IV. Environmental Impact Analysis

E. Geology and Soils

1. Introduction

This section of the Draft EIR analyzes the Project’s potential impacts with regard to geology and soils. The analysis includes an evaluation of the potential geologic hazards associated with fault rupture, seismic ground shaking, ground failure (i.e., liquefaction), landslides, inundation, expansive soils, and sedimentation and erosion. The analysis is based on the Geotechnical Engineering Investigation prepared for the Project Site by Geotechnologies, Inc. (October 15, 2013), included as Appendix J 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 [PRC] 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 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,” around the surface traces

¹ The Act was originally entitled the Alquist–Priolo Geologic Hazards Zone Act.
IV.E Geology and Soils

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 controlling 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 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. The Alquist–Priolo Earthquake Fault Zoning Act and its regulations are presented in California Department of Conservation, CGS, Special Publications 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 with the intent of providing oversight, review, and recommendations to the Governor and State Legislature regarding seismic issues. The commission’s name was changed to Alfred E. Alquist Seismic Safety Commission in 2006. Since then, the Commission has adopted several documents based on recorded earthquakes, including:2


- Findings and Recommendations on Hospital Seismic Safety, report dated November 2001; and


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(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 of California passed the Seismic Hazards Mapping Act of 1990 (PRC 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 PRC 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. Under PRC Section 2698, nothing is intended to prevent cities and counties from establishing policies and criteria which are stricter than those established by the Mining and Geology Board.

State publications supporting the requirements of the Seismic Hazards Mapping Act include the 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 (CBC) [California Code of Regulations (CCR), Title 24] is a compilation of building standards, including seismic safety standards for new buildings. CBC standards are based on building standards that have been adopted by state agencies without change from a national model code; building standards based on a national model code that have been changed to address particular California conditions; and 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 CBC are among the strictest in the world. The CBC includes provisions for demolition and construction as well as regulations regarding building foundations and soil types. The CBC applies to all occupancies in California, except where stricter standards have been adopted.
by local agencies. The CBC is published on a triennial basis, and supplements and errata can be issued throughout the cycle. The operative edition of the California Building Code is currently the 2010 edition, which became effective on January 1, 2011. The 2013 edition of the California Building Code has been adopted and will become effective on January 1, 2014. The 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. Specific CBC building and seismic safety regulations have been incorporated by reference in the Los Angeles Municipal Code with local amendments. As such, the CBC forms the basis of the Los Angeles Building Code.

(2) City of Los Angeles

(a) 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.

(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 material; Section 91.7010 includes regulations pertaining to excavations; Section 91.7011 includes requirements for fill materials; Section 91.7013 includes regulations pertaining to erosion control and drainage devices; 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. 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. The Los Angeles Building Code incorporates by reference the CBC, with City amendments for additional requirements. The City Department of Building and Safety is responsible for implementing the provisions of the Los Angeles Building Code.

b. Existing Conditions

(1) Regional Geology

The Project Site is located in the Transverse Ranges Geomorphic Province. The Transverse Ranges are characterized by roughly east-west trending mountains and the northern and southern boundaries are formed by reverse fault scarps. The convergent deformational features of the Transverse Ranges are a result of north-south shortening due to plate tectonics. This has resulted in local folding and uplift of the mountains along with the propagation of thrust faults (including blind thrusts). The intervening valleys have been filled with sediments derived from the bordering mountains.

(2) Faulting and Seismicity

CGS has defined a fault as a fracture or zone of fractures along which there has been displacement of the adjacent blocks relative to one another. The southern California region is crossed by numerous faults, and is underlain by several blind thrust faults. As such, the region is susceptible to strong seismic groundshaking.

Based on criteria established by the CGS, faults may be categorized as active, potentially active, or inactive. 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. Additionally, blind thrust faults, which are low angle reverse faults with no surface exposure, overlay areas of the region. While, the risk for surface rupture potential of blind thrusts faults is inferred to be low, blind thrust faults can be a significant source of seismic activity.

(a) Fault Locations

The locations of significant active and potentially active faults in the Southern California region are shown on the Southern California Fault Map illustrated in Figure IV.E-1 on page IV.E-6. In addition, Table IV.E-1 on page IV.E-7 lists the faults that are located within a 60-mile radius of the Project Site and indicates the significant active and potentially active faults in the vicinity of the Project Site.

(i) Active Faults

As discussed above, active faults are those which show evidence of surface displacement within the last 11,000 years (Holocene-age). A brief description of the major
Faults of the Los Angeles Area

Lisa Wald, U.S. Geological Survey (modified from SCEC)

1 Alamo thrust
2 Arrowhead fault
3 Bailey fault
4 Big Mountain fault
5 Big Pine fault
6 Blake Ranch fault
7 Cabrillo fault
8 Chatsworth fault
9 Chino fault
10 Clamshell-Sawpit fault
11 Clearwater fault
12 Cleghorn fault
13 Crafton Hills fault zone
14 Cucamonga fault zone
15 Dry Creek
16 Eagle Rock fault
17 El Modeno
18 Frazier Mountain thrust
19 Garlock fault zone
20 Grass Valley fault
21 Helendale fault
22 Hollywood fault
23 Holser fault
24 Lion Canyon fault
25 Llano fault
26 Los Alamitos fault
27 Malibu Coast fault
28 Mint Canyon fault
29 Mirage Valley fault zone
30 Mission Hills fault
31 Newport Inglewood fault zone
32 North Frontal fault zone
33 Northridge Hills fault
34 Oak Ridge fault
35 Palos Verdes fault zone
36 Pelona fault
37 Peralta Hills fault
38 Pine Mountain fault
39 Raymond fault
40 Red Hill (Etiwanda Ave) fault
41 Redondo Canyon fault
42 San Andreas Fault
43 San Antonio fault
44 San Cayetano fault
45 San Fernando fault zone
46 San Gabriel fault zone
47 San Jacinto fault
48 San Jose fault
49 Santa Cruz-Santa Catalina Ridge f.z.
50 Santa Monica fault
51 Santa Ynez fault
52 Santa Susana fault zone
53 Sierra Madre fault zone
54 Simi fault
55 Soledad Canyon fault
56 Stoddard Canyon fault
57 Tunnel Ridge fault
58 Verdugo fault
59 Waterman Canyon fault
60 Whittier fault

Figure IV.E-1
Southern California Fault Map

### Table IV.E-1
Major Active and Potentially Active Faults in the Southern California Region

<table>
<thead>
<tr>
<th>Abbreviated Fault Name</th>
<th>Approximate Distance from Project Site (miles)</th>
<th>Maximum Earthquake Magnitude(^a) (M(_w))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active Faults</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malibu Coast (EFZ)</td>
<td>4.00</td>
<td>7.0</td>
</tr>
<tr>
<td>Hollywood</td>
<td>4.00</td>
<td>6.7</td>
</tr>
<tr>
<td>Newport–Inglewood (EFZ)</td>
<td>6.20</td>
<td>7.5</td>
</tr>
<tr>
<td>Palos Verdes</td>
<td>8.16</td>
<td>7.7</td>
</tr>
<tr>
<td>Verdugo</td>
<td>12.46</td>
<td>6.9</td>
</tr>
<tr>
<td>Northridge</td>
<td>14.17</td>
<td>6.9</td>
</tr>
<tr>
<td>Raymond (EFZ)</td>
<td>15.00</td>
<td>6.8</td>
</tr>
<tr>
<td>Sierra Madre (San Fernando) (EFZ)</td>
<td>15.73</td>
<td>6.7</td>
</tr>
<tr>
<td>Sierra Madre</td>
<td>16.00</td>
<td>7.3</td>
</tr>
<tr>
<td>Santa Susana</td>
<td>16.00</td>
<td>6.9</td>
</tr>
<tr>
<td>Simi-Santa Rosa (EFZ)</td>
<td>20.87</td>
<td>6.9</td>
</tr>
<tr>
<td>Elsinore (EFZ)</td>
<td>24.74</td>
<td>7.8</td>
</tr>
<tr>
<td>San Cayetano (EFZ)</td>
<td>30.50</td>
<td>7.2</td>
</tr>
<tr>
<td>San Andreas (EFZ)</td>
<td>39.02</td>
<td>8.2</td>
</tr>
<tr>
<td>Santa Ynez (East)</td>
<td>41.43</td>
<td>7.2</td>
</tr>
<tr>
<td>Cucamonga (EFZ)</td>
<td>41.78</td>
<td>6.7</td>
</tr>
<tr>
<td>Ventura-Pitas Point (EFZ)</td>
<td>42.78</td>
<td>7.0</td>
</tr>
<tr>
<td>Santa Cruz Island</td>
<td>45.46</td>
<td>7.2</td>
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<td>Newport–Inglewood (Offshore)</td>
<td>45.77</td>
<td>7.0</td>
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<td>Red Mountain (EFZ)</td>
<td>51.13</td>
<td>7.4</td>
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<td>San Jacinto (EFZ)</td>
<td>54.16</td>
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<td>North Channel (EFZ)</td>
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<tr>
<td>Garlock (EFZ)</td>
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<td>Pleito (EFZ)</td>
<td>58.07</td>
<td>7.1</td>
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<tr>
<td><strong>Potentially Active Faults</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Santa Monica, alt 1</td>
<td>1.26</td>
<td>6.8</td>
</tr>
<tr>
<td>Santa Monica, Connected alt 1</td>
<td>1.42</td>
<td>7.3</td>
</tr>
<tr>
<td>Anacapa–Dume</td>
<td>5.56</td>
<td>7.2</td>
</tr>
<tr>
<td>San Gabriel (EFZ)</td>
<td>20.60</td>
<td>7.3</td>
</tr>
<tr>
<td>Clamshell–Sawpit</td>
<td>27.53</td>
<td>6.7</td>
</tr>
<tr>
<td>Chino</td>
<td>37.95</td>
<td>6.7</td>
</tr>
<tr>
<td>Oak Ridge (Offshore)</td>
<td>44.07</td>
<td>7.0</td>
</tr>
</tbody>
</table>

\(^a\) Moment magnitude scale (denoted as M\(_w\)) is a logarithmic scale of 1 to 10 that enables seismologists to compare the energy released by different earthquakes on the basis of the area of the geological fault that ruptured in the quake. Developed after the commonly known Richter scale, the moment magnitude scale retains the familiar continuum of magnitude values defined by the Richter scale, and is the scale used to estimate magnitudes for all modern large earthquakes by the United States Geological Survey.

active fault systems in the Project Site vicinity is provided below. No known active fault crosses the Project Site.

**Malibu Coast Earthquake Fault Zone**

The Malibu Coast fault zone is part of the Transverse Ranges Southern Boundary fault system, a west-trending system of reverse, oblique-slip, and strike-slip faults that extends for more than approximately 124 miles along the southern edge of the Transverse Ranges and includes the Hollywood, Raymond, Anacapa–Dume, Malibu Coast, Santa Cruz Island, and Santa Rosa Island faults. The Malibu Coast fault zone runs in an east-west orientation onshore subparallel to and along the shoreline for a linear distance of about 17 miles through the Malibu City limits, but also extends offshore to the east and west for a total length of approximately 37.5 miles. The onshore Malibu Coast fault zone involves a broad, wide zone of faulting and shearing as much as 1 mile in width. While the Malibu Coast Fault Zone has not been officially designated as an active fault zone by the State of California and no Special Studies Zones have been delineated along any part of the fault zone under the Alquist–Priolo Act of 1972, evidence for Holocene activity (movement in the last 11,000 years) has been established in several locations along individual fault splays within the fault zone. Due to such evidence, several fault splays within the onshore portion of the fault zone are identified as active.4 Large historic earthquakes along the Malibu Coast fault include the 1979, 5.2 magnitude earthquake and the 1989, 5.0 magnitude earthquake.5 The Malibu Coast fault zone is approximately 4 miles southwest of the Project Site and is believed to be capable of producing a maximum 7.0 magnitude earthquake.

**Hollywood Fault**

The Hollywood fault zone is part of the Transverse Ranges Southern Boundary fault system. The Hollywood fault is located approximately 4 miles southeast of the Project Site. This fault trends east-west along the base of the Santa Monica Mountains from the West Beverly Hills Lineament in the West Hollywood–Beverly Hills area to the Los Feliz area of Los Angeles. The Hollywood fault is the eastern segment of the reverse oblique Santa Monica–Hollywood fault. Based on geomorphic evidence, stratigraphic correlation between exploratory borings, and fault trenching studies, this fault is classified as active.

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Until recently, the approximately 9.3-mile long Hollywood fault was considered to be expressed as a series of linear ground-surface geomorphic expressions and south-facing ridges along the south margin of the eastern Santa Monica Mountains and the Hollywood Hills. Multiple recent fault rupture hazard investigations have shown that the Hollywood fault is located south of the ridges and bedrock outcroppings along Sunset Boulevard. The Hollywood fault has not produced any damaging earthquakes during the historical period and has had relatively minor micro-seismic activity. It is estimated that the Hollywood fault is capable of producing a maximum 6.7 magnitude earthquake. An Alquist–Priolo Earthquake Fault Zone has not been established for the Hollywood fault. However, the Hollywood fault is considered active by the State and the City of Los Angeles.

**Newport–Inglewood Earthquake Fault Zone**

The Newport–Inglewood fault system is located approximately 6.2 miles east of the Project Site. The Newport–Inglewood fault zone is a broad zone of discontinuous north to northwest en echelon faults and northwest to west trending folds. The fault zone extends southeastward from West Los Angeles, across the Los Angeles Basin, to Newport Beach and possibly offshore beyond San Diego. The onshore segment of the Newport–Inglewood fault zone extends for about 37 miles from the Santa Ana River to the Santa Monica Mountains. Here it is overridden by, or merges with, the east-west trending Santa Monica zone of reverse faults.

The surface expression of the Newport–Inglewood fault zone is made up of a strikingly linear alignment of domal hills and mesas that rise as much as 400 feet above the surrounding plains. From the northern end to its southernmost onshore expression, the Newport–Inglewood fault zone is made up of: Cheviot Hills, Baldwin Hills, Rosecrans Hills, Dominguez Hills, Signal Hill Reservoir Hill, Alamitos Heights, Landing Hill, Bolsa Chica Mesa, Huntington Beach Mesa, and Newport Mesa. Several single and multiple fault strands, arranged in a roughly left stepping en echelon arrangement, make up the fault zone and account for the uplifted mesas.

The most significant earthquake associated with the Newport–Inglewood fault system was the Long Beach earthquake of 1933 with a magnitude of 6.3 on the Richter scale. It is believed that the Newport–Inglewood fault zone is capable of producing a maximum 7.5 magnitude earthquake.

**Palos Verdes Fault**

Studies indicate that there are several active on-shore extensions of the strike-slip Palos Verdes fault, which is located approximately 8.16 miles south-southeast of the Project Site. Geophysical data also indicate the off-shore extensions of the fault are active, offsetting Holocene age deposits. No historic large magnitude earthquakes are associated
with this fault. However, the fault is considered active by the CGS. It is estimated that the Palos Verdes fault is capable of producing a maximum 7.7 magnitude earthquake. An Alquist–Priolo Earthquake Fault Zone has not been established for this fault.

**Raymond Earthquake Fault Zone**

The Raymond fault is part of the Transverse Ranges Southern Boundary fault system and lies approximately 15 miles east of the Project Site. The Raymond fault extends approximately 15 miles from the Los Angeles River east of Griffith Park east to east-northeast across the San Gabriel Valley through South Pasadena, Pasadena, San Marino, Arcadia, and Monrovia to a junction with the Sierra Madre fault at the foot of the San Gabriel Mountains. The fault is convex southward, consisting of a western section that strikes east-west and an eastern section that strikes east-northeast. The Raymond fault joins the Sierra Madre fault south of Santa Anita Wash and south of the Clamshell–Sawpit fault in the foothills of the San Gabriel Mountains on which the 1991 Sierra Madre earthquake of magnitude 5.8 occurred. The 1988 Pasadena earthquake of magnitude 5.0 is also believed to have occurred on the Raymond fault. It is believed that the Raymond fault may produce a maximum 6.8 magnitude earthquake.

**Sierra Madre Fault Zone**

The Sierra Madre fault alone forms the southern tectonic boundary of the San Gabriel Mountains in the northern San Fernando Valley. It consists of a system of faults approximately 75 miles in length. The individual segments of the Sierra Madre fault system range up to 16 miles in length and display a reverse sense of displacement and dip to the north. The most recently actively portions of the zone include the Mission Hills, Sylmar, and Lakeview segments, which produced an earthquake in 1971 of magnitude 6.4. Tectonic rupture along the Lakeview Segment during the San Fernando Earthquake of 1971 produced displacements of approximately 2.5 to 4 feet upward and southwestward.

It is believed that the Sierra Madre fault zone is capable of producing an earthquake of magnitude 7.3 with a recurrence interval of 200 years. The closest trace of the fault is approximately 16 miles northeast of the Project Site.

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Santa Susana Fault

The western Transverse Ranges are crossed obliquely by a set of north-dipping reverse faults extending from the Santa Barbara Channel east to an intersection with the San Jacinto fault near Cajon Pass. These faults include, from west to east, the Red Mountain, San Cayetano, Santa Susana, Sierra Madre, and Cucamonga faults. These faults are located approximately 51, 30, 16, 15, and 41 miles, respectively, from the Project Site.

The Santa Susana fault extends approximately 17 miles west-northwest from the northwest edge of the San Fernando Valley into Ventura County and is at the surface high on the south flank of the Santa Susana Mountains. The fault ends near the point where it overrides the south-side-up South strand of the Oak Ridge fault. The Santa Susana fault strikes northeast at the Fernando lateral ramp and turns east at the northern margin of the Sylmar Basin to become the Sierra Madre fault. This fault is exposed near the base of the San Gabriel Mountains for approximately 46 miles from the San Fernando Pass at the Fernando lateral ramp east to its intersection with the San Antonio Canyon fault in the eastern San Gabriel Mountains, east of which the range front is formed by the Cucamonga fault. The Santa Susana fault has not experienced any recent major ruptures except for a slight rupture during the 6.5 magnitude 1971 Sylmar earthquake. It is believed that the Santa Susana fault has the potential to produce a 6.9 magnitude earthquake.

San Andreas Fault System

The San Andreas fault system forms a major plate tectonic boundary along the western portion of North America. The system is predominantly a series of northwest trending faults characterized by a predominant right lateral sense of movement. The fault system is located approximately 39 miles to the northeast of the Project Site.

The San Andreas and associated faults have a long history of inferred and historic earthquakes. Cumulative displacement along the system exceeds 150 miles in the past 25 million years. Large historic earthquakes have occurred at Fort Tejon in 1857, at Point Reyes in 1906, and at Loma Prieta in 1989. Based on single-event rupture length, the maximum Richter magnitude earthquake is expected to be approximately 8.25. The


8 The Richter scale is an open-ended logarithmic scale for expressing the magnitude of a seismic disturbance in terms of the energy dissipated in it, with 1.5 indicating the smallest earthquake that can be felt, 4.5 indicating an earthquake causing slight damage, and 8.5 indicating a very devastating earthquake.
recurrence interval for large earthquakes on the southern portion of the fault system is on the order of 100 to 200 years. It is believed that the San Andreas fault is capable of producing a 8.2 magnitude earthquake.

(ii) Potentially Active Faults

As discussed above, potentially active faults are those that show evidence of most recent surface displacement within the last 1.6 million years (Quaternary-age). The potentially active faults in the Project vicinity are discussed below.

Santa Monica

The Santa Monica fault located approximately 1.26 to 1.42 miles to the south of the Project Site is also part of the Transverse Ranges Southern Boundary fault system. The Santa Monica fault extends east from the coastline in Pacific Palisades through Santa Monica and West Los Angeles and merges with the Hollywood fault at the West Beverly Hills Lineament in Beverly Hills where its strike is northeast. It is believed that at least six surface ruptures have occurred in the past 50 thousand years. In addition, a well-documented surface rupture occurred between 10 and 17 thousand years ago, although a more recent earthquake probably occurred 1 to 3 thousand years ago. This leads to an average earthquake recurrence interval of 7 to 8 thousand years.9 The Santa Monica fault system may produce earthquakes with a maximum magnitude of 6.8 to 7.3.

Anacapa–Dume Fault

The Anacapa–Dume fault located approximately 5.56 miles to the southwest of the Project Site is a near-vertical offshore escarpment exceeding 600 meters locally, with a total length exceeding 62 miles. This fault is also part of the Transverse Ranges Southern Boundary fault system. It occurs as close as 3.6 miles offshore south of Malibu at its western end, but trends northeast where it merges with the offshore segment(s) of the Santa Monica Fault Zone. It is believed that the Anacapa–Dume fault is responsible for generating the historic 1930 magnitude 5.2 Santa Monica earthquake, the 1973 magnitude 5.3 Point Mugu earthquake, and the 1979 and 1989 Malibu earthquakes, each of which possessed a magnitude of 5.0.10 The Anacapa–Dume fault may be capable of producing a maximum magnitude 7.2 earthquake.

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San Gabriel Fault System

The San Gabriel fault system is located approximately 20.6 miles northeast of the Project Site. The San Gabriel fault system comprises a series of sub-parallel, steeply north-dipping faults trending approximately north 40 degrees west with a right-lateral sense of displacement. There is also a small component of vertical dip-slip separation. The fault system exhibits a strong topographic expression and extends approximately 90 miles from San Antonio Canyon on the southeast to Frazier Mountain on the northwest. The estimated right lateral displacement on the fault varies from 34 miles to 40 miles to 10 miles. The San Gabriel fault system is considered potentially active by the CGS with a potential to produce a 7.3 magnitude earthquake. However, recent seismic exploration in the Valencia area has indicated that faulting in the Valencia area occurred between 3,500 and 1,500 years ago. In addition, seismic evidence indicates that the San Gabriel fault system is truncated at depth by the younger, north-dipping Santa Susana–Sierra Madre faults. Therefore, it is generally accepted that the San Gabriel fault system is not capable of producing large earthquakes. However, ground rupture may be produced in response to passive movement.

(iii) Blind Thrusts Faults

Blind or buried thrust faults are faults without a surface expression but are a significant source of seismic activity. They are typically broadly defined based on the analysis of seismic wave recordings of hundreds of small and large earthquakes in the southern California area. Due to the buried nature of these thrust faults, their existence is sometimes not known until they produce an earthquake. Two blind thrust faults in the Los Angeles metropolitan area are the Puente Hills blind thrust located just east of Downtown Los Angeles and the Elysian Park blind thrust just north of Downtown Los Angeles. Another blind thrust fault of note is the Northridge fault located in the northwestern portion of the San Fernando Valley. These blind thrust faults are described below.

Puente Hills Blind Thrust

The Puente Hills blind thrust fault extends eastward from Downtown Los Angeles to the City of Brea in northern Orange County. The Puente Hills blind thrust fault includes three north-dipping segments, named from east to west as the Coyote Hills segment, the Santa Fe Springs segment, and the Los Angeles segment. These segments are overlain by folds expressed at the surface as the Coyote Hills, Santa Fe Springs Anticline, and the Montebello Hills. The Puente Hills blind thrust fault lies directly beneath downtown Los Angeles.

The Santa Fe Springs segment of the Puente Hills blind thrust fault is believed to be the cause of the October 1, 1987, Whittier Narrows Earthquake. Earthquake scenarios for
the Puente Hills blind thrust fault include single-segment fault ruptures capable of producing an earthquake of magnitude 6.5 to 6.6 moment magnitude and a multiple-segment fault rupture capable of producing an earthquake of magnitude 7.1. Based on deformation of late Quaternary age sediments above this fault system and the occurrence of the Whittier Narrows earthquake, the Puente Hills blind thrust fault is considered an active fault capable of generating future earthquakes beneath the Los Angeles Basin. An average slip rate of 0.7 millimeter per year and a maximum moment magnitude of 7.1 are estimated by the CGS for the Puente Hills blind thrust fault.

**Elysian Park Blind Thrust**

The Elysian Park anticline is thought to overlie the Elysian Park blind thrust. This fault has been estimated to cause an earthquake every 500 to 1,300 years in the magnitude range of 6.2 to 6.7. The Elysian Park anticline is located approximately 10 miles east of the Project Site.

**Northridge (Blind) Thrust**

The January 17, 1994, 6.7 moment magnitude Northridge earthquake was caused by the sudden rupture of a previously unknown blind thrust fault. This fault has since been named the Northridge Thrust. The Northridge Thrust is an active feature that can generate future earthquakes. The Northridge Thrust is located approximately 14 miles north of the Project Site. The CGS estimates an average slip rate of 1.5 millimeters per year and 7.0 maximum moment magnitude for the Northridge Thrust.

**(b) Surface Ground Rupture**

Ground rupture is the visible breaking and displacement of the earth's surface along the trace of a fault during an earthquake. The Alquist–Priolo Earthquake Fault Zoning Act, described further above, requires the State Geologist to establish and map fault rupture zones (called earthquake fault zones). These zones, which generally extend from 200 to 500 feet on each side of a known active fault, identify areas where potential fault rupture along an active fault could prove hazardous and identify where special studies are required to characterize hazards to habitable structures. In addition, the City of Los Angeles General Plan Safety Element designates fault rupture study areas extending along each side of active and potentially active faults to establish areas of hazard potential due to fault rupture.

As indicated in the Geotechnical Engineering Investigation for the Project Site, no known active or potentially active faults underlie the Project Site. In addition, as shown in Figure IV.E-2 on page IV.E-15, the Project Site is not located within a State-designated Alquist–Priolo Earthquake Fault Zone or within a City-designated fault rupture study area.
Figure IV.E-2
Alquist-Priolo Special Study Zones and Fault Rupture Study Areas in the City of Los Angeles

Source: City of Los Angeles General Plan Safety Element, Exhibit A, 2008.
As shown in Table IV.E-1 on page IV.E-7, the nearest active fault with surface
displacement is the Malibu Coast fault, located approximately 4 miles southwest of the
Project Site. However, only a small segment of this fault, located approximately 16 miles
away from the Project Site, has been given an Earthquake Fault Zone designation. Thus,
the nearest Earthquake Fault Zone designation to the Project Site is associated with the
Newport-Inglewood fault, which is located approximately 6 miles to the east of the Project
Site. Based on the distance of the nearest Earthquake Fault Zone to the Project Site, the
potential for surface ground rupture within the Project Site is low.

(3) Local Geology

(a) Soil Conditions

Based on on-site investigations conducted as part of the Geotechnical Engineering
Investigation for the Project Site, encountered fill materials varied between 1 and 5 feet in
dept. Fill materials consisted of mixtures of sand, silt, and clay, which ranged from light
brown to orange brown to dark brown in color, slightly moist to moist, loose to medium
dense or medium firm to stiff, and fine grained with occasional gravel, slate fragments, and
concrete fragments. The fill was found to be underlain by older alluvial soils consisting of
interlayered mixtures of sand, silt, and clay. The older alluvium ranged in color from brown
to reddish brown to dark brown, and was slightly moist to moist, dense to very dense, stiff
to very stiff, and fine to coarse grained with occasional gravel. Slate fragments were also
found, varying from occasional to abundant.

Expansive soils are soils that swell when subjected to moisture and shrink when
dried. Depending on the soil characteristics and design of building construction, expansive
soils can cause extensive damage to building foundations. Expansive soils are typically
associated with clayey soils. The soils underlying the Project Site consist of interlayered
mixtures of sand, silt, and clay. Based on the Geotechnical Engineering Investigation for
the Project Site, the soils beneath the Project Site are in the low to high expansion range.

(b) Liquefaction

Liquefaction is a phenomenon in which saturated silty to cohesionless soils below
the groundwater table are subject to a temporary loss of strength due to the buildup of
excess pore pressure during cyclic loading conditions such as those induced by an
earthquake. Liquefaction-related effects include loss of bearing strength, amplified ground
oscillations, lateral spreading, and flow failures.

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. Cities and
counties must regulate certain development projects within these zones until the geologic and soil conditions of a project site are investigated and appropriate mitigation measures, if any, are incorporated into development plans. In accordance with the Seismic Hazards Mapping Act, the California Geologic Survey has produced Seismic Hazards Zone Maps. As shown in Figure IV.E-3 on page IV.E-18, based on the Seismic Hazard Zone Map for the Beverly Hills Quadrangle, the Project Site is not located within a State-designated seismic hazard zone for liquefaction potential.\footnote{California Department of Conservation, Division of Mines and Geology. State of California Seismic Hazard Zones Beverly Hills Quadrangle, March 25, 1999, http://gmw.consrv.ca.gov/shmp/download/pdf/ozn_bevh.pdf, accessed December 22, 2011.} This determination is based on groundwater depth records, soil type, and distance to a fault capable of producing a substantial earthquake. In addition, based on the City of Los Angeles General Plan Safety Element, the Project Site is not located within a City-designated liquefiable area or potentially liquefiable area.\footnote{City of Los Angeles. General Plan Safety Element, Exhibit B, adopted by the City Council, November 26, 1996.} Furthermore, based on a liquefaction potential evaluation performed as part of the Geotechnical Engineering Investigation, the soils underlying the Project Site would not be capable of liquefaction during the design earthquake.

\((c)\) Landslides

As shown in Figure IV.E-3, based on the Seismic Hazard Zone Map for the Beverly Hills Quadrangle, the Project Site is not located within a State-designated seismic hazard zone for landslide potential.\footnote{California Department of Conservation, Division of Mines and Geology. State of California Seismic Hazard Zones Beverly Hills Quadrangle, March 25, 1999, http://gmw.consrv.ca.gov/shmp/download/pdf/ozn_bevh.pdf, October 25, 2012.} As shown in Figure IV.E-4 on page IV.E-19, per the City of Los Angeles General Plan Safety Element, the Project Site is located within an area designated as “cluster of small shallow surficial landslides.”\footnote{City of Los Angeles. General Plan Safety Element, Exhibit C, adopted by the City Council, November 26, 1996.}

\((d)\) Groundwater

As indicated in the Geotechnical Engineering Investigation prepared for the Project Site, groundwater was not encountered during exploration conducted to a maximum depth of 60 feet below the existing grade. In addition, California Geologic Survey data indicates the historically highest groundwater level within the Project Site is 40 feet below grade.
PROJECT SITE

**Liquefaction**
Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693© would be required.

**Earthquake-Induced Landslides**
Areas where previous occurrence of landslide movement, or local topographic, geological and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693© would be required.

Source: California Department of Conservation, Division of Mines and Geology, 2012.
Figure IV.E-4
Landslide Inventory and Hillside Areas

Source: City of Los Angeles General Plan Safety Element, Exhibit C, 2008.
(e) Other Geologic Conditions

The Project Site ranges in elevation from 495 feet on the northern boundary adjacent to Chaparal Street, to 465 feet on the southern boundary adjacent to Sunset Boulevard. The steepest slope gradient found in the site is approximately 5:1 horizontal to vertical. No major water-retaining structures are located immediately up gradient from the Project Site. In addition, review of the County of Los Angeles Flood and Inundation Hazards Map indicates the Project Site does not lie within mapped inundation boundaries due to a breached upgradient reservoir. The Project Site is also not located within a City of Los Angeles Methane Zone or Methane Buffer Zone. Additionally, 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. Lastly, no distinct or prominent geologic or topographic features such as hilltops, ridges, hillslopes, canyons, ravines, rock outcrops, water bodies, streambeds, or wetlands are located at the Project Site.

3. Environmental Impacts

a. Methodology

To evaluate potential impacts relative to geology and soils, the Geotechnical Engineering Investigation was prepared for the Project Site. The Geotechnical Engineering Investigation included field exploration (i.e., exploratory soil borings) and laboratory testing to determine the characteristics of the subsurface conditions at the Project Site. In addition, relevant literature (CGS’ Seismic Hazard Zone Maps, previous geotechnical studies, etc.) and materials were reviewed. Recommendations regarding the design and construction of the Project are based on these results. The Geotechnical Engineering Investigation is provided in Appendix J of this Draft EIR.

b. Thresholds of Significance

Appendix G of the CEQA Guidelines provides a set of sample questions that address impacts with regard to geology and soils. These questions are as follows:

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 or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

- Strong seismic ground shaking?
- Seismic-related ground failure, including liquefaction?
- Landslides?

- 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?
- 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?
- 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?

In the context of these questions from the CEQA Guidelines, the City of Los Angeles CEQA Thresholds Guide states that a project would normally have a significant geology and soils impact if the project would:

- Cause or accelerate geologic hazards, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury.
- Constitute a geologic hazard to other properties by causing or accelerating instability from erosion.
- 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.
- One or more distinct and prominent geologic or topographic features would 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.
c. **Project Design Features and Regulatory Compliance Measures**

(1) **Project Design Features**

**Project Design Feature E-1:** Development of the Project Site shall comply with the construction and design recommendations provided in the site-specific geotechnical report.

(2) **Regulatory Compliance Measures**

**Regulatory Compliance Measure E-1:** Earthwork activities associated with the grading and export of soil shall occur in accordance with City requirements, as specified in the Los Angeles Building Code and CBC and through the grading plan review and approval process, including a haul route approval as specified in the LAMC.

**Regulatory Compliance Measure E-2:** Appropriate erosion control and drainage devices shall be provided to the satisfaction of the City of Los Angeles Department of Building and Safety through the grading plan review and approval process. These measures would include, but not be limited to, interceptor terraces, berms, vee-channels, and inlet and outlet structures, as specified by Section 91.7013 of the Los Angeles Building Code, including planting fast-growing annual and perennial grasses in areas where construction is not immediately planned.

**Regulatory Compliance Measure E-3:** Project building design and construction shall conform to the current building and safety design provisions of the LAMC, which incorporates the CBC, including all provisions related to seismic activity.

d. **Project Impacts**

Construction of the Project would be implemented as three separate components, each designed and timed to facilitate continued School operations on-site and minimize disruptions to neighbors. Specifically, development of the Project would commence with the North Wing Renovation, followed by two phases of development. Construction activities would include demolition, grading and excavation, and construction of new structures and related infrastructure. It is anticipated that the Project would result in the excavation of approximately 98,853 cubic yards of soil, of which approximately 258 cubic yards would be used for fill on-site and the remaining 98,595 cubic yards would be exported off-site. The maximum depth of excavation for Project development would be approximately 38 feet below ground surface.
(1) Geologic Hazards

The following discussion includes an analysis of whether the Project would cause or accelerate geologic hazards related to seismic hazards (including seismic-related ground failure), soil stability, expansive and corrosive soils, and groundwater.

(a) Seismic Hazards

(i) Surface Ground Rupture

Ground rupture is the visible breaking and displacement of the earth’s surface along the trace of a fault during an earthquake. As discussed previously, 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 or City-designated fault rupture study area. Based on these considerations, the potential for surface ground rupture at the Project Site is considered low. As such, the Project would not cause or accelerate geologic hazards related to fault rupture, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury. Impacts associated with fault rupture would be less than significant and no mitigation measures are required.

(ii) Strong Seismic Ground Shaking

The Project Site is located within the seismically active region of Southern California and 25 known active faults and six known potentially active faults are located within 60 miles of the Project Site. Thus, the Project Site would be subject to strong seismic ground shaking, typical of areas within Southern California. The seismic exposure for the Project Site was analyzed in the Geotechnical Engineering Investigation. Specifically, based on information from CGS, the analysis indicated a 10 percent probability that peak ground acceleration (PGA) of 0.46g (0.46 times the acceleration of gravity) would be exceeded in 50 years in the Project area. In addition, the predominant earthquake, which has a moment magnitude of 6.6, contributes the majority of the ground motion to the Project Site. Based on information derived from the subsurface investigation, the Project Site is classified as Site Class D, which corresponds to a “Stiff Soil” Profile, according to Table 1613.5.2 of the 2010 California Building Code. This information and the Project Site coordinates were input into the USGS Ground Motion Parameter Calculator (Version 5.1.0) to calculate the Maximum Considered Earthquake (MCE) Ground motions for the Project Site. The Geotechnical Engineering Investigation determined that the MCE Ground motions are equivalent to the 2475-year recurrence interval ground motions adjusted by a deterministic limit, which is consistent with the 2009 International Building Code requirements. As such, the Project Site is not exposed to a greater than normal seismic
risk compared to other areas of Southern California. This level of shaking is within the anticipated parameters for a well-designed structure.

As with any new development in the State of California, building design and construction for the Project would be required to conform to the current seismic design provisions of the CBC. The 2013 CBC 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. Additionally, construction of the Project would be required to adhere to the seismic safety requirements contained in the Los Angeles Building Code, which incorporates the California Building Code with City amendments for additional requirements.

Based on the above, the Project would not cause or accelerate geologic hazards related to strong seismic ground shaking, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury, and impacts associated with strong seismic ground shaking would be less than significant. Notwithstanding, Mitigation Measure E-1 is provided below to require the preparation of site-specific geotechnical reports prior to the issuance of building or grading permits that would include detailed geotechnical recommendations to address the site-specific conditions and construction and design requirements for the proposed buildings, including applicable seismic design parameters. With implementation of Mitigation Measure E-1, impacts associated strong seismic ground shaking would be further reduced.

(iii) Liquefaction

As discussed above, the Project Site is not located within a State-designated seismic hazard zone for liquefaction potential or within a City-designated liquefiable area or potentially liquefiable area. Furthermore, based on the site-specific liquefaction analysis performed as part of the Geotechnical Engineering Investigation, the soils underlying the Project Site would not be capable of liquefaction during the design earthquake with a moment magnitude of 6.6. Accordingly, the potential for liquefaction to occur at the Project Site is considered remote. Therefore, the Project would not 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, impacts associated with liquefaction would be less than significant and no mitigation measures are required.

(iv) Landslides

As previously described, the Project Site ranges in elevation from 495 feet on the northern boundary adjacent to Chaparal Street to 465 feet on the southern boundary adjacent to Sunset Boulevard. The steepest slope gradient found in the Project Site is
approximately 5:1 horizontal to vertical, in a slope that is approximately four feet high. Therefore, while the Project Site is within a City-designated “cluster of small shallow surfacial landslides” area, the Geotechnical Engineering Investigation concluded that the probability of seismically induced landslides occurring on the Project Site would be low due to the general gentle slope gradient across the Project Site. In addition, the Project Site is not located within a State-designated seismic hazard zone for landslide potential. Therefore, the Project would not cause or accelerate geologic hazards related to landslides, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury. Impacts related to landslides would be less than significant and no mitigation measures are required.

(v) Settlement

Seismically induced settlement or compaction of dry or moist, cohesionless soils can result from earthquake ground motion. Such settlements are typically most damaging when the settlements are differential in nature across the length of structures. Some seismically induced settlement of structures within the Project Site should be expected as a result of strong ground shaking. However, due to the uniform nature of the underlying older alluvial soils, differential settlement would be considered negligible. Therefore, the Project would not cause or accelerate geologic hazards related to seismically induced settlement, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury. Impacts related to seismically induced settlement would be less than significant and no mitigation measures are required.

(vi) Tsunamis and Seiches

Tsunamis are large ocean waves generated by sudden water displacement caused by a submarine earthquake, landslide, or volcanic eruption. Due to the Project Site’s elevation and distance from the ocean (approximately 4 miles), the Project Site would not be exposed to hazards from a tsunami. In addition, the Project Site is not located within an area that is designated by the City as having the potential to be impacted by a tsunami. Therefore, the Project would not cause or accelerate geologic hazards related to seismically induced tsunamis, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury. Impacts related to tsunamis would be less than significant and no mitigation measures are required.

Seiches are large waves generated in enclosed bodies of water which can be caused by ground shaking associated with an earthquake. No major water-retaining
structures or water bodies are located in the vicinity of the Project Site. In addition, review of the County of Los Angeles Flood and Inundation Hazards Map indicates that the Project Site does not lie within mapped inundation boundaries. As such, the Project would not cause or accelerate geologic hazards related to seismically induced seiches, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury. Impacts related to seiches would be less than significant and no mitigation measures are required.

(b) Soil Stability

The soils underlying the Project Site consist of fill and older alluvial deposits. The fill consists of mixtures of sand, silt, and clay and range from slightly moist to moist, loose to medium dense or medium firm to stiff, and fine grained with occasional gravel, slate fragments, and concrete fragments. The fill is then underlain by older alluvial soils consisting of inter-layered mixtures of sand, silt, and clay. The older alluvium ranges from slightly moist to moist, dense to very dense, stiff to very stiff, and fine to coarse grained with occasional gravel. Slate fragments were also found, varying from occasional to abundant. Based on on-site investigations, the depth of fill materials encountered on the Project Site varied between 1 and 5 feet. The anticipated maximum depth of excavation for Project development is approximately 38 feet below ground surface.

As described in the Geotechnical Engineering Investigation for the Project, the existing fill is considered to be unsuitable for support of foundations, concrete slabs, or additional fill. Therefore, mitigation is required. In accordance with Mitigation Measure E-2, provided below, existing fill materials and any fill generated during demolition would be removed and recompacted or excavated. For the proposed underground parking structure, the fill material would be removed by the proposed excavations. With implementation of Mitigation Measure E-2, the Project would not cause or accelerate geologic hazards related to unstable soils, which would result in substantial damage to structures or infrastructure, or expose people to substantial risk of injury, and impacts associated with unstable soils would be reduced to less than significant.

(c) Expansive Soils

The earth materials underlying the Project Site have yielded test results from the low to the high expansion potential ranges. Expansive soils are typically addressed through drainage control and increased reinforcing for foundations and concrete slabs-on-grade. The LAMC and CBC set forth specific minimum drainage and soil stability requirements for all projects. Compliance with regulatory requirements set forth by Mitigation Measure E-1 would minimize risk of damage to structures due to expansive soils. Therefore, with implementation of Mitigation Measure E-1, potential impacts related to expansive soils would be reduced to a level that is less than significant.
(d) Groundwater

As indicated above, groundwater was not encountered during exploration conducted to a maximum depth of 60 feet below the existing grade. In addition, California Geologic Survey data indicates the historically highest groundwater level within the Project Site is 40 feet below grade. Based on the maximum depth of excavation of approximately 38 feet below ground surface, no groundwater would be expected to be encountered during Project development. Therefore, impacts associated with groundwater would be less than significant and no mitigation measures are required.

(2) Sedimentation and Erosion

As discussed above, it is anticipated that the Project would result in the excavation of approximately 98,853 cubic yards of soil, of which approximately 258 cubic yards would be used for fill on-site and the remaining 98,595 cubic yards would be exported off-site. Sedimentation and erosion could potentially occur from exposed soils during Project construction. 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 Los Angeles Municipal Code Chapter IX, which requires necessary permits, plans, plan checks, and inspections to ensure that the Project would reduce the sedimentation and erosion effects. In addition, as discussed further in Section IV.G, Hydrology, Surface Water Quality, and Groundwater, of this Draft EIR, the Project would be required to have an erosion control plan approved by the City of Los Angeles Department of Building and Safety, as well as a Storm Water Pollution Prevention Plan (SWPPP) pursuant to the National Pollutant Discharge Elimination System permit requirements. As part of the SWPPP, Best Management Practices (BMPs) would be implemented during construction to reduce sedimentation and erosion levels to the maximum extent possible. In addition, Project construction contractors would be required to comply with City grading permit regulations, which require necessary measures, plans, and inspections to reduce sedimentation and erosion. Furthermore, the Project would be required to have a Standard Urban Stormwater Mitigation Plan (SUSMP) in place during the operational life of the Project. The SUSMP would include BMPs that would reduce on-site erosion from vegetated areas on the Project Site. As such, with implementation of these requirements, which are reinforced as Regulatory Compliance Measure E-2 above and as Mitigation Measure E-3 and Mitigation Measure E-4 below, Project construction would not 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, and impacts related to sedimentation and erosion would be less than significant.
Please refer to Section IV.G, Hydrology and Water Quality, of this Draft EIR for a more detailed analysis regarding sedimentation and erosion effects during construction and operation of the Project.

(3) Landform Alteration

As described above, 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.

4. Cumulative Impacts

Due to the site-specific nature of geological conditions (i.e., soils, geological 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 2020 (inclusive of the 11 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 the Los Angeles Building Code. Therefore, with adherence to such regulations, cumulative impacts with regard to geology and soils would be less than significant.

5. Mitigation Measures

In addition to the project design features and regulatory compliance measures set forth above, the following mitigation measures are included to ensure that potential impacts related to geology and soils would be less than significant:

**Mitigation Measure E-1:** Prior to the issuance of building or grading permits, the Applicant shall submit a final design-level geotechnical, geologic, and seismic hazard investigation report that complies with all applicable state and local code requirements prepared by a qualified geotechnical engineer and certified engineering geologist. The report shall be submitted the Los Angeles Department of Building and Safety, consistent with City of Los Angeles requirements. The site-specific geotechnical report shall include recommendations for the specific building location and design including those pertaining to site preparation, fills and compaction, foundations, etc.
The site-specific geotechnical reports shall be prepared to the written satisfaction of the City of Los Angeles Department of Building and Safety.

**Mitigation Measure E-2:** During construction, non-engineered fills shall be excavated and replaced, as compacted fill properly bunched into suitable materials in accordance with City of Los Angeles requirements, or removed. The suitability of the excavated material for reuse in the compacted fills shall be confirmed during the final design-level, site specific geotechnical investigation.

**Mitigation Measure E-3:** Excavation and grading activities shall be scheduled during dry weather periods. If grading occurs during the rainy season (October 15 through April 1), diversion dikes shall be constructed to channel runoff around the site. Channels shall be lined with grass or roughened pavement to reduce runoff velocity.

**Mitigation Measure E-4:** Stockpiled and excavated soil shall be covered with secured tarps or plastic sheeting.

### 6. Level of Significance After Mitigation

With implementation of the project design features, regulatory compliance measures, and mitigation measures above, potential impacts related to geology and soils would be reduced to a level that is less than significant. In addition, cumulative impacts with regard to geology and soils would be less than significant.