! Fencing should be placed around the dripline of existing oak trees that are not scheduled for removal in order to protect them from damage to limbs or from compaction of soil around the root ball.

Impacts After Mitigation

The proposed grading activities, including the amount of material that is to be imported, would not result in significant impacts to the topography of the site.

2. Geologic Hazards (Seismicity)

Environmental Setting

The site is located within the Transverse Range Province of Southern California, at the southwestern edge of the San Fernando Valley. The site lies in a small valley at the northerly base of the Santa Monica Mountains. The Santa Monica Mountain in the vicinity of the site are complexly folded and faulted sedimentary and volcanic rocks of marine origin varying from late Cretaceous through Tertiary age.

Geologic hazards at the site are primarily limited to those caused by earthquakes. Damage due to actual displacement or fault movement beneath a structure is infrequent. More frequently, damage from earthquakes is the result of violent ground shaking from seismic waves. Ground shaking occurs not only immediately adjacent to the earthquake epicenter, but in areas for many miles in all directions. The possible secondary effects of seismic activity include liquefaction, seismic settlement, lateral spreading, slope stability, and flooding, tsunamis and seiches.

<u>Fault Rupture</u>

Faults are classified as active, potentially active, or inactive. Active faults are defined as those which have had surface displacement within Holocene time (the past 11,000 years). Potentially active faults are those which show evidence of surface displacement during Quaternary time (the past 1.6 million years) without showing evidence of displacement during the past 11,000 years. Inactive faults are defined as those faults without recognized Quaternary displacement.

The closest active fault to the site is the Malibu Coast fault, located about 7.7 miles south of the site. Other nearby active faults are the Santa Monica-Hollywood fault, Santa Susana fault, and the San Fernando Fault Zone, located 10.5 miles south-southeast, 11.5 miles north-northeast, and 12.5 miles northeast of the site, respectively. The San Andreas fault zone is located about 37 miles north-northeast of the site.

The closest potentially active fault to the site is the Northridge Hills fault, located about 8.7 miles north-northeast of the site. Other nearby potentially active faults are the Overland fault, the Charnock fault, and the MacArthur Park fault, located 15 miles southeast, 16 miles southeast, and 19 miles east-southeast of the site, respectively.

The site is not within a currently established Alquist-Priolo Earthquake Fault Zone for surface fault rupture hazards. The closest Alquist-Priolo Earthquake Fualt Zone, established for the Santa Susana fault zone, is located 12 miles to the northwest. No active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site is considered low.

Ground Shaking

Substantial ground shaking could occur on the project site as a result of earthquakes on any of the aforementioned nearby active or potentially active faults. An estimation of the distance from these faults to the site and information regarding anticipated earthquake magnitudes and the resulting ground shaking levels which might be experienced at the site is shown on **Tables 8, and 9, Maximum Credible Earthquakes** and **Maximum Probable Earthquakes**, page 38. As indicated on these tables, many faults could give rise to strong ground shaking at the site. **Figure 9, Major Faults in the Los Angeles Area**, page 39, shows the location of major faults in the Southern California area.

A maximum credible event, as shown on **Table 8, Maximum Credible Earthquakes**, is defined as the largest earthquake that is anticipated along a particular fault. The maximum probable event, as shown on **Table 9, Maximum Probable Earthquakes**, is the largest earthquake that is likely to occur during a 100 year period. This scale has been modified for current construction standards. The San Andreas fault, as shown on the aforementioned tables, would register the largest maximum credible and probable earthquake in the area.

Liquefaction

In addition to ground shaking, another seismic effect to be considered is the potential for liquefaction. Liquefaction occurs when the water pressure between soil grains is increased to the point that the grains separate and the soil loses its bearing capacity. Significant seismic forces can provide the pressure increase. The results could include differential settlement of the ground surface, lateral spreading of the ground surface, or dramatic settlement of structures founded on the liquefying layer. Liquefaction commonly occurs below the water table. However, after liquefaction has developed, it can propagate upwards into overly non-saturated soil as excess pore water escapes. Liquefaction usually does not occur at depths exceeding 50 feet, since naturally occurring confining pressures are too great.

Portions of the site are designated as "Zones of Required Investigation" for liquefaction on the *State of California Seismic Hazard Zones Map* (Calabasas Quadrangle). (See **Figure 8, Area of Liquefaction Hazard,** page 31.) The loose silty sands and soft sandy silts at the site could be subject to liquefaction in the event of earthquake ground motion. The liquefiable soils on the site generally occur from depths of 10 feet and extend to bedrock (which is at a depth of about 42 to 54 feet).

TABLE 8

MAXIMUM CREDIBLE EARTHQUAKES[1]

Fault	Minimum Distance from Site (Miles)	Maximum Credible Magnitude (Richter)	Maximum Credible Bedrock Acceleration (Gravity$_{[g]}$)
Northridge Hills	8.7	6.5	0.141
Malibu Coast	7.7	7.5	0.136
Santa Susana	11.5	7.0	0.20
San Fernando	12.5	7.5	0.46
San Andreas	37	8.3	0.188

[1] Theoretical maximum based upon empirical data. Very low probability of occurrence.

TABLE 9

MAXIMUM PROBABLE EARTHQUAKES[1]

Fault	Minimum Distance From Site(Miles)	Maximum Probable Magnitude(Richter)	Maximum Probable Site Acceleration (G-gravity)
Northridge Hills	8.7	5.00	0.064
Malibu Coast	7.7	6.5	0.080
Santa Susana	11.5	6.0	0.118
San Fernando	12.5	6.0	0.208
San Andreas	37	8.00	0.161

[1] Theoretical maximum based upon empirical data. Very low probability of concurrence.

FIGURE 9
MAJOR FAULTS IN THE LOS ANGELES AREA

Seismic Settlement

Seismic-induced settlement is often caused by loose to medium-dense granular soils densified during ground shaking. Uniform settlement beneath a given structure would cause minimal damage; however, because of variations in distribution, density, and confining conditions of the soils, seismic settlement is generally non-uniform and can cause serious structural damage. Dry and partially saturated soils as well as saturated granular soils are subject to seismically-induced settlement. Potential seismic settlement at the site is estimated to be between 2 to 7 inches.

Lateral Spreading

Liquefaction-induced lateral spreading displacement is a possible consequence of liquefaction occurring beneath a site on which a slope gradient exists or beneath a site adjacent to a free face (a steep earth slope). There is a potential for lateral spreading at the site in the event of a moderate or large earthquake in the area. The looser sandy soils are susceptible to liquefaction. Lateral spreading is a function of the distance from the fault, the magnitude of the earthquake, the ratio of the distance from the free-face divided by the height of the free face, the thickness of the lateral spreading inducing layer, the fines content of materials in that layer, and the mean grain size diameter. Using this methodology, there is a potential for lateral spreading at the site. Lateral spreading on the order of 1 inch to 4 inches could occur in the event of a maximum credible earthquake (magnitude 6.7) on the Malibu Coast fault, located at a distance of 7.7 miles from the site.

Slope Stability

The site is within a City of Los Angeles Slope Stability Study Area. However, the gently sloping topography at the site precludes both slope stability problems and the potential for lurching (earth movement at a right angle to a cliff or steep slope during ground shaking). There are no known landslides at the site, nor is the site in the path of any known or potential landslides.

Flooding, Tsunamis and Seiches

The site is located in an area of minimal flood hazard. The site is located 4.6 miles south of the Chatsworth Reservoir and 3.1 miles south-southwest of the Los Angeles River, neither of which present a danger.

Due to the location of the project site in an inland area, there is no potential for seismically induced sea waves called tsunamis on the project site.

No large bodies of permanently stored water are located such that they would affect the site in the event of earthquake induced failure or seiches (oscillations in a body of water due to earthquake shaking).

Significance Criteria

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.

Environmental Impacts

Fault Rupture

No faults, either active or potentially active, run across the project site. Therefore, geologic hazard impacts due to fault rupture on the site would be less than significant.

Ground Shaking

Movement due to active faults in the project area would cause varying intensities of ground shaking on the site. As indicated on **Table 8, Maximum Credible Earthquakes**, page 38, the maximum credible peak horizontal acceleration the developed site might experience is approximately 0.460 gravity (g). The maximum probable peak horizontal acceleration for the developed site would be 0.208 gravity. For the purposes of this discussion, (g) refers to the magnitude of horizontal acceleration experienced on site. These values are based on events occurring on the San Fernando Fault, which is part of the Lakeview Fault Zone.

The analysis on **Tables 8** and **9, Maximum Credible Earthquakes** and **Maximum Probable Earthquakes**, (page 38) indicates that strong ground shaking due to a major earthquake on the nearby faults may occur during the life of the project. As stated above, ground acceleration at the site would probably not exceed 0.208 g. The Uniform Building Code provides buildings with standards capable of withstanding ground acceleration up to 0.50 g. The impact of ground shaking under the Proposed Project would be reduced to a less than significant level because the buildings would be designed and constructed in conformance with existing building codes and standard engineering practice.

Liquefaction

Under the proposed Master Plan, buildings would be constructed within the area of liquefaction hazard designated on the *State of California Seismic Hazard Zones Map*. (See **Figure 8, Area of Liquefaction Hazard,** page 31.) The loose silty sands and soft sandy silts at the site could be subject to liquefaction in the event of earthquake ground motion. The liquefiable soils on the site generally occur from depths of 10 feet and extend to bedrock (which is at a depth of about 42 to 54 feet). Therefore, the Proposed Project would be subject to potential impacts from liquefaction.

Seismic Settlement

The Proposed Project could be subject to potential seismic settlement of between 2 to 7 inches. Therefore there is a potential for a seismic settlement impact under the Proposed Project.

Lateral Spreading

The looser sandy soils at the project site are susceptible to liquefaction. Lateral spreading on the order of 1 inch to 4 inches could occur in the event of a maximum credible earthquake (magnitude 6.7) on the Malibu Coast fault, located at a distance of 7.7 miles from the site. Therefore the Proposed Project could potentially have an impact due to lateral spreading at the site.

Slope Stability

The gently sloping topography at the site precludes both slope stability problems and the potential for lurching. There are no known landslides at the site, nor is the site in the path of any known or potential landslides. Therefore, there is no potential for slope stability impacts under the Proposed Project.

Flooding, Tsunamis and Seiches

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

Cumulative Impacts

All of the related projects would be subject to potential ground shaking, as with most other areas of Los Angeles. Due to the nature of the related projects and their separation from the site, these projects are not anticipated to present cumulative seismic impacts in relation to the Proposed Project.

Mitigation Measures

In order to mitigate impacts from liquefaction, seismic settlement and lateral spreading on the site, building foundations shall be designed to account for the very soft to medium stiff and very loose to medium dense alluvial soils that exists on the site. Three options are available:

Mat Foundation

A mat foundation, supported on properly compacted fill soils, and carried at least 2 feet below the lowest adjacent grade or floor level may be designed to impose a net, static, dead-plus-live load pressure of 1,500 pounds per square foot. A bearing value of 2,000 pounds per square foot may be used for transient wind or seismic loading. The recommended bearing value is a net value, and the weight of concrete in the mat may be taken as 50 pounds per cubic foot.

Ground Improvement

As an alternative to a mat foundation, ground improvement techniques may be considered beneath the proposed buildings to make conventional spread footings feasible. Footings established above an area of improved soil, and underlain by 3 feet of compacted fill, may be designed to impose a net dead-plus-live load pressure of 3,000 pounds per square foot. The footings should extend at least 2 feet below the lowest adjacent final grade.

Pile Foundation

Drilled or driven piles may also be used to support the proposed buildings. To provide uniform support, all piles should be driven at least 10 feet into the underlying siltstone. In the event of a major earthquake, liquefaction of some of the soils could occur, resulting in unsupported length of the piles. The piles should be designed to resist buckling due to column action over a potentially unsupported length of approximately 40 feet.

Variances from the following code-required measures shall not be approved:

! No building shall straddle the surface trace of a known active fault. This mitigation measure is consistent with the Seismic Safety Plan, Department of City Planning, CPC #24880, adopted by the City Council, September 10, 1975.

! The Proposed Project shall conform to applicable provisions of the Municipal Code, including Division 23, Section 2312, of the Building Code.

! The Proposed Project shall conform to the adopted Seismic Safety Plan. The plan sets forth standards for geologic evaluation, existing development, new development, non-structural elements, critical facilities, emergency preparedness, post-disaster and recovery.

! Seismic factors, including maximum credible seismic events, must be taken into consideration in the detailed soils engineering studies required for the grading permit.

! During building planning, recommendations set forth in a geotechnical report shall be prepared, as required, and approved specifically by the Department of Building and Safety for the foundation design.

! Structures on site should be designed with the potential for moderate to high intensity ground shaking taken into account.

! Safety factors for proposed structures shall contain a factor for earthquake loading conditions.

Impacts After Mitigation

Although the project site would be subject to potential ground shaking in the event of a major earthquake, this ground shaking would be within structural limits required for buildings proposed for the site. Furthermore, the foundations of the proposed structures would be designed in such a way to mitigate the potential impacts from liquefaction, seismic settlement and lateral spreading on the site. As a result, less than significant impacts due to geologic hazards are anticipated at the project site.