slough is expected to experience some erosion; however, hydraulic modeling showed that the increased velocities in the slough due to the proposed program would not be high enough to cause wide-spread erosion, nor would they require erosion and/or bank protection. After some initial channel adjustment, erosion during typical tides is expected to be minimal. In a stable estuary, mature marshes remain in a dynamic equilibrium between erosional and depositional processes. The marsh vegetation and its root structures help hold sediments in place, so the marsh would be expected to capture sediment running onto the site, reducing erosion. Finally, as summarized in Section 2.7.1, *Overview of Comment Program Features, Flood Risk and Stormwater Management*, the existing Los Angeles County Drainage Area project structures and facilities are maintained in such a manner and operated at such times and for such periods as necessary to obtain the maximum flood protection benefits (33 C.F.R. §208.10). The implementation of the proposed program would require revisions to the U.S. Army Corps of Engineers' OMRR&R Manual to reflect changes made to the existing Los Angeles County Drainage Area project structures and facilities within the program area. Section 3.8, *Hydrology and Water Quality*, provides a detailed analyses of water movement within the program area, which concludes that impacts from erosion during operations would be less than significant.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

Less than Significant

Impact GEO-3: The proposed program would result in a significant impact if the proposed program would be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the proposed program, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

As discussed above in Section 3.5.3, *Environmental Setting*, and Impact GEO-1c, the program area is relatively flat and the wetlands habitat restoration efforts would not result in slope susceptible to landslides. Impacts from landslides during construction and operations would be less than significant.

Although liquefaction and lateral spreading can occur without a seismic event, these ground failures are primarily caused by seismic shaking. As discussed above in Impact GEO-1c, impacts from liquefaction and lateral spreading during construction and operations would be less than significant.

As discussed in Section 3.5.2, *Environmental Setting*, subsidence and collapse can be caused by the withdrawal of oil and/or groundwater. The produced water from oil extraction is injected back into production zones to prevent subsidence. The proposed program does not include changes to the existing oil methodology. In addition, as oil production is phased out, oil extraction would be reduced and eventually end, eliminating the need to inject the produced water back into the production zones. The proposed program does not include the extraction of shallow groundwater and collapse would not occur. Relative to impacts from subsidence and collapse during construction and operations, there would be no impact.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

No Impact

Impact GEO-4: The proposed program would result in a significant impact if the proposed program would be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property.

The CBC, based on the IBC and the now-defunct UBC, no longer includes a Table 18-1-B. Instead, CBC Section 1803.5.3 describes the criteria for analyzing expansive soils. As discussed in Section 3.5.2, *Environmental Setting*, the geotechnical investigation at the Pumpkin Patch site concluded that the fill and soil materials have a low to moderate expansion potential (KCG 2016a). It is assumed this condition may also apply to other areas within the program area.

Expansion and contraction of expansive soils in response to changes in moisture content can cause differential and cyclical movements that can result in damage and/or distress to structures and equipment.

Construction

There would be no construction-related impacts relative to expansive soils. Until construction has been completed, there would be no structures that expansive soils could damage, and there would be no impact.

Operation

Portions of the program area, including levees, berms and flood walls, trails, and restored ecosystem area would be located on fill and/or soil that could be expansive. With the exception of the visitor center, the proposed program components do not include aboveground structures that could be damaged by expansive soils during operation. Damage to levees, berms and flood walls, trails, and the restored ecosystem area would consist only of earth movement, which would not expose people to risks because people would not be inside collapsing buildings or under bridges. The levees, berms and flood walls, trails could be easily restored and repaired. Further, restored areas would not contain large amounts of people during operation. The trail would only be open to the public for specific daytime hours and in limited areas, thereby limiting the use and presence of persons on-site. Finally, the areas around the existing Signal Hill Petroleum well heads that would be raised would use imported engineered fill that would not be subject to expansion. Therefore, based on the proposed uses, limited hours of use, and anticipated number of people visiting the site, exposure of people to expansive soil impacts on the program area during operation would be unlikely, and impacts would be less than significant.

With regard to the visitor center on the State Lands Parcel site in the South Area, the structure would be required to comply with the CBC since the structure would be occupied by people. As discussed in Section 3.5.3, *Regulatory Framework*, and in Impact GEO-1b, the structural elements of the visitor center would be required to undergo appropriate design-level geotechnical evaluations prior to final design, permitting, and construction. Implementing the regulatory requirements of the CBC and local ordinances, and ensuring that all buildings and structures are constructed in compliance with the law is the responsibility of the project engineers and building officials and the geotechnical engineer, as a registered professional with the State of California, is required to comply with the CBC and local codes while applying standard engineering practice and the appropriate standard of care. As discussed above, the geotechnical investigations would include recommendations to address geotechnical issues, including expansive soils. With compliance with the regulatory requirements and the implementation of geotechnical design recommendations as required by the CBC, impacts relative to expansive soils would be less than significant.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

Less than Significant

Impact GEO-5: The proposed program would result in a significant impact if the proposed program would have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

The proposed program does not include the construction or operation of septic tanks or alternative waste water disposal systems, resulting in no impact.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

No Impact

Impact GEO-6: The proposed program would result in a significant impact if the proposed program would directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

Construction

Geologic mapping indicates that the surface of the program area is composed almost entirely of artificial fill, with small areas of old shallow marine deposits (Qom) present within the southern-most program area. The artificial fill has been placed over native sediments that likely consist of alluvial, estuarine, and marine deposits ranging in age from relatively recent times to the middle Pleistocene (up to 780,000 years old).

As discussed above in the Paleontological Resources subsection of Section 3.5.2, *Environmental Setting*, artificial fill and estuarine deposits have no or low paleontological sensitivity, respectively. However, they overlie young alluvium and old shallow marine deposits at an undetermined depth, which have low-to-high or high paleontological sensitivity, respectively. Therefore, the program area is considered to have low-to-high paleontological potential, increasing with depth. While the exact depth of the artificial fill overlying the majority of the program area is unknown and may vary across the program area, 5 feet bgs is used as a conservative estimate of the transition from low to high potential since there have been fossil discoveries in the region from a similar depth.

Ground disturbing activities related to development of the proposed program have the potential to encounter significant paleontological resources. Disturbance of such resources could constitute a significant impact on the environment. Mitigation Measures GEO-1 through GEO-7 would reduce impacts to paleontological resources by requiring retention of qualified professionals; a project-level review to assess the potential for each project to encounter paleontological resources; training for construction personnel on how to identify paleontological resources and the procedures to follow should they be encountered; paleontological resources monitoring in sensitive sediments; and treatment, curation, and reporting of significant discoveries. With implementation these measures, impacts to paleontological resources would be less than significant.

Operation

Operation of the proposed program would include ongoing inspection and maintenance of the perimeter levees and berms, flood walls and water-control structures; removal of non-native vegetation in restored habitat and stormwater management features; trash removal within the restored wetlands; and operation of the visitor centers and associated parking lots. Any ground disturbance associated with these activities would occur within soils that have already been subject to ground disturbance, and they are unlikely to disturb paleontological. Impacts to paleontological resources from operation of the proposed program would be less than significant.

Mitigation Measure

Mitigation Measure GEO-1: Retention of a Qualified Professional Paleontologist. Prior to the start of construction of any near-term, mid-term, or long-term project, LCWA shall retain a Qualified Professional Paleontologist as defined by the Society of Vertebrate Paleontology to carry out all mitigation related to paleontological resources including: project-level review (**GEO-2**); paleontological resources sensitivity training (**GEO-3**); oversight of paleontological resources monitoring (**GEO-4**); and recovery, treatment, analysis, curation, and reporting (**GEO-5**, **GEO-6**, and **GEO-7**).

Mitigation Measure GEO-2: Project-Level Paleontological Resources Review and Monitoring Recommendations. Prior to LCWA approval of any near-term, mid-term, and long-term project, the Qualified Professional Paleontologist shall review the *Los Cerritos Wetlands Program Paleontological Resources Assessment* (ESA, 2019), grading plans, and any available geotechnical reports/data to determine the potential for ground disturbance to occur within older alluvium and old shallow marine deposits. If available data is sufficient to accurately determine the depth of older alluvium and old shallow marine deposits within a project site, monitoring shall be required beginning at or just above that depth. If available data is insufficient to determine the depth of older alluvium and old shallow marine deposits, monitoring shall be required beginning at 5 feet below surface (consistent with the accepted depth at which high sensitivity sediments could occur based on regional evidence). The results of the reviews shall be documented in technical memoranda to be submitted to LCWA prior to the start of ground disturbance, along with recommendations specifying the locations, depths, duration, and timing of any required monitoring. The technical memoranda shall include map figures that outline where monitoring is required and at what depths, and shall stipulate whether screen washing is necessary to recover small specimens. Any required screen washing shall follow SVP Guidelines.

Mitigation Measure GEO-3: Paleontological Resources Sensitivity Training. Prior to the start of ground disturbance for any near-term, mid-term, or long-term project, the Qualified Professional Paleontologist shall conduct paleontological resources sensitivity training. The training shall focus on the recognition of the types of paleontological resources that could be encountered within the program area, the procedures to be followed if they are found, confidentiality of discoveries, and safety precautions to be taken when working with paleontological monitors. LCWA shall ensure that construction personnel are made available for and attend the training, and retain documentation demonstrating attendance. The training should be repeated as necessary for incoming construction personnel.

Mitigation Measure GEO-4: Paleontological Resources Monitoring. A qualified paleontological monitor, as defined by the Society of Vertebrate Paleontology, shall

monitor all ground-disturbing activities occurring in the older alluvium and old shallow marine deposits for each near term, mid-term, or long-term project. Monitoring shall be implemented consistent with the locations, depths, duration, and timing recommendations specified in the technical memorandum for the project. Monitors shall work under the direction of the Qualified Professional Paleontologist. The number of monitors required to be on-site during ground-disturbing activities shall be determined by the Qualified Professional Paleontologist and shall be based on the construction scenario – specifically the number of pieces of equipment operating at the same time, the distance between these pieces of equipment, and the pace at which equipment is working – with the goal of monitors being able to effectively observe sediments as they are exposed. Monitors shall have the authority to temporarily halt or divert work away from exposed fossils in order to recover the fossil specimens, and to request assistance from construction equipment operators to recover samples for screen washing as necessary. Monitors shall prepare daily logs detailing the types of activities and soils observed, and any discoveries. The Qualified Professional Paleontologist, in consultation with LCWA, shall have the ability to modify (i.e., increase, reduce, or discontinue) monitoring requirements based on observations of soil types and frequency of discoveries. Requests for modifications shall be submitted in writing to LCWA for approval prior to implementation.

Mitigation Measure GEO-5: Paleontological Discoveries. If any potential fossils are discovered by paleontological resources monitors or construction personnel, all work shall cease at that location (within 100 feet) until the Qualified Professional Paleontologist has assessed the discovery and made recommendations as to the appropriate treatment. The paleontological resources monitor (if one is present) or construction personnel (if a monitor is not present) shall flag the fossiliferous area for avoidance until the Qualified Professional Paleontologist can evaluate the discovery and develop plans for avoidance or removal/salvage of the specimen(s), if deemed significant. Significant discoveries shall be salvaged following SVP Guidelines.

Mitigation Measure GEO-6: Preparation, Identification, Cataloging, and Curation Requirements. All significant fossil discoveries shall be prepared to the point of identification to the lowest taxonomic level possible, cataloged, and curated into a certified repository with retrievable storage (such as a museum or university). All GPS data, field notes, photographs, locality forms, stratigraphic sections, and other data associated with the recovery of the specimens shall be deposited with the institution receiving the specimens. The Qualified Professional Paleontologist shall be responsible for obtaining a signed curation agreement from a certified repository in southern California prior to the start of the program. Given the length of the program, multiple agreements may be necessary due to changing capacities of repositories.

Mitigation Measure GEO-7: Reporting Requirements. The Qualified Professional Paleontologist shall prepare weekly status reports detailing activities and locations observed (with maps) and summarizing any discoveries to be submitted to LCWA via email for each week in which monitoring activities occur. Monthly progress reports summarizing monitoring efforts shall be prepared and submitted to LCWA for the duration of monitored ground disturbance. Reports detailing the results of monitoring for any near-term, mid-term, or long-term project and treatment of significant discoveries shall be submitted to LCWA within 120 days of completion of treatment, or within 30 days of completion of monitoring if no significant discoveries occurred. If significant fossils are recovered, the Qualified Professional Paleontologist shall file the final report with the Natural History Museum of Los Angeles County and the certified repository.

Significance after Mitigation

Less than Significant with Mitigation

3.5.6 Cumulative Impacts

This section presents an analysis of the cumulative effects of the proposed program in combination with other past, present, and reasonably foreseeable future projects that could cause cumulatively considerable impacts.

As previously discussed, the proposed program would have no impact with respect to fault rupture, landslides, subsidence or collapse, loss of topsoil, septic tanks, or alternative wastewater disposal systems. Accordingly, the proposed program could not contribute to cumulative impacts related to these topics and are not discussed further.

The geographic area affected by the proposed program and its potential to contribute to cumulative impacts varies based on the environmental resource under consideration. The geographic scope of analysis for cumulative geologic impacts encompasses and is limited to the program area and its immediately adjacent area. This is because impacts relative to geologic hazards are generally site-specific. For example, the effect of erosion would tend to be limited to the localized area of a project and could only be cumulative if erosion occurred as the result of two or more adjacent projects that spatially overlapped.

The timeframe during which proposed program could contribute to cumulative geologic hazards includes the construction and operations phases. For the proposed program, the operations phase is permanent. However, similar to the geographic limitations discussed above, it should be noted that impacts relative to geologic hazards are generally time-specific. Geologic hazards could only be cumulative if two or more geologic hazards occurred at the same time, as well as overlapping at the same location.

3.5.6.1 Construction

Significant cumulative impacts related to geology and soils could occur if the incremental impacts of the proposed program combined with the incremental impacts of one or more of the cumulative projects identified in Table 3-1, *List of Cumulative Projects*, to substantially increase risk to people or the environment would be exposed to hazardous materials. Note that while three cumulative projects are within proximity of the proposed program (Cumulative Projects 22 and 23 listed on Table 3-1), only Project 24, Los Cerritos Wetlands Oil Consolidation and Restoration Project, listed on Table 3-1 would geographically overlap the proposed program. Cumulative Project No. 24 is a marsh restoration project with the same proposed activities as the Los Cerritos Wetlands Restoration Plan: operate existing oil wells until no longer productive, remove unproductive wells, and restore marshland areas.

As described in Impact GEO-2, construction activities have the potential to cause soil erosion. If the cumulative projects were constructed at the same time, the erosion effects could be

cumulatively significant if appropriate measures were not taken; however, the state Construction General Permit and the Long Beach Storm Water Management Program would require each cumulative project to prepare and implement a SWPPP. The SWPPPs would describe BMPs to control runoff and prevent erosion for each project. Through compliance with the Construction General Permit, the potential for erosion impacts would be reduced to less-than-significant levels. The Construction General Permit has been developed to address cumulative conditions arising from construction throughout the state, and is intended to maintain cumulative effects of projects subject to this requirement below levels that would be considered significant. For example, two adjacent construction sites would each be required to implement BMPs to reduce and control the release of sediment and/or other pollutants in any runoff leaving their respective sites, including from erosion. The runoff water from both sites would be required to achieve the same action levels, measured as a maximum amount of sediment or pollutant allowed per unit volume of runoff water. Thus, even if the runoff waters were to combine after leaving the sites, the sediments and/or pollutants in the combined runoff would still be at concentrations below action levels and would not be cumulatively considerable (less than significant). Similarly, the impacts of the proposed program combined with other cumulative projects within the region would not cause a significant cumulative impact related to soil erosion and the proposed action's contribution to cumulative impacts on soil erosion would not be cumulatively considerable (less than significant).

Until the construction of structures has been completed, there would be no impacts from seismic events (e.g., seismic shaking, seismic-induced ground failures such as liquefaction or lateral spreading) or non-seismically induced ground failures (e.g., expansive soil) due largely to the relatively short period that construction would take place and the likelihood of a seismic event occurring at that time. Therefore, the cumulative impacts during construction would not be cumulatively considerable (less than significant).

As described in Impact GEO-6, construction activities have the potential to impact paleontological resources. Cumulative impacts to paleontological resources could occur if one or more of the cumulative projects identified in Table 3-1 in conjunction with the proposed program, would have impacts on paleontological resources that, when considered together, would be significant.

Potential impacts to paleontological resources would be mitigated through the implementation of Mitigation Measures GEO-1 through GEO-7, which would reduce the impact by requiring retention of qualified professionals; a project-level review to assess the potential for each project to encounter paleontological resources; training for construction personnel on how to identify paleontological resources and the procedures to follow should they be encountered; paleontological resources monitoring in sensitive sediments; and treatment, curation, and reporting of significant discoveries. These measures would reduce the impact to a level of less than significant. The activities for Project 24 would also be required to implement similar measures to address the potential for paleontological resources, if any. As such, the proposed program's contribution to impacts on paleontological resources is less than cumulatively considerable.

Mitigation Measure

Mitigation Measures GEO-1 through GEO-7.

Significance after Mitigation

Less than Significant with Mitigation

3.5.6.2 Operation

Impacts from seismic events (e.g., seismic shaking, seismically induced ground failures such as liquefaction or lateral spreading) or non-seismically induced ground failures (e.g., expansive soil) tend to be confined to each given site due to varying conditions and distance to epicenter. In addition, each cumulative project would also be required to comply with the requirements of the CBC and local building codes, which would require geotechnical investigations to identify potential geotechnical issues and provide recommendations to reduce or eliminate the risks. Each cumulative project would be required to conduct geotechnical investigations and develop recommendations to address geotechnical hazards. With compliance with applicable regulations, the cumulative impacts would be reduced and would not be cumulatively considerable (less than significant).

Upon completion of the proposed program and any nearby cumulative projects, each project would be required to comply with local MS4 Permits, which contain requirements to control surface water runoff and erosion. Similar to the discussion above in Impact GEO-2 of how SWPPPs would control runoff and prevent erosion for cumulative construction impacts, because each cumulative project would be required to comply with the same regulations and to the same action levels, the impacts would not be cumulatively considerable (less than significant with mitigation).

No impacts to paleontological resources are anticipated during project operations. Therefore, cumulative impacts during operations would not be cumulatively considerable.

Mitigation Measure

No mitigation is required.

Significance after Mitigation

Less than Significant

3.5.7 References

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