D. GEOLOGIC HAZARDS

An evaluation of geologic and soil conditions at the Project Site was prepared for the Master Environmental Impact Report by Law/Crandall, Inc on June 7, 2002. This report is attached in full in **Appendix C** of the Technical Appendices. Findings from this evaluation were utilized in the preparation of this section.

ENVIRONMENTAL SETTING

Project Site

The Project Site is located in the northwestern portion of the San Fernando Valley. The San Fernando Valley is an elliptical, alluvium-filled basin, approximately 23 miles wide and 12 miles long, formed by deposition from streams and rivers that have transported sediments from the surrounding upland areas. The alluvium is mainly derived from the Santa Monica Mountains to the south, the Santa Susana Mountains to the northwest, the Simi Hills to the west, the San Gabriel Mountains to the northeast, and the Verdugo Mountains to the east.

Regionally, the Project Site is located in the Transverse Ranges geomorphic province. This province is characterized by east-west trending geologic structures that include the Santa Monica Mountains and the active San Fernando fault zone. The trend of the San Fernando Valley reflects the overall trend of the Transverse Ranges, where major structural features exhibit an east-west orientation in contrast to the northwest-southeast trend that dominates in the rest of California. The San Fernando Valley is an area of compression between the San Gabriel Mountains on the northeast and the Santa Monica Mountains on the south.

The relationship of the Project Site to local geologic features is depicted in **Figure 15: Geologic Map,** and the surface faults in the vicinity of the Project Site are shown in **Figure 16: Regional Faults**. **Figure 17: Regional Seismicity** shows the locations of major faults and earthquake epicenters in Southern California.

Geologic Materials

Law/Crandall previously drilled five borings at the Project Site in 1965 and 27 borings at the Project Site in 1965 and 1966 in connection with construction of the existing building, to a maximum depth of 41.5 feet below the existing ground surface. Additionally, Law/Crandall drilled over 52 borings on the adjacent property to the east in 1969, to a maximum depth of 71 feet as part of a prior geotechnical investigation for the existing Northridge Fashion Center. The Project Site is predominantly underlain by Holocene-age alluvial fan deposits. As encountered in previous borings, the upper 35 feet of alluvial materials consists of predominantly alternating layers of silty sand and sandy silt with localized layers of gravelly sand and cobbles (up to 7 inches maximum dimension). Locally, clayey silt is present in the upper 12 feet. Below a depth

Figure 15: Geologic Map

Figure 16: Regional Faults

Figure 17: Regional Seismicity

of 35 feet, the alluvial materials consist predominantly of alternating layers of clayey silt and silty clay. The Holocene-age alluvial materials and the underlying Pleistocene-age materials are approximately 750 feet thick and are underlain by Tertiary-age sedimentary rocks.

Groundwater

According to the County of Los Angeles DPW, the nearest groundwater monitoring well is Well No. 4735B, located approximately .4 miles west of the Project Site. Groundwater level information is available for this well for the 1956 to 2001 monitoring period. The highest groundwater level recorded in this well for the referenced monitoring period was in 1957 at a depth of 56.4 feet. Since the 1960s, groundwater levels have steadily declined in this well. The lowest groundwater level recorded in this well was a depth of 86 feet in 1996. The most recent water level measurement in this well indicates a depth to groundwater of about 84 feet and a corresponding groundwater elevation of approximately 789 feet on April 20, 2001. Based on a Site elevation of approximately 830 to 855 feet, the corresponding depth to groundwater beneath the Site is estimated between approximately 41 to 66 feet.

Groundwater was encountered during borings previously drilled at the Project Site in 1965 and 1966 at depths of 34.5 to 38.5 feet. Groundwater was encountered in borings drilled on the adjacent site to the east (Northridge Fashion Center site) in 1969 at depths of 37 to 54 feet. Groundwater levels were deeper in the northern portion of the Northridge Fashion Center site.

Based on historic records of water levels at the Site, groundwater beneath the Site can fluctuate, both seasonally and annually. Groundwater level fluctuation is the result of the amount of precipitation received in an area as well as management practices at groundwater recharge areas. Although water levels have been known to have steadily declined in the area since the 1960s, water levels could reach historic highs in the future. Based on historic groundwater levels as recorded in borings at the Project Site and in nearby wells, there is a potential for shallow groundwater to have an adverse impact on the proposed development.

The closest groundwater recharge area to the Project Site is the Tujunga Spreading Grounds. Recharge of groundwater by spreading is accomplished by diverting native water sources (primarily stormwater runoff) from the Tujunga Wash into the San Fernando Basin. This water then percolates into the groundwater aquifer and replenishes groundwater basins. During the 1999-2000 water year (October 1 to September 30), 2,684 acre-feet of water were spread at the Tujunga Spreading Grounds.[44]

[44]Upper Los Angeles River Area Watermaster, *ULARA Watermaster Report: 2000-2001 Water Year, Section2-Water Supply, Operations, and Hydrologic Conditions*. May 2002.

Although groundwater management practices at groundwater recharge areas have the potential to alter water levels, groundwater levels basin-wide are not expected to rise above historically high levels.[45] Based on current pumping and recharge activities, groundwater levels in the area of the Project Site are unlikely to reach historically high water levels in the foreseeable future.[46]

Fault Rupture

The numerous faults in Southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Division of Mines and Geology (CDMG) for the Alquist-Priolo Earthquake Fault Zoning Program. By definition, an active fault is one that has had surface displacement within Holocene time (about the last 11,000 years). A potentially active fault is a fault that has demonstrated surface displacement of Quaternary age deposits (last 1.6 million years). Inactive faults have not moved in the last 1.6 million years. A list of nearby active faults and the distance in miles between the Site and the nearest point on the fault, the maximum magnitude, and the slip rate for the fault is given in **Table 19: Active Faults in Southern California**.

Active Faults

San Fernando Fault Zone

The San Fernando fault zone comprises one of a number of left lateral/reverse frontal faults bounding the southern margin of the Santa Susana Mountains and the portion of the San Gabriel Mountains west of Big Tujunga Canyon. An earthquake of magnitude 6.6 originated along this fault zone on February 9, 1971. Surface rupture occurred along the Tujunga, Sylmar, and Mission Wells segments of the San Fernando fault zone during this earthquake.

Simi-Santa Rosa Fault Zone

The active Simi fault of the Simi-Santa Rosa fault zone is located approximately 8.2 miles northwest of the Project Site. The Simi-Santa Rosa fault zone is a reverse/oblique fault system that extends over 31 miles across Ventura County from the northeastern end of Simi Valley westward to the Camarillo Hills on the east margin of the Oxnard Plain. The fault zone consists of a series of north-dipping reverse or oblique slip faults within the hanging-wall of the Oak Ridge fault system. The principal faults of the Simi-Santa Rosa fault zone, from east to west, include the Simi fault in the Simi and Tierra Rejada valleys, the Santa Rosa fault in the Santa Rosa Valley, and the Springville and Camarillo faults in the Camarillo Hills area.

[45] The historic high water level in the area occurred in 1944 when water levels were reportedly 35 to 40 feet below the ground surface.

[46] Phone conversation between Mark Mackowski of the Upper Los Angeles River Area Watermaster and Carrie Riordan of Planning Associates, Inc. May 1, 2002.

TABLE 19
ACTIVE FAULTS IN SOUTHERN CALIFORNIA

Fault	Maximum Magnitude	Slip Rate (mm/yr)	Distance from Site (miles)	Direction from Site
Northridge Thrust	6.9 RO	1.5	0	–
San Fernando	6.7 RO	2.0	2.1	N
Simi-Santa Rosa	6.7 RO	1.0	8.2	NW
Verdugo	6.7 RO	0.5	8.4	E
San Gabriel	7.0 SS	1.0	11	NE
Hollywood	6.4 RO	1.0	13	SE
Santa Monica	6.6 RO	1.0	13.5	SSE
Malibu Coast	6.7 RO	0.3	14	S
Oak Ridge	6.9 RO	4.0	15	NW
Sierra Madre	7.0 RO	3.0	15	E
Newport-Inglewood Zone	6.9 SS	1.0	17	SSE
San Cayetano	6.8 RO	6.0	17.5	NW
Anacapa-Dume	7.3 RO	3.0	18	SSW
Palos Verdes	7.1 SS	3.0	20	S
Raymond	6.5 RO	0.5	21	ESE
Compton-Los Alamitos Thrust	6.8 RO	1.5	22	SE
Elysian Park Thrust	6.7 RO	1.5	25	SE
San Andreas (Southern segment)	7.4 SS	24.0	29	NE
Whittier	6.8 SS	2.5	33	SE
Ventura -Pitas Point	6.8 RO	1.0	37	W
Red Mountain	6.8 RO	2.0	43	W
Cucamonga	7.0 RO	5.0	47	ESE
Elsinore (Glen Ivy Segment)	6.8 SS	5.0	58	SE

SS: Strike Slip; NO: Normal Oblique; RO: Reverse Oblique
SOURCE: Law/Crandall. *Report of Geotechnical Evaluation for Proposed Corbin-Nordhoff Project*, June 7, 2002.

The Simi fault forms the linear mountain front along the north margin of the Simi and Tierra Rejada valleys. The overall north-side up sense of slip is greater than 5,300 feet in the Tierra Rejada Hills west of Simi Valley. The fault exhibits strong geomorphic evidence of Quaternary deformation in the western Simi Valley, where more than 500 feet of Pleistocene and younger alluvium fills an east-west trending, down-dropped bedrock trough. Recent studies of the Simi

fault at Arroyo Simi, have documented Holocene faulting and slickensides on the near vertical fault plane that revealed a significant lateral component of slip, suggesting that the fault has an overall left-lateral, reverse sense of slip. The timing of the most recent surface rupturing event at the Arroyo Simi site is constrained between faulted clay deposits yielding a calibrated radiocarbon age of 7,666±50 years BP (before present) and overlying unfaulted colluvial deposits yielding a calibrated radiocarbon age of 1,205±80 years BP. The California Division of Mines and Geology considers the Simi fault to be active and have established an Alquist-Priolo Earthquake Fault Zone for the Simi fault.

Verdugo Fault

The Verdugo fault is located approximately 8.4 miles east of the Project Site. The Verdugo fault is a part of the larger Verdugo fault zone that also includes the San Rafael fault and the Eagle Rock fault. The most recent documented activity along this fault occurs in the Holocene-age alluvial deposits along the western flank of the Verdugo Mountains in the Burbank area. An Alquist-Priolo Earthquak Fault Zone has not been established for the Verdugo fault. However, a fault rupture hazard zone has been designated by the City of Burbank for the Verdugo fault. For planning purposes, the Verdugo fault should be considered active.

San Gabriel Fault Zone

The San Gabriel fault zone is located about 11 miles northeast of the Project Site. The fault zone has an accurate pattern that is convex to the southwest. The fault has a total length of about 80 miles. Estimates of right lateral separation along the fault zone vary from as little as about 2 to 5 miles to greater than 31 miles. Numerous geomorphic indicators such as deflected drainages and scarps along the fault zone indicate relatively recent movement. Offset of Holocene units has been demonstrated in the Saugus area. Subsequently, the Saugus-Newhall segment of the San Gabriel fault zone is included within an Alquist-Priolo Earthquake Fault Zone.

San Andreas Fault Zone

The active San Andreas fault zone is located about 29 miles northeast of the Project Site. This fault zone, California's most prominent, trends generally northwest for almost the entire length of the state. The southern segment, closest to the site, is approximately 280 miles long and extends from the Mexican border to the Transverse Ranges west of Tejon Pass. The recurrence interval for a magnitude 8.0 earthquake along the entire fault zone was estimated to be between 50 and 200 years. The 1857 Fort Tejon earthquake was the last major earthquake along the San Andreas fault zone in Southern California.

Blind Thrust Fault Zones

Northridge Thrust

The Northridge Thrust is an inferred deep thrust fault that is considered the eastern extension of the active Oak Ridge fault. The Northridge Thrust is located beneath the majority of the San Fernando Valley and is believed to be the causative fault of the January 17, 1994, Northridge earthquake. This deep, buried thrust fault is located beneath the Project Site. The Northridge Thrust is not exposed at the surface and does not present a potential surface fault rupture hazard. However, this thrust fault is an active feature that can generate future earthquakes. The average slip rate is estimated to be 1.5 mm/year with a maximum magnitude of 6.9 for the Northridge Thrust.

Compton-Los Alamitos Thrust

The Compton-Los Alamitos Thrust is an inferred blind thrust fault located within the south-central portion of the Los Angeles Basin. This deep, buried thrust fault is suggested to extend over 50 miles from the Santa Monica Bay coastline southeast into northwestern Orange County. The Compton-Los Alamitos Thrust may connect with the Elysian Park Thrust (to the northeast) along a detachment fault below Los Angeles. The closest edge of the vertical surface projection of this thrust fault is located about 22 miles southeast of the Project Site. Like other blind thrust faults in the Los Angeles area, the Compton-Los Alamitos Thrust is not exposed at the surface and does not present a potential surface rupture hazard. However, the Compton-Los Alamitos Thrust should be considered an active feature capable of generating future earthquakes. An average slip rate of 1.5 mm/year and a maximum magnitude of 6.8 are estimated for the Compton-Los Alamitos Thrust.

Elysian Park Thrust

The Elysian Park Thrust, previously defined as the Elysian Park Fold and Thrust Belt, was postulated to extend northwesterly from the Santa Ana Mountains to the Santa Monica Mountains, extending westerly and paralleling the Santa Monica-Hollywood and Malibu Coast faults. The Elysian Park Thrust is now believed to be smaller in size, only underlying the central Los Angeles Basin. The vertical surface projection of the Elysian Park Thrust is about 25 miles southeast of the Project Site at its closest point. Like other blind thrust faults in the Los Angeles area, the Elysian Park Thrust is not exposed at the surface and does not present a potential surface rupture hazard; however, the Elysian Park Thrust should be considered an active feature capable of generating future earthquakes. An average slip rate of 1.5 mm/year and a maximum magnitude of 6.7 are estimated for the Elysian Park Thrust.

Potentially Active Faults

Northridge Hills Fault

The closest potentially active fault to the Project Site is the Northridge Hills Fault located approximately 1.3 miles to the north-northeast. The Northridge Hills Fault is a high-angle fault and its location is based primarily on the numerous petroleum test wells that have been drilled in the Northridge Hills. Logs of these wells indicate that the Modelo Formation has been displaced between 490 to 1,000 feet along the dip of the fault. The apparent movement along the fault has been dip-slip with the north block moving down. The apparent surface trace of the fault can be found in the Cretaceous Chico Formation north of Chatsworth. Geomorphic evidence, such as scarps in the Pleistocene-age alluvial deposits, have been identified on aerial photographs. The fault is considered potentially active. However, a recent publication suggests that deformation of young sediments in the area could relate to movement along the Northridge Hills fault.

Santa Susana Fault

The potentially active Santa Susana Fault is located approximately 3.8 miles north of the Project Site. This fault extends northeastward from the Santa Susana Mountains across San Fernando Pass and into the San Gabriel Mountains. Maximum offset along the Santa Susana Fault has been postulated as one mile of vertical displacement and one to two miles of horizontal displacement. It has been suggested that the Santa Susana Fault has been inactive since the middle Pleistocene. However, others have suggested late Pleistocene displacement along the Santa Susana Fault. There is no evidence that this fault has offset Holocene-age alluvial deposits.

Holser Fault

The potentially active Holser Fault is located 16 miles north-northwest of the Project Site. This fault is a high-angle reverse fault that offsets Pleistocene-age terrace deposits. The Holser Fault intersects the San Gabriel fault east of Saugus. There is no evidence that this fault has offset Holocene-age alluvial deposits.

Fault Rupture

The Project Site is not within a currently established Alquist-Priolo Earthquake Fault Zone for surface fault rupture hazards. The closest Alquist-Priolo Earthquake Fault Zone, established for surface breaks along the Santa Susana Fault that are a result of ground motions generated by the San Fernando Earthquake, is located 4.0 miles to the north. Based on available geologic data, active or potentially active faults with the potential for surface fault rupture are not known to be located directly beneath or projecting toward the Site. Therefore, the potential for surface rupture due to fault plane displacement propagating to the surface at the Site during the design life of the project is considered low.

Seismicity

Earthquake Catalog Data

The seismicity of the region surrounding the Project Site was determined from research of an electronic database of seismic data. This database includes earthquake data compiled by the California Institute of Technology between 1932 and 2002 and data from 1812 to 1931 compiled by Richter and the U.S. National Oceanic Atmospheric Administration (NOAA). The search for earthquakes that occurred within approximately 62 miles (100 kilometers) of the Site indicates that 529 earthquakes of Richter magnitude 4.0 and greater occurred between 1932 and 2002; one earthquake of magnitude 6.0 or greater occurred between 1906 and 1931; and one earthquake of magnitude 7.0 or greater occurred between 1812 and 1905. A list of these earthquakes is presented in **Table 20: Historic Earthquakes**.

Table 20
Historic Earthquakes

Earthquake (Oldest to Youngest)	Date of Earthquake	Magnitude	Distance to Epicenter (miles)	Direction to Epicenter
Long Beach	March 10, 1933	6.4	55	SE
Tehachapi	July 21, 1952	7.5	59	NW
San Fernando	February 9, 1971	6.6	15	NNE
Whittier Narrows	October 1, 1987	5.9	30	ESE
Sierra Madre	June 28, 1991	5.8	32	E
Landers	June 28, 1992	7.3	120	E
Big Bear	June 28, 1992	6.4	102	E
Northridge	January 17, 1994	6.7	1.8	S
Hector Mine	October 16, 1999	7.1	136	NE

SOURCE: Law/Crandall. *Report of Geotechnical Evaluation for Proposed Corbin-Nordhoff Project*, June 7, 2002.

Historic Earthquakes

A number of earthquakes of moderate to major magnitude have occurred in the Southern California area within the last 69 years. A partial list of these earthquakes is included in **Table 20: Historic Earthquakes**.

The Project Site could be subjected to strong ground shaking in the event of an earthquake. However, this hazard is common in Southern California and the effects of ground shaking can be mitigated to a less than significant level by proper engineering design and construction in conformance with current building codes and engineering practices.

Slope Stability

The relatively flat topography at the Project Site precludes both stability problems and the potential for lurching (earth movement at right angles to a cliff or steep slope during ground shaking). According to the City of Los Angeles Safety Element (1996) and the County of Los Angeles Seismic Safety Element (1990), the Project Site is not within an area identified as having a potential for slope instability. There are no known landslides near the Project Site, nor is the Project Site in the path of any known or potential landslides. Additionally, the Project Site is not located within an area identified as having a potential for seismic slope instability.[47]

Liquefaction and Seismically Induced Settlement

Liquefaction potential is greatest where groundwater is shallow, and submerged loose, fine sands occur within a depth of about 50 feet or less. Liquefaction potential decreases as grain size and clay and gravel content increase. As ground acceleration and shaking duration increase during an earthquake, liquefaction potential increases.

According to the California Division of Mines and Geology (1998), the City of Los Angeles Safety Element (1996), and the County of Los Angeles Seismic Safety Element (1990), the northern portion of the Project Site is not within an area identified as having a potential for liquefaction. However, the southern portion of the Project Site is within an area identified as having a potential for liquefaction. The Project Site boundaries relative to the state-designated liquefaction hazard zone are shown in **Figure 18: Seismic Hazard Zone Map**.

Based on groundwater levels in nearby wells, the historic and current groundwater levels beneath the northern portion of the Project Site are at depths greater than 50 feet below the existing ground surface. Historic groundwater levels beneath the southern portion of the Site were as shallow as about 34 feet beneath the existing ground surface which could enhance the potential for a significant impact due to liquefaction. Therefore, there is a potential for liquefaction and associated ground deformation at the Project Site, especially beneath the portion of the Project Site that is included in the liquefaction hazard zone.

Tsunamis, Inundation, Seiches, and Flooding

The Project Site is not in a coastal area. Therefore, tsunamis (seismic sea waves) are not considered a significant hazard at the Project Site.

[47] California Division of Mines and Geology, 1998.

Figure 18: Seismic Hazard Zone Map

According to the City of Los Angeles Safety Element (1996) and the County of Los Angeles Seismic Safety Element (1990), the Project Site is not located within a potential inundation area for an earthquake-induced dam failure. Therefore, the potential for the Project Site to be inundated as a result of an earthquake-induced dam failure is considered to be low.

The Project Site is not located downslope of any large bodies of water that could adversely affect the Project Site in the event of earthquake-induced seiches (wave oscillations in an enclosed or semi-enclosed body of water).

According to Federal Insurance Rate Maps (FIRM) panel number 0601370018C produced by the Federal Emergency Management Agency (FEMA), the Project Site is located within flood zone "C". Flood zone "C", since replaced by zone "X (No Shading)," is defined as an area outside both the 100-year and 500-year flood plains.

Subsidence

The Project Site is not within an area of known subsidence associated with fluid withdrawal (groundwater or petroleum), peat oxidation, or hydrocompaction.

Add Area

See **Section IV. D: Geologic Hazards- Project Site**. Due to the proximity of the Add Area to the Project Site, geotechnical information gathered for the Project Site analysis also pertains to the Add Area properties.

Whereas a portion of the Project Site is located with a liquefaction zone, according to the California Division of Mines and Geology (1998), the Add Area properties are not located within a designated liquefaction zone. The Add Area boundaries relative to the state-designated liquefaction hazard zone are shown in **Figure 18: Seismic Hazard Zone Map**.

THRESHOLDS OF SIGNIFICANCE

According to the City of Los Angeles CEQA Thresholds Guide, a project would normally have a significant geologic hazard impact if it would cause or accelerate geologic hazards which would result in substantial damage to structures or infrastructures, or expose people to substantial risk of injury.

A project would normally have significant sedimentation or erosion impacts if it would:

- 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.

ENVIRONMENTAL IMPACTS

Project Site

Fault Rupture

The Project Site is not within a currently established Alquist-Priolo Earthquake Fault Zone. The closest Alquist-Priolo Earthquake Fault Zone is located 4.0 miles north of the Project Site, established along the Santa Susana Fault. Based on the available geologic data, active or potentially active faults with the potential for surface fault rupture are not known to be located beneath or projecting toward the Site. Therefore, the potential for surface rupture at the Project Site due to fault plane displacement propagating to the ground surface during the design life of the project is considered low. Although the Project Site could be subjected to strong ground shaking in the event of an earthquake, this hazard is common in Southern California and the effects of ground shaking can be mitigated to a less than significant level by proper engineering design and construction in conformance with current building codes and engineering practices. The proposed Project at the Project Site will not result in substantial damage to structures or infrastructures, or expose people to substantial risk of injury. Therefore, the proposed Project at the Project Site will result in a less than significant impact due to geologic hazards in the project area.

Groundwater

In 2001, groundwater at the Project Site was reported at 84 feet below the ground surface. The historically high groundwater level of between 35 and 40 feet below the surface was recorded in 1944.

Based on the historic recorded water levels beneath the Site, groundwater levels beneath the Site could fluctuate (seasonally and annually) as a result of groundwater management practices. Although water levels are known to have steadily declined in the area since the 1960s, water levels could reach historic highs in the future. Based on historical groundwater levels as recorded in borings at the Project Site and in nearby wells, there is a potential for shallow groundwater to have an adverse impact on the proposed development. However, it is unlikely that the groundwater would have an impact on development unless subterranean levels are included, to a depth of at least 30 feet. The Homeplace Retirement Community proposed for the Project Site includes a maximum of two levels of subterranean parking which with a maximum depth of sixteen feet. This will not exceed the 30 foot depth at which groundwater may impact development. Development on the remainder of the Project Site will not include subterranean

levels. Further, with adherence to current building codes and engineering practices, the proposed Project at the Project Site will not result in substantial damage to structures or infrastructures, or expose people to substantial risk of injury. Therefore, the proposed Project at the Project Site will result in a less than significant impact due to groundwater hazards in the project area.

Slope Stability

According to the City of Los Angeles Safety Element (1996) and the County of Los Angeles Seismic Safety Element (1990), the Project Site is not within an area identified as having a potential for slope instability. Additionally, the California Division of Mines and Geology does not identify the project area as having a potential for seismic slope instability. There are no known landslides near the Project Site, nor is the Project Site in the path of any known or potential landslides.

However, the sandy alluvial deposits could be prone to local raveling or caving and a temporary shoring system with lagging will be required for vertical excavations. Temporary and permanent retaining walls should be designed for lateral earth pressures and provided with a drainage system to mitigate any potential instability caused by excavation. With incorporation of the proposed mitigation measures, the proposed Project at the Project Site would not result in substantial damage to structures or infrastructures or expose people to substantial risk of injury. Thus, the proposed Project at the Project Site will result in a less than significant impact due to slope stability hazards in the project area.

Although no subterranean levels are proposed for development at the Project Site, if basements or other subterranean levels become necessary, excavations will expose alluvial deposits. These deposits are horizontally stratified and lack any well-defined planar features or discontinuities (such as bedding or joints) that would act as planes of weakness and will not adversely affect the proposed basement construction. Also, geologic conditions at the Project Site will not create an additional surcharge on the proposed basement walls.

Liquefaction

Liquefaction would not be anticipated in the northern portion of the Project Site where groundwater is deeper. However, approximately three quarters of the southern portion of the Project Site is located within a designated area of liquefaction hazard as defined by the California Department of Mines and Geology, the City of Los Angeles, and The County of Los Angeles.

Soils at the Site could be subject to liquefaction in the event of earthquake ground motion. Clayey soils at depths beneath the Site would not be considered liquefiable; only the sandy and silty layers at the Site might be subject to liquefaction. Uniform settlement beneath a given structure would cause minimal damage; however, because of variations in distribution, density, and confining conditions of the soils, seismically induced settlement is generally non-uniform

and can cause serious structure damage. Generally, differential settlements induced by ground failures such as liquefaction, flow slides, and surface ruptures would be much more severe than those caused by densification alone. Based on the results of previous borings at the Project Site and at the adjacent Northridge Fashion Center, the deeper soils (beneath the historic high groundwater level) are predominantly clayey, with some thinner layers of sand and silty sand. Therefore, the soils would only be anticipated to have minimal liquefaction, if any, in the sandier layers beneath the depth of the groundwater. Seismic settlement due to limited liquefaction of thin layers at this depth would be anticipated to be small and relatively uniform, resulting in little, if any, distress to hardscape, utilities, or structures. Nevertheless, a building-specific liquefaction evaluation will be required for the Site to evaluate the anticipated magnitude of liquefaction-induced settlement and to provide foundation recommendations to mitigate the potentially adverse effects of liquefaction.

Therefore, the proposed Project at the Project Site would be subject to potentially significant impacts from liquefaction. However, with the incorporation of the proposed mitigation measures, the proposed Project at the Project Site would result in a less than significant impact due to liquefaction potential in the project area.

Subsidence

The Site is not within an area of known subsidence associated with fluid withdrawal (groundwater or petroleum), peat oxidation, or hydrocompaction. Therefore, impacts to the Project Site as a result of subsidence would be less than significant.

Tsunamis, Seiches, and Flooding

Due to the location of the Project Site in an inland area, there is no potential for impacts resulting from tsunamis. No large bodies of permanently stored water are located such that they would adversely impact the Project Site due to either seiches or flooding due to ground shaking.

Add Area

Similar to potential geotechnical impacts resulting from the proposed Project at the Project Site, potential impacts may result from the development scenarios analyzed for the Add Area.

Fault Rupture

Similar to the Project Site, the Add Area is not within a currently established Alquist-Priolo Earthquake Fault Zone. The closest Alquist-Priolo Earthquake Fault Zone is located approximately 4.0 miles north of the Add Area, established along the Santa Susana Fault. Based on the available geologic data, active or potentially active faults with the potential for surface fault rupture are not known to be located beneath or projecting toward the Add Area. Therefore,

the potential for surface rupture at the Add Area due to fault plane displacement propagating to the ground surface during the design life of the project is considered low. Although the Add Area properties could be subjected to strong ground shaking in the event of an earthquake, this hazard is common in Southern California and the effects of ground shaking can be mitigated to a less than significant level by proper engineering design and construction in conformance with current building codes and engineering practices. The development scenarios analyzed for the Add Area would not result in substantial damage to structures or infrastructures, or expose people to substantial risk of injury.

Groundwater

In 2001, groundwater just downstream and to the east of the Add Area properties (at the Project Site) was reported at 84 feet below the ground surface. The historically high groundwater level was recorded in 1944 between 35 and 40 feet below the surface.

Based on the historic recorded water levels in the area, groundwater levels could fluctuate seasonally and annually as a result of groundwater management practices. Although water levels have been known to have steadily declined in the project area since the 1960s, water levels could reach historic highs in the future. Based on historical groundwater levels as recorded in borings in nearby wells, there is a potential for shallow groundwater to have an adverse impact on the proposed development. However, it is unlikely that groundwater would have an impact on development unless subterranean levels are included, to a depth of at least 30 feet. Similar to the proposed Project at the Project Site, the development scenarios analyzed for the Add Area does not include the construction of subterranean levels. Further, the development scenarios analyzed for the Add Area is not anticipated to result in substantial damage to structures or infrastructures, or expose people to substantial risk of injury. Therefore, the development scenarios analyzed for the Add Area would result in a less than significant impact due to groundwater in the project area.

Slope Stability

Similar to the proposed Project at the Project Site, the Add Area is not within an area identified as having a potential for slope instability, according to the City of Los Angeles Safety Element (1996) and the County of Los Angeles Seismic Safety Element (1990). Additionally, the California Division of Mines and Geology does not identify the project area as having a potential for seismic slope instability. There are no known landslides near the Add Area, nor is the Add Area in the path of any known or potential landslides. Future scenarios at the Add Area will not result in substantial damage to structures or infrastructures or expose people to substantial risk of injury as a result of slope stability in the area. Therefore, the development scenarios analyzed for the Add Area would result in a less than significant impact as a result of slope instability.

Liquefaction

Unlike the proposed Project Site, the Add Area properties are not located within a designated area of liquefaction hazard, according to the California Department of Mines and Geology. Therefore, the development scenarios analyzed for the Add Area would result in a less than significant impact due to liquefaction hazards in the area.

Subsidence

Similar to the proposed Project at the Project Site, the Add Area is not located within an area of known subsidence associated with fluid withdrawal (groundwater or petroleum), peat oxidation, or hydrocompaction. Based on this information, the development scenarios analyzed for the Add Area will not result in substantial damage to structures or infrastructures or expose people to a substantial risk of injury. Therefore, the development scenarios analyzed for the Add Area will result in a less than significant impact due to areas of subsidence in the project vicinity.

Tsunamis, Seiches, and Flooding

Due to the location of the Add Area in an inland area, there is no potential for impacts resulting from tsunamis. No large bodies of permanently stored water are located such that they would adversely impact the Add Area due to seiches or flooding due to ground shaking. Therefore, the development scenarios analyzed for the Add Area would result in a less than significant impact due to water hazards in the project area.

MITIGATION MEASURES

Seismic

Environmental impacts may result to the safety of future occupants at the Project Site and Add Area due to the location of the Project Site and Add Area within an area of potential seismic activity. However, any potential impacts will be mitigated to a less than significant level by the following measure:

24. The design and construction of the Project at the Project Site and Add Area shall conform to the Uniform Building Code seismic standards as approved by the Department of Building and Safety. (O, C, R)

Liquefaction

Environmental impacts may result due to the location of a portion of the Project Site within a designated liquefaction zone. However, any potential impacts will be mitigated to a less than significant level by the following measure:

25. Potential impacts from liquefaction may arise on the southern portion of the Project Site which is located within a designated liquefaction zone. Building design shall comply with the Uniform Building Code Chapter 18, Division 1, Section 1804.5 Liquefaction Potential and Soil Strength Loss, requirements for the preparation of a building specific geotechnical report assessing potential consequences of any liquefaction and soil strength loss, estimation of settlement, lateral movement, or reduction in foundation soil-bearing capacity, and discussion of mitigation measures that may include building design consideration. Building design considerations may include, but are not limited to ground stabilization, selection of appropriate foundation type and depths, selection of appropriate structural systems to accommodate anticipated displacements, or any combination of these measures. (O, C, R)

Subsidence

Although a specific significant impact has not been identified for the Project Site or Add Area, environmental impacts may result from project implementation due to the location of the project in an area prone to subsidence. However, any potential impact will be further reduced to a less than significant impact with the following mitigation measure:

26. Prior to the issuance of building or grading permits, the applicant shall submit a geotechnical report prepared by a registered civil engineer or certified engineering geologist to the Department of Building and Safety for approval. (O, C, R)

Grading

For potential impacts and mitigation measures regarding grading and earth movement, see **Section IV. B: Air Quality**.

LEVEL OF IMPACT AFTER MITIGATION

Less than significant.

CUMULATIVE IMPACTS

Related Projects

As with the proposed project, each related project requiring discretionary approval would be subject to a review process and appropriate geotechnical investigation, and potential incorporation of mitigation measures.

As with the Project Site and Add Area properties, related projects in the area could be subjected to strong ground shaking in the event of an earthquake. However, this hazard is common in Southern California and the effects of ground shaking can be mitigated to a less than significant level by proper engineering design and construction in conformance with current building codes and engineering practices.

Related projects number four (Porter Ranch) and number five (Deer Lake Ranch), located to the north of the SR-118 freeway, are near an established Alquist-Priolo Earthquake Fault Zone along the Santa Susana fault. Further fault identification (active and potentially active) and identification of the potential for fault rupture would be necessary for individual related projects.

Site specific groundwater analysis must be conducted for individual related projects. Further, areas of slope instability, liquefaction, subsidence, tsunamis, and seiches will have to be determined on a site- or project-specific basis.

Project Site, Add Area, and Related Projects

The Project Site, Add Area, and related Project Sites would be subject to potential ground shaking, as with most areas within the City and County of Los Angeles. However, incorporation of the proposed mitigation measures will reduce any significant impacts resulting from the proposed Project at the Project Site and Add Area and related projects to a less than significant level.

Therefore, a significant cumulative impact due to geotechnical hazards is not expected.