5.0 ENVIRONMENTAL ANALYSIS

5.1 GEOLOGY, SOILS, AND SEISMICITY

This section addresses impacts related to geologic hazards and conditions at the proposed project site. The analysis presented in this section is based on a geotechnical investigation performed for the proposed project by Pacific Soils in March 2004 and April 2006[1]. These reports were prepared pursuant to the standards established by the County of Los Angeles Department of Public Works. The *Geotechnical Reports* are included in their entirety in Appendix K.

5.1.1 ENVIRONMENTAL SETTING

REGIONAL GEOLOGIC CONDITIONS

The proposed project site is situated in the eastern portion of the East Ventura Basin, a former structural/sedimentary basin, which is part of the western Transverse Ranges Province of southern California. This structural basin is filled with more than 10,000 feet of both marine and nonmarine sediments that were deposited during the Tertiary (beginning about 65 million years ago) through Quaternary time (1.6 million years ago to the present), with periods of erosion and nondeposition. The East Ventura Basin is bounded on the north by the San Gabriel fault, and on the south and east by the Oat Mountain/Santa Susana and Weldon Canyon thrust faults, respectively, each of which are considered seismically active. Tectonic activity during the last 5 million years (+/-) has produced a series of large amplitude, east-west trending anticlines and synclines within the bedrock, portions of which have been exploited for oil and gas e.g., Aliso Canyon and the abandoned Wiley Canyon oil fields). The proposed project site is situated on the steeply dipping northern limb on what is referred to as the Pico Anticline.

Exposed bedrock within the southern portion of the proposed project site is represented by Pliocene age marine claystone, siltstone, and sandstone assigned to the Pico formation. In the northern two-thirds of the project site the Pico Formation is overlain by, and interfingers with, upper Pliocene-lower Pleistocene nonmarine mudstone, conglomerate, and sandstone of the Saugus formation. Much of these exposed sediments are undergoing erosion and mass wasting associated with ongoing tectonic uplift of the region. There are no documented mineral deposits within the proposed project site.

There are paleontological (i.e. fossil) sites within the proposed project site as discussed in more detail in Section 5.7, Cultural Resources, of this DEIR.

[1] Pacific Soils Engineering, Inc. Preliminary Geotechnical Report for Proposed Lyons Canyon Ranch Development. March 10, 2004.
Pacific Soils Engineering, Inc. Updated Preliminary Geotechnical Report and Response to County of Los Angeles Geotechnical and Materials Engineering Division Review Sheets for Proposed Lyons Canyon Ranch Development. April 11, 2006.

Project Site Conditions

The project site occupies approximately 234.8 acres of undeveloped land that is traversed by a number of dirt roads that were reportedly created for various television and film productions. Site topography is represented by both primary and secondary ridgelines, Lyon Canyon (which is a major drainage that bisects the proposed development area), and a number of first- and second-order drainages that are tributary to the main canyon. In the southeastern portion of the proposed project site, a primary, east-west trending ridgeline serves as a drainage divide between the Lyon Canyon drainage basin and Towsley Canyon to the south. There are five first-order hillside drainages within this portion of the proposed project site that drain into Towsley Canyon.

Elevations within and adjacent to the proposed project site range between 1,820 feet above mean sea level (msl) along the southern primary ridgeline to about 1,310 feet msl near the mouth of Lyon Canyon next to The Old Road. Natural slope gradients vary from nearly vertical along the crests and upper flanks of the primary ridgelines, to about 3:1 (horizontal to vertical) along the flanks of the lower "spur" ridges. The surface gradient of Lyon Canyon is relatively gentle, on the order of about 0.01 foot vertical per foot horizontal.

Potential geologic and geotechnical constraints to development at the site include the following:

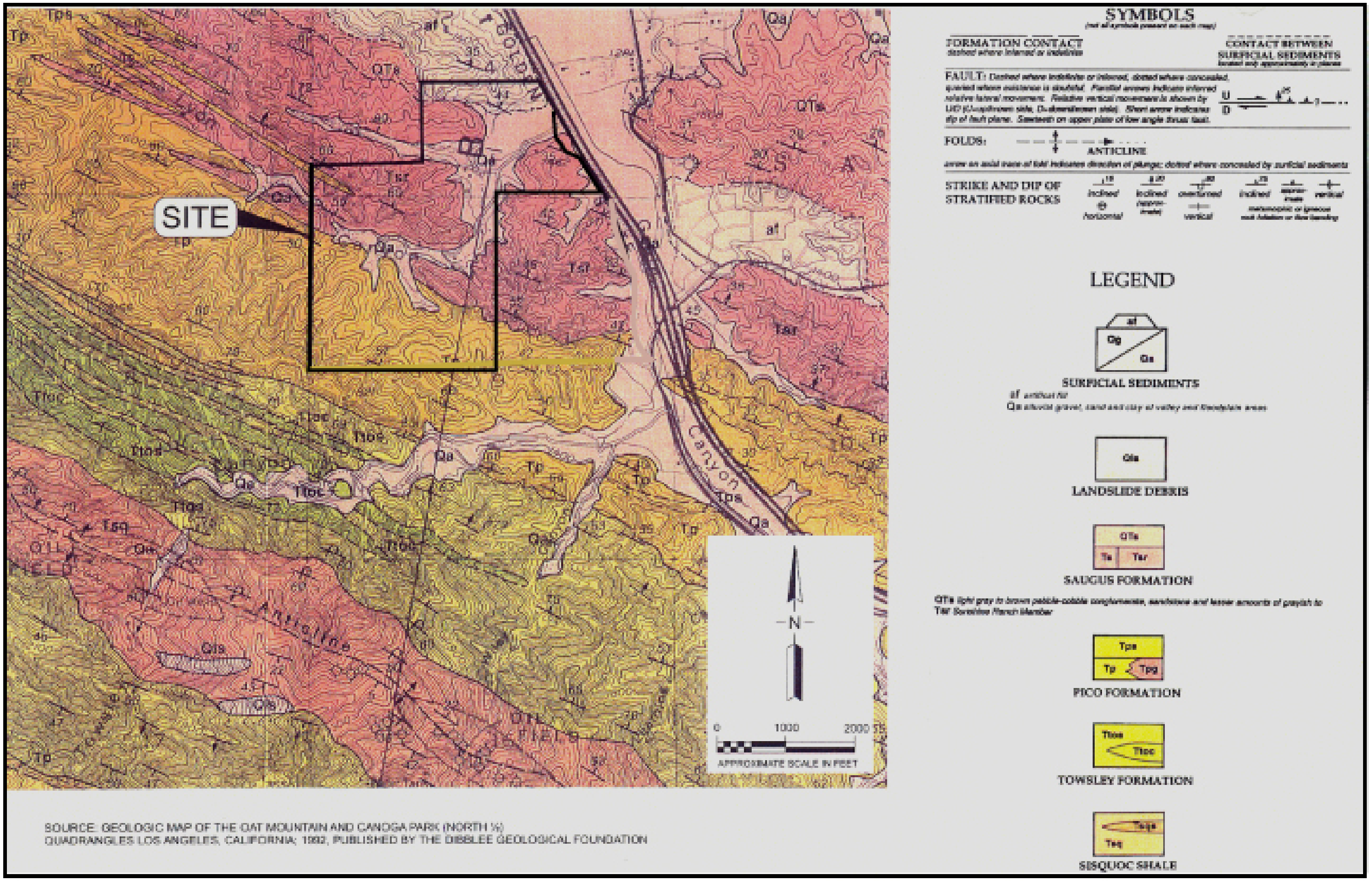
- Debris flows emanating from natural hillside drainages and soil erosion resulting from surface water runoff from graded pads and both cut and natural slopes;
- Collapsible alluvial-type soils within Lyon Canyon and along the bottoms of other tributary drainages and smaller canyons;
- Slope instability along steep, natural slopes;
- Seismically induced moderate to strong groundshaking; and
- Rock fall along naturally occurring, over-steepened slopes.

Although the proposed project site is located within a highly seismically active portion of the state, there are no documented active or potentially active faults transecting or projecting towards the proposed project site. Moreover, there are no documented landslides within the proposed project site.

Geologic Materials

Bedrock exposed within the southern portion of the proposed project site consists of steep, north dipping beds of interbedded, marine claystone, siltstone, and sandstone assigned to the Miocene age Pico formation. Bedrock in the northern two-thirds of the project site consists of upper Pliocene-lower Pleistocene age, nonmarine mudstone, conglomerate, and sandstone of the Saugus formation (Sunshine Ranch member).

Surficial soils within the property are represented by artificial (man-made) fill, colluvium, rock fall debris, and alluvium. Soil types at the proposed project site are illustrated in Exhibit 5.1-1, Geologic Map.



Geologic Map

Exhibit 5.1-1

Artificial fill (af)

Artificial fill soils associated with construction of The Old Road have been identified along the eastern margin of the proposed project site, as well as at other various locations resulting from past oil exploration and grading of dirt roads. Estimated thicknesses of these compressible soils range from a few feet to as much as 10 feet or more. Artificial fill soils are depicted as “af” on Exhibit 5.1-1.

Colluvium

Colluvium represents the downslope accumulation of relatively loose soil derived from erosion of the bedrock. These soil-like materials occupy many of the hillside swales and drainages where they “interfinger” (i.e., cross and overlap) with alluvial soils and vary in thickness from 2 to 7 feet. In some areas, colluvial soils form a relatively thin (several inches to about 1 ½-feet-thick) mantle atop more gentle slopes underlain by bedrock. Typically, these materials consist of yellowish brown, silty sand that is typically dry to slightly moist, loose, and porous, containing numerous roots and rootlets, and is considered moderately to highly permeable, highly compressible, and erodible. Colluvial soils derived from the Pico formation are also considered to possess expansion potential ranging from low to high. If left in place, colluvial soils are subject to collapse upon placement of structural loads (e.g., single-family homes).

According to the PSE report reviewed as part of the analysis contained in the proposed project’s Geotechnical Report, once excavated, colluvial soil materials are suitable for use as compacted fill, provided they are relatively free of large roots and other similar forms of organic materials, as well as free of any construction debris e.g., wood, concrete, bottles, and aluminum cans.) that may be found in these deposits alongside The Old Road. Colluvial soils are not shown on Exhibit 5.1-1.

Alluvium (Qa)

Alluvial soils are those deposited by the intermittent stream flow and are found in most of the larger drainages courses. Encountered in PSE’s borings and test pits, these soils consist primarily of layers and lenses of yellowish brown, fine-to-coarse-grained, silty sand with varying amounts of pebbles and cobbles that have been eroded from the surrounding bedrock. Typically, these alluvial soils are loose to medium dense, slightly moist to moist, porous, most portions of which are considered subject to collapse/settlement upon wetting and/or placement of structural loads (e.g., embankment and fill soils, single-family homes, or commercial buildings). The looser portions of the alluvium are also considered prone and seismically-induced settlement. Alluvial soils derived from the Pico formation are also considered to possess expansion potential ranging from low to high. Given that groundwater was not encountered within 50 feet of the ground surface in the alluviated portion of the site, the likelihood for liquefaction is considered remote.

Current development plans indicate that the majority of the large lot residential area (Lots 1-75), and various interior roadways are all underlain by alluvial soils. According to the PSE analysis, these soils will be completely removed during rough grading.

Alluvial soils are shown as “Qa” on Exhibit 5.1-1.

Rock Fall Debris

Rock fall debris occurs along the base of near vertical slopes along the north side of Lyon Canyon, located in the west-central portion of the proposed project site. Blocks of bedrock derived from toppling and/or wedge-type failures within the Saugus formation vary in size from several feet to perhaps as much as 10 feet in maximum dimension. Rock fall debris is not shown on Exhibit 5.1-1.

Saugus Formation--Sunshine Ranch Member (Tsf)

Bedrock assigned to the Plio–Pleistocene Saugus formation–Sunshine Ranch member is widely exposed throughout the eastern and northern portion of the proposed project site. According to PSE (2004), this formation is composed of, in increasing order of abundance, thin-to thick-bedded mudstone, siltstone, and very-fine to coarse-grained sandstone with some interbedded pebble and cobble conglomerate. These sedimentary rocks are well indurated and form bold outcrops, and represent deposits associated with the distal portion of an ancient alluvial fan complex. Saugus Formation is shown as “Tsf” on Exhibit 5.1-1.

Pico Formation (Tp)

The Pico formation both underlies and interfingers with the Saugus formation and is exposed within the southern portion of the proposed project site. PSE (2004) reports that this formation consists generally of laminated to thick-bedded, micaceous siltstone and claystone with lesser amounts of interbedded fine-grained sandstone. The Pico formation is considered to represent the accumulation of ancient, shallow marine deposits. It is labeled “Tp” on Exhibit 5.1-1.

Bedrock Structure

Regionally, the project site is situated on the steeply dipping northern limb of what is referred to as the “Pico Anticline.” This anticline represents part of an actively growing fold complex associated with ongoing deformation on the seismically active Oak Ridge/Santa Susana thrust fault, which is located approximately 1.3 miles southwest of the Lyon Canyon site, as well as other related faults to the north.

The geologic structure within the proposed project site is represented by a homocline that dips north to northeast at moderate to steep angles (45 to 90 degrees) with localized areas of overturned (southward dipping) bedding planes. Although localized bedrock shears have been identified by PSE, there are no active or potentially active faults within or projecting toward the proposed project site.

Groundwater

Groundwater was encountered within alluvial soils in several of PSE’s exploratory borings within the main, easternmost portion of Lyon Canyon. Depth to groundwater in this area varied from about 53 to 67 feet below ground surface. These depths to groundwater correspond to what appears to be perched water within the alluvium that lies within several feet of the underlying bedrock. There is no evidence of past or present substantial groundwater use in the proposed project site, although what appeared to be a water well was observed at the site during the proposed project's Phase I Environmental Site Assessment, performed by RBF Consulting in April 2004. No evidence of springs or seeps has been observed.

Mineral Resources

There are no economic metallic or nonmetallic ore deposits within or directly adjacent to the proposed project site. There is one abandoned oil well (Ayers 61-9786) located in the canyon bottom just south the northern debris/detention basin. According to PSE, Sun Drilling Company drilled this well in 1961 to a total depth of 9,785 feet and subsequently abandoned the well. There are no records of the abandonment procedures. The well will likely require re-abandonment before development in the immediate vicinity, per the requirements of the California Department of Conservation, Department of Oil, Gas, and Geothermal Resources (DOGGR).

GEOLOGIC HAZARDS AND CONSTRAINTS

General

The project site is situated within an area underlain by alluvial and colluvial soils that are subject to settlement and competent bedrock that is regarded as relatively safe from damage by ground shaking resulting from seismic activity. The site is located in an area with a low risk of damage resulting from liquefaction, subsidence, or large landslides.

The major geologic hazards and constraints identified during the project's geotechnical investigation are those associated with soil erosion and hillside debris flows, slope stability, rock-fall, and collapsible colluvial and alluvial sediments.

Faulting and Seismicity

The proposed project site is situated within a highly seismically active area of southern California, referred to as the Ventura Basin, which is part of the Western Transverse Ranges fold-and-thrust belt. Hazards associated with earthquakes include primary hazards, such as groundshaking and surface fault rupture, and secondary hazards, such as liquefaction, seismically-induced settlement, lateral spreading, ground lurching, landslides, rock falls, tsunamis, and seiches.

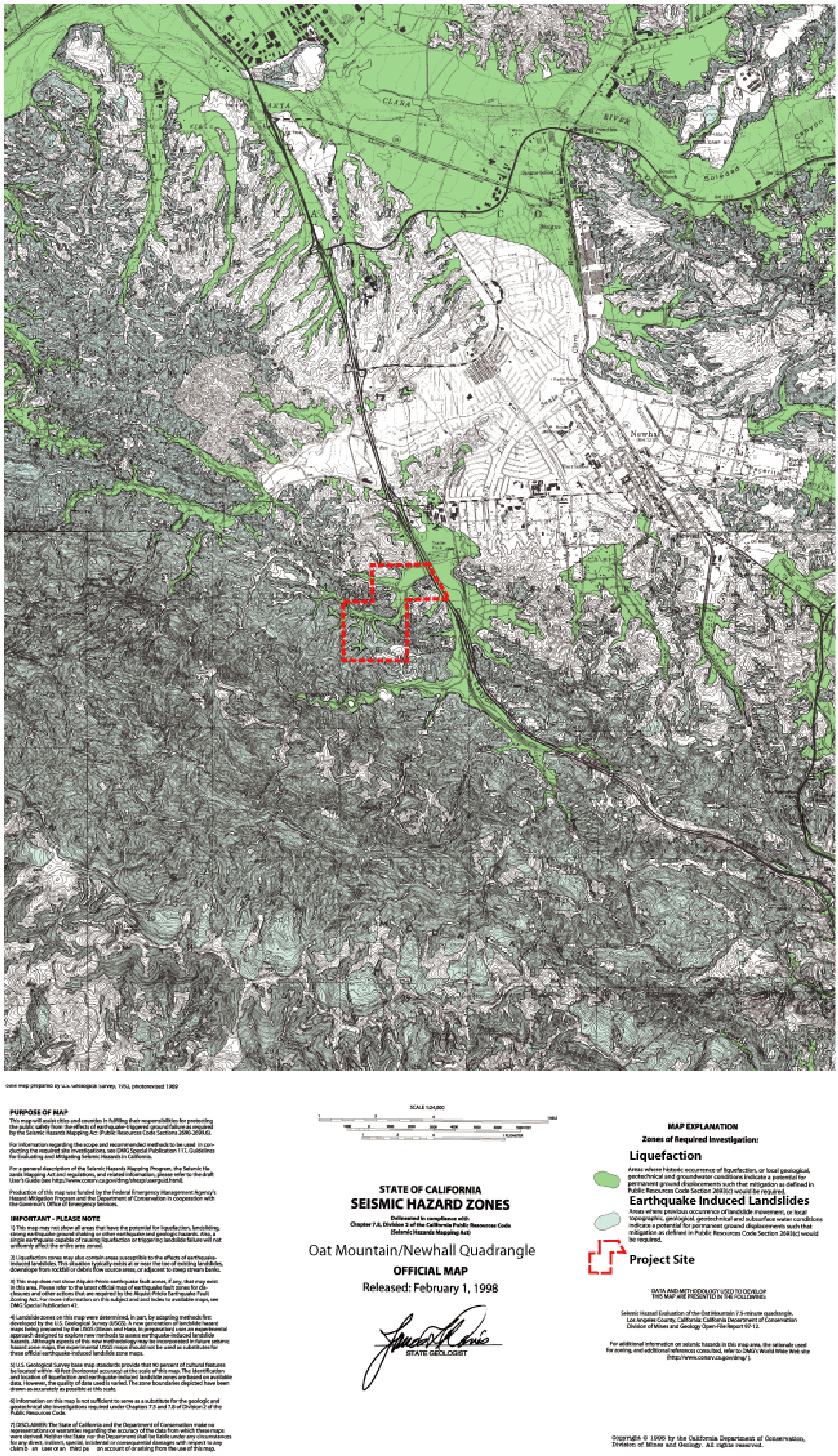
Primary Earthquake Hazards

In accordance with the California Geological Survey (formerly the California Division of Mines and Geology), a fault is a fracture in the crust of the earth along which rocks on one side have moved relative to those on the other side. Most faults are the result of repeated displacements over a long period of time. An inactive fault is a fault that has not experienced earthquake activity within the past three million years. In comparison, an active fault is one that has experienced earthquake activity in the past 11,000 years. A fault that has moved within the past two to three million years, but not proven by direct evidence to have moved within the past 11,000 years, is considered potentially active. Because there is no evidence of active faults within or projecting towards the project site, the likelihood of ground surface rupture or substantial ground deformation is considered very low.

The Modified Mercalli intensity scale was developed in 1931 and measures the intensity of an earthquake's effects in a given locality, and is perhaps much more meaningful to the layman because it is based on actual observations of earthquake effects at specific places. On the Modified Mercalli intensity scale, values range from "I" to "XII". The most commonly used adaptation covers the range of intensity from the conditions of "I: not felt except by very few, favorably situated," to "XII: damage total, lines of sight disturbed, objects thrown into the air." While an earthquake has only one magnitude, it can have many intensities, which decrease with distance from the epicenter.

The Alquist-Priolo Act of 1972 (now the Alquist-Priolo Earthquake Fault Zoning Act, Public Resources Code 2621-2624, Division 2 Chapter 7.5) regulates development near active faults so as to mitigate the hazard of surface fault rupture. Under the Act, the State Geologist is required to delineate Fault Rupture Hazard Zones along known active faults in California. The Act also requires that, prior to approval of a project, a geologic study be conducted to define and delineate any hazards from surface rupture. A geologist registered by the State of California, within or retained by the lead agency for the project, must prepare this geologic report.

A 50-foot setback from any known trace of an active fault is required. The proposed project site is not currently known to be located within an Alquist-Priolo Fault Rupture Hazard Zone, according to the California Geological Survey. However, according to Seismic Hazard Maps published by the State Geologist, the project site is within areas known to be susceptible to liquefaction, and earthquake induced landslides (please refer to Figure 5.1-2, Seismic Hazard Map). Those issues are discussed below.



Seismic Hazard Map

Exhibit 5.1-2

Groundshaking

Ground motions, on the other hand, are often measured in percentage of gravity (g, the acceleration due to gravity), where g is approximately 32 feet per second per second (9.8 meters per second per second) on the Earth.

Groundshaking accompanying earthquakes on nearby faults can be expected to be felt within the Lyons Canyon Ranch site. However, the intensity of ground shaking would depend upon the magnitude of the earthquake, the distance to the epicenter, and the geology of the area between the epicenter and the proposed project site.

A listing of active faults considered capable of producing strong ground motion at the proposed project site, their closest distances to the property, and the maximum expected earthquake along each fault are presented in Table 5.1-1, Summary of Faults and Generalized Earthquake Information – Proposed Project Site. Also presented are generalized evaluations of maximum groundshaking on-site for the maximum earthquakes, and generalized predictions of the likelihood of such events occurring.

The greatest amount of groundshaking at the proposed project site would be expected to accompany large earthquakes on the Northridge/East Oak Ridge, Santa Susana, Holser, and San Gabriel faults. Richter earthquake magnitudes (M) in the range of M6.5 to M7.0 could produce Modified Mercalli intensities in the range of VIII to XI within the project site, and maximum horizontal ground acceleration on the order of 0.93g. As stated above, ground rupture on-site is extremely unlikely because no known active faults cross the property.

Table 5.1-1
Summary of Faults and Generalized Earthquake Information – Proposed Project Site

Fault Name	Miles (Direction from Site)	Maximum Credible Magnitude (M)	Expected Level of Ground Shaking	Earthquake Likelihood
Northridge (East Oak Ridge)	1.3 (southwest)	6.9	High	High
Santa Susana	3.4 (south)	6.6	High	High
Holser	3.6 (north)	6.5	High	Moderate
San Gabriel	4.3 (northeast)	7.0	High	Moderate
Sierra Madre	6.6 (southeast)	6.7	High	High
Santa Rosa	14 (south)	6.7	Moderate	Moderate
San Andreas (Mojave)	22 (northeast)	7.1	Moderate	High
Newport–Inglewood	25 (southeast)	6.9	Low	Moderate
Garlock (west)	37 (northeast)	7.1	Low	Moderate

Secondary Earthquake Hazards

Liquefaction

Seismic groundshaking of relatively loose, granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. Liquefaction is caused by a sudden temporary increase in pore water pressure due to seismic densification or other displacement of submerged granular soils. Liquefaction more often occurs in earthquake-prone areas underlain by young (Holocene age) alluvium where the groundwater table is higher than 50 feet below the ground surface. Holocene age alluvium is present within all of the major canyons at the proposed project site. However, groundwater levels are deeper than 50 feet within the main canyon where the most alluvial soils are located. *Exhibit 5.1-2* above illustrates the areas within the subject site that could be subject to liquefaction. Those areas are primarily characterized by canyon bottoms, and riparian areas.

Lateral Spreading

Lateral spreading is the lateral displacement of surficial blocks of sediment as a result of liquefaction in a subsurface layer. Because the liquefaction potential within the proposed project site is unlikely, the likelihood of lateral spreading is considered remote.

Ground Lurching

Lurching is a phenomenon where loose to poorly consolidated deposits move laterally as a response to strong groundshaking during an earthquake. Lurching is typically associated with soil deposits on or adjacent to steep slopes. Lurching can also affect areas that are underlain by steep contacts of dissimilar bearing materials at depth, such as compacted fill caps that have been placed over a transition from bedrock to Holocene age alluvium. Lurching that occurred in the Santa Monica and Santa Susana mountains during the 1994 Northridge earthquake usually was attributable to the outer 2 to 8 feet of loose fill soils, which were spilled over the edge of graded pads cut onto bedrock. Graded and compacted housing pads did not experience lurching during this very damaging earthquake.

Certain soils have been observed to move in a wave-like manner in response to intense seismic ground shaking, forming ridges or cracks on the ground surface. Areas underlain by thick accumulations of colluvium and alluvium appear to be more susceptible to ground lurching than bedrock. Under strong seismic ground motion conditions, lurching can be expected within loose, cohesionless solids, or in clay-rich soils with high moisture content. Generally, only lightly loaded structures such as pavement, fences, pipelines, and walkways are damaged by ground lurching; more heavily loaded structures appear to resist such deformation. Ground lurching may occur where deposits of loose alluvium exist on the proposed project site. If alluvial soils prove to be loose (i.e. poorly consolidated), ground lurching could occur in areas underlain by these materials. Lurching can also affect areas that are underlain by steep contacts of dissimilar bearing materials at depth, such as compacted fill caps that have been placed over a transition from bedrock to Holocene age alluvium.

Seismically Induced Ground Settlement

Strong groundshaking can cause settlement by allowing sediment particles to become more tightly packed, thereby reducing pore space. Unconsolidated, loosely packed alluvial deposits are especially susceptible to this phenomenon. Poorly compacted artificial fills may also experience seismically induced settlement. Unconsolidated soils, such as near-surface alluvial soils, are subject to seismically induced ground settlement.

Seismically Induced Landsliding and Rock Fall

There are no existing landslides within or directly adjacent to the proposed project site. However, *Exhibit 5.1-2* above illustrates the areas within the subject site that could be subject to seismically induced landslides. Those areas are primarily characterized by steep slopes (25% and above). PSE performed seismic stability analysis in accordance with County of Los Angeles guidelines of selected proposed cut slopes and natural slopes within the proposed project site. Their results indicate that the vast majority of the natural slopes, and all cut slopes, meet or exceed the minimum required factor of safety (FS) against seismically induced landsliding.

Evidence of rock falls is present along the base of steep, near vertical slopes bordering the north side of the proposed project site. Although it is unknown whether or not these rock slope failures are the result of strong groundshaking or intermittent stream flows undercutting along the base of the slope, it is not unreasonable to attribute this phenomenon, at least in part, to seismically induced groundshaking.

Tsunamis

A tsunami is a seismic sea wave caused by sea bottom deformations that are associated with earthquakes or large landslides on the ocean floor. The hazard from tsunamis is nil, given the large distance to the proposed project site from the Pacific Ocean.

Seiching

Seiching is the oscillation of an enclosed body of water due to groundshaking, usually following an earthquake. Lakes and water towers are typical bodies of water affected by seiching. Given the large distance to the ocean (and associated bays, harbors, or estuaries) and the fact that there are no large open bodies of water or reservoirs upgradient of the proposed project site, the potential for seiching is considered nil.

Landslides

No landslides are known to exist within the proposed project site. Neither geologic mapping by nor field reconnaissance performed by PSE disclosed the presence of landslides within or near the subject property. Aerial photographic analyses performed as part of the proposed project's Geotechnical Investigation also did not disclose any existing landslides or significant soil slumps within the proposed project site. Given the steeply dipping nature of the on-site bedrock, the potential for landsliding on slopes in the bedrock is considered low.

Expansive Soils

Based on laboratory testing by PSE, alluvial and colluvial soils derived from the Saugus formation-Sunshine Ranch member possess expansion potential ranging from very low to low.

On the other hand, soils derived from the Pico formation are anticipated to possess expansion potential ranging from low to high, and claystone and mudstone bedrock within the Saugus and Pico formations may possess expansion potential in the medium to high range. The effects of expansive soils on foundation systems can cause significant cracking, differential heave, and other adverse impacts.

Soil Erosion and Debris Flows

On-site soils are considered susceptible to erosion from both wind and stormwater. Other forms of soil erosion are debris flows, which typically form as a result of significant saturation from rainfall or concentrated surface water runoff within steeper, first-order hillside drainages underlain by any combination of soil, colluvium, and/or highly weathered bedrock. These types of flows can involve slow movement of a highly viscous soil-like mass to rapid down-slope movement of a fluid-like flow.

Slope Stability

Given the steeply dipping (45 to 90 degrees), self-buttressing nature of the bedrock, the vast majority of natural slopes within the proposed project site are expected to be grossly and surficially stable.

Slope stability calculations by PSE have shown that proposed fill slopes within the proposed project site possess Factors of Safety in excess of the minimum 1.5 determined by the County of Los Angeles Department of Public Works.

Bedrock exposed along the near vertical natural slopes adjacent to the north side of Lyon Canyon is considered subject to block-and/or toppling-type failures. Intermittent stream erosion undermining portions of these slopes, the buildup of water within naturally occurring joints and fractures due to infiltration of surface water runoff, combined with seismically induced strong groundshaking are the most likely mechanisms that promote these types of slope failure.

5.1.2 SIGNIFICANCE THRESHOLD CRITERIA

Appendix G of the *CEQA Guidelines* contains the Initial Study Environmental Checklist form used during preparation of the project Initial Study, which is contained in Appendix A of this EIR. The Initial Study includes questions relating to geology, soils, and seismicity. The issues presented in the Initial Study Checklist have been utilized as thresholds of significance in this Section. Accordingly, a project may create a significant environmental impact if one or more of the following occurs:

(a) 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; or

iv. Landslides;

(b) Result in substantial wind or water soil erosion or the loss of topsoil, either on or off site;

(c) 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;

(d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1997), creating substantial risks to life or property;

(e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater;

(f) Change in topography or ground surface relief features;

(g) Earth movement (cut and/or fill) of 10,000 cubic yards or more;

(h) Development and/or grading on a slope greater than 10% natural grade; or

(i) The destruction, covering, or modification of any unique geologic or physical feature.

All of the thresholds listed above are addressed in the following analysis, with the exception of item (e), because the proposed project does not include the use of septic tanks or alternative wastewater disposal systems.

5.1.3 IMPACTS AND MITIGATION MEASURES

The level of geotechnical and landform information contained in the proposed project's Geotechnical Investigation is adequate to analyze the potential project effects on earth resources and landforms, and to determine appropriate mitigation measures for the proposed development. There are a number of short- and long-term impacts related to the current physical and geological setting that can be generally expected from grading and development activities associated with the proposed development.

SURFACE FAULT RUPTURE

◆ ***DEVELOPMENT ASSOCIATED WITH THE PROPOSED PROJECT COULD EXPOSE PEOPLE OR STRUCTURES TO POTENTIAL SUBSTANTIAL ADVERSE EFFECTS FROM SUFACE FAULT RUPTURE.***

Level of Significance Before Mitigation: Less Than Significant Impact.

Impact Analysis: No known active or potentially active faults exist within, or project onto, the proposed project site. As such, there would be no potential for surface fault rupture of an active or potentially active fault. No impact is anticipated in this regard.

Mitigation Measures: No mitigation measures are required.

Level of Significance After Mitigation: Less Than Significant Impact.

SEISMIC GROUNDSHAKING

◆ ***DEVELOPMENT ASSOCIATED WITH THE PROPOSED PROJECT COULD EXPOSE PEOPLE OR STRUCTURES TO POTENTIAL SUBSTANTIAL ADVERSE EFFECTS FROM SEISMIC GROUNDSHAKING.***

Level of Significance Before Mitigation: Less Than Significant Impact.

Impact Analysis: Groundshaking accompanying earthquakes on nearby faults is anticipated to be felt within the Lyons Canyon Ranch project site. However, the intensity of groundshaking would depend upon the magnitude of the earthquake, the distance to the epicenter, and the geology of the area between the epicenter and the proposed project site. The greatest amount of groundshaking at the proposed project site would be expected to accompany large earthquakes on the Northridge/East Oak Ridge, Santa Susana, Holser, and San Gabriel faults. Earthquake magnitudes in the range of M6.5 to M7.0 could produce Modified Mercalli intensities in the range of VIII to XI within the project site, and maximum horizontal ground acceleration on the order of 0.93g.

The proposed project site would experience groundshaking as a result of an earthquake along any of the active or potentially active faults in the region, as is the case in all of southern California. As a result, the proposed structures would be required to be designed, engineered, and constructed to meet all applicable local and State seismic safety requirements, including those of the Uniform Building Code. Given compliance with applicable seismic safety requirements, impacts on the proposed development from seismic groundshaking would be less than significant.

Mitigation Measures: No mitigation measures are required.

Level of Significance After Mitigation: Less Than Significant Impact.

GROUND FAILURE

◆ ***DEVELOPMENT ASSOCIATED WITH THE PROPOSED PROJECT COULD EXPOSE PEOPLE OR STRUCTURES TO POTENTIAL SUBSTANTIAL ADVERSE EFFECTS FROM GROUND FAILURE, INCLUDING SETTLEMENT, COLLAPSE, GROUND LURCHING, LIQUEFACTION, OR LATERAL SPREADING.***

Level of Significance Before Mitigation: Significant Impact.

Impact Analysis:

Soil Settlement and Collapse

Most alluvial soils within modern drainages, as well as all topsoil and colluvium, are susceptible to collapse upon placement of structural loads, such as from placement of fill/embankment soils or construction of single-family and multi-family homes and commercial structures. The impact on structures built atop these alluvial soils from either soil collapse or settlement could be significant unless mitigated. PSE has recommended complete removal and replacement of the soils that are prone to settlement and collapse with engineered fill. All alluvial and colluvial soils beneath the site would be removed and replaced with compacted fill. With implementation of recommended mitigation, areas of the proposed project site proposed for development with structures that are currently characterized by settlement- or collapse-prone soils would be made suitable for support of structures, and impacts would be less than significant.

Ground Lurching

Although the current grading plan shows a number of development areas where the pad would overlie a transition between Holocene age alluvium and bedrock, all alluvial soils in these areas are planned for complete removal and replacement with compacted/engineered fill. Therefore, the likelihood of lurching impacting the developed areas within the project site is considered low. With removal of Holocene age alluvium from alluvium-bedrock transition areas, included as mitigation, impacts related to ground lurching would be less than significant.

Liquefaction

Because groundwater levels are deeper than 50 feet within the main canyon and all, if not most, of the alluvial soils that could be susceptible to liquefaction will be removed and replaced with compacted fill, liquefaction is not expected to pose a threat to people or structures at the project site. Removal of liquefiable soil materials from areas proposed for development, included as mitigation, would reduce potential liquefaction impacts to less than significant.

Lateral Spreading

Because the liquefaction potential within the proposed project site is unlikely with removal of liquefiable soil materials from development areas, the likelihood of lateral spreading is remote. Impacts related to lateral spreading would be less than significant.

Mitigation Measures:

Soil Settlement and Collapse

GEO1 All on-site soils that are prone to settlement and collapse in areas proposed for development of structures shall be removed and replaced with engineered fill.

Ground Lurching

GEO2 If identified during on-site grading by a registered Geotechnical Engineer and/or Geologist, Holocene-age alluvium shall be removed and replaced with engineered fill in areas proposed for development where alluvium directly overlies bedrock, to preclude the possibility of ground lurching.

Liquefaction

GEO3 All liquefaction-prone soils identified during on-site grading by a registered Geotechnical Engineer and/or Geologist, shall be removed from areas proposed for development and replaced with engineered fill.

Level of Significance After Mitigation: Less Than Significant Impact.

LANDSLIDES AND SLOPE STABILITY

◆ ***DEVELOPMENT ASSOCIATED WITH THE PROPOSED PROJECT COULD EXPOSE PEOPLE OR STRUCTURES TO POTENTIAL SUBSTANTIAL ADVERSE EFFECTS FROM LANDSLIDES OR OTHER SLOPE FAILURES.***

Level of Significance Before Mitigation: Significant Impact.

Impact Analysis:

Seismically-Induced Landslide and Rock Fall

Although one location on-site does not meet the required factor of safety for seismically-induced landsliding, no development is proposed at or near this location. All other natural slopes and proposed cut slopes meet or exceed the minimum factor of safety for landslides. Impacts from seismically-induced landsliding would be less than significant.

Evidence of rock falls is present along the base of steep, near vertical slopes bordering the north side of the proposed project site; therefore, the rock fall hazard at this location would be considered a potentially significant impact. However, appropriate setbacks along the base of these over-steepened slopes, or laying the slope back to a shallower angle, would serve to effectively eliminate the rock fall hazard in this area. Mitigation requiring inclusion of setbacks or grading of slopes to a shallower angle in this area, as deemed appropriate, would reduce impacts to less than significant.

Deep Landslides and Slope Failures

No landslides are known to exist within the proposed project site. Given the steeply dipping nature of the on-site bedrock, and the fact that planned cut slopes are designed no steeper than 27 degrees (2:1: horizontal to vertical) the potential for landsliding on slopes in the bedrock is considered low.

Conventional cut-and-fill grading would be used to create the proposed development. Current grading plans indicate the construction of 2:1 (horizontal to vertical) cut slopes up to 125 feet high within the Pico formation, and up to approximately 75 feet high in the Saugus formation. Numerous 2:1 fill slopes, as high as about 90 feet, are also planned.

Given the steeply dipping (45 to 90 degrees), self-buttressing nature of the bedrock, the vast majority of natural slopes within the proposed project site and all manufactured 2:1 cut slopes are expected to be grossly and surficially stable. Given the distance of proposed development from such areas, landslides are not expected to pose a risk to people or structures at the proposed project site, and impacts would be less than significant in this regard.

Bedrock exposed along the steep natural slopes adjacent to the north side of Lyon Canyon is considered subject to block-and/or toppling-type failures. The buildup of water within joints and fractures, as well as the removal of natural support from stream erosion can exacerbate any existing instability of bedrock in these areas. Establishing adequate structural setbacks for homes and commercial sites, and maintaining surface drainage away from the toe of these steep slopes should provide appropriate mitigation against landslides or other slope failures. With implementation of applicable setback and drainage recommendations, impacts related to block-and/or toppling-type slope failures would be less than significant.

Where cut slopes are planned, they would be excavated primarily within dense, steeply-dipping bedrock materials at inclinations not exceeding 2:1 (horizontal to vertical) under the observation and by a qualified geotechnical firm. Fill slopes would be constructed with engineered fill at inclinations no steeper than 2:1. Cut and fill slopes are expected to be grossly and surficially stable and thereby would ensure that any impacts related to stability of graded slopes would be less than significant. Slope stability would be further protected by adherence to construction guidelines set forth in the latest issue of the Unified Building Code.

Mitigation Measures:

Seismically Induced Landslide and Rock Fall

GEO4 Setbacks from over-steepened slopes or grading of slopes to a shallower angle, as recommended in the project's *Geotechnical Report*, shall be required to minimize rock fall hazards to development along the northern boundary of the proposed project site.

Deep Landslides and Slope Failures

GEO5 Adequate structural setbacks for homes and commercial sites shall be required, and surface drainage shall be directed away from the toe of affected steep slopes, in order to prevent landslides or other slope failures in on-site areas susceptible to block-and/or toppling-type failures.

Level of Significance After Mitigation: Less Than Significant Impact.

SOIL EROSION

◆ ***RESULT IN SUBSTANTIAL WIND OR WATER SOIL EROSION OR THE LOSS OF TOPSOIL, EITHER ON- OR OFF-SITE.***

Level of Significance Before Mitigation: Significant Impact.

Impact Analysis: Increased on-site soil erosion would result from implementation of the proposed project due to the following:

- Grading of individual hillside lots within lots 1-71, and lots 87-93, as well as the would disturb the natural soil conditions and expose the contact between bedrock and the overlying highly erodible soils;
- Loss of vegetative cover;
- Construction of cut slopes for individual lots and roadways that will expose weathered bedrock and overlying soils to accelerated erosion;
- Increased surface water runoff resulting from construction of impermeable surfaces, such as roadways, driveways, and extensive hardscape on individual lots; and
- Channelization of surface water runoff collected from roadways and natural drainages.

The near-surface alluvial soils and highly weathered bedrock materials at the proposed project site are moderately to highly erodible. Adverse surface drainage across individual residential lots, on the face of manufactured slopes, or from concentrated discharge from slope drains into natural drainage channels, could promote accelerated soil erosion which could lead to surficial instability of slopes and increased sedimentation.

Colluvial soils at the proposed project site are also considered highly erodible. Adverse surface water runoff from residential lots that lie above colluvial-filled hillside drainages could promote soil slumping and resultant debris flows and increased sedimentation. Erosion and sedimentation impacts are considered potentially significant. However, mitigation measures, such as installation of catchment basins, protective berms and barriers, and/or reinforced walls, would be implemented to reduce these impacts to less than significant.

Also refer to Section 5.2, Hydrology and Water Quality, for a discussion of erosion and sedimentation impacts relative to stormwater quality.

Mitigation Measures:

GEO6 As soon as grading is completed for each lot, establish a protective vegetative cover in all disturbed areas via planting and/or seeding, then place a temporary protective cover, such as jute netting, mulch, hay, or other nonerodible form of ground cover, until a vegetative cover is established.

GEO7 Divert surface drainage from cut and fill slopes via brow ditches; collect surface drainage in ditches with relatively shallow gradients; and provide a means to inhibit sediment runoff into natural drainages until a protective vegetative cover effectively mitigates further soil erosion. Place energy-dissipating devices in drainages subject to increased runoff.

GEO8 When grading, attempt to minimize the area of disturbance.

Level of Significance After Mitigation: Less Than Significant Impact.

EXPANSIVE SOILS

◆ ***ON-SITE EXPANSIVE SOILS COULD POSE A RISK TO PEOPLE AND STRUCTURES ASSOCIATED WITH PROPOSED DEVELOPMENT.***

Level of Significance Before Mitigation: Significant Impact.

Impact Analysis: Some of the soils on-site have a medium to high potential for expansion, which could cause significant cracking, differential heave, and other adverse impacts on structure foundations. However, mitigation measures designed to address the effects of expansive soils would reduce potentially significant impacts to less than significant.

Mitigation Measures:

GEO9 Incorporate foundation designs recommended by the applicant's geotechnical engineer and/or the County of Los Angeles, where applicable, to preclude any adverse effects on proposed structures in areas characterized by expansive soils, including but not limited to post-tensioned slabs, mat-slabs, or other foundation systems for residential structures.

Level of Significance After Mitigation: Less Than Significant Impact.

GRADING

◆ ***DEVELOPMENT ASSOCIATED WITH THE PROPOSED PROJECT WOULD RESULT IN A CHANGE IN TOPOGRAPHY OR GROUND SURFACE RELIEF FEATURES, EARTH MOVEMENT OF 10,000 CUBIC YARDS OR MORE, AND DEVELOPMENT AND/OR GRADING ON SLOPES GREATER THAN 10 PERCENT NATURAL GRADE.***

Level of Significance Before Mitigation: Significant Impact.

Impact Analysis: Grading activities associated with the residential development and where grading of pads, slopes and interior roads are planned would create moderate to significant changes to the current topography. The project proposes the grading of approximately 3.8 million cubic yards of earth, which would be balanced on the site. Additionally, the project would grade and development on slopes greater than 25 percent natural slope. The greatest changes to existing topography would occur from construction of the residential lots and roadways within the southern portion of the site. Only through avoidance of topographic features could grading-related impacts to topography be reduced to a less than significant level.

In accordance with the County of Los Angeles's Hillside Design Guidelines, the proposed project has been designed to avoid development on primary and secondary ridgelines at the project site, and is required to incorporate specific design features for development on hillsides at the project site. Although compliance with the conditions of the County's Conditional Use Permit (if approved) would reduce impacts on topographic features and onsite hillsides, the project would permanently alter the topography of the site, would place development on slopes greater than 25 percent natural grade, and would involve substantial grading on-site. As such, these impacts would be significant and unavoidable.

Mitigation Measures*:* No mitigation measures are recommended that could feasibly reduce the significant impacts referenced.

Level of Significance After Mitigation: Significant Unavoidable Impact.

UNIQUE GEOLOGIC OR PHYSICAL FEATURES

◆ ***DEVELOPMENT OF THE PROPOSED PROJECT WOULD RESULT IN THE DESTRUCTION, COVERING, OR MODIFICATION OF UNIQUE GEOLOGIC OR PHYSICAL FEATURES AT THE PROJECT SITE.***

Level of Significance Before Mitigation: Significant Impact.

Impact Analysis: The proposed project would move approximately 3.8 million cubic yards of earth, which would be balanced on-site, including cutting and filling of hillside areas and canyon bottoms. Although the project would preserve on-site primary and secondary ridgelines, grading for proposed development would permanently alter on-site natural drainages and slope areas, which would be considered an adverse impact. Because no mitigation exists that could reduce this impact to on-site geologic and physical features, this is considered a significant unavoidable impact.

Mitigation Measures*:* No mitigation measures are recommended that could feasibly reduce the significant impacts referenced.

Level of Significance After Mitigation: Significant Unavoidable Impact.

PALEONTOLOGICAL RESOURCES

◆ ***DEVELOPMENT OF THE PROPOSED PROJECT WOULD RESULT IN THE DESTRUCTION, COVERING, OR MODIFICATION OF SIGNIFICANT FOSSIL BEDS AT THE PROJECT SITE.***

Level of Significance Before Mitigation: Significant Impact.

Impact Analysis: The proposed project would move approximately 3.8 million cubic yards of earth, which would be balanced onsite, including cutting and filling of hillside areas and canyon bottoms. Loss of onsite fossil beds, consisting of marine vertebrate and macroinvertebrate fossils would destroy portions of the fossil record from the Pliocene epoch in the Saugus and Pico Formations. The scientific value of these fossil beds would be lost.

Mitigation Measures*:*

GEO10 Fossil beds impacted by the proposed project should be excavated by a qualified paleontologist to gather and record which species of vertebrate and macroinvertebrate fauna existed onsite during the Pliocene. The fossil record should be preserved in an appropriate museum, such as the Natural History Museum of Los Angeles County, and the results published for the benefit of the scientific community and general public. (Same as Mitigation Measure CR6)

Level of Significance After Mitigation: Less Than Significant Impact.

5.1.4 CUMULATIVE IMPACTS AND MITIGATION MEASURES

◆ ***DEVELOPMENT ASSOCIATED WITH THE PROPOSED PROJECT, IN CONJUNCTION WITH OTHER CUMULATIVE PROJECTS IN THE SANTA***

CLARITA VALLEY, WOULD NOT RESULT IN CUMULATIVELY CONSIDERABLE GEOLOGY, SOILS, AND SEISMICITY IMPACTS.

Level of Significance Before Mitigation: Less Than Significant Impact.

Impact Analysis: Although the proposed project would result in significant unavoidable impacts related to geology, soils, and seismicity, these impacts are site-specific and each development site is subject to, at minimum, uniform site development and construction standards relative to seismic and other geologic conditions that are prevalent within the locality and/or region. Because the development of each cumulative project site would have to be consistent with the requirements of the Los Angeles County Department of Public Works for project sites in unincorporated Los Angeles County, and the Uniform Building Code, as they pertain to protection against known geologic hazards, impacts of cumulative development would be less than significant, given known geologic considerations.

Mitigation Measures: No mitigation measures are required.

Level of Significance After Mitigation: Not applicable.