

## IV. ENVIRONMENTAL IMPACT ANALYSIS

### E. GEOLOGY, SOILS, AND SEISMICITY

#### 1. INTRODUCTION

Geological, soils and seismic information presented in this section is derived primarily from the “*Geotechnical Engineering Investigation Proposed Studio City Senior Living Center 4141 Whitsett Avenue, Studio City, California*” report prepared by Geotechnologies, Inc. (Glendale, California) and dated December 12, 2011 (see *Appendix D: Geotechnical and Soils Report of this Draft EIR*).

#### 2. ENVIRONMENTAL CONDITIONS

##### a. Physical Setting

###### (1) *Existing Geological Conditions*

The Project Site, located in the community of Studio City in the City of Los Angeles, consists of a golf course, driving range, clubhouse, and tennis center generally located at the southwest corner of Whitsett Avenue and Valley Spring Lane. The Development Site (i.e., the area of the Project Site that will be physically disturbed) for the Studio City Senior Living Center Project is located at the southeast corner of the Project Site, in an area currently occupied by a maintenance facility, tennis courts, small tennis house, minor portions of the golf course, and a surface parking lot. The proposed Project would retain the existing golf course and driving range on the Project Site, although the configurations of small portions of the golf course and driving range within the Development Site (areas adjacent to proposed Lot 2) would be slightly altered for the Project. Due to the fact that the areas of the Project Site that are outside of the Development Site will not be physically disturbed, most of the geologic impact discussion below is pertinent to only the Development Site. However, the undisturbed portion of the Project Site or the Project Site as a whole, will be discussed as necessary and pertinent.

The entire Project Site is located in the Transverse Ranges Geomorphic Province, which are characterized by east-west trending mountains and the northern and southern boundaries formed by reverse fault scarps. The features of the Transverse Ranges are a result of plate tectonics movements that have resulted in localized folding and uplift of the mountains. The intervening valleys have been filled with sediments derived from the bordering mountains.

The Project Site is roughly level, with total relief of approximately five to six feet. South of the Project Site, a 10- to 15-foot-high, 2:1 slope descends towards the Los Angeles River channel. There is an existing level area, approximately 25 feet wide, adjacent to the vertical channel walls. Drainage is by sheetflow along the existing contours generally southward, or towards area drains.

## (2) Existing Seismic Hazards

Since year 1800 there have been approximately 60 damaging earthquakes in the Los Angeles region. After a brief hiatus between major events (circa 1940-1972), the greater Los Angeles area has experienced a number of moderate events, which have resulted in considerable disruption of the infrastructure, impact on social and economic life, loss of lives, and extensive property damage within the City of Los Angeles, the greater metropolitan area, and the adjacent region. The most recent of these was the 6.7 magnitude 1994 Northridge earthquake, which was centered in the northwest part of the City of Los Angeles, in the general vicinity of the 1971 San Fernando (Sylmar) quake.

The U.S. Geological Survey has estimated the probability of a ten to thirty percent potential for a 7.5 or more magnitude quake along the southern portion of the San Andreas Fault within the next five to thirty years.<sup>1</sup> The Alquist-Priolo Act requires the State Geologist to map active earthquake fault zones. Those faults in the Los Angeles area typically are visible, above ground faults. However, it is the quakes along the unmapped faults, such as the buried thrust fault associated with the Northridge earthquake, which increasingly are becoming the focus of study and concern. The concept of blind thrust faults has been recognized only recently by seismologists and the full potential of effects is still under study.

Based on criteria published by the California Geological Survey (CGS), faults may be categorized as active, potentially active, or inactive. Active faults are those that show evidence of surface displacement within the last 11,000 years (Holocene-age). Potentially active faults are those that show evidence of most recent surface displacement within the last 1.6 million years (Quaternary-age). Faults showing no evidence of surface displacement within the last 1.6 million years are considered inactive for most purposes, although seismic design standards may still apply to critical structures along inactive faults.

Buried thrust faults are faults without a surface expression but are a significant source of seismic activity. Due to the buried nature of these thrust faults, their existence is usually not known until they produce an earthquake. The risk for surface rupture potential of these buried thrust faults is low; however, the seismic risk is not well established, thus the potential for surface rupture at magnitudes higher than 6.0 cannot be precluded.

*Figure IV.E-1: Alquist-Priolo Special Study Zones & Fault Rupture Study Areas* shows the Alquist-Priolo Special Study Zones and the Fault Rupture Study Areas in the City of Los Angeles. As shown in *Figure IV.E-1*, the Project Site is neither within an Alquist-Priolo Special Study Zone nor a Fault Rupture Study Area.

Liquefaction is a phenomenon in which saturated silty to cohesionless soils below the groundwater table are subject to a temporary loss of strength during conditions such as those induced by an earthquake. Liquefaction-related effects include loss of bearing strength, amplified ground oscillations, lateral spreading, and flow failures. *Figure IV.E-2: Areas Susceptible to Liquefaction* shows areas in the City of Los Angeles that are susceptible to liquefaction. As

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<sup>1</sup> United States Department of the Interior, U.S. Geologic Survey, *2009 Earthquake Probability Mapping*, <https://geohazards.usgs.gov/eqprob/2009/index.php> (2009).





**SAFETY ELEMENT EXHIBIT B**  
**Areas Susceptible to Liquefaction**  
 In the City of Los Angeles

- Liquefiable Areas: recent alluvial deposits; ground water less than 30 feet deep
- Potentially Liquefiable Areas: recent alluvial deposits; ground water 30-50 feet deep
- ★ PROJECT SITE

**NOTES:**  
 The Safety Element's seismic and landslide exhibits, along with any official geologic or seismic hazard maps prepared by the City Building Safety Department are used in determining if additional soils and geologic hazards and mitigations, as a part of the development permit process.

Sources: Environmental Impact report, Framework Element, Los Angeles City General Plan, May 1995; County of Los Angeles, General Plan Safety Element Technical Appendix Vol. 2, plate 4 "Liquefaction Susceptibility", January 1990.

Prepared by the General Plan Framework Section • City of Los Angeles Planning Department • Citywide Graphics • October, 1993 • Council File No. 89-2104

**FIGURE IV.E-2**  
**AREAS SUSCEPTIBLE TO LIQUEFACTION**

shown on *Figure IV.E-2*, the Project Site is located within an area that is susceptible to liquefaction.

### **(3) Soils and Stability**

Previous Project Site development and uses have changed the onsite soil characteristics over time. During boring explorations conducted as part of the geotechnical study for the Project (see *Appendix D: Geotechnical and Soils Report*), fill materials were encountered to depths between 1 and 7 feet below the existing ground surface. The fill consists of sandy silt and silty sand, which range from light brown to black, and are slightly moist to moist, medium dense to dense, and fine to coarse grained. The native soils underlying the site consist of silty sand, clayey silt, silty clay, clayey sand, sandy silt and sand, which range from light brown to grey to dark brown, and are slightly moist to wet, soft to very dense, and fine to coarse grained. The native earth materials consist of alluvial sediments deposited by river and stream action typical to this area of the San Fernando Valley. Bedrock was encountered below the native soils in some of the exploratory borings at depths ranging from approximately 42.5 to 55 feet below the existing site grade. The bedrock consists of shale, siltstone and mudstone of the Miocene Monterey formation. The bedrock is light brown to grayish green to black, moist to very moist, and hard to very hard.

Landslides can be triggered by natural causes such as earthquakes, ocean wave action or saturation by storm, or can be induced by the undercutting of slopes during construction, improper artificial compaction or saturation from sprinkler systems or broken pipes. *Figure IV.E-3: Landslide Inventory & Hillside Areas* shows areas in the City of Los Angeles that have hillsides and areas that are prone to landslides. As shown in *Figure IV.E-3*, the Project Site is not located on a hillside nor is it located in an area prone for landslides.

## **b. Regulatory and Policy Setting**

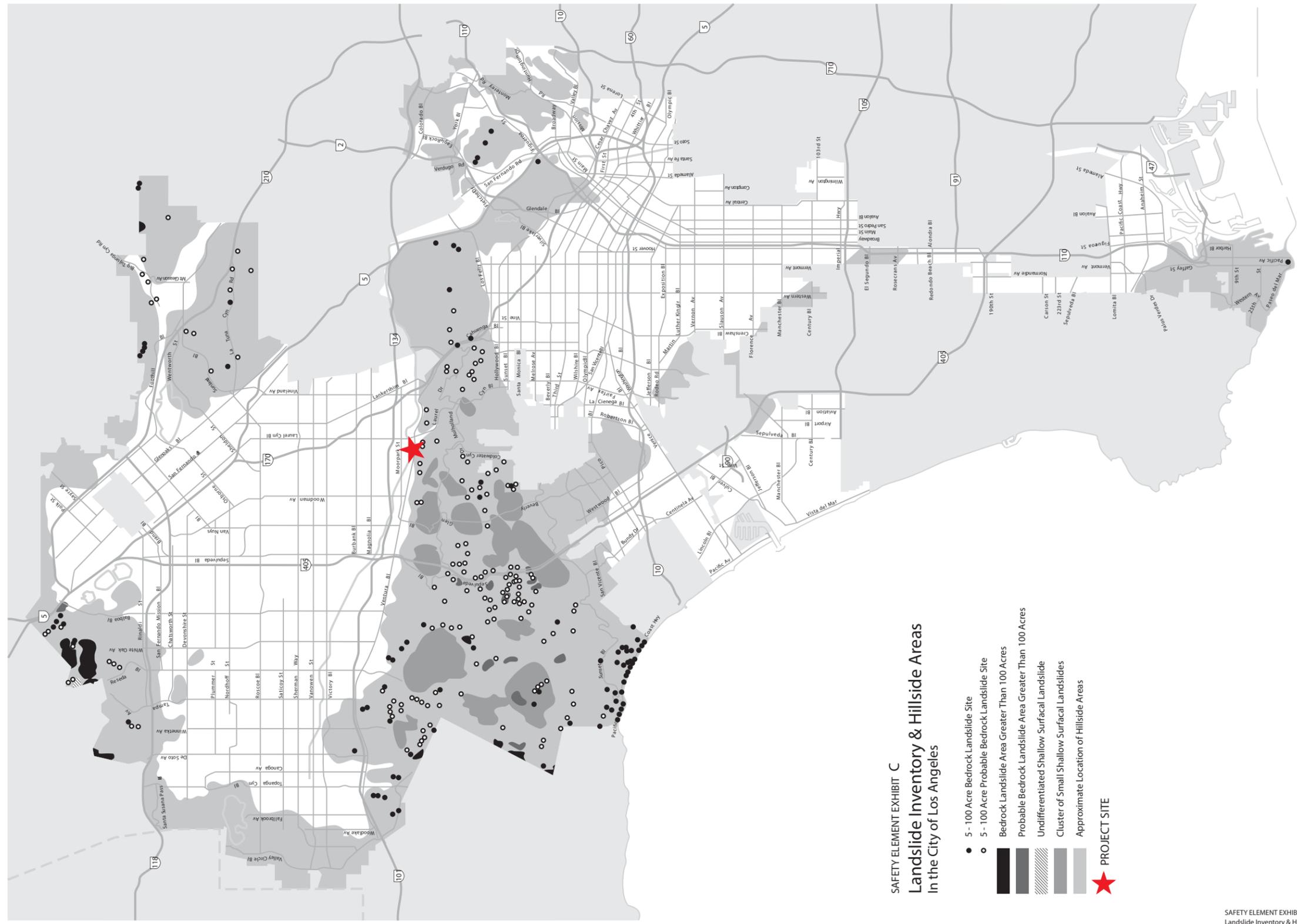
### **(1) California Geological Survey**

Under the Seismic Hazards Mapping Act<sup>2</sup>, the CGS is tasked with compiling maps that identify seismic hazard zones, which in turn are provided to all affected cities, counties, and State agencies for review and consideration. The intent is to protect the public health and safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure and other seismic hazards caused by earthquakes.

Each city and county, in preparing the safety element to its general plan pursuant to subdivision (g) of Section 65302 of the Government Code, and in adopting or revising land use planning and permitting ordinances, shall take into account the information provided in available seismic hazard maps.

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<sup>2</sup> California Public Resources Code, Chapter 7.8 Seismic Hazard's Mapping Act.



**SAFETY ELEMENT EXHIBIT C**  
**Landslide Inventory & Hillside Areas**  
 In the City of Los Angeles

- 5 - 100 Acre Bedrock Landslide Site
- 5 - 100 Acre Probable Bedrock Landslide Site
- Bedrock Landslide Area Greater Than 100 Acres
- ▨ Probable Bedrock Landslide Area Greater Than 100 Acres
- ▧ Undifferentiated Shallow Surficial Landslide
- ⋯ Cluster of Small Shallow Surficial Landslides
- Approximate Location of Hillside Areas
- ★ PROJECT SITE

**NOTES**  
 The Safety Element seismic and landslide exhibits, along with any official geologic or seismic hazard maps prepared by the State and any other potential hazard areas identified by the City Building Safety Department are used in determining if additional soils and geology prepared to help assess potential hazards and mitigations, as a part of the development permit process.

Sources: Environmental Impact Report, Framework Element, Los Angeles City General Plan, May 1995; County of Los Angeles Geology Department Technical Appendix Vol. 2 Part 1 Landslide Inventory, January 1990; County of Los Angeles/Plan Safety Element Technical Appendix, Hazard Reduction in Los Angeles County, December 1990 California Environmental Quality Act of 1970 (CEQA) with guideline, Public Resources Code Section 17000, as amended; City of Los Angeles, Planning and Zoning Code Section 17.050(c), as amended 10-13-99

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SAFETY ELEMENT EXHIBIT C  
 Landslide Inventory & Hillside Areas

**FIGURE IV.E-3**  
**LANDSLIDE INVENTORY & HILLSIDE AREAS**

(2) *City of Los Angeles General Plan/Community Plan*

The Safety Element of the City of Los Angeles General Plan<sup>3</sup> relates to the entire City of Los Angeles. The Safety Element establishes goals, objectives and policies to protect citizens and buildings from potential geological hazards. The following goal, objective and policies would be applicable to the Development Site and the Project for reducing building loss and human injury or death during a hazardous geological event:

**Goal 1:** A city where potential injury, loss of life, property damage and disruption of the social and economic life of the City due to fire, water related hazard, seismic events, geologic conditions or release of hazardous materials disasters is minimized.

**Objective 1.1:** Implement comprehensive hazard mitigation plans and programs that are integrated with each other and with the City's comprehensive emergency response and recovery plans and programs.

**Policy 1.1.1:** Coordination. Coordinate information gathering, program formulation and program implementation between City agencies, other jurisdictions and appropriate public and private entities to achieve the maximum mutual benefit with the greatest efficiency of funds and staff.

**Policy 1.1.2:** Disruption reduction. Reduce, to the greatest extent feasible and within the resources available, potential critical facility, governmental functions, infrastructure and information resource disruption due to natural disaster.

**Policy 1.1.3:** Facility/systems maintenance. Provide redundancy (back-up) systems and strategies for continuation of adequate critical infrastructure systems and services so as to assure adequate circulation, communications, power, transportation, water and other services for emergency response in the event of disaster related systems disruptions.

**Policy 1.1.5:** Risk reduction. Reduce potential risk hazards due to natural disaster to the greatest extent feasible within the resources available, including provision of information and training.

**Policy 1.1.6:** State and federal regulations. Assure compliance with applicable State and federal planning and development regulations, e.g., Alquist-Priolo Earthquake Fault Zoning Act, State Mapping Act and Cobey-Alquist Flood Plain Management Act.

(3) *Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass Community Plan*

The Community Plan does not provide specific goals, objectives or policies addressing loss of buildings and human injury or death due to hazardous geological conditions. However, the

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<sup>3</sup> Department of City Planning Los Angeles, California, Safety Element of the Los Angeles City General Plan, adopted November 26, 1996.

Community Plan does identify recommended actions be promoted by the City of Los Angeles regarding Natural Disasters and Earthquake Preparedness.<sup>4</sup>

Natural Disasters Natural disasters such as the 1971 Sylmar-San Fernando and the 1994 Northridge earthquakes, floods, and fires have impacted, and will continue to impact, the Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass community. City government, other governmental agencies, the private sector, disaster relief agencies, and the citizens of Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass should be encouraged to work together to minimize the impacts of a disaster in terms of land development practices, providing essential services, preventing transportation and communication blockages, and to ensure that recovery will proceed as expeditiously as possible.

Earthquake Preparedness The 1994 Northridge earthquake devastated portions of the Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass area. The magnitude 6.8 (Richter scale) earthquake caused extensive and widespread property damage to residences, businesses, nonprofit organizations, public facilities, and infrastructure, including freeways, water lines, power lines, and natural gas lines. Recovery and rebuilding efforts began shortly after the Northridge earthquake and will continue over the next several years.

#### (4) *Los Angeles Municipal Code*

Specific grading requirements and geotechnical hazard regulations are provided in the Los Angeles Municipal Code (LAMC). Chapter IX, Division 70<sup>5</sup> of the LAMC includes general construction, grading, and site excavation requirements that would apply to the proposed Project.

### 3. ENVIRONMENTAL IMPACTS

#### a. Methodology

Representatives from Geotechnologies, Inc. completed field testing for the Project (see *Appendix D: Geotechnical and Soils Report*). The Project Site was explored on March 30 and 31, 2000, and June 4, 6, and 12, 2007 by drilling 15 exploratory borings, performing five Cone Penetrometer Test (CPT) soundings and excavating one test pit. The borings varied in depth from 30 to 60 feet below the existing site grade, and the CPT soundings were all pushed to refusal, which occurred at depths between 45 and 72 feet below the site grade. The borings were excavated with the aid of a truck mounted, hollow stem auger drilling rig, and were approximately eight inches in diameter.<sup>6</sup> Further geotechnical testing methodology is described on pages 46 through 49 of the *Geotechnical Engineering Investigation (Appendix D: Geotechnical and Soils Report)*.

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<sup>4</sup> City of Los Angeles Planning Department, City of Los Angeles General Plan, Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass Community Plan, May 13, 1998, pg. IV-3

<sup>5</sup> City of Los Angeles Municipal Code, Chapter IX Building Regulations, Division 70 Grading, Excavations and Fills.

<sup>6</sup> *Geotechnical Engineering Investigation for the Proposed Studio City Senior Living Center at 4141 Whitsett Avenue, Studio City, California.*

## **b. Thresholds of Significance**

The thresholds of significance identified below for geological/soil resources are based on Appendix G of the State CEQA Guidelines and the 2006 LA CEQA Thresholds Guide. In accordance with Appendix G of the State CEQA Guidelines and the 2006 LA CEQA Thresholds Guide, the Project would have significant impact on geological/soil resources if it would cause any of the following conditions to occur<sup>7</sup>:

- 1.) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - i.) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault.
  - ii.) Strong seismic ground shaking.
  - iii.) Seismic-related ground failure, including liquefaction.
  - iv.) Landslides.
- 2.) Result in substantial soil erosion or the loss of topsoil.
- 3.) 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.
- 4.) 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.
- 5.) 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.

## **c. Project Impacts**

### **(1) Seismic Hazards and Groundshaking**

No known active or potentially active faults underlie the proposed Development Site or Project Site.<sup>8</sup> Nor are the Development Site and Project Site located within an Alquist-Priolo Earthquake Fault Zone. Based on these considerations, impacts related to ground rupture would be less-than-significant.

Although the Development Site is not located in an area identified as an Alquist-Priolo Earthquake Fault Zone nor does a known active or potentially active fault underlie the

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<sup>7</sup> State of California, *California Environmental Quality Act: Guidelines*, [http://ceres.ca.gov/topic/env\\_law/ceqa/guidelines](http://ceres.ca.gov/topic/env_law/ceqa/guidelines) (May 2012).

<sup>8</sup> *Geotechnical Engineering Investigation for the Proposed Studio City Senior Living Center at 4141 Whitsett Avenue, Studio City, California*.

Development Site, the Project would still be exposed to moderate to strong ground motion (acceleration) caused by an earthquake on any of the local or regional faults that are located nearby. However, it is assumed that the proposed Project structures would be developed in accordance with the 2010 California Building Code Seismic Parameters to reduce the potential for building loss, and human injury or death. With implementation of all required Compliance Measures, impacts related to seismic activity would be less-than-significant.

To determine the risk of building loss, or human injury/death involving seismic-related ground failure such as liquefaction, a magnitude 6.4 earthquake was used in modeling as the Design-Based Earthquake (DBE) for ground motion in this area of Los Angeles.<sup>9</sup> The historic high groundwater level was obtained from review of CGS Seismic Hazard Evaluation Report 98-08. Review of this report indicates that the historically highest groundwater level is 0 feet below grade at the Development Site. Liquefaction analysis of the soils underlying the site was performed using the spreadsheet “templateLIQ2\_30.WQ1”<sup>10,11</sup>. The testing and modeling indicates that soils underlying the Development Site could be subject to liquefaction during the ground motion expected during the Design-Based Earthquake. As such, Mitigation Measures (below) will be implemented to reduce the potential for liquefaction of the underlying soils during a seismic event. Without such Mitigation Measures, the Project could result in a significant geological impact related to liquefaction and seismic-related ground failure at the Development Site.

## (2) *Landslides and Soil Stability*

The probability of seismically-induced landslides occurring on the Project Site is considered to be low due to the general lack of elevation difference and slope geometry across and adjacent to the Project Site. Building loss or human injury or death involving landslides are not expected to occur on the Project Site; therefore impacts would be less-than-significant.

Lateral spreading is the most pervasive type of liquefaction-induced ground failure. Saturated cohesionless sediments that underlie the Development Site, and would have the greatest potential for liquefaction-induced ground failure, have a corrected  $(N_1)_{60}$  that is greater than 15. Therefore, the potential for lateral spread is considered remote at the Development Site and impacts would be less-than-significant.

Seismically-induced settlement or compaction of dry or moist, cohesionless soils can be an effect related to earthquake ground motion, but also occurs naturally. Such settlements are typically most damaging when the settlements are differential in nature across the length of structures. Some settlement of the Project structures should be expected as a result of strong ground-shaking; however, due to the uniform nature of the underlying earth materials, excessive differential settlements are not expected to occur and impacts would be less-than-significant.

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<sup>9</sup> *Geotechnical Engineering Investigation for the Proposed Studio City Senior Living Center at 4141 Whitsett Avenue, Studio City, California.*

<sup>10</sup> Developed by Thomas F. Blake in 1996.

<sup>11</sup> *Geotechnical Engineering Investigation for the Proposed Studio City Senior Living Center at 4141 Whitsett Avenue, Studio City, California.*

The existing fill material and upper native soils are not suitable to support the proposed Project's foundations, floor slabs or additional fill. If the Project were to be developed on this native soil and existing fill material, there would be potential for collapse of the buildings associated with the proposed Project, resulting in a significant geologic impact. Mitigation Measures (below) will be required for removal and replacement of engineered and recompacted fill to ensure a stable base for onsite development.

**(3) *Soils and Local Geotechnical Issues***

Based on field testing results, the Development Site is not located on expansive soils as defined in Table 18-1-B of the 1994 Uniform Building Code.<sup>12</sup> However, as noted above, the existing fill materials and upper native soils are not suitable to support the proposed Project's foundations, floor slabs or additional fill. However, excavation for the proposed subterranean parking lot would remove the unsuitable materials on the Development Site. Mitigation Measures (below) will be required to replace the removed unsuitable materials with engineered and recompacted fill to ensure a stable base for onsite development.

Because the Project would connect to an existing sewer system located in Whitsett Avenue and Valley Spring Lane, the use of septic tanks or an alternative water disposal system is not proposed. Therefore, the Project would not be located in an area where soils are incapable of adequately supporting such alternative sewage disposal systems and there would be no impact.

**(4) *Consistency with Adopted Plans and Policies***

City General Plan and Community Plan policies encourage adequate disaster preparedness and service planning to support the community in the event of a major disaster. Because the Project would be developed in accordance with all applicable and required building requirements and Compliance Measures, the potential for serious damage to buildings, and the risk to life and property from seismic-induced building damage, would be reduced to a less-than-significant level. Due to the existing stability of the soil under the Development Site, without appropriate and required Mitigation Measures (below), the potential for serious damage due to seismic-induced ground failure, and the risk to life and property from ground failure, would be significant. However, implementation of Mitigation Measures would reduce impacts to a less-than-significant level. Consequently, the potential to interfere with citywide disaster response is minimized. The proposed Project would also be consistent with adopted General Plan Safety Element Goal 1 (and its related objectives and policies) and the Sherman Oaks-Studio City-Toluca Lake-Cahuenga Pass Community Plan recommended actions for natural disasters and emergency preparedness; therefore, impacts related to plans and policies affecting geotechnical and geological issues would be less-than-significant.

**d. *Cumulative Impacts***

Geological and soil hazards are generally considered to be site-specific issues and thus do not have potential to be cumulatively considerable. Implementation of Compliance Measures and

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<sup>12</sup> *Geotechnical Engineering Investigation for the Proposed Studio City Senior Living Center at 4141 Whitsett Avenue, Studio City, California.*

required Mitigation Measures MM GEO-1 through MM GEO-71 listed below would adequately mitigate against geological and soil hazards to ensure that building loss and human injury or death due to the proposed Project is reduced to the extent practically feasible and to a less-than-significant level. Other Related Projects would be required to complete similar geotechnical investigations to determine site-specific geological hazards and provide adequate Mitigation Measures to reduce building loss or human injury or death. Furthermore, each Related Project would be required to abide by development standards and Compliance Measures in the Los Angeles Municipal Code's Building Code and the Uniform Building Code to reduce impacts associated with geological and soil hazards. Cumulative geotechnical and geological impacts associated with concurrent development of the Project and Related Projects are not anticipated and would be less-than-significant.

#### **4. COMPLIANCE MEASURES, PDFS, AND MITIGATION PROGRAM**

##### **a. Compliance Measures**

The following Compliance Measures are reasonably anticipated standard conditions that are based on local, State, and federal regulations or laws that serve to offset or prevent specific geotechnical and geological impacts. These Compliance Measures are applicable to the proposed Project and shall be incorporated to ensure that the Project has minimal impacts to Project residents and surrounding uses:

- Design and construction of the Project shall conform to the Uniform Building Code seismic standards as approved by the Department of Building and Safety.
- All grading and earthwork shall be performed in accordance with the Grading Ordinances of the City of Los Angeles and the applicable portions of the General Earthwork Specifications in an approved Geotechnical Report.

##### **b. Project Design Features (PDFs)**

There are no PDFs included with respect to geology, soils, and seismicity.

##### **c. Mitigation Measures**

The Project will result in less-than-significant geological impacts related to building and structural integrity in the event of seismic or other geologic activity. To ensure that the geological impacts are less-than-significant in relation to ground failure due to seismic or other geologic activity, the following Mitigation Measures shall be implemented:

##### General Mitigation Measures

MM GEO-1: In order to mitigate against the effects of liquefaction, the Project structures shall be supported on a mat foundation, which shall be designed to resist one inch of differential settlement that could result due to seismic shaking.

- MM GEO-2: In order to reduce differential settlement between the shallow and deep foundations, the developer shall create a compacted fill blanket. In areas of the shallow foundations, all existing fill materials shall be removed and recompacted. Where existing fill materials are shallower than four feet in depth, all soils shall be removed to a minimum of three feet below the proposed foundations and recompacted as controlled fill prior to foundation excavation.
- MM GEO-3: Foundations for small outlying structures not tied to the main structure, such as property line walls or maintenance sheds, shall be supported on conventional foundations bearing in native earth materials.

#### Fill Soil Mitigation Measures

- MM GEO-4: Fill material, including any fill material generated during demolition of existing structures on the Development Site, shall be removed during the excavation of the subterranean parking level and removed from the Project Site. Where not removed by the proposed excavations, this material and any fill material generated during demolition shall be removed and recompacted as controlled fill prior to foundation excavation. All existing fill materials and any disturbed geologic materials resulting from grading operations shall be removed and properly recompacted prior to foundation excavation.

#### Water-Soluble Sulfate Mitigation Measure

- MM GEO-5: A water-cement ratio of 0.5 shall be maintained in the poured concrete used for development of the Project. Minimum concrete strength for moderate sulfate exposure shall be a minimum of 4,000 pounds per square inch (psi).

#### Site Preparation Mitigation Measures

- MM GEO-6: All vegetation, existing fill, and soft or disturbed geologic materials shall be removed from the areas to receive controlled fill. Any vegetation or associated root system located within the footprint of the Development Site shall be removed during grading. The excavated areas shall be carefully observed and monitored by a geotechnical engineer prior to placing compacted fill.
- MM GEO-7: Any existing or abandoned utilities located within the Development Site shall be removed or relocated as appropriate.
- MM GEO-8: Any at-grade portions of proposed structures within the Development Site shall be excavated to a minimum depth of three feet below the bottom of all foundations. The excavations shall extend at least five feet beyond the edge of the foundations or for a distance equal to the depth of fill below the foundations, whichever is greater. All positions of the proposed structure shall be accurately located so that the limits of the graded area are accurate and the grading operation proceeds efficiently.

- MM GEO-9: Subsequent to the surface soil removals, the exposed grade shall be scarified to a depth of six inches, moistened to optimum moisture content and recompactd in excess of the minimum required comparative density.
- MM GEO-10: All fill shall be mechanically compacted in layers not more than eight inches thick. All fill shall be compacted to at least 90 or 95 percent of the maximum laboratory density for the materials used. The maximum density shall be determined by a qualified professional using test method ASTM D 1557-07 or equivalent.
- MM GEO-11: Any imported material shall be observed and tested by the representative of the geotechnical engineer prior to use in fill areas. Imported materials shall contain sufficient fines so as to be relatively impermeable and result in a stable subgrade when compacted. Any required import materials shall consist of geologic materials with an expansion index of less than 50. The water-soluble sulfate content of the import materials shall be less than 0.1 percentage by weight.
- MM GEO-12: Imported materials shall be free from chemical or organic substances, which could affect the Project structures. A competent professional shall be retained in order to test imported materials and address environmental issues and organic substances which may effect development at the Development Site.
- MM GEO-13: Utility trenches shall be backfilled with controlled fill. The utility shall be bedded with clean sands at least one foot over the crown. The remainder of the backfill may be onsite soil compacted to 90 or 95 percent of the laboratory maximum density. Utility trench backfill shall be tested by a qualified professional in accordance with ASTM D-1557-07.
- MM GEO-14: Pumping (yielding or vertical deflection) of the high-moisture content soils at the bottom of the excavation may occur during operation of heavy equipment. Where pumping is encountered, angular minimum ¾-inch gravel shall be placed and worked into the subgrade. The exact thickness of the gravel would be a trial and error procedure, and shall be determined in the field. It would most likely be on the order of one to two feet thick.
- MM GEO-15: Rubber tire construction equipment shall not attempt to operate directly on the pumping subgrade soils prior to placing the gravel. Direct operation of rubber tire equipment on the soft sub-grade soils will likely result in excessive disturbance to the soils, which in turn could result in a construction schedule delay. Extreme care shall be utilized to place gravel as the sub grade becomes exposed.
- MM GEO-16: When rain is forecast, all fill that has been spread and awaits compaction shall be properly compacted prior to stopping work for the day or prior to stopping due to inclement weather. These fills, once compacted, shall have the surface sloped to drain to an area where water can be removed.

- MM GEO-17: Temporary non-erosive drainage devices shall be installed to collect and transfer excess water from the graded work area. Drainage shall not be allowed to pond anywhere on the Development Site, and especially not against any foundation or retaining wall. Drainage shall not be allowed to flow uncontrolled over any descending slope.
- MM GEO-18: When delayed due to periods of rainfall, resumption of grading activity shall be held until the Development Site has been reviewed by a qualified geotechnical monitor. Any soils saturated by the rain shall be removed and aerated so that the moisture content will fall within three percent of the optimum moisture content.
- MM GEO-19: Surface materials previously compacted before the rain shall be scarified, brought to the proper moisture content and recompact prior to placing additional fill, as determined appropriate by a qualified geotechnical monitor.
- MM GEO-20: If abandoned seepage pits are encountered during grading, options to permanently abandon seepage pits shall include complete removal and backfill of the excavation with compacted fill, or drilling out the loose materials and backfilling to within a few feet of grade with slurry, followed by a compacted fill cap. If the subsurface structures are to be removed by grading, the entire structure shall be demolished. The resulting void may be refilled with compacted soil. Concrete and brick generated during the seepage pit removal may be reused in the fill as long as all fragments are less than six inches in longest dimension and the debris comprise less than 15 percent of the fill by volume. All grading shall comply with the recommendations of the approved Geotechnical Report.
- MM GEO-21: Compliance with the design concepts, specifications or recommendations during construction shall be reviewed by a qualified geotechnical monitor during the course of construction. Any fill which is placed shall be observed, tested, and verified if used for engineered purposes.
- MM GEO-22: In compliance with credit requirements for LEED Certification, demolition debris shall be crushed onsite in order to reuse it in the ongoing grading operations. Onsite recycled demolition debris shall be limited to concrete, asphalt and other non-deleterious materials. All deleterious materials shall be removed including, but not limited to, paper, garbage, ceramic materials and wood.
- MM GEO-23: For structural fill applications, the materials shall be crushed to two inches in maximum dimension or smaller. The crushed materials shall be thoroughly blended and mixed with onsite soils prior to placement as compacted fill. The amount of crushed material shall not exceed 20 percent. The blended and mixed materials shall be tested by a qualified geotechnical monitor prior to placement to insure it is suitable for compaction purposes and during placement to insure that it has been compacted in a suitable manner.

### Foundation Design Mitigation Measures

MM GEO-24: Conventional foundations for structures such as privacy walls or trash enclosures which will not be rigidly connected to the Project buildings may bear in native soils. Continuous footings shall be designed for a bearing capacity of 1,000 pounds per square foot, and shall be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade and 18 inches into the recommended bearing material.

MM GEO-25: Since the recommended bearing capacity is a net value, the weight of concrete in the foundations shall be taken as 50 pounds per cubic foot and the weight of the soil backfill may be neglected when determining the downward load on the foundations.

MM GEO-26: Resistance to lateral loading may be provided by friction acting at the base of foundations and foundations, and by passive earth pressure. An allowable coefficient of friction of 0.2 shall be used with the dead load forces. Passive earth pressure for the sides of foundations and footings poured against undisturbed or recompacted soil shall be computed as an equivalent fluid having a density of 300 pounds per cubic foot with a maximum earth pressure of 3,000 pounds per square foot. When combining passive and friction for lateral resistance, the passive component shall be reduced by one third. A one-third increase in the passive value shall be used for wind or seismic loads.

MM GEO-27: All foundation excavations shall be observed and inspected by a qualified geotechnical monitor to verify penetration into the recommended bearing materials. The observation shall be performed prior to the placement of reinforcement. Foundations shall be deepened to extend into satisfactory earth materials, if necessary. Foundation excavations shall be cleaned of all loose soils prior to placing steel and concrete. Any required foundation backfill shall be mechanically compacted. Flooding shall not be permitted.

### Foundation Design –Mat Foundation Mitigation Measures

MM GEO-28: The mat shall be founded exclusively in native soils found 10 feet below existing site grades. For the at-grade portion of any proposed structure, the mat shall bear in a minimum of newly placed compacted fill, subsequent to the recommended grading. The bottom of the mat foundation shall be a minimum of 18 inches in depth below the lowest adjacent grade at the perimeter of the proposed structure. An allowable bearing pressure of 850 pounds per square foot shall be utilized in the design of the proposed mat foundation. The mat foundation shall be designed utilizing a modulus of subgrade reaction of 100 pounds per cubic inch.

### Dewatering Mitigation Measure

MM GEO-29: Because the basement of the proposed Project structures will be on the order of 20 feet below grade and historic high groundwater levels may be less than 20 feet,

the building shall be designed for potential hydrostatic and buoyancy pressures or a drainage system shall be installed which would operate in the unlikely event that the reported historic high groundwater level is attained again.

#### Retaining Wall Mitigation Measures

MM GEO-30: Retaining walls supporting a level backslope shall be designed utilizing a triangular distribution of pressure. Cantilever retaining walls shall be designed for 31.5 pounds per cubic foot for walls retaining up to 6 feet of earth. For this equivalent fluid pressure to be valid, walls which are to be restrained at the top shall be backfilled prior to the upper connection being made. Additional active pressure shall be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent structures.

MM GEO-31: Retaining walls shall be provided with a sub-drain covered with a minimum of 12 inches of gravel, and a compacted fill blanket or other seal at the surface. The onsite geologic materials are acceptable for use as retaining wall backfill provided they shall be compacted to a minimum of 90 or 95 percent of the maximum density as determined by ASTM D 1557-07 or equivalent.

MM GEO-32: The type and brand of sub-drain pipe shall be cleared with the City Engineer. Sub-drainage pipes shall outlet to an acceptable location.

MM GEO-33: Restrained retaining walls shall be designed to resist a triangular pressure distribution of at-rest earth pressure and hydrostatic pressure as indicated in the diagram on page 28 of the Geotechnical Report (*Appendix D* of the Draft EIR), or as otherwise approved by the City Engineer. The at-rest soils pressure for design purposes shall be 41 pounds per cubic foot. Additional earth pressure shall be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent structures.

MM GEO-34: The upper ten feet of the retaining wall adjacent to streets, driveways or parking areas shall be designed to resist a uniform lateral pressure of 100 pounds per square foot, acting as a result of an assumed 300 pounds per square foot surcharge behind the walls due to normal street traffic. If the traffic is kept back at least ten feet from the retaining walls, the traffic surcharge shall be neglected.

MM GEO-35: Where necessary, the retaining walls shall be designed to accommodate any surcharge pressures that may be imposed by existing buildings on the adjacent property.

MM GEO-36: The retaining walls shall be waterproofed. Waterproofing design and inspection of its installation is not the responsibility of the geotechnical engineer. A qualified waterproofing expert shall be consulted in order to recommend a product or method that would provide protection to below grade walls.

MM GEO-37: Any required backfill shall be mechanically compacted in layers not more than 8 inches thick, to at least 90 or 95 percent of the maximum density obtainable by the ASTM Designation D 1557-07 method of compaction. Flooding shall not be permitted. Proper compaction of the backfill shall be necessary to reduce settlement of overlying walks and paving. Some settlement of required backfill shall be anticipated, and any utilities supported therein shall be designed to accept differential settlement, particularly at the points of entry to the structure.

#### Temporary Excavations Mitigation Measures

MM GEO-38: Excavations on the order of 10 to 25 feet in vertical height shall be required for the subterranean levels of the Project considering the proposed foundation and the recommended recompaction. The excavations are expected to expose fill and dense native soils, which are suitable for vertical excavations up to 5 feet where not surcharged by adjacent traffic or structures. Excavations, which will be surcharged by adjacent traffic or structures shall be shored.

MM GEO-39: Where sufficient space is available, temporary unsurcharged embankments shall be cut at a uniform 1:1 slope gradient. A uniform sloped excavation does not have a vertical component. Where sloped embankments are utilized, the tops of the slopes shall be barricaded to prevent vehicles and storage loads near the top of slope within a horizontal distance equal to the depth of the excavation.

MM GEO-40: If temporary construction embankments are to be maintained during the rainy season, berms shall be made along the tops of the slopes to prevent runoff water from entering the excavation and eroding the slope faces. Water shall not be allowed to pond on top of the excavation nor to flow towards it.

MM GEO-41: Because the structure will extend to a maximum depth of 20 feet below existing site grades, continuous groundwater could be encountered locally in the deeper portions of the excavation. Temporary dewatering shall be installed as necessary. Temporary dewatering shall consist of gravel-filled drainage trenches leading to a sump area. The collected water shall be pumped to an acceptable disposal area. Where the exposed sub-grade is wet, pumping shall be required.

MM GEO-42: It is critical that the soils exposed in the cut slopes shall be observed by a qualified geotechnical monitor during excavation so that modifications of the slopes can be made if variations in the earth material conditions occur. All excavations shall be stabilized within 30 days of initial excavation.

#### Shoring Design Mitigation Measures

MM GEO-43: The City Engineer shall review the final shoring plans and specifications. Consistent with the Preliminary Geotechnical Report, one acceptable method of shoring shall consist of steel soldier piles, placed in drilled holes and backfilled

with concrete. The soldier piles shall be designed as cantilevers or laterally braced utilizing drilled tied-back anchors or raker braces.

MM GEO-44: Drilled cast-in-place soldier piles shall be placed no closer than two diameters on center. The minimum diameter of the piles shall be 18 inches. Structural concrete shall be used for the soldier piles below the excavation; lean-mix concrete may be employed above that level. As an alternative, lean mix concrete may be used throughout the pile where the reinforcing consists of a wide flange section. The slurry shall be of sufficient strength to impart the lateral bearing pressure developed by the wide flange section to the earth materials. For design purposes, an allowable passive value for the earth materials below the bottom plane of excavation may be assumed to be 600 pounds per square foot per foot. To develop the full lateral value, provisions shall be implemented to assure firm contact between the soldier piles and the undisturbed earth materials.

MM GEO-45: Groundwater was encountered during exploration at a depth of 23 feet below grade. Because proposed piles may be in excess of 23 feet in depth, groundwater may be encountered within that depth. Piles placed below the water level shall require the use of a tremie to place the concrete into the bottom of the hole. A tremie shall consist of a water-tight tube having a diameter of not less than 10 inches with a hopper at the top. The tube shall be equipped with a device that will close the discharge end and prevent water from entering the tube while it is being charged with concrete. The tremie shall be supported so as to permit free movement of the discharge end over the entire top surface of the work and to permit rapid lowering when necessary to retard or stop the flow of concrete. The discharge end shall be closed at the start of the work to prevent water entering the tube and shall be entirely sealed at all times, except when the concrete is being placed. The tremie tube shall be kept full of concrete. The flow shall be continuous until the work is completed and the resulting concrete seal shall be monolithic and homogeneous. The tip of the tremie tube shall always be kept about five feet below the surface of the concrete and definite steps and safeguards shall be taken to insure that the tip of the tremie tube is never raised above the surface of the concrete.

MM GEO-46: A special concrete mix shall be used for concrete to be placed below water. The design shall provide for concrete with strength of 1,000 psi over the initial job specification. An admixture that reduces the problem of segregation of paste/aggregates and dilution of paste shall be included. The slump shall be commensurate to any research report for the admixture, provided that it shall also be the minimum for a reasonable consistency for placing when water is present.

MM GEO-47: Casing may be required should caving be experienced in saturated earth materials. If casing is used, extreme care shall be employed so that the pile is not pulled apart as the casing is withdrawn. At no time shall the distance between the surface of the concrete and the bottom of the casing be less than 5 feet.

- MM GEO-48: The frictional resistance between the soldier piles and retained earth material may be used to resist the vertical component of the anchor load. The coefficient of friction may be taken as 0.2 based uniform contact between the steel beam and lean-mix concrete and retained earth. The portion of soldier piles below the plane of excavation may also be employed to resist the downward loads. The downward capacity may be determined using a frictional resistance of 400 pounds per square foot. The minimum depth of embedment for shoring piles shall be five feet below the bottom of the footing excavation or seven feet below the bottom of excavated plane whichever is deeper.
- MM GEO-49: It is possible that lagging between soldier piles could be omitted within more cohesive earth materials where the clear spacing between soldier piles does not exceed four feet. In less cohesive earth materials, such as sands and gravels, lagging shall be necessary. A qualified geotechnical monitor shall observe the exposed earth materials to verify their nature and establish areas where lagging could be omitted, if any. At this time, it is expected that most of the excavation will require continuous lagging. Soldier piles and anchors shall be designed for the full anticipated pressures. Due to arching in the earth materials, the pressure on the lagging will be less. The lagging shall be designed for the full design pressure but is limited to a maximum of 400 pounds per square foot.
- MM GEO-50: Cantilevered shoring supporting a level backslope shall be designed utilizing a triangular distribution of pressure as indicated in the table on page 36 of the Geotechnical and Soils Report (*Appendix D* of the Draft EIR). A trapezoidal distribution of lateral earth pressure shall be appropriate where shoring is to be restrained at the top by bracing or tie backs, with the trapezoidal distribution as shown in the diagram in the 'Restrained Retaining Walls' section of the approved Geotechnical Report. Restrained shoring supporting a level backslope shall be designed utilizing a trapezoidal distribution of pressure as indicated in the table on page 37 of the Geotechnical Report.
- MM GEO-51: Where a combination of sloped embankment and shoring is utilized, the pressure will be greater and must be determined for each combination. Additional active pressure shall be applied where the shoring will be surcharged by adjacent traffic or structures.
- MM GEO-52: It should be realized that some deflection of a shored embankment will occur and that the estimated deflection could be on the order of one inch at the top of the shored embankment. If greater deflection occurs during construction, additional bracing shall be necessary to minimize settlement of adjacent buildings and utilities in adjacent street and alleys. If desired to reduce the deflection, a greater active pressure shall be used in the shoring design. Where internal bracing is used, the rakers shall be tightly wedged to minimize deflection. The raker braces and the wedging shall be installed properly as their proper installation will be critical to the performance of the shoring.

MM GEO-53: Because of the depth of the excavation, there shall be some means of monitoring the performance of the shoring system. The monitoring shall consist of periodic surveying of the lateral and vertical locations of the tops of all soldier piles and the lateral movement along the entire lengths of selected soldier piles. Also, some means of periodically checking the load on selected anchors shall be necessary, where applicable. Some movement of the shored embankments shall be anticipated as a result of the relatively deep excavation. Photographs of the existing buildings on the adjacent properties shall be taken during construction to record any movements for use in the event of a dispute.

MM GEO-54: It is critical that the installation of shoring shall be observed by a qualified geotechnical monitor. The observations shall insure that the recommendations of the approved Geotechnical Report are implemented and so that field modifications of the recommendations can be made if variations in the earth material or groundwater conditions warrant. The observations shall allow for a report to be prepared on the installation of shoring for the use of the local building official, where necessary.

#### Slabs on Grade Mitigation Measures

MM GEO-55: Concrete floor slabs shall be a minimum of five inches in thickness. Slabs-on-grade shall be cast over undisturbed natural earth materials or properly controlled fill materials. Any earth materials loosened or over-excavated shall be wasted from the site or properly compacted to 90 or 95 percent of the maximum dry density.

MM GEO-56: Outdoor concrete flatwork shall be a minimum of four inches in thickness. Outdoor concrete flatwork shall be cast over undisturbed natural earth materials or properly controlled fill materials. Any earth materials loosened or over-excavated shall be wasted from the site or properly compacted to 90 or 95 percent of the maximum dry density.

MM GEO-57: A qualified monitor in the field of moisture vapor transmission shall be consulted to evaluate the general and specific moisture vapor transmission paths and any impact on the construction of the proposed Project. The qualified consultant shall provide recommendations for mitigation of potential adverse impacts of moisture vapor transmission on various components of the proposed structure. Where dampness would be objectionable, the floor slabs shall be waterproofed. A qualified waterproofing expert shall be consulted in order to recommend a product or method which would provide protection for concrete slabs-on-grade.

MM GEO-58: All concrete slabs-on-grade shall be supported on vapor retarder. The design of the slab and the installation of the vapor retarder shall comply with ASTM E 1643-98 and ASTM E 1745-97. Where a vapor retarder is used, a low-slump concrete shall be used to minimize possible curling of the slabs. The barrier shall be covered with a layer of trimmable, compactable, granular fill, where it is thought to be beneficial.

MM GEO-59: The recommendations of the approved Geotechnical Report shall be implemented to reduce the potential for cracking of concrete slabs-on-grade due to settlement. However even where these recommendations have been implemented, foundations, stucco walls and concrete slabs-on-grade may display some cracking due to minor soil movement and/or concrete shrinkage. The occurrence of concrete cracking shall be reduced and/or controlled by limiting the slump of the concrete used, proper concrete placement and curing, and by placement of crack control joints at reasonable intervals, in particular, where entrant slab corners occur.

MM GEO-60: For standard crack control maximum expansion joint spacing of eight feet shall not be exceeded. Lesser spacing would provide greater crack control. There shall be joints at curves and angle points. The crack control joints shall be installed as soon as practical following concrete placement. Crack control joints shall extend a minimum depth of one-fourth the slab thickness. Construction joints shall be designed by a structural engineer.

MM GEO-61: Complete removal of the existing fill soils beneath outdoor flatwork such as walkways or patio areas shall not be required; however, due to the rigid nature of concrete, some cracking, a shorter design life and increased maintenance costs shall be anticipated. In order to provide uniform support beneath the flatwork, 12 inches of the exposed subgrade beneath the flatwork shall be scarified and recompacted to 90 percent relative compaction.

MM GEO-62: Concrete slabs-on-grade shall be reinforced with a minimum of #4 steel bars on 16-inch centers each way. Outdoor flatwork shall be reinforced with a minimum of #3 steel bars on 18-inch centers each way.

#### Pavements Mitigation Measures

MM GEO-63: Prior to placing paving, the existing grade shall be scarified to a depth of 12 inches, moistened as required to obtain optimum moisture content, and recompacted to 90 percent of the maximum density as determined by ASTM D 1557-02. Removal of all existing fill in the area of new paving is not required; however, pavement constructed in this manner will most likely have a shorter design life and increased maintenance costs.

MM GEO-64: Aggregate base shall be compacted to a minimum of 95 percent of the ASTM D 1557-laboratory maximum dry density. Base materials shall conform with Sections 200-2.2 or 200-2.4 of the "Standard Specifications for Public Works Construction", (Green Book), 1991 Edition.

MM GEO-65: The performance of pavement is highly dependent upon providing positive surface drainage away from the edges. Ponding of water on or adjacent to pavement can result in saturation of the sub grade materials and subsequent pavement distress. If planter islands are planned as part of the Project, the

perimeter curb shall extend a minimum of 12 inches below the bottom of the aggregate base.

#### Design Review Mitigation Measures

MM GEO-66: Engineering of the Project shall not begin until approval of the geotechnical report is obtained in writing from the Department of Building and Safety. Significant changes in the geotechnical recommendations may result during the building department review process. Any additional recommendations identified in the final approved geotechnical report shall be implemented during Project development.

MM GEO-67: Geotechnical aspects of the Project shall be reviewed by a qualified geotechnical expert during the design process. This review provides assistance to the design team by providing specific recommendations for particular cases, as well as review of the proposed construction to evaluate whether the intent of the recommendations presented in the Geotechnical Report are satisfied.

#### Construction Monitoring Mitigation Measures

MM GEO-68: Geotechnical observations and testing during construction are considered to be a continuation of the geotechnical investigation. It is critical that a qualified geotechnical expert review the geotechnical aspects of the project during the construction process. Compliance with the design concepts, specifications or recommendations during construction shall require review by a qualified geotechnical monitor during the course of construction.

MM GEO-69: If conditions encountered during construction appear to differ substantially from those disclosed in the approved Geotechnical Report, the developer shall notify the City Engineer and/or qualified geotechnical expert, as appropriate, immediately so the need for modifications may be considered in a timely manner.

MM GEO-70: It shall be the responsibility of the developer's contractor to ensure that all excavations and trenches are properly sloped or shored. All temporary excavations shall be cut and maintained in accordance with applicable OSHA rules and regulations.

#### Excavation Characteristics Mitigation Measure

MM GEO-71: Since the exploration performed for in the preliminary Geotechnical Report is limited to the geotechnical excavations described therein and the direct exploration of the entire site is not feasible, the Project team shall understand that differing excavation and drilling conditions may be encountered based on boulders, gravel, oversize materials, groundwater and many other conditions. Fill materials, especially when they were placed without benefit of modern grading codes, regularly contain materials which could impede efficient grading and drilling. The appropriateness of all recommended geotechnical mitigation

measures shall be evaluated against infield observations encountered during construction, and any and all adjustments shall be coordinated through the City Engineer.

## **5. LEVEL OF SIGNIFICANCE AFTER MITIGATION**

Based on implementation of Compliance Measures and application of standard rules and regulations of the City of Los Angeles (i.e., Building Code and the Uniform Building Code), development of the proposed Project would result in less-than-significant geological impacts relating to structural integrity during a seismic or other geologic event.

In addition, implementation of recommended Mitigation Measures MM GEO-1 through MM GEO-71, or their equivalent as provided in the final approved Geotechnical and Soils Report, would further reduce the risk of building loss, and human injury or death during a strong seismic ground shaking event. The Mitigation Measures would reduce all potential significant impacts related to liquefaction or ground failure of the underlying soils (and subsequent building collapse) during a seismic event to less-than-significant levels. With implementation of the Compliance Measures and required Mitigation Measures, or their equivalent as provided in the final approved Geotechnical and Soils Report, impacts related to seismic activity, geology, and the potential for building loss and risk of human injury or death, would be less-than-significant.