4.4 Geology and Soils

4.4.1 Introduction

This section evaluates potential geologic and soils hazards associated with the Project including fault rupture, ground shaking, liquefaction, expansive soils, and landforms/landslides. A related issue, erosion, is addressed in Section 4.7, *Hydrology and Water Quality*, of this Draft EIR. This Geology section is based on information and findings presented in the Geotechnical Feasibility Investigation and Geologic-Seismic Hazard Assessment (the Geotechnical Report) prepared for the Project by Geotechnical Professionals Inc. (GPI), included as Appendix E to the Draft EIR.[1]

4.4.2 Environmental Setting

Existing Conditions

Regional Geology

The Project Site is located at the northeast portion of the Los Angeles Basin. The Los Angeles Basin is a northeast-trending structural basin filled with Tertiary age marine sedimentary rocks mantled by recent Pleistocene age non-marine alluvial sediments deposited by washes and streams flowing southward from the San Gabriel Mountains and Repetto Hills to the north of the Site. Published geologic maps indicate that the Site is underlain at depth by Tertiary Marine sedimentary rocks of the Fernando and other Formations.

Local Geology

The bedrock geology exposed in the Repetto Hills just north of the Site indicates folds and faults with a northwest trend that parallel the trend of the Whittier fault system. Although, the faults and folds exposed in the hills are not currently zoned as "active," a growing body of evidence suggests that these structures may be active in response to activity on the Elysian Park blind thrust fault. This fault is thought to be responsible for the Elysian Park Anticline and similar, smaller folds to the northeast.

A few surface faults have been mapped within the Repetto Hills, most of which are unnamed. Many minor faults probably exist within the hills and have resulted as a product of the folding (compressional) processes.

Soils and Subsurface Conditions

The Project Site is underlain by Quaternary age surficial sediments mapped as alluvial floodplain deposits. These sediments are described as unconsolidated gravel, sand and silt.

The subsurface profile consists of natural soils and minor fills near the existing ground surface. Deeper fills in the form of existing utility trench backfill may be present. Undocumented fill soils may exist in the upper 1 to 3 feet of the subsurface soils profile. The deeper fills are associated with recent improvements at the Project Site. The natural soils consist of interbedded layers of

[1] Geotechnical Professionals Inc, *Geotechnical Feasibility Investigation, AVA Arts District, 668 S. Alameda Street, Los Angeles, California*, March 2017.

silty sands and sands. These materials exhibit moderate to high strengths and low to moderate compressibility characteristics.

Expansive Soil

Expansive soils contain significant amounts of clay particles that swell considerably when wetted and shrink when dried. Foundations constructed on these soils are subject to uplifting forces caused by the swelling. Without proper mitigation measures, heaving and cracking of both building foundations and slabs-on-grade could result. Expansive or collapsible soils were not encountered during on-site field explorations. Per the Geotechnical report, undocumented fill soils are anticipated to exist in the upper 1 to 3 feet of the soil profile. Some deeper fills are associated with recent improvements to the site. The natural soils encountered during soil explorations consisted of interbedded layers of medium dense to very dense silty sands. These natural soils generally exhibit moderate to high strength and low to moderate compressibility characteristics. Although not encountered in exploratory borings of the Project Site, the existence of expansive soils cannot be ruled out. However, the lack of shallow groundwater conditions at the Project Site would generally preclude the potential for soil expansion or collapse.

Groundwater

Groundwater was not encountered to the maximum depth explored of 37.5 feet below ground surface (bgs). Historical groundwater levels are greater than 150 feet bgs.

Geologic Hazards

Fault Rupture and Systems

Fault rupture is defined as the displacement that occurs along the surface of a fault during an earthquake. Based on criteria established by the California Geological Survey (CGS), faults are classified as active, potentially active, or inactive. According to those criteria, active faults are those that have shown evidence of movement within the past 11,000 years (i.e., Holocene epoch). Potentially active faults are those that have shown evidence of movement between 11,000 and 1.6 million years ago (Quaternary age). Faults showing no evidence of surface displacement within the last 1.6 million years are considered inactive for most design purposes, with the exception of design of some critical buildings or structures; e.g., hospitals, communication centers, and emergency response centers.

Regional Fault Systems

The geologic structure of southern California is dominated by northwest trending faults associated with the San Andreas Fault System. Faults such as the Newport-Inglewood, Whittier, Palos Verdes Hills and San Jacinto are all considered active and are all associated with the San Andreas, which collectively form the boundary between the North American and Pacific tectonic plates. Most of these faults have ruptured the ground surface historically and/or produced significant earthquakes.

Anomalous to the general northwest structural fabric are a series of active west trending reverse or thrust faults. The majority of these occur as north dipping planes projecting along the southern base of the Santa Monica and San Gabriel Mountains in the greater Los Angeles area. The known active thrust faults in the region include the Cucamonga, Sierra Madre, San Fernando, Raymond, Santa Monica and Hollywood faults.

Concealed Faults

Another category of fault known as the "blind thrusts" was recognized as a significant seismic hazard following the 1987 magnitude 6.0 Whittier Narrows Earthquake and then again by the 1994 San Fernando magnitude 6.7 Earthquake. The north to south structural convergence in the region is a result of deep-seated fault movement along features called “blind thrusts.” These are buried low angle north and some south dipping faults which do not project to the ground surface, but are capable of generating a major earthquake that may cause uplift in the form of anticlinal hills. Some uplands that surround the Los Angeles Basin, including the Elysian Park and Repetto Hills, are products of blind thrusts. Because blind thrusts do not intersect the ground surface, primary surface fault rupture is considered unlikely. Major portions of the Los Angeles Basin are now believed to be underlain by various blind thrusts ramps. Due to continued north-south convergence (shortening) across the Los Angeles Basin, slippage along these features will generate earthquakes.

At the present time, the potential magnitudes and recurrence intervals of blind thrust produced earthquakes cannot be quantified with confidence because many characteristics of these features (including areal extent and Quaternary slip rates) are poorly understood. Nonetheless, the proximity to densely populated urban centers and their history of producing damaging earthquakes clearly demonstrate the risk that blind thrusts pose to large metropolitan areas such as Los Angeles and surrounding cities.

Seismogenic Sources Near the Project Site

Distances between the Project Site and active faults in Southern California are listed in **Table 4.4-1**, *Major Faults Considered to be Active or Potentially Active in the Los Angeles Area,* below. **Figure 4.4-1**, *Regional Fault Map*, illustrates the locations of the region’s active and potentially active faults and fault zones.

In 1987, the magnitude 5.9 Whittier Narrows Earthquake occurred on a previously unknown blind thrust, which has now been given the name Elysian Park Blind Thrust or Structural Zone. This fault underlies the Elysian Park Hills at 3 km and deepens northward to 10 km of depth. Because of the 1987 event, the fault has been placed into an active category and has been tentatively mapped to underlie a major portion of the eastern Los Angeles Basin and adjacent San Gabriel Valley to the north. Subsequent to this earthquake was the 1994 M6.7 Northridge Earthquake in the San Fernando Valley. This earthquake occurred along a previously unknown similar blind thrust fault. This type of active faulting and resulting earthquake activity are considered relatively common in regions undergoing convergence. The Elysian Park Thrust has a length of 34 km, slip rate of 1.50 mm/yr and is capable of generating a maximum earthquake of M6.7.

The Puente Hills Blind Thrust is a north dipping blind thrust extending from the Santa Fe anticline northward to the Montebello anticline. Movement on the fault is responsible for the 1987 Whittier Narrows earthquake. Research on the earthquake and its aftershocks, as well as fault plane reflections, have resulted in the conclusions that the fault is located between 3 and 7 kilometers below sea level. Data on the slip rate and possible recurrence intervals are still being researched.

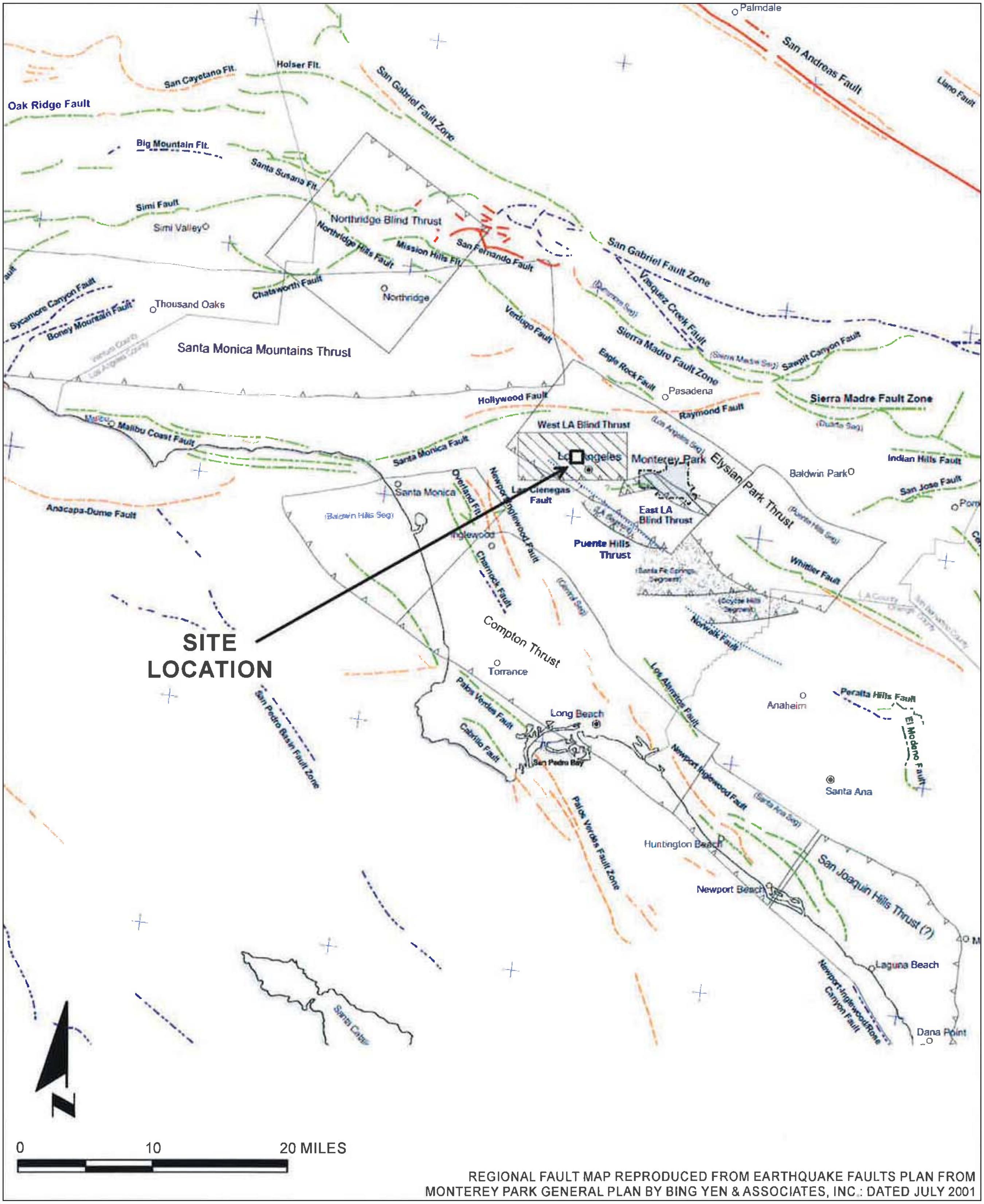
TABLE 4.4-1
MAJOR FAULTS CONSIDERED TO BE ACTIVE OR POTENTIALLY ACTIVE IN THE LOS ANGELES AREA

Fault	Maximum Credible Earthquake (magnitude)	Slip Rate (mm/yr)	Distance from the Project Site[a] (approximate miles)	Direction of Fault
Elysian Park Blind Thrust	6.7	1.5	2.2	North to South
Puente Hills Blind Thrust (LA)	Unknown[b]	Unknown[b]	3.3	North
Hollywood	7.0	1.5	5.7	East
Santa Monica (Alt.)	7.0	1.5	6.0	East-west
Raymond	6.5	0.5	12	East
Newport-Inglewood Fault Zone	7.0	0.6	7.5	Southeast
Verdugo	6.8	0.5	13.1	Northeast
Santa Monica	7.0	0.39	10.4	North
Puente Hills Blind Thrust (Santa Fe Springs)	-	-	10.44	North
Elsinore	7.5	4.0	11.1	Southeast
Sierra Madre	7.0	4.0	12.4	North
Puente Hills Blind Thrust (Coyote Hills)	-	-	14.8	-

Notes:
[a] Defined as the closest distance to projection of rupture area along fault trace.
[b] Data on the slip rate and possible recurrence intervals are still being researched.

Sources:
California Institute of Technology, Southern California Earthquake Data Center, Significant Earthquakes and Faults, 2017 http://scedc.caltech.edu/significant/index.html;
GPI, Geotechnical Feasibility Investigation and Geologic-Seismic Hazard Assessment, Proposed Ava Arts District, 668 S. Alameda Street, Los Angeles, CA, February, 2017.

The Hollywood and Santa Monica Faults comprise the western and central portions of the Santa Monica-Hollywood-Raymond fault system, a generally east west trending series of oblique, reverse and left-lateral strike-slip faults. The Hollywood Fault is mapped along the foot of the southern flank of the east-west trending Santa Monica Mountains about 9.2 kilometers to the northwest of the Site at its closest approach. Mapping of the feature indicates the fault has a length projecting from the coast eastward to the Los Angeles River channel. Locations of the faults are poorly constrained in the field due to alluvial cover and urban development. The fault is believed to be a high angle, north dipping thrust fault and has been partly responsible for uplift of the Santa Monica Mountains. Carbon dating methods indicate the fault has moved at least once between 8,000 to 17,000 years ago, which places in into a likely active category. No significant historic earthquakes have been associated with the fault. The faults are capable of producing a moment magnitude (Mw) 6.5 earthquake and perhaps larger if couple with simultaneous movement on an adjacent fault. The feature has been assigned a slip rate of 1.0 mm/yr. Studies dated the most recent surface rupture of the Hollywood fault at between about 6,000 and 11,000 years ago, with a possible earlier surface rupture about 22,000 years ago, indicating a relatively long recurrence interval between surface rupture events. The Hollywood Fault has been recently re-assessed by the State of California. However, the revised locations do not impact the Project Site.



SOURCE: Geotechical Professionals Inc., 2017

668 S. Alameda Street

Figure 4.4-1
Regional Fault Map

ESA PCR

The Raymond Fault projects roughly east-west from the San Gabriel Mountains to at least the Arroyo Seco in South Pasadena. The fault has a length of about 15 miles. This north dipping thrust fault lies approximately 9.6 kilometers to the north of the subject Site. A well-developed linear scarp up to 100 feet high clearly defines the feature. Fault investigations indicate the fault has moved at least once in the last 10,000 years (Holocene Time) placing it into an active category. Minor earthquakes have occurred within the Raymond Basin to the north and in 1991 a moderate sized event (M5.8) occurred beneath Pasadena presumably on the Raymond Fault though no surface rupture was reported. The Raymond Fault is assigned a maximum magnitude of 6.5 and a slip rate of 0.5 mm/yr.

Alquist-Priolo Earthquake Fault Zone

The Alquist-Priolo Earthquake Fault Zoning Act (formerly known as the Alquist-Priolo Special Studies Zones Act) defines "active" and "potentially active" faults utilizing the same age-based criteria as the CGS. Established state policy has been to zone only those faults that have direct evidence of movement within the last 11,000 years. The CGS considers more recent activity as having the highest potential for continued activity and potential for ground rupture in the future. CGS policy is to delineate a boundary zone on either side of a known fault trace, called the Alquist-Priolo Earthquake Fault Zone. The delineated width of an Alquist-Priolo Earthquake Fault Zone is based on the location precision, complexity, or regional significance of the fault can be between 200 and 500 feet wide on either side of the fault trace. If a site lies within a designated Alquist-Priolo Earthquake Fault Zone, a geologic fault rupture investigation must be performed that demonstrates a proposed building site is not threatened by surface displacement from the fault, before development permits may be issued. Based on a review of available literature, and as summarized in the Geotechnical Report, the Project Site is not located within a designated Alquist-Priolo Earthquake Fault Zone.

The City also has a system for identifying fault lines and requiring fault rupture studies. The City designates the areas within 500 feet of a fault line as Fault Rupture Study Areas. The Project Site is not located within a City of Los Angeles Fault Rupture Study Area and the nearest Fault Rupture Study Areas to the Project Site is over 4 miles to the north of the Project Site.[2]

Ground Shaking

As noted above, the Project Site is not located within an Alquist-Priolo Earthquake Fault Zone or City Fault Rupture Study Area. However, the Site is located within seismically active Southern California. Active faults and fault systems that might generate seismic shaking at the Project Site include the Elysian Park Blind Thrust, Puente Hills Blind Thrust, Hollywood and Santa Monica Faults, and Raymond Fault, as well other regional faults in the Los Angeles area.

Liquefaction

Liquefaction is a form of earthquake-induced ground failure that occurs primarily in relatively shallow, loose, granular, water-saturated soils. Liquefaction can occur when these types of soils lose their inherent shear strength due to excess water pressure that builds up during repeated movement from seismic activity. A shallow groundwater table, the presence of loose to medium

2 City of Los Angeles General Plan Safety Element, Exhibit A, Alquist-Priolo Special Study Zones and Fault Rupture Study Areas, 1994.

dense sand and silty sand, and a long duration and high acceleration of seismic shaking are factors that contribute to the potential for liquefaction. Liquefaction usually results in horizontal and vertical movement of soils from lateral spreading of liquefied materials and post-earthquake settlement of liquefied materials.

The Seismic Hazards Mapping Act requires the State Geologist to delineate seismic hazard zones in areas where the potential for strong ground shaking, liquefaction, landslides, and other ground failures due to seismic events are likely to occur. The Seismic Hazard Map for the Los Angeles Quadrangle by the State of California (CGS, 1999) does not classify the Project Site as being within an area susceptible to liquefaction. This determination is based on groundwater depth records, soil type, and distance to a fault capable of producing a substantial earthquake.

Seismically Induced Settlement

Seismically-induced settlement or compaction of dry or moist, cohesionless soils can be caused by earthquake-related ground motion. Such settlement is typically most damaging when it is differential in nature across the length of structures. During a strong seismic event, seismically induced settlement can occur within loose to moderately dense, unsaturated granular soils, separate from liquefaction. Settlement caused by ground shaking is often non-uniformly distributed, which can result in differential settlement. If strong seismically-induced groundshaking occurs, the estimated magnitude of seismic ground subsidence is expected to be less than 0.25-inch.

Lateral Spreading

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 soil zone must be laterally continuous, unconstrained laterally, and free to move along sloping ground. Due to the low susceptibility for liquefaction, the potential for lateral spreading is also considered low.

Slope Stability and Seismically Induced Landslides

The Site topography and vicinity is relatively flat, with ground surface elevations ranging from approximately 246 to 250 feet across the Site. The Seismic Hazard Map for the Los Angeles Quadrangle by the State of California (CGS, 1999) does not classify the Project Site as being within an area susceptible to seismically induced landslides.

Oil Fields and Methane

The Project Site is not located within the limits of an oil field, and no oil wells are known to have been drilled on the Project Site.[3],[4] In addition, the Project Site is not located within a City of Los Angeles Methane Zone or Methane Buffer Zone.[5]

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3 California Environmental Geologists and Engineers, Inc., 2016, *California Environmental, Environmental Site Assessment – Phase I and Screening Subsurface Assessment Phase II, Commercial/Industrial Property, APNs 5164-022-005, 5164-022-010 & 5164-23-004, -015, -016, -019, -020, -021, -022, -023, 668 S. Alameda Street and 1522-1570 Industrial Street, Los Angeles, CA 90021*, December 2016.

4 State Water Resources Control Board, GeoTracker, https://geotracker.waterboards.ca.gov/, accessed February 24, 2017.

5 Los Angeles Department of Planning Zimas, http://zimas.lacity/org/ accessed February 24, 2017.

4.4.3 Regulatory Framework

This section provides an overview of state, and local environmental laws, policies, plans, regulations, and/or guidelines (hereafter referred to generally as "regulatory requirements") relevant to geology, soils, and seismicity.

State

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. [6] The purposes of the Alquist-Priolo Earthquake Fault Zoning Act are to prevent the construction of buildings intended for human occupancy on the surface traces of active faults, to provide the citizens with increased safety and to minimize the loss of life during and immediately 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." These are zones that lie within 500 feet on either side of the surface traces of active faults. The State Geologist is also required to issue appropriate maps to assist cities and counties in planning, zoning, and building regulation functions. Local agencies 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 that is within an Alquist-Priolo 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. Although setback distances may vary, a minimum 50-foot setback is required.

Seismic Hazards Mapping Act

To address the effects of strong ground shaking, liquefaction, landslides, and other ground failures due to seismic events, the State of California passed the Seismic Hazards Mapping Act of 1990 (Public Resources Code Section 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 until the geologic and soil conditions of the Project Site are investigated and appropriate mitigation measures, if any, are incorporated into development plans.

The State Mining and Geology Board provides additional regulations and policies to assist municipalities in preparing the Safety Element of their General Plan and encourage land use management policies and regulations to reduce and mitigate those hazards to protect public health and safety. Under the Seismic Hazards Mapping Act, cities and counties are required, prior to the approval of a project located in a seismic hazard zone, to prepare a geotechnical report defining and delineating any seismic hazard. Each city or county is required to submit one copy of each

6 The Act was originally entitled the Alquist-Priolo Geologic Hazards Zone Act.

geotechnical report, including mitigation measures, to the State Geologist within 30 days of its approval

State publications supporting the requirements of the Seismic Hazards Mapping Act include the California Geological Survey SP 117A, *Guidelines for Evaluating and Mitigating Seismic Hazards in California and SP 118, Recommended Criteria for Delineating Seismic Hazard Zones in California*. The objectives of SP 117A 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. SP 118 implements the requirements of the Seismic Hazards Mapping Act in the production of Probabilistic Seismic Hazard Maps for the State.

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. 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 7-10, *Minimum Design Loads for Buildings and Other Structures*, provides requirements for general structural design and includes means for determining earthquake loads[7] 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

[7] 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.

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 Chapter 16 of the CBC. Chapter 18 of the CBC covers the requirements of geotechnical investigations (Section 1803), excavation, grading, and fills (Section 1804), load-bearing of soils (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, 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.

Chapter 18 also describes analysis of expansive soils and the determination of the depth to groundwater table. Expansive soils are defined in the CBC as follows:

> **1803.5.3 Expansive Soil**. In areas likely to have expansive soil, the building official shall require soil tests to determine where such soils do exist. Soils meeting all four of the following provisions shall be considered expansive, except that tests to show compliance with Items 1,2 and 3 shall not be required if the test prescribed in Item 4 is conducted:
>
> 1. Plasticity index (PI) of 15 or greater, determined in accordance with ASTM D 4318
> 2. More than 10 percent of the soil particles pass a No. 200 sieve (75 micrometers), determined in accordance with ASTM D 422
> 3. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D 422
> 4. Expansion index greater than 20, determined in accordance with ASTM D 4829

Specific CBC building and seismic safety regulations contained in Chapter 16 and Chapter 18 regarding soils and foundations of the CBC have been incorporated by reference into the Los Angeles Municipal Code (LAMC) with local amendments.

City of Los Angeles

General Plan Safety Element

The City's General Plan Safety Element, which was adopted in 1996, addresses public safety risks due to natural disasters including seismic events and geologic conditions, as well as sets forth guidance for emergency response during such disasters. The Safety Element also provides maps of designated areas within the City that are considered susceptible to earthquake-induced hazards, such as fault rupture and liquefaction. Safety Element goals, objectives, and policies are broadly stated to provide information for planning future development and guidance for the City's Emergency Operations Organization in planning to address emergency situations.

Information presented in the Safety Element is in some cases supplemented by more detailed and/or up-to-date information that is developed by the City and presented in Navigate LA (http://navigatela.lacity.org/index.cfm), Zone Information and Map Access System (ZIMAS) (http://zimas.lacity.org/), and Los Angeles Department of Building and Safety (LADBS) Parcel Profile Report (http://www.permitla.org/parcel/).

Los Angeles Municipal Code

Chapter IX of the LAMC contains the City's Building Code, which 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. To that end, LADBS issues building and grading permits for construction projects. Building permits are required for any building or structure that is erected, constructed, enlarged, altered, repaired, moved, improved, removed, converted, or demolished. Grading permits are required for all grading projects other than those specifically exempted by the LAMC. The function of the City's Building Code, which comprises Chapter IX of the LAMC, is to ensure life safety and compliance with the LAMC.

The sections of Chapter IX address numerous topics including earthwork and grading activities, import and export of soils, erosion and drainage control and general construction requirements that address flood and mudflow protection, slides and unstable soils. Additionally, the Los Angeles Building Code includes specific requirements addressing seismic design, grading, foundation design, geologic investigations and reports, soil and rock testing, and groundwater. Specifically, LAMC, Chapter IX, Section 91.1803, requires that a Final Geotechnical Report with final design recommendations must be prepared by a California-registered geotechnical engineer and submitted to the LADBS for review prior to issuance of a grading permit. Final foundation design recommendations must be developed during final project design, and other deep foundation systems that may be suitable would be addressed in the Final Geotechnical Report. All earthwork (i.e., excavation, site preparation, any fill backfill placement, etc.) must be conducted with engineering control under observation and testing by the Geotechnical Engineer and in accordance by the LADBS.

4.4.4 Environmental Impacts

Methodology

This analysis of impacts associated with geology and soils is based on the Geotechnical Report prepared for the Project by GPI and included as Appendix E to the Draft EIR. The scope of work for the Geotechnical Report includes a review of available data, including the reports prepared for the parking structure southeast of the Project Site, geologic mapping, field exploration, laboratory testing, geophysical surveys, slope stability analysis, and engineering evaluations.

The Geotechnical Report was prepared according to requirements established by LADBS. The requirements are based on guidelines and specifications established in such sources as the City of Los Angeles Building Code, the California Geological Survey, American Society for Testing and Materials (ASTM) and Department of Building and Safety Information Bulletins (IB), which document LADBS requirements and guidelines for specific topics in greater detail than the Building Code.

Per the established procedures, the Geotechnical Report evaluates underlying soils and geologic conditions to determine their potential for instability or other geologic hazards, as well as procedures to correct identified hazardous conditions needed to ensure that new building construction is safe. Site borings were conducted at various locations across the Project Site to ensure coverage across the entire building(s), and capture conditions at all locations. A geophysical survey was also performed to determine depth to bedrock and to evaluate the presence of existing, buried concrete piles. The Geotechnical Report provides sufficient detail to determine whether the Project Site is suitable for the intended use and whether more detailed studies are required to address specific geological issues.

A Final Geotechnical Report must also be prepared and reviewed by the City prior to issuance of building permits, which is prepared based on the final construction and building plans prepared by the Applicant. Based on the ground conditions and building design, the Final Geotechnical Report will include specific recommendations for Site preparation, excavation, foundation design and shoring/retaining wall specifications.

Thresholds of Significance

Appendix G of the State CEQA Guidelines provides a set of screening questions that address impacts with regard to geology and soils. In 2015, *the California Supreme Court in California Building Industry Association v. Bay Area Air Quality Management District* (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 thresholds 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.

Would the project:

- Expose people or structures to 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 based on other substantial evidence of a known fault, caused in whole or in part by the project's exacerbation of the existing environmental conditions? Refer to Division of Mines and Geology Special Publication 42;
  - Strong seismic ground shaking, caused in whole or in part by the project's exacerbation of the existing environmental conditions;
  - Seismic-related ground failure, including liquefaction, caused in whole or in part by the project's exacerbation of the existing environmental conditions; or
  - Landslides, caused in whole or in part by the project's exacerbation of the existing environmental conditions?
- Result in substantial soil erosion or the loss of topsoil?
- 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 the existing environmental conditions?
- Be located on expansive soils, as defined by 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's exacerbation of the existing environmental conditions?
- 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?

As discussed in the Initial Study, provided in Appendix A-2 of this Draft EIR, and in Chapter 6, *Other CEQA Considerations*, the Project Site is relatively flat and is not located within a City-designated hillside or landslide area. Accordingly, the Project would not expose people or structures to potential substantial adverse effects involving landslides and no impact would result. Furthermore, the Project Site is located in an urbanized area with wastewater infrastructure currently in place and no use of septic tanks is proposed. Thus, no impact would occur regarding septic tanks or alternative waste disposal systems. Per the Initial Study, no further analysis of these topics in this EIR section is necessary. Besides these topics, the other geology and soils topics were determined to have a potentially significant impact in the Initial Study. The potentially significant impacts identified in the Initial Study are covered below under the City's L.A. CEQA Thresholds Guide thresholds.

The L.A. CEQA Thresholds Guide incorporates the screening questions contained in Appendix G. In accordance with the City's thresholds, a project would normally have a significant geology and soils impact if it would:

Geologic Hazards

GS-1 Cause or accelerate geologic hazards, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

Sedimentation and Erosion

GS-2 Constitute a geologic hazard to other properties by causing or accelerating instability from erosion; or

GS-3 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.

Landform Alteration

GS-4 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.

Project Characteristics and Project Design Features

The Project would demolish all existing on-site improvements (i.e., buildings, surface parking lots, and all other related improvements) in order to construct a new mixed-use residential and commercial development as further described in Chapter 2, *Project Description*, of this Draft EIR. Parking for vehicles would be provided within three subterranean levels and one at-grade level. To accommodate the subterranean levels, the Project would excavate the Project Site to a depth of approximately 40 feet bgs, resulting in the excavation of approximately 185,000 cubic yards of soil material, all of which would be exported off-site.

During Project construction, the use of temporary shoring systems may be necessary where excavation takes place. Excavated soils would be balanced onsite and no export or import of soils is anticipated. In accordance with Building Code requirements, a Final Geotechnical Report with final design recommendations would be prepared by a California-registered geotechnical engineer and submitted to the City Department of Building and Safety for review prior to issuance of a grading permit. Final foundation design recommendations would be developed during final Project design, and other deep foundation systems that may be suitable would also be evaluated at that time and addressed in Final Geotechnical Report. Activities associated with the grading would occur in accordance with City requirements, as specified in the LAMC and through the grading plan review and the approval process.

Project Impacts

Geologic Hazard Effects

Threshold GS-1: The Project would result in a significant geology and soils impact if it would cause or accelerate geologic hazards, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.

Impact Statement GS-1: Implementation of LAMC regulations would ensure geologic hazards impacts are less than significant. With adherence to the recommendations of the qualified geotechnical engineer, the Project is not anticipated to cause or exacerbate geologic hazards that would result in damage to structures or exposure of people to substantial risk of injury as a result of fault rupture, seismic ground shaking, liquefaction, expansive and compressible soils, or land-sliding. As such, impacts would be less than significant.

Fault Rupture

No known active or potentially active faults underlie the Project Site, and the Project Site is not located within a designated earthquake fault zone. Thus, the potential for surface ground rupture at the Project Site is considered low. Development of the Project would not result in substantial damage to structures or cause or accelerate geologic hazards, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury as a result of fault rupture. Impacts regarding fault rupture would be less than significant, and no mitigation measures would be necessary.

Ground Shaking/Seismicity

The Project Site is located within a seismically active region of Southern California, and the most likely sources for ground motion are known faults (e.g., Elysian Park Blind Thrust, Puente Hills Blind Thrust, Hollywood and Santa Monica Faults, and Raymond Fault) located within ten miles of the Project Site. Moderate to strong ground motion (acceleration) at the Project Site could be caused by an earthquake at these or any of the local or regional faults. Under CBC Seismic Design Parameters, the design value for building construction is based on mapped spectral response acceleration parameters that take into account ground motion, use, and other factors.

During the Project's final design phase, a Final Geotechnical Report would be prepared by a California-registered geotechnical engineer and submitted to the Department of Building and Safety for review and approval. As with any new project development in the City, building foundation design and construction are required to conform to current seismic design provisions of the 2016 CBC, as amended by the City's Building Code. The Geotechnical Report evaluates known and potentially active faults and ground-motion parameters in compliance with Chapter IX, Div. 16 of the Municipal Code (including applicable sections of CBC Chapter 16). The City's Building Code, including Chapter IX, Div. 16, Section 91.1613, incorporates specific seismic design standards for structural loads and materials to provide for earthquake safety. The approved Final Geotechnical Report required under LAMC Section 91.1803, would set forth specific construction guidelines consistent with the CBC and Municipal Code. With compliance with applicable codes the Project would not increase or exacerbate risk from seismic ground shaking that would cause greater damage to structures or expose people to substantial risk of injury. Therefore, impacts with respect to seismic ground shaking would be less than significant.

Corrosive Soils

The Geotechnical Report recommends that testing of on-site soils should be performed during a design-level investigation as part of the Final Geotechnical Report and a corrosion engineer should be consulted for design services. If ferrous building materials could be placed in contact with onsite soils, the corrosion engineer would provide design-level recommendations regarding chosen construction materials and/or protection features for the proposed structure. With such testing, if deemed necessary, and adherence to the recommendations of the Final Geotechnical Report, impacts related to corrosive soils would be less than significant.

Expansive Soils

The Project Site's near surface onsite soils are generally considered to have a low potential for expansion. With adherence to CBC and LAMC building regulations applicable to expansive soils, the proposed structures and building would not be adversely affected by soil expansion. Additional expansion testing would be performed on bearing surfaces at or near the completion of overexcavation (excavation below grade) to confirm that structures would not be affected by soil expansion. Soil excavation and building foundation requirements appropriate to site-specific soil conditions would be included in the Final Geotechnical Report. With compliance to CBC and Building Code regulations, as well as soil excavation and foundation requirements of the Final Geotechnical Report, impacts related to expansive soils would be less than significant.

Landslides

The Site topography and vicinity is relatively flat, with ground surface elevations ranging from approximately 246 to 250 feet across the Site. According to the Geotechnical Report, the potential for landsliding and seismically induced slope instability at the Project Site is considered unlikely. In addition, the Project Site is not located within a designated landslide area, as shown in the Los Angeles General Plan Safety Element, Exhibit C, Landslide Inventory and Hillside Areas in the City. Further, the Project would not create new significant slopes on the Project Site which would be subject to landslide hazards. Therefore, landslides are not expected to pose a risk to people or structures on the Project Site, and impacts associated with landslides or other forms of natural slope instability would be less than significant.

Temporary Excavations – Site Stability

Due to current Project Site uses, there is a potential for soils below the freezer building(s) to be frozen if insulation below the slab on grade was not provided. Since there is no known water source, deep influence of the low temperatures is not expected. As noted in the Geotechnical Report, the excavations for the proposed subterranean level(s) should remove these soils.

The structures would be located immediately adjacent to the existing streets and properties. Therefore, shoring would be required to support the temporary excavations to the bottom of the foundations.

All earthwork for the Project would be performed in accordance with the future grading plan review report(s), the City of Los Angeles grading requirements, and the General Earthwork and Grading Specifications included in Appendix E of the preliminary Geotechnical Report.

With compliance to CBC and Building Code regulations and recommended excavation and compaction standards of the Final Geotechnical Report, impacts related to site stability would be less than significant.

Sedimentation and Erosion

Threshold GS-2: The project would result in a significant impact if it would constitute a geologic hazard to other properties by causing or accelerating instability from erosion.

Threshold GS-3: The project result in a significant impact if it would 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.

Impact Statement GS-2 and GS-3: Implementation of the Project would not result in substantial erosion or sedimentation given compliance with applicable regulatory requirements and building codes. Therefore, impacts regarding sedimentation and erosion would be less than significant.

Soil erosion refers to the process by which soil or earth material is loosened or dissolved and removed from its original location. Erosion can occur by varying processes and may occur in a project area where bare soil is exposed to wind or moving water (both rainfall and surface runoff). The processes of erosion are generally a function of material type, terrain steepness, rainfall or irrigation levels, surface drainage conditions, and general land uses. Topsoil is used to cover surface areas for the establishment and maintenance of vegetation due to its high concentrations of organic matter and microorganisms.

The Project Site is located in a highly urbanized area of the City and is currently developed with warehouse and cold storage uses. Negligible, if any, native topsoil is likely to occur on the Project Site as it is currently developed with structures and surface parking. Project construction would result in ground surface disruption during excavation, grading, and trenching that would create the potential for erosion to occur. Wind erosion would be minimized through soil stabilization measures required by the SCAQMD Rule 403 (Fugitive Dust), such as daily watering. Potential for water erosion would be reduced by implementation of standard erosion control measures implemented during Site preparation and grading activities. As discussed in more detail under Section 4.7, *Hydrology and Water Quality*, the Project would be subject to all existing regulations associated with the protection of water quality. Construction activities would be carried out in accordance with applicable City standard erosion control practices required pursuant to the CBC and the requirements of the National Pollutant Discharge Elimination System (NPDES) General Construction Permit issued by the Los Angeles Regional Water Quality Control Board (LARWQCB), as applicable. Consistent with these requirements, a Stormwater Pollution Prevention Plan (SWPPP) would be prepared that incorporates Best Management Practices (BMPs) to control water erosion during the Project's construction period. Following Project construction, the Project Site would be covered completely by paving, structures, and landscaping. Thus, impacts due to erosion of topsoil would be less than significant with compliance to applicable regulatory requirements.

Landform Alteration

Threshold GS-4: The project would 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.

Impact Statement GS-4: The Project Site is currently completely developed with urban uses and does not contain any distinct or prominent geologic or topographic features that could be destroyed, permanently covered, or materially and adversely modified as a result of the Project. Therefore, no impacts regarding landform alteration would result from Project implementation.

The Site topography and vicinity is relatively flat, with ground surface elevations ranging from approximately 246 to 250 feet across the Project Site. The Project Site includes the existing commercial buildings with adjacent paved parking areas, and is surrounded by urban development. No distinct or prominent geologic or topographic features are located on the Project Site such as hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, or wetlands. Therefore, no impact from landslides or other forms of natural slope instability, or landform alteration would occur on the Project Site.

Cumulative Impacts

Impacts associated with geologic hazards are typically confined to a Project Site or otherwise highly localized. However, all related projects that increase population or building occupancy in the vicinity of active and potentially active faults in the region have the potential to increase potential exposure to geologic and seismic hazards by potentially increasing the number of people exposed to geologic hazards. The nearest related projects in the immediate project vicinity are Related Project 36, Camden Arts Mixed-Use, located immediately north of the Project Site which involves the development of 240 apartment units, 7,165 square feet (sf) of retail uses, and 4,110 sf of restaurant uses, and Related Project 122, the Row DTLA, located southwest of the Project Site, which involves the development of 1.3 million sf of office space.

Related projects would be required to prepare geotechnical studies in accordance with CBC and Los Angeles Building Code requirements and, as with the Project, must comply with CBC and City regulations related to seismic safety, grading foundation design, and other geotechnical issues. As with the Project, related projects would be required to implement BMPs during construction to reduce surface erosion. With implementation of BMPs and Municipal Code requirements that address seismic shaking, establish standards for grading practices, and other regulations, the Project and related projects would not result in significant cumulative geologic impacts. As with the Project, Municipal Code standards for shoring and foundation construction; SCAQMD’s requirements for wind-caused erosion; and Regional Water Quality Control Board regulations pertaining to surface water runoff and water quality, which require BMPs for construction projects, would reduce geologic stability and erosion hazards for related projects to less than significant levels. Therefore, with implementation of established guidelines and adherence to applicable building regulations and standard engineering practices pertaining to seismic hazards, the Project's contribution to cumulative geology and soils impacts would be less than cumulatively considerable, and therefore, less than cumulatively significant.

4.4.5 Mitigation Measures

No mitigation measures are required.

4.4.6 Level of Significance After Mitigation

Not applicable. Impacts related to geologic hazard effects, sedimentation and erosion, and landform alteration would be less than significant with compliance to applicable regulatory requirements.

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