IV. Environmental Impact Analysis
C. Geology and Soils

1. Introduction

This section of the Draft EIR provides an analysis of the Project's potential impacts with regard to geology and soils, including rupture of a known earthquake fault, seismic ground shaking, soil erosion, geologic unit or soil stability (e.g., lateral spreading, subsidence), expansive soils, and other geologic conditions. The analysis is based on a review of California regulatory requirements, City of Los Angeles requirements, as well as the *Geotechnical Feasibility Report* (Geotechnical Investigation, approved on October 25, 2017), prepared for the Project by Golder Associates, Inc., which is included in Appendix C of this Draft EIR; and the *Methane Investigation Report* (Methane Report), prepared for the Project by Carlin Environmental Consulting, Inc., and included as Appendix D of this Draft EIR.

2. Environmental Setting

a. Regulatory Framework

(1) State of California

(a) Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code Section 2621) was enacted by the State of California in 1972 to address the hazard of surface faulting to structures for human occupancy.[1] The Alquist-Priolo Earthquake Fault Zoning Act was enacted in response to the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged homes, commercial buildings, and other structures. The primary purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to prevent the construction of buildings intended for human occupancy on the surface traces of active faults. The Alquist-Priolo Earthquake Fault Zoning Act is also intended to increase the safety of citizens and minimize the loss of life during and immediately

[1] *The Alquist-Priolo Earthquake Fault Zoning Act was originally entitled the Alquist-Priolo Geologic Hazard Zones Act. California Geological Survey, Fault-Rupture Hazard Zones in California, Special Publication 42, Interim Revision 2007.*

following earthquakes by facilitating seismic retrofitting to strengthen buildings against ground shaking.

The Alquist-Priolo Earthquake Fault Zoning Act requires the State Geologist to establish regulatory zones, known as "earthquake fault zones," around the surface traces of active faults and to issue appropriate maps to assist cities and counties in planning, zoning, and building regulation functions. Maps are distributed to all affected cities and counties for the control of new or renewed construction and are required to sufficiently define potential surface rupture or fault creep. The State Geologist is charged with continually reviewing new geologic and seismic data, and revising existing zones and delineating additional earthquake fault zones when warranted by new information. Local agencies must enforce the Alquist-Priolo Earthquake Fault Zoning Act in the development permit process, where applicable, and may be more restrictive than state law requires. According to the Alquist-Priolo Earthquake Fault Zoning Act, before a project located within an earthquake fault zone can be permitted, cities and counties shall require a geologic investigation, prepared by a licensed geologist, to demonstrate that buildings will not be constructed across active faults. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back a minimum of 50 feet.[2] The Alquist-Priolo Earthquake Fault Zoning Act and its regulations are presented in California Department of Conservation, California Geological Survey, Special Publication 42, *Fault-Rupture Hazard Zones in California*.

(b) Seismic Safety Act

The California Seismic Safety Commission was established by the Seismic Safety Act in 1975 to provide oversight, review, and recommendations to the Governor and State Legislature regarding seismic issues. The Commission's name was changed to the Alfred E. Alquist Seismic Safety Commission in 2006. The Commission has adopted several documents based on recorded earthquakes, including:[3]

- Research and Implementation Plan for Earthquake Risk Reduction in California 1995 to 2000, report dated December 1994; and
- Commercial Property Owner's Guide to Earthquakes Safety, report dated October 2006.

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[2] *California Department of Conservation, www.conservation.ca.gov/cgs/rghm/ap/Pages/main.aspx, accessed February 14, 2017.*

[3] *Alfred E. Alquist Seismic Safety Commission, Publications, www.seismic.ca.gov/pub.html, accessed February 14, 2017.*

(c) Seismic Hazards Mapping Act

In order to address the effects of strong ground shaking, liquefaction, landslides, and other ground failures due to seismic events, the State Legislature enacted the Seismic Hazards Mapping Act of 1990 (Public Resources Code Sections 2690–2699). Under the Seismic Hazards Mapping Act, the State Geologist is required to delineate "seismic hazard zones." Cities and counties must regulate certain development projects within these zones to ensure that the geologic and soil conditions of the project site are investigated and appropriate mitigation measures, if required, are incorporated into development plans. The State Mining and Geology Board has promulgated additional regulations and policies to assist municipalities in preparing the Safety Element of their General Plans and encourage land use management policies and regulations to reduce and mitigate those hazards to protect public health and safety. Under Public Resources Code Section 2697, cities and counties shall require, prior to the approval of a project located in a seismic hazard zone, a geotechnical report defining and delineating any seismic hazard. Each city or county shall submit one copy of each geotechnical report, including mitigation measures, to the State Geologist within 30 days of its approval. Public Resources Code Section 2698 does not prevent cities and counties from establishing policies and criteria which are stricter than those established by the State Mining and Geology Board.

State publications supporting the requirements of the Seismic Hazards Mapping Act include CGS Special Publication 117, *Guidelines for Evaluating and Mitigating Seismic Hazards in California,* and CGS Special Publication 118, *Recommended Criteria for Delineating Seismic Hazard Zones in California*. The objectives of Special Publication 117 are to assist in the evaluation and mitigation of earthquake-related hazards for projects within designated zones of required investigations and to promote uniform and effective statewide implementation of the evaluation and mitigation elements of the Seismic Hazards Mapping Act. Special Publication 118 implements the requirements of the Seismic Hazards Mapping Act in the production of Probabilistic Seismic Hazard Maps for the State.

(d) California Building Code

The California Building Code (California Code of Regulations, Title 24) is a compilation of building standards, including seismic safety standards for new buildings. California Building Code standards are based on the following: (i) building standards that have been adopted by state agencies without change from a national model code; (ii) building standards based on a national model code that have been changed to address particular California conditions; and (iii) building standards authorized by the California legislature but not covered by the national model code. Given the State's susceptibility to seismic events, the seismic standards within the California Building Code are among the strictest in the world. The California Building Code includes provisions for demolition and construction, as well as regulations regarding building foundations and soil types. The

California Building Code applies to all occupancies in California, except where stricter standards have been adopted by local agencies.

The California Building Code is published on a triennial basis, and supplements and errata can be issued throughout the cycle. The 2016 edition of the California Building Code became effective on January 1, 2017, and incorporates by adoption the 2015 edition of the International Building Code of the International Code Council, with California amendments.[4] The 2016 California Building Code incorporates the latest seismic design standards for structural loads and materials, as well as provisions from the National Earthquake Hazards Reduction Program to mitigate losses from an earthquake and provide for the latest in earthquake safety. The current California Building Code has been adopted by the City of Los Angeles as the Los Angeles Building Code, with local amendments. As such, the California Building Code forms the basis of the Los Angeles Building Code.

(2) City of Los Angeles

(a) Los Angeles General Plan Safety Element

The City of Los Angeles General Plan Safety Element (Safety Element), which was adopted in 1996, addresses public safety risks due to natural disasters, including seismic events and geologic conditions; and sets forth guidance for emergency response during such disasters. The Safety Element also provides generalized maps of designated areas within the City that are considered susceptible to earthquake-induced hazards such as fault rupture and liquefaction.

Regarding assessment of seismic hazards, the Safety Element acknowledges that Section 2699 of the California Public Resources Code requires that a safety element take into account available seismic hazard maps prepared by the State Geologist pursuant to the Alquist-Priolo Earthquake Fault Zoning Act to assess seismic hazards. The Public Resources Code also requires that the State Geologist map active faults throughout the state. The Safety Element states that those maps which are applicable to the City of Los Angeles are incorporated into Exhibit A of the Safety Element. The Safety Element also states that local jurisdictions are required by the Seismic Hazards Mapping Act to require additional studies and appropriate mitigation measures for development projects in the areas identified as potential hazard areas by the state seismic hazard maps. In addition, the Safety Element states that as maps are released for Los Angeles, they will be utilized by the Los Angeles Department of Building and Safety (LADBS) to help identify areas where additional soils and geology studies are needed for evaluation of hazards and imposition of appropriate mitigation measures prior to the issuance of building permits.

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[4] *California Building Code, California Code of Regulations, Title 24, Part 2.*

The Safety Element was approved in 1996 during an ongoing mapping effort by the State. Therefore, it contemplated that, once the entire set of maps for Los Angeles was complete, it would be used to revise the soils and geology exhibits of the Safety Element. The Safety Element acknowledged that it was based on available official maps at the time, and that exhibits in the Safety Element would be revised following receipt of reliable new information.

(b) Los Angeles Building Code

Earthwork activities, including grading, are governed by the Los Angeles Building Code, which is contained in Los Angeles Municipal Code (LAMC), Chapter IX, Article 1. Specifically: Section 91.7006.7 includes requirements regarding import and export of earth material; Section 91.7010 includes regulations pertaining to excavations; Section 91.7011 includes requirements for fill materials; Section 91.7014 includes general construction requirements, as well as requirements regarding flood and mudflow protection; and Section 91.7016 includes regulations for areas that are subject to slides and unstable soils. In addition, Section 91.1803 includes specific requirements addressing seismic design, grading, foundation design, geologic investigations and reports, soil and rock testing, and groundwater. The Los Angeles Building Code incorporates by reference the California Building Code, with City amendments for additional requirements. LADBS is responsible for implementing the provisions of the Los Angeles Building Code.

(c) Los Angeles Ordinance No. 175790

Los Angeles Ordinance No. 175790 defines the methane mitigation requirements for all projects which fall within the “methane zone” or the “methane buffer zone.” The zones have been defined by the City of Los Angeles to include areas of the City which fall within or adjacent to the oil production fields by the Division of Gas and Geothermal Resources. The ordinance requires that each parcel that falls within the methane or methane buffer zone be evaluated for methane concentration and pressure and certified by an approved testing agency. Upon completion and certification, the highest concentration and pressure measured during the investigation determines the “design level” for the project.

The ordinance defines five design levels and corresponding mitigation measures for all sites in the methane and methane buffer zones. Level I is the least stringent escalating to Level V as the most stringent “active” methane mitigation. As part of the ordinance, alternatives to the measures specified in the ordinance are permitted with the approval of the City.

b. Existing Conditions

(1) Regional Geology

The Project Site is located in the west portion of the Los Angeles Basin, a seismically active coastal plain area bounded by the Santa Monica Mountains on the north, the Elysian Hills and Repetto Hills on the northeast, the Puente Hills and Whittier Fault on the east, the Palos Verdes Peninsula and Pacific Ocean on the west and south, and the Santa Ana Mountains and San Joaquin Hills on the southeast. The basin is underlain by a deep structural depression which has been filled by both marine and continental sedimentary deposits underlain by a basement complex of igneous and metamorphic composition. The basement surface within the central portion of the basin extends to a maximum depth of approximately 32,000 feet below sea level. Regionally, the Project Site is located within the northern portion of the Peninsular Ranges geomorphic province. This geomorphic province is characterized by northwest-trending physiographic and geologic features.

(2) Regional Faulting and Seismicity

The numerous faults in Southern California include active, potentially active, and inactive faults. Based on criteria established by the California Geological Survey, active faults are those that have shown evidence of surface displacement within the past 11,000 years (i.e., Holocene-age). Potentially active faults are those that have shown evidence of surface displacement within the last 1.6 million years (i.e., Quaternary-age). Inactive faults are those that have not shown evidence of surface displacement within the last 1.6 million years. The Southern California region also includes blind thrust faults, which are faults without a surface expression. Due to the buried nature of these thrust faults, their existence is usually not known until they produce an earthquake. Since the seismic risk of these buried thrust faults in terms of recurrence and maximum potential magnitude is not well established, the potential for earthquakes with magnitude (M) higher than 6.0 occurring on buried thrust faults cannot be precluded. The known faults in the vicinity of the Project Site are discussed below and shown in Figure IV.C-1 on page IV.C-7.

(a) Active Faults

The Alquist-Priolo Earthquake Fault Zoning Act defines “active” and “potentially active” faults utilizing the same aging criteria as those used by the California Geological Survey, as described above. However, according to the Alquist-Priolo Earthquake Fault Zoning Act, only those faults which have direct evidence of movement within the last 11,000 years are required to be zoned. The California Geological Survey considers fault movement within this period a characteristic of faults that have a relatively high potential for ground rupture in the future.

Figure IV.C-1
Regional Fault Map

Source: Golder Associates, 2017.

As discussed in the Regulatory Framework above, the Alquist-Priolo Earthquake Fault Zoning Act requires the State Geologist to establish earthquake fault zones around the surface traces of active faults and to issue appropriate maps to assist cities and counties in planning, zoning, and building regulation functions. These zones, which generally extend from 200 to 500 feet on each side of a known active fault, are based on the location precision, complexity, or regional significance of the fault. The zones identify areas where potential surface fault rupture along an active fault could prove hazardous, and identify where special studies are required to characterize hazards to habitable structures. If a site lies within an Earthquake Fault Zone on an official California Geological Survey map, then a geologic fault rupture investigation must be performed before issuance of permits to demonstrate that the proposed development is not threatened by surface displacement from the fault.

As illustrated in Figure IV.C-1 on page IV.C-7, no known active faults have been mapped within or immediately adjacent to the Project Site. In addition, the Project Site is not located within an Alquist-Priolo Earthquake Fault Zone. The closest major active (and zoned) fault near the Project Site is the Santa Monica Fault, located approximately 4 miles north of the Project Site, which could generate a maximum magnitude earthquake of 6.6. The second closest major active (and zoned) fault near the Project Site is the Newport-Inglewood Fault (north Los Angeles Basin section), located approximately 4.3 miles east of the Project Site. The Newport-Inglewood Fault could generate a maximum magnitude earthquake of 6.9. The next closest major active (and zoned) fault near the Project Site is the Palos Verdes Fault (Santa Monica Basin section), located approximately 4.5 miles west of the Project Site, which could generate a maximum magnitude earthquake of 7.1.

(b) Seismicity

While no known active faults have been mapped across the Project Site and the Project Site is not located within an Alquist-Priolo Earthquake Fault Zone, the Project Site is located within the seismically active region of Southern California and would potentially be subject to strong seismic ground shaking if a moderate to strong earthquake occurs on a local or regional fault. According to the California Earthquake Data Center, recent historic earthquakes near the Project Site include the 1933 Long Beach Earthquake (M 6.3), the 1971 Sylmar Earthquake (M 6.6), and the 1994 Northridge Earthquake (M 6.7).

(3) Local Geology

(a) Soil Conditions

The Project Site is relatively flat and generally characterized by gently sloping topography. According to the Geotechnical Investigation, the Project Site is located on alluvial soils that are derived from the nearby Ballona Creek. The alluvial soils that underlie the Project Site are characterized primarily as silt and clay with layers of sand and silty

sand that extend approximately 17 to 20 feet below the Project Site. Further beneath the silt and clay is a layer of medium dense to dense sand that extends approximately 20 to 25 feet below the silt and clay layer. The sand layer is underlain by another layer of silt and clay that is approximately 5 to 15 feet thick.

(b) Groundwater

According to the Geotechnical Report included in Appendix C of this Draft EIR, the historic high groundwater level beneath the Project is approximately six feet below the existing ground surface. According to the Geotechnical Investigation, borings on the properties next to the Project Site encountered groundwater at approximately 17 feet below ground surface.

(c) Liquefaction

Liquefaction is a phenomenon whereby saturated, granular soils lose their inherent shear strength due to excess pore water pressure buildup, such as that generated during repeated cyclic loading from an earthquake. Liquefaction is associated primarily with low density, granular, saturated soil in areas where the groundwater table is 50 feet or less below the ground surface. Liquefaction-related effects can include sand boils, excessive settlement, bearing capacity failures, and lateral spreading.

As illustrated in Figure IV.C-2 on page IV.C-10 and according to the California Geological Survey, the Project Site is located within an area prone to liquefaction.[5] In addition, the Project Site is located in an area that has been identified as being potentially susceptible to liquefaction in the City of Los Angeles Safety Element, and the City's Zoning Information and Map Access System.[6,7] Furthermore, according to the Geotechnical Investigation, borings on the properties next to the Project Site encountered groundwater at approximately 17 feet below ground surface. Thus, there is a potential for liquefaction and settlement to occur on the Project Site.

Lateral spreading is a phenomenon in which large blocks of intact, non-liquefied soil move downslope on a liquefied soil layer. Lateral spreading is often a regional event. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained

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[5] *State of California, California Geologic Survey, Venice Quadrangle, Seismic Hazard Zones (March 25, 1999) Map.*

[6] *Los Angeles General Plan Safety Element, Exhibit B, Areas Susceptible to Liquefaction (November 1996), p. 49.*

[7] *City of Los Angeles Department of City Planning, ZIMAS, Parcel Profile Report, http://zimas.lacity.org/, accessed February 17, 2017.*

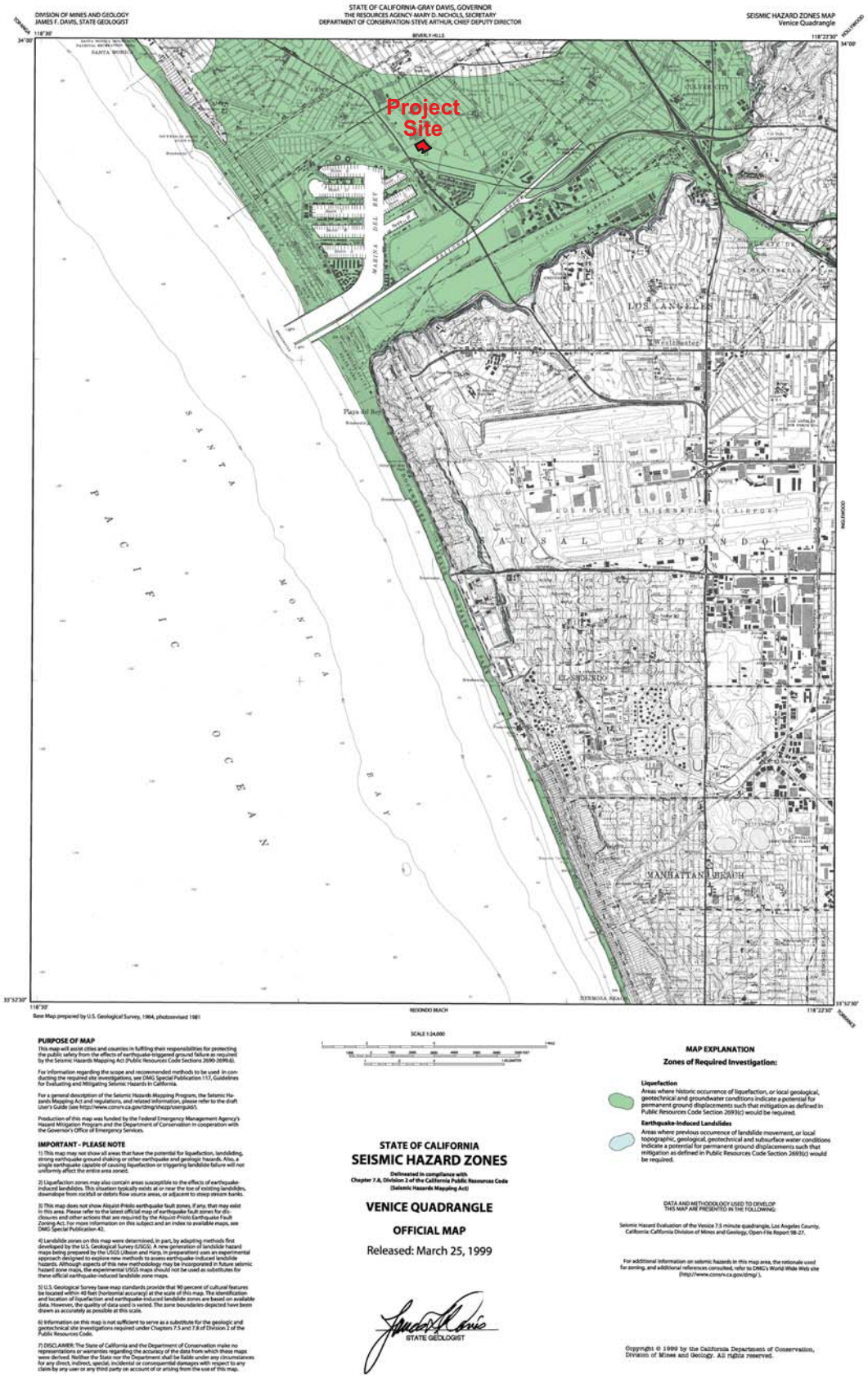

Figure IV.C-2
Seismic Hazard Map

Source: US Geological Survey, 1999.

laterally, and free to move along gently sloping ground toward an unconfined area, such as an unlined river channel. Since there is a potential for liquefaction at the Project Site, there is also a potential for lateral spreading to occur at the Project Site.

(d) Subsidence

Subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of groundwater, oil, or natural gas. According to the Geotechnical Investigation, the Southern California Gas Company operates a natural gas storage field beneath Playa del Rey, south of the Project Site. The natural gas storage area does not extend below the Project Site. Furthermore, no large-scale extraction of groundwater, gas, oil, or geothermal energy is occurring, or is planned at the Project Site. Therefore, there is little to no potential for ground subsidence due to withdrawal of fluid or gas at the Project Site.

(e) Expansive Soils

Expansive soils are soils that swell when subjected to moisture and shrink when dried. Expansive soils are typically associated with clayey soils. According to the Geotechnical Investigation, the alluvial soils on the Project Site have a low expansion potential.

(f) Other Geologic Conditions

(i) Corrosive Soils

Based on geotechnical explorations and sampling of the soil underlying the Project Site, the Project Site soils were found to be corrosive. Corrosive soils are characterized by their ability to degrade concrete and corrode ferrous materials in contact with water or soil. In particular, concrete is susceptible to corrosion when it is in contact with soil or water that contains high concentrations of soluble sulfates.

(ii) Oil Wells

According to the Division of Oil, Gas, and Geothermal Resources Regional Wildcat Map, the Project Site is not located within the limits of an oil field, and no oil wells have been drilled on the Project Site.[8] There are no active or abandoned oil/gas wells within the footprint of the Project Site. Therefore, the likelihood of encountering an abandoned oil/gas well during construction is low.

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[8] *Division of Oil, Gas, and Geothermal Resources Regional Wildcat Map 120.*

(iii) Methane

The Project Site is located within an area delineated by the City of Los Angeles as a Methane Buffer Zone. Methane is a naturally occurring gas associated with the decomposition of organic materials. In high-enough concentrations, between 50,000 parts per million and 150,000 parts per million by volume in the presence of oxygen, methane can be considered an explosion hazard.

A methane investigation was conducted for the Project Site and the results are provided in the Methane Report, included as Appendix D of this Draft EIR. As discussed therein, 11 soil vapor probes were installed approximately five feet below ground surface throughout the Project Site. The methane probe readings indicated the highest methane readings occurred between 1,001 and 5,000 parts per million (high of 1,050 ppm) of methane by volume.

As provided in the Methane Report in Appendix D, the Project would comply with the City of Los Angeles' Methane Mitigation Ordinance No. 175790. Under this ordinance, the Project Site is categorized as a Level III Site Design with a Design Methane Pressure of equal to and less than 2 inches in the water column. Adherence to the City of Los Angeles' Methane Mitigation Ordinance No. 175790, the construction safety measures, as well as compliance with California Occupational Safety and Health Act safety requirements, would serve to avoid substantial risk in the event that elevated levels of these soil gases are encountered during grading and construction.

(iv) Landform Alteration

No distinct or prominent geologic or topographic features such as hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, or wetlands are located on the Project Site.

3. Project Impacts

a. Thresholds of Significance

In 2015, the California Supreme Court in *California Building Industry Association v. Bay Area Air Quality Management District* (2015) 62 Cal.4th 369 *(*CBIA v. BAAQMD), held that CEQA generally does not require a lead agency to consider the impacts of the existing environment on the future residents or users of the project. The revised thresholds provided below are intended to comply with this decision. Specifically, the decision held that an impact from the existing environment to the project, including future users and/or residents, is not an impact for purposes of CEQA. However, if the project, including future users and residents, exacerbates existing conditions that already exist, that impact must be

assessed, including how it might affect future users and/or residents of the project. Thus, in accordance with Appendix G of the State CEQA Guidelines and the CBIA v. BAAQMD decision, the Project would have a significant impact related to geology and soils if it would result in any of the following impacts to future residents or users on the Project Site:

Threshold (a): Exacerbate existing hazardous environmental conditions by bringing people or structures into areas that are susceptible to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area based on other substantial evidence of a known fault. Refer to Division of Mines and Geology9 Special Publication 42.

ii. Strong seismic ground shaking

iii. Seismic-related ground failure, including liquefaction

iv. Landslides

Threshold (b): Result in substantial soil erosion or the loss of topsoil, or

Threshold (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 caused in whole or in part by the project's exacerbation of existing of environmental conditions; or

Threshold (d): Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property caused in whole or in part by the project exacerbating the expansive soil conditions; or

Threshold (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 wastewater.

For this analysis, the Appendix G Thresholds listed above are relied upon. The analysis utilizes factors and considerations identified in the City's 2006 L.A. CEQA

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[9] *Now the California Geological Survey*

Thresholds Guide, as appropriate, to assist in answering the Appendix G Threshold questions.

The City's L.A. CEQA Thresholds Guide criteria for landform alteration has no equivalent Appendix G threshold and will be analyzed following the evaluation of Appendix G "Threshold e." The L.A. CEQA Thresholds Guide identifies the following criteria to evaluate geology:

(1) Geologic Hazards

- Cause or accelerate geologic hazards, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

(2) Sedimentation and Erosion

- Constitute a geologic hazard to other properties by causing or accelerating instability from erosion; or
- Accelerate natural processes of wind and water erosion and sedimentation, resulting in sediment runoff or deposition which would not be contained or controlled on-site.

(3) Landform Alteration

- Cause one or more distinct and prominent geologic or topographic features to be destroyed, permanently covered, or materially and adversely modified as a result of the project. Such features may include, but are not limited to, hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands.

b. Methodology

To evaluate potential impacts relative to geology and soils, a Geotechnical Investigation was prepared by Golder Associates, Inc., as provided in Appendix C, of this Draft EIR. The Geotechnical Investigation included a review of published geologic data relevant to the Project Site, subsurface cone penetration tests, a soils test boring, and data from previous geological investigations performed adjacent to the Project Site.

c. Analysis of Project Impacts

(1) Project Design Features

No specific project design features are proposed with regard to geology and soils.

(2) Project Impacts

Threshold (a): Would the Project exacerbate existing hazardous environmental conditions by bringing people or structures into areas that are susceptible to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area based on other substantial evidence of a known fault? Refer to Division of Mines and Geology10 Special Publication 42.

Ground rupture is the visible breaking and displacement of the earth's surface along the trace of a fault during an earthquake. As previously discussed, based on research of available literature and the findings of the Geotechnical Investigation, no known active or potentially active faults underlie the Project Site. In addition, the Project Site is not located within a state-designated Alquist-Priolo Earthquake Fault Zone. According to the Geotechnical Investigation, the closest major active (and zoned) fault near the Project Site is the Santa Monica Fault, located approximately 4 miles north of the Project Site. Therefore, no active faults with the potential for surface fault rupture are known to pass directly beneath the Project Site, and the potential for surface rupture due to faulting occurring beneath the Project Site, is considered low. Thus, the Project would not exacerbate existing environmental conditions or cause or accelerate geologic hazards related to fault rupture as no known active or potentially active faults underlie the Project Site which could result in substantial damage to proposed structures or infrastructure or expose people to substantial risk of injury. **Impacts associated with surface rupture from a known earthquake fault would be less than significant, and no mitigation measures are required.**

Threshold (a): Would the project exacerbate existing hazardous environmental conditions by bringing people or structures into areas that are

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[10] *Now the California Geological Survey*

susceptible to potential substantial adverse effects, including the risk of loss, injury, or death involving:

ii. Strong seismic ground shaking?

As described above, the Project Site is located within the seismically active region of Southern California and would potentially be subject to strong seismic ground shaking if a moderate to strong earthquake occurs on a local or regional fault. However, state and local building code requirements, as discussed above in the Regulatory Framework, ensure that buildings are designed and constructed in a manner that, although the buildings may sustain damage during a major earthquake, would reduce the substantial risk that buildings would collapse. Specifically, the state and City mandate compliance with numerous rules related to seismic safety, including the Alquist-Priolo Earthquake Fault Zoning Act, Seismic Safety Act, Seismic Hazards Mapping Act, the City's General Plan Safety Element, and the Los Angeles Building Code. Pursuant to those laws, the Project must demonstrate compliance with the applicable provisions of these safety requirements before permits can be issued for construction of the Project. Accordingly, the design and construction of the Project would comply with all applicable existing regulatory requirements, the applicable provisions of the Los Angeles Building Code relating to seismic safety, and the application of accepted and proven construction engineering practices, including the specific geotechnical design recommendations set forth for the Project in the Geotechnical Investigation.

As with other development projects in the City, the Project would comply with the Los Angeles Building Code, which incorporates current seismic design provisions of the 2016 California Building Code, with City amendments, to minimize seismic impacts. The 2016 California Building Code incorporates the latest seismic design standards for structural loads and materials, as well as provisions from the National Earthquake Hazards Reduction Program to mitigate losses from an earthquake and maximize earthquake safety. LADBS is responsible for implementing the provisions of the Los Angeles Building Code, and the Project would be required to comply with the plan review and permitting requirements of LADBS, including the recommendations provided in a final, site-specific geotechnical report subject to review and approval by LADBS, as set forth below in Mitigation Measure GEO-MM-1. The final geotechnical report would include the recommendations of the Geotechnical Investigation included in Appendix C of this Draft EIR, and its final recommendations would be enforced by the LADBS for the construction of the Project. **Through compliance with regulatory requirements, site-specific geotechnical recommendations contained in a final design-level geotechnical engineering report required by Mitigation Measure GEO-MM-1 below, the Project would not exacerbate existing environmental conditions or cause or accelerate geologic hazards related to strong seismic ground shaking, which could result in substantial damage to structures or infrastructure, or expose people to substantial**

risk of injury. Thus, impacts related to strong seismic ground shaking would be less than significant.

Threshold (a): Would the project exacerbate existing hazardous environmental conditions by bringing people or structures into areas that are susceptible to potential substantial adverse effects, including the risk of loss, injury, or death involving:

iii. Seismic-related ground failure, including liquefaction?

As discussed above, according to the State of California Seismic Hazard Zones Map for the Venice Quadrangle, the Project Site is located within an area susceptible to liquefaction. The City's Safety Element also classifies the Project Site as part of an area that is susceptible to liquefaction. Furthermore, the City's Zoning Information and Map Access System indicates that the Project Site is located in an area that has been identified by the State as being potentially susceptible to liquefaction. As noted in the Geotechnical Investigation, borings on the properties next to the Project Site encountered groundwater at approximately 17 feet below ground surface.

According to the Geotechnical Investigation, liquefaction is likely to occur at the Project Site in thin layers/lenses generally below 20 feet below ground surface. As discussed in Section II, Project Description, of this Draft EIR, the Project includes two subterranean parking levels that would extend to a depth of approximately 28 feet below ground surface. Therefore, as part of the construction of the subterranean parking levels, the liquefiable soil layers above the floor of the subterranean parking (i.e., approximately 28 feet below ground surface) would be removed during excavation. As such, the liquefaction potential within the Project Site would be addressed during construction of the Project.

As discussed above, liquefaction-related effects include sand boils, excessive settlement, bearing capacity failures, and lateral spreading. As provided in the Geotechnical Investigation, the potential for liquefaction-related settlement would be addressed through the installation of mat foundations, as set forth in Mitigation Measure GEO-MM-1, below. Specifically, as detailed in the Geotechnical Investigation, with the implementation of mat foundations, the total estimated liquefaction-induced settlement (i.e., seismic settlement) is estimated to be 0.5 inch or less, and the differential seismic settlement is estimated to be 0.25 inch or less. The LADBS limits the total allowable settlement (including seismic) to 4 inches and the total allowable differential settlement (including seismic) to 2 inches. The total and differential settlements (including seismic) of the mat foundation of up to 1.5 inches and 0.75 inch, respectively, would be less than the limits set forth by the LADBS. With regard to lateral spreading, in order for lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along gently sloping ground toward an unconfined area, such as an unlined river channel. As described in Section II, Project Description, of this Draft EIR, the Project

Site is located in an urbanized area. In addition, the Project Site is relatively flat with a grade sloping to the south and east toward other existing developments. Furthermore, with the removal of the liquefiable soils and installation of mat foundations, the potential for liquefaction-related lateral spreading to occur within the Project Site would be addressed.

As stated above, the Project would also be required to comply with the permitting requirements of the LADBS, including the recommendations provided in a final design-level geotechnical report, as set forth below in Mitigation Measure GEO-MM-1. The final recommendations from that report would be enforced for the construction of the Project. The state and City also mandate compliance with numerous rules related to seismic safety, as provided above in Subsection 2.a, Regulatory Framework. Pursuant to those laws, and the mitigation measures proposed in this Draft EIR, the Project must demonstrate compliance with the applicable provisions of these safety requirements before permits can be issued for the construction of the Project.

Based on the above, through compliance with regulatory requirements, site-specific geotechnical recommendations contained in a final design-level geotechnical engineering report, and adherence to the mitigation measures provided below, the Project would not exacerbate existing environmental conditions or cause or accelerate geologic hazards related to liquefaction, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury. As such, with the implementation of Mitigation Measure GEO-MM-1, impacts associated with liquefaction would be reduced to a less than significant level.

Threshold (a): Would the project exacerbate existing hazardous environmental conditions by bringing people or structures into areas that are susceptible to potential substantial adverse effects, including the risk of loss, injury, or death involving:

iv. Landslides?

As summarized in Section VI, Other CEQA Considerations, of this Draft EIR, and evaluated in the Initial Study prepared for the Project included in Appendix A of this Draft EIR, landslides generally occur in loosely consolidated, wet soil and/or rocks on steep sloping terrain. The Project Site and surrounding area are fully developed and generally characterized by flat topography. The Project Site is not located in a landslide area as mapped by the City of Los Angeles, or within an area identified as having a potential for slope instability. The Project Site would not be susceptible to landslides and the Project would not exacerbate existing hazardous conditions related to landslides. As such, no impacts related to landslides would occur.

Threshold (b): Would the project result in substantial soil erosion or the loss of topsoil?

Development of the Project would require grading, excavation, and other construction activities that have the potential to disturb existing soils and expose soils to rainfall and wind, thereby potentially resulting in sedimentation and erosion. However, construction activities would occur in accordance with erosion control requirements, including grading and dust control measures, imposed by the City pursuant to grading permit regulations. Specifically, Project construction would comply with the Los Angeles Building Code, which requires permits, plans, plan checks, and inspections to ensure that the Project would reduce the sedimentation and erosion effects. In addition, as discussed in detail in Section IV.F, Hydrology and Water Quality, of this Draft EIR, the Project would be required to have a Storm Water Pollution Prevention Plan (SWPPP) during construction pursuant to National Pollutant Discharge Elimination System permit requirements. As part of the SWPPP, Best Management Practices would be implemented during construction to reduce sedimentation and erosion levels. Once operational, the Project Site would be paved and landscaped. As such, the Project Site's underlying soils would not be exposed and there would be a limited potential for soil erosion to occur during operation of the Project. **With compliance with regulatory requirements that include the implementation of Best Management Practices, the Project's impacts from soil erosion or the loss of topsoil would be less than significant, and no mitigation measures are required.**

Threshold (c): Would the project 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 caused in whole or in part by the project's exacerbation of existing of environmental conditions?

As summarized in Section VI, Other CEQA Considerations, of this Draft EIR, and evaluated in the Initial Study prepared for the Project included in Appendix A of this Draft EIR, landslides generally occur in loosely consolidated, wet soil and/or rocks on steep sloping terrain. The Project Site and surrounding area are fully developed and generally characterized by flat topography. The Project Site is not located in a landslide area as mapped by the City of Los Angeles, or within an area identified as having a potential for slope instability. **The Project Site would not be susceptible to landslides. As such, no impacts related to landslides would occur.**

As previously discussed, subsidence generally occurs when a large portion of land is displaced vertically, usually due to the rapid and intensive withdrawal of subterranean fluids such as groundwater or oil. According to the Geotechnical Investigation, the Southern California Gas Company operates a natural gas field beneath Playa del Rey,

located south of the Project Site. The natural gas storage area does not extend below the Project Site. Furthermore, as discussed in Section IV.F, Hydrology and Water Quality, of this Draft EIR, in the event groundwater is encountered during construction of the Project, temporary dewatering or other groundwater control methods could be required within the Project Site. In the event dewatering is required during construction, a temporary dewatering system would be installed and operated in accordance with General National Pollutant Discharge Elimination System Permit requirements. The dewatering system would be designed in accordance with recommendations in the final design-level geotechnical report and such that dewatering-induced ground settlements would be localized and controlled so as not to impact existing adjacent structures. If dewatering is required, it would not involve a large-scale extraction of groundwater. In addition, no large-scale extraction of gas, oil, or geothermal energy is occurring, or is planned at the Project Site. **Therefore, there is little to no potential for significant ground subsidence due to withdrawal of fluid or gas at the Project Site. Thus, the Project would not exacerbate, cause, or accelerate geologic hazards related to subsidence. Impacts related to subsidence would be less than significant.**

The Project's potential impacts associated with liquefaction are addressed above in Threshold (a)iii. As discussed therein, as part of the construction of the subterranean parking levels, the liquefiable soil layers above the floor of the subterranean parking (i.e., approximately 28 feet below ground surface) would be removed during excavation. As such, the liquefaction potential within the Project Site would be addressed during construction of the Project. As discussed above, liquefaction-related effects include sand boils, excessive settlement, bearing capacity failures, and lateral spreading. As provided in the Geotechnical Investigation, the potential for liquefaction-related settlement would be addressed through the installation of mat foundations, as set forth in Mitigation Measure GEO-MM-1, below. Specifically, as detailed in the Geotechnical Investigation, with the implementation of mat foundations, the total estimated liquefaction-induced settlement (i.e., seismic settlement) is estimated to be 0.5 inch or less, and the differential seismic settlement is estimated to be 0.25 inch or less. The LADBS limits the total allowable settlement (including seismic) to 4 inches and the total allowable differential settlement (including seismic) to 2 inches. The total and differential settlements (including seismic) of the mat foundation of up to 1.5 inches and 0.75 inch, respectively, would be less than the limits set forth by the LADBS. With regard to lateral spreading, in order for lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along gently sloping ground toward an unconfined area, such as an unlined river channel. As described in Section II, Project Description, of this Draft EIR, the Project Site is located in an urbanized area. In addition, the Project Site is relatively flat with a grade sloping to the south and east toward other existing developments. Furthermore, with the removal of the liquefiable soils and installation of mat foundations, the potential for liquefaction-related lateral spreading to occur within the Project Site would be addressed. **Overall, through compliance with regulatory requirements, site-specific geotechnical**

recommendations contained in a final design-level geotechnical engineering report, and implementation of the mitigation measures provided below, the Project would not exacerbate existing environmental conditions or cause or accelerate geologic hazards related to liquefaction, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury. As such, with the implementation of Mitigation Measure GEO-MM-1, impacts associated with liquefaction and lateral spreading would be reduced to a less than significant level.

Collapsible soils consist of loose, dry, low-density materials that collapse and compact under the addition of water or excessive loading. Soil collapse occurs when the land surface is saturated at depths greater than those reached by typical rain events.[11] According to the Geotechnical Investigation, the Project Site is located on alluvial soils that are derived from the nearby Ballona Creek. The alluvial soils that underlie the Project Site are characterized primarily as silt and clay with layers of sand and silty sand that extend approximately 17 to 20 feet below the Project Site. Further beneath the silt and clay is a layer of medium dense to dense sand that extends approximately 20 to 25 feet below the silt and clay layer. The sand layer is underlain by another layer of silt and clay that is approximately 5 to 15 feet thick. Due to the type and density of the soils underlying the Project Site, the Project Site soils would not be considered collapsible soils. In addition, as discussed in Section IV.F, Hydrology and Water Quality, of this Draft EIR, the subterranean levels of the Project would be designed such that they are able to withstand hydrostatic forces and incorporate comprehensive waterproofing systems in accordance with current industry standards and construction methods. **Therefore, the Project would not 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 collapse cause in whole or in part by the Project's exacerbation of existing environmental conditions.**

Threshold (d): Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property caused in whole or in part by the project exacerbating the expansive soil conditions?

As discussed in the Geotechnical Investigation, the alluvial soils on the Project Site have a low expansion potential. Therefore, the Project would not create substantial risks to life or property associated with expansive soils, and potential impacts related to expansive soils would not be exacerbated by the Project. Thus, impacts related to expansive soils would be less than significant.

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[11] *Association of Environmental & Engineering Geologists. Expansive and Collapsible Soil, www.aegweb.org/?page=ExpansiveSoil, accessed April 26, 2018.*

Threshold (e): Would the project 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 wastewater?

As summarized in Section VI, Other CEQA Considerations, of this Draft EIR, and evaluated in the Initial Study prepared for the Project included in Appendix A of this Draft EIR, the Project Site is located within a community served by existing sewage infrastructure. The Project's wastewater demand would be accommodated by the connections to the existing wastewater infrastructure. As determined in the Initial Study, the Project would not result in impacts related to the ability of soils to support septic tanks or alternative wastewater disposal systems. Therefore, the Project would have no impact related to the ability of soils to support septic tanks or alternative wastewater disposal systems.

Landform Alteration: Cause one or more distinct and prominent geologic or topographic features to be destroyed, permanently covered, or materially and adversely modified as a result of the project. Such features may include, but are not limited to, hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, and wetlands.

There are no distinct and prominent geologic or topographic features (i.e., hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, or wetlands) on the Project Site or vicinity. **Therefore, the Project would not destroy, permanently cover, or materially and adversely modify any distinct and prominent geologic or topographic features. Impacts associated with landform alteration would not occur, and no mitigation measures are required.**

d. Cumulative Impacts

Due to the site-specific nature of geological conditions (i.e., soils, geological features, subsurface features, seismic features, etc.), geology impacts are typically assessed on a project-by-project basis, rather than on a cumulative basis. Nonetheless, cumulative growth through 2023, the Project's anticipated build-out year, (inclusive of the 39 related projects identified in Section III, Environmental Setting, of this Draft EIR) would expose a greater number of people to seismic hazards. However, as with the Project, related projects and other future development projects would be subject to established guidelines and regulations pertaining to building design and seismic safety, including those set forth in the California Building Code and Los Angeles Building Code. **With adherence to applicable regulations, the Project's impacts, together with impacts associated with the related projects, with regard to the exacerbation of geological and soils**

constraints, would not be cumulatively considerable and cumulative impacts with regard to geology and soils would be less than significant.

e. Mitigation Measures

The following mitigation measure would ensure that the Project's potential impacts associated with liquefaction and any associated settlement would be reduced to less than significant levels:

Mitigation Measure GEO-MM-1: Prior to issuance of grading permits, the Applicant shall submit final design plans and a final design-level geotechnical report to the Los Angeles Department of Building and Safety for review and approval. The design-level geotechnical report shall be used for final design of the foundation system for the structures and shall take into consideration the engineering properties beneath the proposed structures and the projected loads. The final report shall specify geotechnical design parameters that are needed by structural engineers to determine the type and sizing of structural building materials. The final report shall be subject to the specific performance criteria imposed by all applicable state and local codes and standards. The final geotechnical report shall be prepared by a registered civil engineer or certified engineering geologist and include appropriate measures to address seismic hazards and ensure structural safety of the proposed structure. The proposed structure shall be designed and constructed in accordance with all applicable provisions of the California Building Code and the Los Angeles Building Code. The design-level geotechnical report shall address each of the recommendations provided in the *Geotechnical Feasibility Report Marina Marketplace Phase III 13450 W. Maxella Avenue, Marina del Rey, California* prepared by Golder Associates, Inc., dated January 16, 2015 (Revised March 16, 2017), including, but not limited to the following:

- A mat foundation shall be required on native soils with a static allowable bearing pressure per the final geotechnical recommendations.
- A mat foundation with an allowable passive resistance and friction factor shall be based on the recommendations of the geotechnical consultant.
- Waterproofing of the base and sides of the mat foundation shall be required to prevent moisture intrusion and water seepage through walls.
- Basement walls shall be designed per the recommendations of the final geotechnical report.

- Retaining walls shall be designed using the active and at-rest earth pressures provided in the final geotechnical report.
- Wall backfill specifications (e.g., material gradation, compaction requirements, etc.), and surcharge conditions shall be designed per the recommendations of final geotechnical report.
- Walls shall be provided with backdrains to prevent buildup of hydrostatic pressures behind walls or be designed to withstand hydrostatic pressures.
- Backdrains, if utilized, shall be designed per the recommendations of the final geotechnical report.
- Corrosivity testing shall be performed during the final design.
- Concrete mix design shall be reviewed by a qualified corrosion engineer to evaluate the general corrosion potential of the Project Site.
- Buried metallic structures and elements shall be designed with corrosions protection as determined by a qualified corrosion engineer.
- Project Site soils shall be evaluated for expansion in the final geotechnical report.
- All surface water shall be diverted away from excavations.
- All basement excavations including sloping and/or shoring shall be designed per the recommendations of the final geotechnical report.

f. Level of Significance After Mitigation

Considering the rigorous investigation process required under the engineering standard of care, compliance with state laws and City regulatory requirements, technical review and final approval by the LADBS of a design-level geotechnical report, and adherence to applicable regulatory requirements and with the implementation of the mitigation measure proposed above, the Project's impacts related to geology and soils would be less than significant. In addition, cumulative impacts with regard to geology and soils would be less than significant.