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County of Los Angeles Department of Regional Planning, "Valencia Commerce Center Environmental Impact Report, Geotechnical Information" (April 1990).

R.T. Frankian & Associates, "Report of 100-Scale Plan Review, Vesting Tentative Tract Map No. 53295, Valencia, California" (March 2005).

4.13.1 INTRODUCTION

This section provides an overview of existing geologic conditions within the Project area, and evaluates the potential for the proposed Project and the alternatives to result in significant direct and indirect environmental impacts related to geologic hazards and processes. This section does not include an extensive analysis of secondary impacts. Secondary impacts are those that would occur off site of the Project area as a result of the proposed Project. Because all geologic impacts associated with the proposed Project would be confined to the Project area, no secondary impacts would be created. However, this section analyzes whether the proposed Project and alternatives would have the potential to expose people or structures to significant geological hazards such as fault rupture, ground motion, liquefaction, and landslides. The analysis also evaluates the potential for the proposed Project and alternatives to result in significant erosion and sedimentation impacts.

The evaluation of potential geologic hazard impacts considers the two major components of the proposed Project. The first component, the RMDP, involves the development of infrastructure in the Santa Clara River and its tributary drainages. The second component is the adoption of the SCP, which identifies spineflower preserves within the Project area.

Implementation of the RMDP and SCP Project components would facilitate development of the previously approved Specific Plan, the VCC, and a portion of the Entrada planning area. Therefore, this section also provides a summary of indirect geology hazard impacts that have the potential to occur as a result of the build-out of the Specific Plan, VCC, and a portion of the Entrada planning area.

4.13.1.1 Relationship of Project to Newhall Ranch Specific Plan Program EIR

This section provides a stand-alone assessment of the potential significant impacts to geology and geologic hazards associated with the proposed Project and alternatives; however, the previously certified Newhall Ranch environmental documentation provides important information and analysis for the RMDP and SCP components of the proposed Project. The Project components would require federal and state permitting, consultation, and agreements that are needed to facilitate development of the approved land uses within the Specific Plan site and that would establish spineflower preserves within the Project area, also facilitating development in the Specific Plan, VCC, and a portion of the Entrada planning area. Due to this relationship, the Newhall Ranch environmental documentation, findings, and mitigation, as they relate to geologic resources, are summarized below to provide context for the proposed Project and alternatives.

Section 4.1 of the Newhall Ranch Revised Draft EIR (March 1999) identified and analyzed the existing conditions, potential impacts, and mitigation measures associated with geologic, soil, and geotechnical resources for the entire Specific Plan area. In addition, Section 5.0 of the Revised Draft EIR (March 1999) identified and analyzed the potential geologic, soil, and geotechnical resources impacts and mitigation measures associated with construction and operation of the approved WRP, which would treat the wastewater generated by the Specific Plan. The Newhall Ranch mitigation program was adopted by Los Angeles County in findings and in the revised Mitigation Monitoring Plans for the Specific Plan and WRP.

The Newhall Ranch Revised Draft EIR (March 1999) identified potentially significant geologic, soil, and geotechnical impacts that would result from implementation of the Specific Plan and WRP, including landslides, surficial failures, cut slopes, expansive bedrock, hydroconsolidation, liquefaction potential, and seismic hazards. It recommended the implementation of Mitigation Measures SP-4.1-1 through SP-4.1-56 and Mitigation Measures SP-5.0-1 through SP-5.0-13 to address the significant geologic, soil, and geotechnical impacts caused by implementation of the Specific Plan and WRP, respectively, as identified in the document.[1] The Board of Supervisors found that adoption of the recommended mitigation measures would reduce the identified significant geologic, soil, and geotechnical impacts to less-than-significant levels.

Table 4.13-1 summarizes the Specific Plan's and WRP's impacts related to geology and geologic hazards, the applicable mitigation measures, and the significance findings after the mitigation is implemented.

Table 4.13-1
Impacts to Geology and Geologic Hazards Caused By Implementation of the Specific Plan and WRP

Impact Description	Mitigation Measures	Finding After Mitigation
Specific Plan Geology and Geologic Hazard Impacts - The Specific Plan site is traversed by the Salt Creek and Del Valle faults and the Holser structural fault zone. In addition, and similar to geotechnical characteristics elsewhere in the area, some portions of the site have soils that are poorly consolidated. As a result, implementation of the Specific Plan may result in significant geotechnical impacts such as landslides, surficial failures, cut slopes, expansive bedrock, hydroconsolidation, liquefaction potential, and seismic hazards.	• SP-4.1-1 through SP-4.1-3 (requiring compliance with Los Angeles County Building Code and Grading Ordinance); • SP-4.1-4 (location of trenches and borings must be noted on grading plans); • SP-4.1-5 (requiring testing wherever Pacoima Formation is exposed); • SP-4.1-6 and SP-4.1-7 (restricting placement of expansive soils encountered during grading or at subgrade elevations in cut areas near finished surfaces); • SP-4.1-8 (areas subject to liquefaction must be mitigated prior to development); • SP-4.1-9 through SP-4.1-12 (requiring placement of subdrains); • SP-4.1-13 (geological materials subject to hydroconsolidation must be removed prior to placement of fill); • SP-4.1-14 (minimum 20-foot setback for structures on ridgelines to prevent perched or groundwater levels); • SP-4.1-15 (subsurface exploration required to delineate landslide);	Not significant.

[1] References to mitigation measures included in the Newhall Ranch Specific Plan Program EIR are preceded by "SP" in this EIS/EIR to distinguish them from other mitigation measures discussed herein.

Table 4.13-1
Impacts to Geology and Geologic Hazards Caused By Implementation of the Specific Plan and WRP

Impact Description	Mitigation Measures	Finding After Mitigation
	• SP-4.1-16 and SP-4.1-17 (existence of landslides must be confirmed at subdivision stage); • SP-4.1-18 (potential geologic hazards in proximity to roadway alignments must be evaluated at subdivision stage); • SP-4.1-19 (debris must be removed from surficial failures during grading prior to placement of fill); • SP-4.1-20 (all soils and/or consolidated slopewash and landslide debris must be removed before placement of compacted fill); • SP-4.1-21 (cut-slopes must be further evaluated at subdivision stage); • SP-4.1-22 (additional geologic investigations required prior to approval of future tentative maps); • SP-4.1-23 (compacted fill shear key must be constructed prior to construction of road embankment); • SP-4.1-24 (landslides, which will not affect proposed grading concept, must be placed in Restricted Use Areas on the Final Maps); • SP-4.1-25 through SP-4.1-28 (cut-slopes must be further evaluated at subdivision stage and corrective grading measures are to be presented); • SP-4.1-29 (orientations of bedrock attitudes are to be evaluated); • SP-4.1-30 (fills must be compacted to at least 90 percent of maximum dry unit weight); • SP-4.1-31 (no fill is to be placed until area has been prepared and approved); • SP-4.1-32 (fill soils must be kept free of debris and organic material);	

Table 4.13-1
Impacts to Geology and Geologic Hazards Caused By Implementation of the Specific Plan and WRP

Impact Description	Mitigation Measures	Finding After Mitigation
	• SP-4.1-33 and SP-4.1-34 (restricting placement of rocks and fragments larger than eight inches in fill or near finished pad grades, subgrade of roadways, or slope faces); • SP-4.1-35 (rock fragments larger than eight inches may be placed in windrows, if certain restrictions are complied with); • SP-4.1-36 (fill material must be placed in layers not to exceed eight inches per layer when compacted); • SP-4.1-37 (water must be added when moisture content of fill material is too low to obtain adequate compaction); • SP-4.1-38 (fill material is to be aerated when moisture content of fill material is too high to obtain adequate compaction); • SP-4.1-39 (a keyway must be cut at the toe of the fill where fills toe out on a natural slope or surface); • SP-4.1-40 (a drainage bench must be established where fills toe out on a slope steeper than 5:1); • SP-4.1-41 through SP-4.1-43 (requirements for fills over slopes and constructing fill slopes); • SP-4.1-44 (artificial fill associated with past petroleum activities must be evaluated); • SP-4.1-45 (surface runoff from future graded areas must not run over any natural, cut, or fill slopes); • SP-4.1-46 (runoff from future pads and structures must be collected and channeled); • SP-4.1-47 (water must not stand or pond on graded pads); • SP-4.1-48 (oil and water wells on site must be abandoned);	

Table 4.13-1
Impacts to Geology and Geologic Hazards Caused By Implementation of the Specific Plan and WRP

Impact Description	Mitigation Measures	Finding After Mitigation
	• SP-4.1-49 (any leaking or undocumented wells that are encountered during grading must be evaluated); • SP-4.1-50 (the status and location of the Exxon well #31 will be evaluated at the subdivision stage); • SP-4.1-51 (survey control will be required to locate the Salt Creek and Del Valle faults at the subdivision stage); • SP-4.1-52 (additional subsurface trenching will be performed in and to evaluate the Holser structure zone during subdivision stage); • SP-4.1-53 (building setback zones will be defined at subdivision stage); • SP-4.1-54 (site development must remain outside of building setback zones around fault traces); • SP-4.1-55 (structures and storage tanks proposed on ridgelines must have 20-foot setback from the margins of bedrock to minimize shattered ridge effects); • SP-4.1-56 (potential for ground motion and ground failure associated with seismic event in proximity to planned roadways will be evaluated at subdivision stage).	
Specific Plan Cumulative Geology and Geologic Hazard Impacts - Geotechnical impacts tend to be site-specific rather than cumulative in nature and each development site is subject to, at a minimum, uniform site development and construction standards relative to seismic and other geologic conditions that are prevalent within the region. Because the development of each site would have to be consistent with Los Angeles County requirements 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.	• No further mitigation recommended.	Not significant.

Table 4.13-1
Impacts to Geology and Geologic Hazards Caused By Implementation of the Specific Plan and WRP

Impact Description	Mitigation Measures	Finding After Mitigation
WRP Geology and Geologic Hazard Impacts - The WRP improvements would be on raised and compacted fill and elevated above the alluvial sediments of the Santa Clara River floodplain and would not be subject to hazards associated with expansive soils or liquefaction. Surface and near-surface soils throughout the site are poorly consolidated, commonly contain void space, and are subject to hydroconsolidation, which causes settlement and can be potentially hazardous to overlying structures.	• SP-5.0-1 (prior to construction, detailed geotechnical report must be prepared to outline performance requirements for placing and compacting fill); • SP-5.0-2 (expansive soils must not be placed near finished surface); • SP-5.0-3 (prior to grading, a detailed geotechnical report must be prepared to assess liquefaction potential); • SP-5.0-4 (all structures and facilities must be constructed according to Uniform Building Code standards); • SP-5.0-5 (potentially consolidatible materials must be property removed and fill material is to be property compacted); • SP-5.0-6 (all fill must be compacted to at least 90 percent of maximum dry unit weight); • SP-5.0-7 (no fill is to be placed until the area has been adequately prepared); • SP-5.0-8 (fill soils must be kept free of debris and organic material); • SP-5.0-9 and SP-5.0-10 (restricting slope faces); • SP-5.0-11 (water must be added to fill material when moisture content is too low to obtain adequate compaction); • SP-5.0-12 (fill material is to be aerated when moisture content of fill material is too high to obtain adequate compaction); • SP-5.0-13 (surface runoff from future graded areas must not run over natural, cut, or fill slopes).	Not significant.

Source: Newhall Ranch Revised Additional Analysis (May 2003).

4.13.1.2 Relationship of Proposed Project to VCC and Entrada Planning Areas

4.13.1.2.1 VCC Planning Area

The SCP component of the proposed Project, if approved, would facilitate development in the VCC planning area. The VCC is reliant on the SCP and associated take authorizations, and would not be developed without the take authorizations due to grading constraints. The VCC planning area is the remaining undeveloped portion of the VCC commercial/industrial complex currently under development by the applicant. The VCC was the subject of an EIR certified by Los Angeles County in April 1990 (SCH No. 1987123005). The applicant recently has submitted to Los Angeles County the last tentative parcel map (TPM No. 18108) needed to complete build-out of the remaining undeveloped portion of the VCC planning area. The County will require preparation of an EIR in conjunction with the parcel map and related project approvals; however, the County has not yet issued a Notice of Preparation (NOP) of the EIR or released the EIR. **Table 4.13-2** summarizes the VCC's impacts on geologic, soil, and geotechnical resources, the applicable mitigation measures, and the significance findings after mitigation from the previously certified VCC EIR (April 1990).

Table 4.13-2
Impacts to Geology and Geologic Hazards Caused By VCC Implementation

VCC Impact Description	VCC Mitigation Measures	Finding After Mitigation
Project Geology and Geologic Hazard Impacts - The Holser fault traverses the site. Shaking from earthquakes on nearby or distant faults is possible. There are 10 landslides on the site. There is expansive bedrock on the site.	• A minimum 60- to 80-foot setback from the Holser fault is incorporated into project design. • Potential impacts from ground shaking will be mitigated by compliance with the Los Angeles County Building Code. • All cut slopes will be designed at 2:1 gradients. • If cut slopes are steeper than the bedding, then buttresses, retaining walls, and/or stability equivalents will be provided. • Landslides will be stabilized with shear keys and/or removal of compaction. • Expansive bedrock will be removed and replaced with certified fill, or special foundations will be designed. • Fills will be designed at 2:1 gradients. • All major canyon fills, buttresses, stability fills, sheer keys, and retaining walls will require subdrains.	Not significant.

Table 4.13-2
Impacts to Geology and Geologic Hazards Caused By VCC Implementation

VCC Impact Description	VCC Mitigation Measures	Finding After Mitigation
Cumulative Geology and Geologic Hazard Impacts - Geologic concerns are site specific. Geotechnical aspects of related projects will neither impact nor be impacted upon by VCC development.	• No further mitigation recommended.	Not significant.

Source: VCC EIR (April 1990).

4.13.1.2.2 Entrada Planning Area

The applicant is seeking approval from Los Angeles County for planned residential and non-residential development within the Entrada planning area. The SCP component of the proposed Project would designate an area within Entrada as a spineflower preserve. If approved, the SCP component would include take authorization of spineflower populations in Entrada that are located outside of the designated spineflower preserve area. Thus, the planned residential and nonresidential development within portions of the Entrada planning area is reliant on the SCP and associated take authorizations, and those portions would not be developed without the take authorizations. The applicant has submitted to Los Angeles County Entrada development applications, which cover the portion of the Entrada planning area facilitated by the SCP component of the proposed Project. However, as of this writing, the County has not yet issued a NOP of an EIR or released an EIR for Entrada. As a result, there is no underlying local environmental documentation for the Entrada planning area at this time.

4.13.2 METHODOLOGY

The Revised Draft EIR for the Newhall Ranch Specific Plan and WRP (March 1999), Section 4.1, Geotechnical and Soil Resources, includes a comprehensive analysis of the geotechnical conditions and soil resources located on the Specific Plan site. Section 4.1 also summarizes the findings from the following soils and geologic reports prepared for the Specific Plan site:

- *Preliminary Geologic Report [for] Newhall Ranch*, by Allan E. Seward Engineering Geology, Inc. (September 19, 1994);
- *Addendum No. 1 Preliminary Geologic Report [for] Newhall Ranch*, by Allan E. Seward Engineering Geology, Inc. (December 4, 1995);
- *Preliminary Geologic Feasibility Report [for] Offsite Extensions of Magic Mountain Parkway and Valencia Boulevard to Newhall Ranch*, by Allen E. Seward Engineering Geology, Inc. (December 13, 1995);
- *Geologic Report - Addendum No. 2 Response to County Comments [for] Newhall Ranch Specific Plan*, by Allan E. Seward Engineering Geology, Inc. (May 13, 1996);

- *Report of Geotechnical Reconnaissance [for the] Proposed Newhall Ranch Project*, by R.T. Frankian & Associates (September 19, 1994);
- *Geotechnical Response to Letter Dated July 31, 1995 From County of Los Angeles Department of Public Works*, by R.T. Frankian & Associates (December 6, 1995);
- *Preliminary Geotechnical Review [of the] Proposed Extensions of Valencia Boulevard and Magic Mountain Parkway to Newhall Ranch, Valencia California*, by R.T. Frankian & Associates (December 12, 1995); and
- *Response to County Remarks; Geotechnical Review Sheet Dated March 28, 1996 [for] Newhall Ranch Specific Plan*, by R.T. Frankian & Associates (May 15, 1996).

The soils and geologic reports prepared by Allen E. Seward Engineering Geology, Inc. (Seward) evaluate the Salt Creek and Del Valle Fault Zones, delineate the approximate extent of on-site landslides, provide preliminary recommendations relative to the proposed grading concept for the Specific Plan, and evaluate the feasibility of the proposed extensions of Magic Mountain Parkway and Valencia Boulevard from I-5 to the Specific Plan site. The reports prepared by R.T. Frankian & Associates (RTF&A or Frankian) supplement Seward's investigations with respect to future potential earthquake ground motion and liquefaction, and evaluate the site within twenty-one distinct geographic areas. All of these reports are summarized in Section 4.1 of the Revised Draft EIR for the Newhall Ranch Specific Plan and WRP (March 1999). In addition, copies of these reports are identified as reference documents in this EIS/EIR.

In addition, the Revised Draft EIR for the Newhall Ranch Specific Plan and WRP (March 1999) includes an impacts analysis and identifies specific mitigation measures for the proposed WRP within the Specific Plan site (see Section 5.0, pages 5.0-19 to 5.0-22).

Based on the soils and geologic reports, and upon the current standards of practice in Los Angeles County, the Revised Draft EIR for the Newhall Ranch Specific Plan and WRP (March 1999) found that development was proposed in areas that are subject to landslides, surficial failure, hydroconsolidation and liquefaction, as well as in areas of expansive soils. In addition, the Revised Draft EIR for the Newhall Ranch Specific Plan and WRP (March 1999) found that the site will be subject to hazards associated with seismic activity in the region, and that development in areas of geologic instability would result in a significant impact because it would expose people and structures to geologic hazards. However, it also found that, with implementation of the mitigation measures identified in Sections 4.1 and 5.0, on-site development was feasible from a geotechnical and soils standpoint. In addition, it found that, with implementation of the mitigation measures, all geologic impacts and hazards would be mitigated to below a level of significance and not result in any significant unavoidable geologic impacts or hazards.

The methodologies used in the Seward and Frankian reports included review of: (a) in-house data; (b) published and unpublished maps and documents; (c) oil and gas field mapping; (d) aerial photographics; (e) topographic base maps; (f) data gathered from the U.S. Geological Survey (USGS); and (g) geologic logging of trenches on the Specific Plan site. In addition, the geologic investigation included: (a) delineation of landslides within the Specific Plan site; (b) delineation of the Salt Creek and Del Valle Fault Zones as they occur in the Specific Plan site and designation of geologically-recommended preliminary building setback zones; (c) review of Specific Plan grading concepts; (d) coordination with

other consultants, including the grading engineer; and (e) geotechnical reconnaissance of the Specific Plan site and off-site roadway extensions.

Since certification of the Newhall Ranch Specific Plan Program EIR (May 2003), Seward completed additional geologic reports in 2005 and 2007, which are found in **Appendix 4.13** of this EIS/EIR. This EIS/EIR also relies on the geotechnical information presented in the certified EIR for the VCC project (SCH No. 1987123005), and a geologic report, dated March 18, 2005, prepared by Frankian (Frankian 2005). The Frankian 2005 study addressed the portion of the Entrada planning area analyzed in this EIS/EIR (located within Planning Areas 3-14 as described in the Frankian 2005 study) as well as a larger area including land located outside the Project area. The geotechnical information for the VCC project and Frankian 2005 study also are found in **Appendix 4.13** of this EIS/EIR.

4.13.3 REGULATORY SETTING

4.13.2.1 Federal

Clean Water Act (33 U.S.C. §§ 1251 *et seq.*). Storm water runoff from the Project area, and discharges of runoff into drainages, wetlands, and/or floodplains are subject to the requirements of the Clean Water Act (CWA). Under the requirements of the CWA, the discharge of pollutants to "waters of the United States" from any point source is effectively prohibited, unless the discharge is in compliance with a National Pollutant Discharge Elimination System (NPDES) permit. Under the requirements of the NPDES program, the U.S. Environmental Protection Agency (USEPA) has adopted regulations pertaining to the storm water discharges from construction and industrial sites. These regulations require the implementation of Best Management Practices (BMPs) to minimize erosion and discharges of sediment and other pollutants. Additional information regarding this regulatory program and the WRP outfall is provided in **Section 4.4**, Water Quality, of this EIS/EIR.

4.13.3.2 State

Alquist-Priolo Earthquake Fault Zoning Act (Pub. Resources Code, §§ 2621 *et seq.*). The Alquist-Priolo Earthquake Fault Zoning Act of 1972 is intended to minimize the chance for structures used for human occupancy to be built over active faults by requiring a geological investigation for new development within designated active earthquake fault zones. An active fault is defined as a fault that has ruptured the ground surface within the Holocene (last 11,000 years). For purposes of implementing the Act, it is assumed, until proven otherwise by an appropriate geologic investigation, that the area within 50 feet of an active fault is underlain by active branches of the fault. (Pub. Resources Code, § 3603, subd. (a).) The State Department of Conservation, California Geologic Survey Special Publication 42 describes and maps Alquist-Priolo Earthquake hazard zones.

Seismic Hazards Mapping Act (Pub. Resources Code, §§ 2690 *et seq.*). The California Geologic Survey provides guidance with regard to seismic hazards. Under the Seismic Hazards Mapping Act, seismic hazard zones are to be identified and mapped to assist local governments in planning development. The intent of this publication is to protect the public from the effects of strong ground motion and shaking, liquefaction, landslides, other types of ground failure, and other hazards caused by earthquakes. The California Geologic Survey's Special Publication 117, Guidelines for Evaluating and

Mitigating Seismic Hazards in California, provides guidance for evaluation and mitigation of earthquake-related hazards for projects within designated zones of required investigations.

California Building Code. The State of California provides a minimum standard for building design through the 2002 California Building Code. The 2002 California Building Code is based on the 1997 Uniform Building Code, but has been modified for California conditions. It is generally adopted on a jurisdiction-by-jurisdiction basis, subject to further modification based on local conditions. Commercial and residential buildings are plan-checked by local city and county building officials for compliance with the California Building Code.

Chapter 23 of the California Building Code contains specific requirements for seismic safety. Chapter 29 of the California Building Code regulates excavation, foundations, and retaining walls. Chapter 33 of the California Building Code contains specific requirements pertaining to site demolition, excavation, and construction to protect people and property from hazards associated with excavation cave-ins and falling debris or construction materials. Chapter 70 of the California Building Code regulates grading activities, including drainage and erosion control. Construction activities are subject to occupational safety standards for excavation, shoring, and trenching as specified in Cal-OSHA regulations (Title 8 of the California Code of Regulations) and in section A33 of the California Building Code.

Porter-Cologne Water Quality Control Act of 1972; Wat. Code, §§ 13260-13269; 23 Cal. Code Regs., Chapter 9. The California Porter-Cologne Water Quality Control Act authorizes the State Water Resources Control Board (SWRCB), in the subject region, through the Los Angeles Regional Water Quality Control Board (RWQCB), to regulate and control the discharge of pollutants into waters of the State. The SWRCB has entered into an agreement with the USEPA to administer the requirements of the NPDES program pertaining to discharges to waters of the State.

4.13.3.3 Local

County of Los Angeles. Los Angeles County's Building Code (Title 26) and grading requirements (Titles 22 and 26) address geologic hazards. The County's General Plan is currently being updated, however, the adopted General Plan (1980) recommends a site-specific investigation be performed where the possibility of soil or geologic problems exist. The 2001 Housing Element 1998-2005 (section 6.2) requires compliance with the Seismic Hazards Mapping Act and special geotechnical review prior to project approval.

4.13.4 EXISTING CONDITIONS

This description of existing geological conditions focuses on the topography, geology, and geologic hazards that have the potential to adversely affect improvements proposed by the Project. The following subsections describe existing geological conditions in the Project area, including the Newhall Ranch Specific Plan site, and they are based on existing information sources including the Newhall Ranch Revised Draft EIR (March 1999). Seward completed on-site geologic investigations in 1995, 2000, 2005, and 2007. Copies of the Seward 1995 and 2000 reports are included in the Newhall Ranch Revised Draft EIR (March 1999). Copies of the Seward 2005 and 2007 reports are found in **Appendix 4.13** of this

EIS/EIR. In addition, this subsection discusses the existing geological conditions of the VCC and Entrada planning areas.

4.13.4.1 Existing Conditions Within the Project Area, Including the Specific Plan Site

The Mission Village portion of the Specific Plan site is dominantly a hillside area cut by several north-draining tributaries of the Santa Clara River, including Lion Canyon on the southwest boundary of the site; and Dead End Canyon, Middle Canyon, and Magic Mountain Canyon on the eastern boundary of the site. (Please see **Figure 2.0-37**, which depicts the location of drainages, and **Figure 2.0-20**, which identifies villages areas within the Specific Plan site.) Two large areas of flat, elevated terrain are present on the western and northeastern portions of the site and are known as Exxon Mesa and Airport Mesa, respectively. Slope gradients range from gentle in the mesa and canyon floor areas to steep along the Santa Clara River bluffs and where resistant sandstone beds outcrop. The site is largely undeveloped except for roads and pads associated with past oil well drilling and operations. One active water well used for agricultural irrigation is located in Middle Canyon. Elevations at the site range from 940 feet along the Santa Clara River to a high point of 1,510 feet. (Seward, 2007.)

The Landmark Village area of the Specific Plan site is located on gently inclined alluvial surfaces. Small banks exist between younger and older alluvium and ascending fill and natural slopes adjacent to SR-126. Elevations at the site range from 900 feet adjacent to the Santa Clara River up to 1,005 feet on the knob along SR-126. Most of the site has been utilized for agricultural purposes and at least 13 water wells are located on the site. The northern margin of the site has been altered by construction of SR-126, the abandoned Southern Pacific Railroad line, and various pipelines. Debris, including concrete and asphalt concrete blocks, is present on several areas of the site. Five abandoned oil wells have been drilled on or immediately adjacent to the site. (Seward, 2007.)

The Homestead portion of the Specific Plan site is largely undeveloped except for roads and pads associated with past oil well drilling operations and ranching/agricultural activities. Old alluvial surfaces at Homestead West, Homestead Central, Onion Fields, and Grapevine Mesa have been used for agricultural purposes in the recent past. Several residential structures (now abandoned) are present at Walnut Orchard on Homestead Central. The Chiquita Canyon Landfill is located on an adjacent parcel east of Chiquito Canyon and a training facility for the Los Angeles County Fire Department currently occupies the mesa north of Homestead Central. Existing public road access to the site includes SR-126, Chiquito Canyon Road, and San Martinez Grande Canyon Road. The site topography is dominated by the Santa Clara River Valley, which bisects the site from east to west. (Seward, 2007.)

North of SR-126, the Specific Plan area is traversed by two major south-draining tributaries of the Santa Clara River, namely San Martinez Grande Canyon to the west and Chiquito Canyon to the east. Elevations north of the Santa Clara River range from approximately 860 to 1,540 feet at Homestead West, 895 to 1,230 feet at Homestead Central, and from 940 feet at the mouth of Chiquito Canyon up to 1,768 feet at the high point in the Chiquito Estate Lot area. The central portion of San Martinez Grande Canyon consists of gently sloping alluvial surfaces bound by steep slopes and ridgelines with short tributary canyons to the east and west. West of San Martinez Grande Canyon, in the Homestead West area, three gently sloping field areas on the south transition abruptly into steep terrain to the north that is dominated by south-draining canyons and intervening ridgelines. At the Homestead Central area, two gently sloping

alluvial surfaces occur to the southwest and are bounded by moderate to steep slopes and ridges to the west. Uplifted mesa surfaces occur on the western ridge and along the northern margin of the site at Fire Training Mesa. The hillside gradients adjacent to Chiquito Canyon vary from moderate to very steep where resistant sandstone beds are exposed. (Seward, 2007.)

South of the Santa Clara River, elevations range from approximately 870 to 1,130 feet at the Onion Field, 905 to 1,410 feet at Potrero Ridge, 900 to 1,440 feet in t he Long Canyon area, and from 920 to 1,530 feet at Mesa West. The Onion Field consists of a gently sloping alluvial fan surface that extends northward from the mouth of Long Canyon and even flatter alluvial surfaces originally formed by the Santa Clara River. The Onion Field is bordered to the south by steep slopes and ridges on both sides of Long Canyon. Potrero Ridge is a steep, narrow, west-trending ridge that rises more than 300 feet above the Onion Field. To the east, this ridge forms the divide between Long Canyon and Potrero Canyon to the south. Long Canyon is a fairly linear, northwest-draining canyon with a series of short tributary canyons. Adobe Canyon is a tributary canyon that extends east-southeast from the northwest end of Long Canyon. The steep ridgeline area on the north side of Long and Adobe Canyons is known as Sawtooth Ridge and forms a natural boundary with Mesas West to the north. (Seward, 2007.)

The central portion of Mesas West is dominated by a large, dissected group of mesas, the largest of which is designated as Grapevine Mesa. These mesas are bounded by steep, ascending natural slopes and ridges to the southeast and along Sawtooth Ridge to the southwest. Lion Canyon bounds the site to the northeast, and steep, descending bluffs bound the proposed Mesas West development along the south margin of the Santa Clara River. (Seward, 2007.)

Elevations at the WRP site range from about 830 feet up to 928 feet on the eastern hill. Two tributary drainage channels cut the western portion of the WRP site and the eastern end of the WRP site is relatively elevated. Remaining portions of the site consist primarily of an elevated alluvial surface that is currently utilized for agriculture. The southern margin of the site roughly coincides with the existing bank of the Santa Clara River floodplain. During previous realignment and widening of SR-126, an ascending fill slope was constructed along portions of the northern margin of the site, and a descending cut slope was constructed along the eastern, elevated portion of the site, forming an isolated hill. Prior to being widened and realigned to the northern margin of the site, SR-126 originally traversed the eastern portion of the site, contouring around the southern margin of the hill. An abandoned railroad line was also constructed around this hill. (Seward, 2007.)

4.13.4.2 Tectonic Setting

California straddles the transform plate margin of western North America. The San Andreas fault, which is generally considered the primary structural boundary between the Pacific and North American tectonic plates, runs through Los Angeles County approximately 21 miles north of the Project area. As the Pacific Plate moves towards the northwest at a rate of about 45 millimeter per year (mm/year), it collides with and slides past the North American Plate. Shortening, due to compressional and lateral forces, occurs at the "Big Bend" of the plate boundary zone where the San Andreas fault deviates to the west from its predominant northwest trend, creating the current orientation of the Transverse Ranges. The Transverse Ranges consist of a series of east-west trending mountains and intervening valleys. The western end of the San Gabriel Mountains is generally regarded as the end of the western section of the Transverse

Ranges. The elevation in the Project region is actively rising as a result of the oblique plate collision process. The Santa Susana Mountains, located approximately 10 miles southwest of the Project area, were uplifted 40 to 70 centimeters (cm) during the 1994 Northridge earthquake.

The Project area lies on the easternmost part of the Ventura Basin, which is a westerly plunging depositional basin produced by tectonic downwarping (*i.e.,* downward movement of the earth's crust in response to forces associated with the movement and interaction of tectonic plates) initiated during the early Miocene (13 to 25 million years before present). The axis of the basin coincides roughly with the Santa Clara River channel. The topography of the Project area is dominated by west- and northwest-trending primary ridges with generally north- and south-trending secondary ridges. Slope gradients vary from moderate to steep in the hilly areas to very gentle within the Santa Clara River floodplain, major tributary canyons, and on uplifted terrace (mesa) surfaces adjacent to the Santa Clara River.

Uplift of bedrock formations and terraces combined with the effects of erosion have largely controlled topographic landforms and drainage development in the Project area. The sedimentary rocks of Miocene to Plio-Pleistocene age form the steeply dipping ridges. Along the Santa Clara River, the bedrock units are overlain by relatively flat-lying sediments and soils of Pleistocene to Holocene (Recent) age. The Late-Quaternary sediments and soils within the Project area have been folded and offset by faults. However, evidence of primary surface fault rupture during Holocene times has not been observed on the Newhall Ranch Specific Plan site.

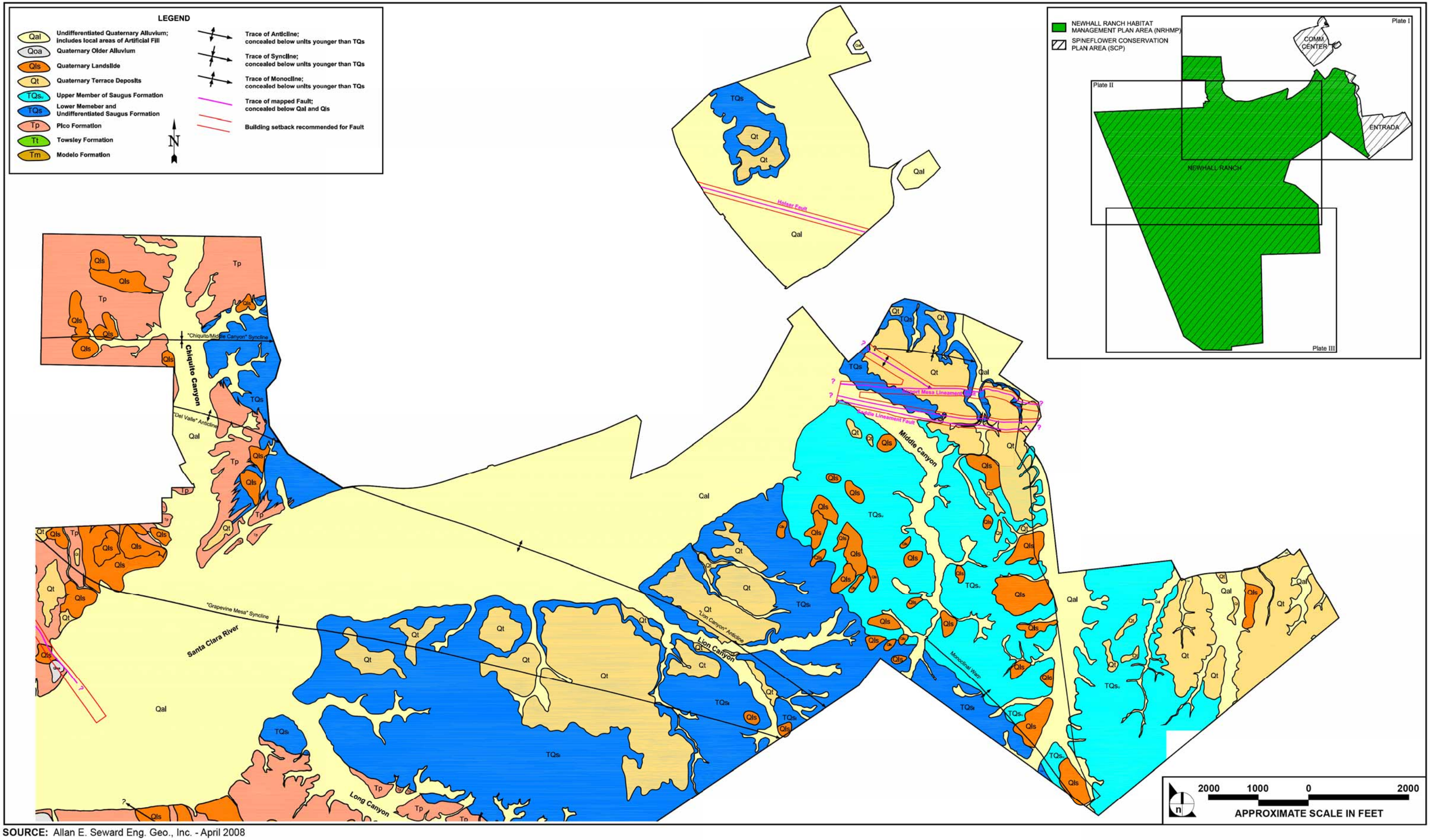
4.13.4.3 Stratigraphy

Stratigraphy is the science of rock strata, including their succession, age, form, distribution, composition, fossil content, geophysical properties and geochemical properties.

4.13.4.3.1 Bedrock Formations

Bedrock formations found in the Project area include the Modelo, Towsley, Pico, Saugus, and Pacoima Formations; and Quaternary terrace deposits (Seward, 1994; 1995; 2004a & b; 2005a & b; 2007). The on-site geologic units are described below and maps of the Project area geology are provided on **Figures 4.13-1** through **4.13-3**, Geology Overview Maps of Project Area.

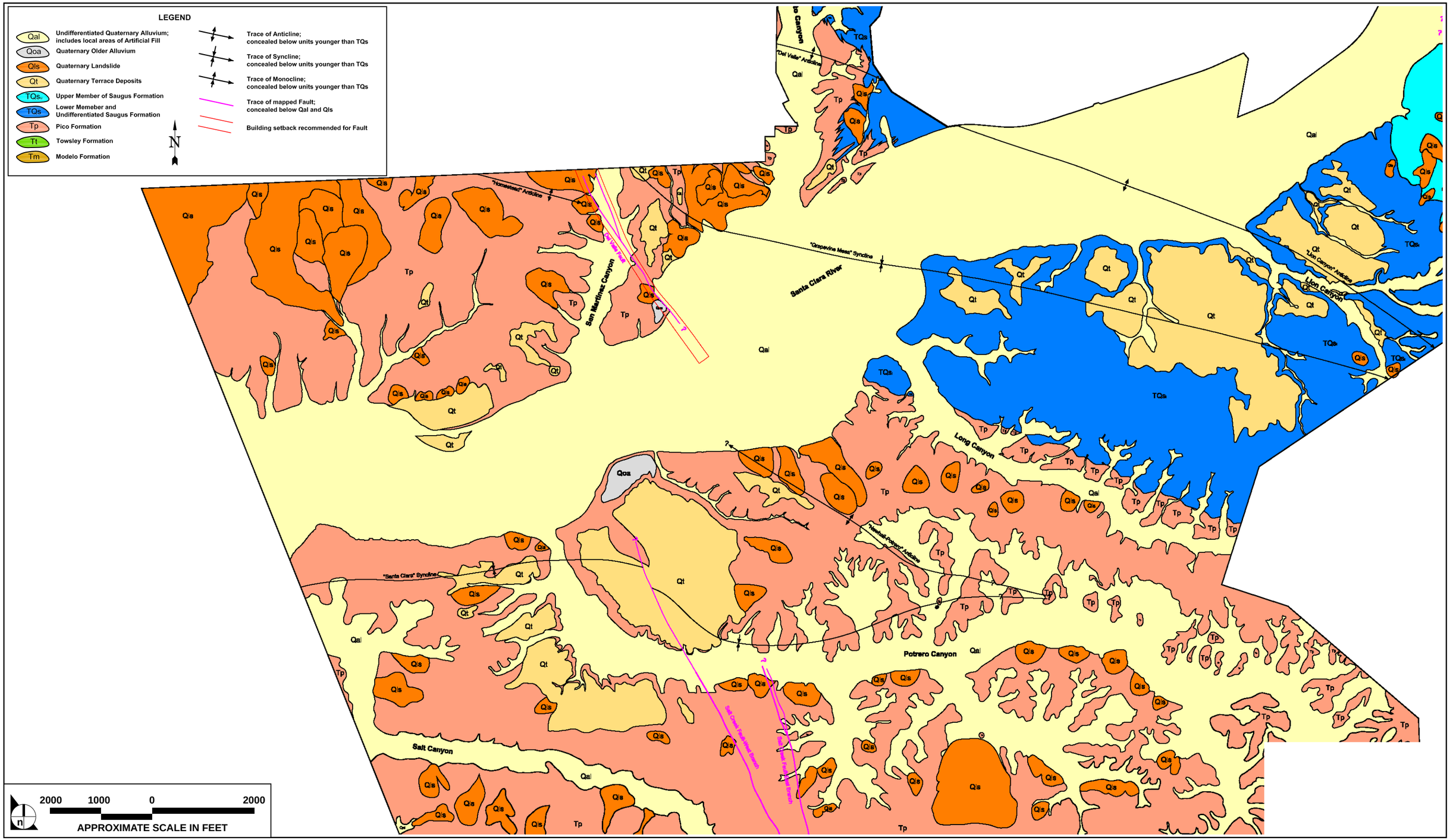
Modelo and Towsley Formations. The Miocene marine Modelo Formation and Miocene to Pliocene (two to 13 million years before present) marine Towsley Formation are present on the southern portion of the Project area. The Modelo Formation consists of weathered, thinly bedded shale with interbedded layers of semi-friable sandstone. This formation is prone to landslide failure and is the source of many large landslides on the southern portion of the Project area. The Towsley Formation consists of sandstone and local conglomerate, with interbedded layers of siltstone. The Modelo and Towsley Formations do not crop out (protrude above ground surface) in the area planned for development and are not expected to be encountered during grading operations. (Seward, 2005.)



SOURCE: Allan E. Seward Eng. Geo., Inc. - April 2008

FIGURE 4.13-1

Geology Overview Map of Project Area

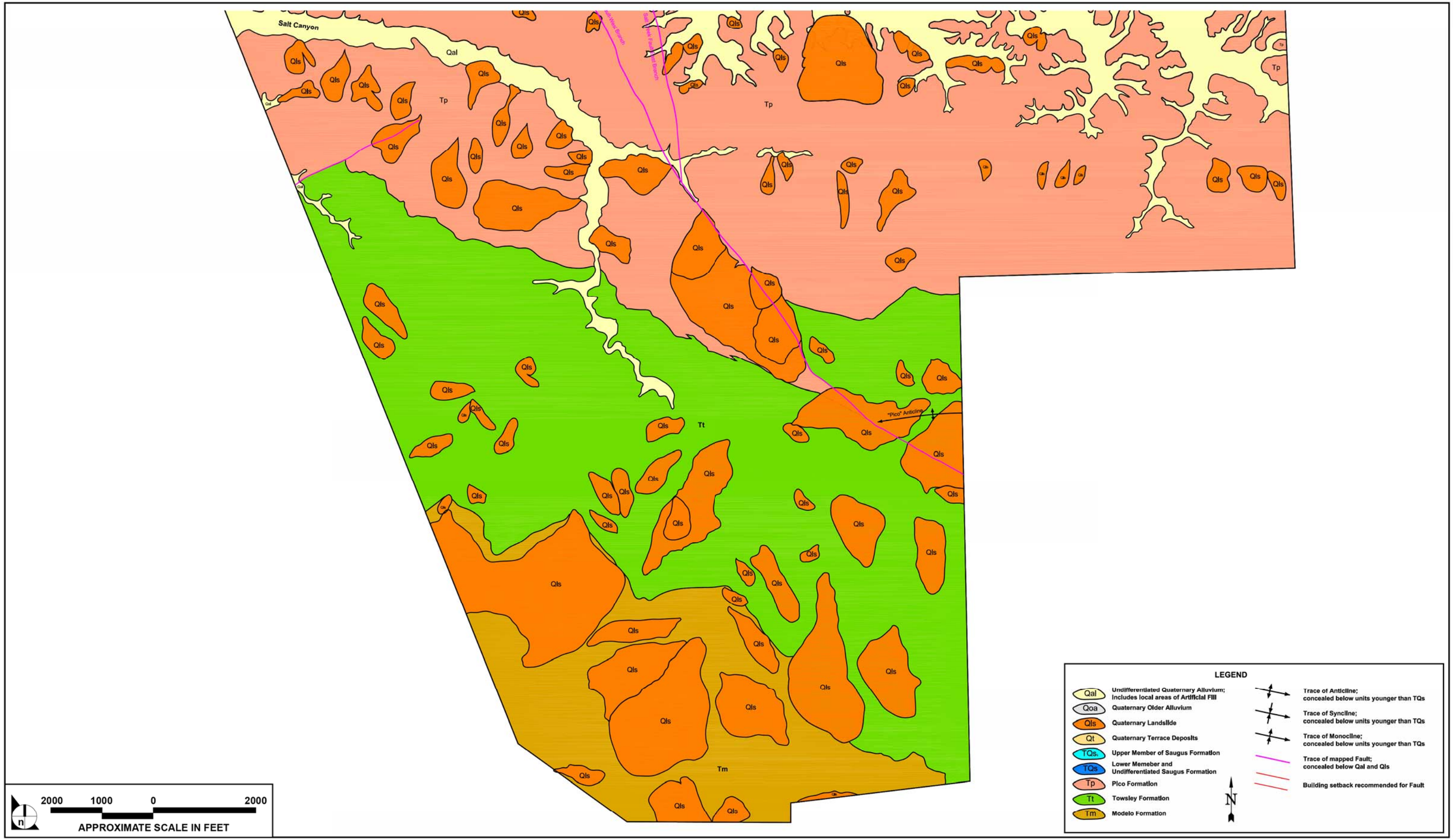


SOURCE: Allan E. Seward Eng. Geo., Inc. - April 2008

FIGURE 4.13-2

Geology Overview Map of Project Area

32-214•04/08



SOURCE: Allan E. Seward Eng. Geo., Inc. - April 2008

FIGURE 4.13-3

Geology Overview Map of Project Area

Pico Formation. The Pico Formation was deposited in a shallow to deep marine environment that existed in the Ventura Basin during the Pliocene. The Pico Formation is the most extensive unit and consists of sandstone and conglomerate with interbedded layers of sandy siltstone, siltstone, and mudstone. A thick section of siltstone underlies Potrero Canyon. The Pico Formation is generally moderately hard and well bedded, except for the siltstone units that are commonly fractured near the surface and poorly bedded.

To the north of the Santa Clara River, the Pico Formation underlies most of the Homestead areas and the west end of Landmark Village, except in the eastern portion of Chiquito Canyon and where it is concealed by terrace deposits and alluvium. West of the Del Valle fault, the older, fine-grained section of the Pico Formation is dominant. The upper 10 to 15 feet of this formation is commonly weathered and subject to shallow surficial failures on steep slopes. Steep, rounded slopes are common because the unweathered rock at such depth is generally hard and stable. East of the fault, at Homestead Central, Chiquito Canyon, and the west end of Landmark Village, sandstone and silty sandstone beds indicative of the upper portion of the formation are common. Where geologically favorable conditions are exposed in this area, steep slopes and cliffs are common. Gentle slopes are common where the bedding conditions are daylighted or adverse. In Chiquito Canyon, the contact with the overlying Saugus Formation is interfingering, with local, nonmarine, clay-rich red beds exposed below marine units. South of the Santa Clara River, the Pico Formation underlies most of the Homestead project southwest of Long Canyon. (Seward, 2007.)

Saugus Formation. The Plio-Pleistocene Saugus Formation is exposed in the northeastern portion of the Project area. This formation was deposited in a river environment between 2.5 million and 750,000 years ago and consists of moderately dense sandstone and conglomerate, sandy siltstone, and mudstone. The siltstone and mudstone of the Saugus Formation are potentially expansive.

South of the Santa Clara River, an essentially complete stratigraphic section of this formation is exposed between Long Canyon and Airport Mesa, with the youngest known deposits occurring just south of the Saddle lineament.[2] This section has been divided into two informal members based on observed changes in the stratigraphy and induration of the rock. (Seward, 2007.)

The lower member (TQsl) is recognized on Homestead and Mission Village to the southwest of Dead End Canyon. The upper member of the Saugus Formation (TQsu) is exposed from Dead End Canyon to the saddle lineament. The Saugus Formation exposed below Airport Mesa to the north of the saddle lineament consists of moderately indurated sandstone, with interbedded siltstone and mudstone. The Saugus Formation exposed in Chiquito Canyon and at Landmark Village typically consists of interbedded light yellowish-gray sandstone and pebbly sandstone, greenish-gray to light-brown siltstone and sandy siltstone, and brown to reddish-brown mudstone. (Seward, 2007.)

The transitional brackish-water Sunshine Ranch member of the Saugus Formation was not mapped on Specific Plan site. Thin stratigraphic sections of gray to greenish-gray, fine-grained deposits typical of

[2] The "Saddle lineament" refers to a topographic feature associated with two aligned, topographic saddles located on the northeastern portion of Mission Village within the Specific Plan site. This lineament was defined during fault investigations by Seward and the term “saddle lineament” was retained to designate a mapped fault zone associated with the observed lineament (see **Figure 4.13-1** for the location of this area).

the Sunshine Ranch member were locally observed at the base of the Saugus Formation in upper Chiquito Canyon and at Long Canyon. However, this unit was not extensive enough to accurately define at the current, small-map scale. (Seward, 2007.)

4.13.4.3.2 Pleistocene Terrace Deposits

A portion of Project area west of the Six Flags Magic Mountain Amusement Park and southwest of Airport Mesa (the East Mesas area) has been alternately mapped as either Pacoima Formation or terrace deposits. Geologic investigations by Seward to the east of the Project area suggest that the terrace deposits are locally present above the Saugus Formation and below the uplifted Quaternary terrace deposits. These deposits generally consist of moderately- to well-consolidated sandstone and conglomerate with interbedded layers of siltstone and silty sandstone.

The terrace deposits are similar to the Saugus Formation relative to engineering characteristics, except that it generally is not as well bedded and contains fewer fine-grained deposits and very little mudstone. Where these fine-grained units are exposed, they may be potentially expansive.

Quaternary Terrace Deposits. Deposits of relatively flat-lying older alluvium that are significantly elevated above the active stream channel areas are designated as Quaternary terrace deposits. At least two different levels of terrace deposits are present on the Project area. The most prominent terraces (including Potrero Mesa, Grapevine Mesa and Airport Mesa) occur along the southern margin of the Santa Clara River and between the San Martinez Grande and the Chiquito Canyons, north of the River. An extensive area of probable terrace deposit is present south of the Six Flags Magic Mountain Amusement Park, on the south-eastern portion of the Entrada planning area. The terrace deposits consist of silty to pebbly sand and pebble to cobble conglomerate, which is generally firm and poorly bedded. A substantial soil zone has developed over the older terrace surfaces.

Terrace deposits underlying Grapevine Mesa, adjacent satellite mesas to the west, Exxon Mesa, Airport Mesa, and Fire Training Mesa, are at a similar elevation above the Santa Clara River and likely represent the eroded remnants of a formerly extensive river floodplain. At least one older (higher) terrace deposit and several remnants of lower (younger) undifferentiated terrace deposits have been mapped on the subject portions of Newhall Ranch. Most of these sediments were deposited in a fluvial environment, although deposits on the marginal portions to the south of the Airport Mesa and Grapevine Mesa are probably alluvial fan deposits.

The large mesa surfaces are typically 180 to 200 feet above the active Santa Clara River channel or adjacent tributary channels and the deposits range from 40 to over 100 feet in thickness. This unit typically consists of a basal five- to 10-ft thick, cobble- to boulder-rich, gravelly sand, with local clast-supported beds that are friable and light gray to yellowish gray in color. Interbedded yellowish-gray to light yellowish-brown sand and silt with local clay overlies the basal unit. This material is generally dense below a depth of 10 to 20 feet. A five- to 10-ft thick cap of sandy silt and clay soil is usually present on the terrace surfaces. Vegetation on the larger mesa surfaces has generally been disturbed by agricultural or oil production activities. Vegetation on the margins of the mesas varies from mixed chaparral and annual grasses to dense chaparral.

An older terrace deposit was encountered on Potrero Ridge and locally to the east, roughly 320 to 350 feet above the Santa Clara River. Two small remnants of old terrace deposits of uncertain affinity were also encountered near the northern margin of the Homestead West portion of the project.

Several remnants of younger terrace deposits are also present on the subject portions of the Specific Plan site. A significant deposit has been mapped at Homestead West, and on the adjacent WRP site to the south, a portion of which is exposed in cut slopes associated with SR-126. This deposit appears to be derived primarily from the adjacent, fine-grained Pico Formation bedrock and consists of silt and clay with local sand interbeds. A second area of younger terrace deposits occurs along the margin of Lion Canyon, on the eastern boundary of Mesas West. Younger terrace deposits were also mapped on the margin of Airport Mesa and in Dead End Canyon.

4.13.4.3.2 Surficial Deposits

Surficial deposits (*i.e.*, relatively thin deposits of earth material or weathering features that mantle the bedrock) found within the Project area include quaternary alluvium, slopewash, soil, and artificial fill. Each of these deposits is described below.

Quaternary Alluvium. Quaternary alluvium includes the active alluvium and floodplain deposits in the Santa Clara River and its tributaries, as well as older uplifted and dissected alluvium on the margins of the Santa Clara River and tributary canyons. The alluvium in the Santa Clara River area consists of moderately-consolidated to unconsolidated silt, sand, and gravel deposits. The alluvium present in the tributary canyons consists of poorly- to moderately-consolidated silt and silty pebbly sand, depending on the types of source rock present in the canyon.

At Homestead Central, the older alluvium consists of interbedded silty clay, silty sand, poorly graded sand, clayey sand, and lean clay. At Homestead West, the older alluvium consists dominantly of lean clay and silty clay, with uncommon sandy interbeds. These fine-grained deposits are likely derived from the fine-grained Pico Formation bedrock exposed in the tributary canyons to the north. The older alluvium at the WRP site is dominantly fine-grained at shallow depths and coarse near the base. The older alluvium mapped in the Onion Field area consists dominantly of silty sand and poorly graded sand with interbeds of gravel, silty clay, and clayey sand. The adjacent younger alluvial deposits are almost entirely coarse-grained. Older alluvium in Long Canyon consists primarily of silty sand and poorly graded sand with uncommon silt and silty clay interbeds. Older alluvium underlies the eastern portion of Landmark Village and consists of sand and silty sand with local interbeds of sandy silt and lean clay. Older alluvium is also present in the tributary canyons on Mission Village, but was not differentiated from the younger alluvium. In general, the older alluvium is incised up to 40 feet in the tributary canyon areas.

Slopewash. Slopewash is a non-bedded, heterogeneous accumulation of soil and weathered bedrock deposited by gravity, which is found on nearly all of the slopes on site. The thickest accumulations occur at the toes of slopes and at the heads of tributary canyons, and consist of silty sand with scattered pebbles and clasts of sandstone and siltstone, depending on the source rock. The maximum thickness of slopewash encountered in previous excavations on the Project area was more than 6.5 feet. Slopewash

commonly contains significant void space and is subject to hydroconsolidation. It is generally unsuitable for support of structures or certified, compacted fills.

Soil. Soil has developed as a mantle on flats up to moderate slopes and consists of silty sand to sandy mud with scattered pebbles and cobbles. The maximum thickness of soil encountered in previous excavations in the Project area was 5.5 feet.

Artificial Fill. Artificial fill was placed on the site primarily during construction of pads and roads for oil exploration and production operations. Additionally, minor fill was used for agricultural purposes, gas line easements, roads which traverse the area, and various tanks and small structures. Artificial fill is generally unsuitable for the support of structures or certified, compacted fill.

4.13.4.4 Geologic Structure

The plate movement that generated the north-south compression described above produced a series of west- to northwest-trending folds within the Project area. These folds range in size from regional to very small. Only the relatively large folds are described below for this analysis.

The Santa Clara Syncline (a concave fold in the earth's surface, the central part of which contains the youngest section of rock) is characterized by relatively moderate (25 percent) to steep (70 percent), generally north-dipping beds of the Pico Formation as well as numerous types of alluvium. The Newhall-Potrero Anticline (a convex fold in the earth's surface, the central part of which contains the oldest section of rock) is expressed in the subsurface all the way across the Project area; however, its surface expression ends in the central portion of the Project area where the Newhall-Potrero Anticline and Santa Clara Syncline terminate against each other. The axis of the Newhall-Potrero Anticline plunges to the northwest, while the Del Valle Anticline plunges to the southeast. At the eastern end of the Project area are the Airport Mesa Anticline and the Bluffs Anticline, where both are plunging to the southeast. On the northern side of the Santa Clara River, the southeast-plunging Grapevine Mesa Syncline, the Del Valle Anticline, and the Middle Canyon Syncline traverse Chiquito Canyon. The southeast-plunging Homestead Anticline traverses the northeastern portion of the Project area and is truncated by the Del Valle fault. This anticline may be the offset continuation of the Newhall-Potrero Anticline. (Seward, 1994.)

It has recently been shown that faulting occurs along the Middle Canyon Syncline and Airport Mesa Anticline. These, along with the regional and local faults, are discussed below. (Seward, 2004a.)

4.13.4.5 Seismicity

Southern California is seismically active and commonly experiences strong ground motion resulting from earthquakes. Major faults in the vicinity of the Project area include the San Andreas, Holser, Santa Susana, Northridge (East Oak Ridge), San Gabriel, and Sierra Madre (San Fernando) faults. The January 17, 1994 Northridge (magnitude 6.6) earthquake occurred on a south-dipping fault that uplifted the Santa Susana Mountains at least 40 to 70 cm. Major faults in the Project region are depicted on **Figure 4.13-4**, Fault and Earthquake Epicenter Location Map. **Table 4.13-3** summarizes the fault characteristics relative to the Project area.

EXPLANATION

APPROXIMATE LOCATION OF MAJOR KNOWN FAULTS

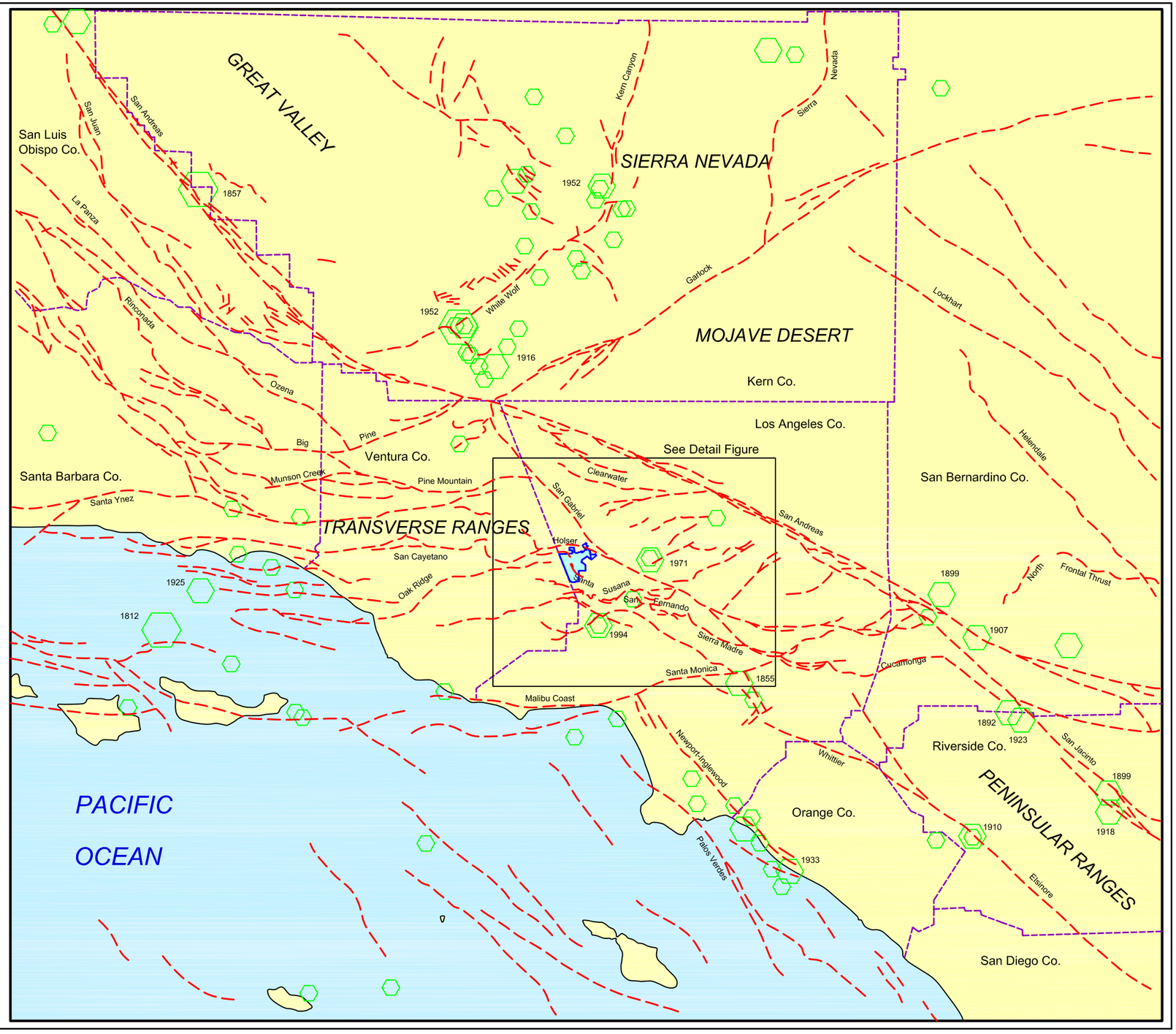
San Andreas

EARTHQUAKE EPICENTERS

Location	Magnitude
	5.0 - 5.9
	6.0 - 6.9
	7.0 - 7.9

APPROXIMATE LOCATION OF SUBJECT SITE

Compiled and modified from: Jennings (1994), Real et al. (1978), Yerkes (1985), Ziony and Jones (1989), and Shakal et al. (1994)



SOURCE: Allan E. Seward Eng. Geo., Inc. - April 2008

FIGURE 4.13-4

Fault and Earthquake Epicenter Location Map

Table 4.13-3
Significant Regional Faults

Fault	Maximum Moment Magnitude	Approximate Distance: Project Area to Projected Surface from Fault Plane (Miles)
Holser	6.5	0
Northridge (E. Oak Ridge)	6.9	0.6
Oak Ridge (Onshore)	6.9	3.1
San Gabriel	7.0	5.7
San Cayetano	6.8	7.4
Santa Susana	6.6	0.0
Sierra Madre-San Fernando	6.7	13.6
San Andreas	7.8	33.0

Notes:

Considering the size of the Project area, precise distances to faults cannot be defined unless a specific area is referenced.

Source for Maximum Moment Magnitude: Seward, 2006 (Seward, 2005b, Mission Village Report, 2000).

4.13.4.5.1 On-Site Faults

The Project area is cut by segments of the potentially active Del Valle and Salt Creek faults. The northeastern corner of the Project area is also traversed by Holser structural zone. (Seward, 1994; 2004a.) A strand of the Holser fault traverses the Airport Mesa area on Mission Village. (Seward, 2007.) The locations of the on-site fault zones are depicted on **Figures 4.13-1** through **4.13-4**. No faults were observed on the Landmark Village or WRP portion of the Specific Plan site.

Del Valle Fault Zone. The Del Valle fault is an north-west trending, south-west dipping reverse fault on the Specific Plan site, which crops out on the northern side of the Santa Clara River. There is no direct evidence of Holocene (past 11,000 years) activity on the Del Valle fault. However, evidence for late Quaternary (*i.e.*, during the last 100,000 years) was observed on VTT 060678. (Seward, 2005b.) The Los Angeles County's Safety Element has designated the fault as potentially active. A building setback was designated for this fault in the initial Specific Plan (Seward, 1994) and the setback zone was refined based on additional studies for VTT 060678 (Seward, 2005b).

Holser Fault. Within the Project area, one strand of the Holser fault is mapped within the VCC planning area. The Holser Fault may have a recurrence interval slightly longer than Holocene time. There is the potential for sympathetic movement associated with seismic events on other faults. One period of deformation (probably caused by compression and displacement of a saturated sandy zone directly at the fault) was recorded in the Holocene stratigraphic record over the Holser Fault

Holser Structural Zone. Several tectonic features identified in the vicinity of the Holser fault on published geologic maps were previously designated as part of the "Holser Structural Zone." These

features were investigated by Seward where they potentially impact proposed development on the Mission Village portion of the Specific Plan site. Faulting that offsets late Quaternary Terrace Deposits was documented along two lineaments (designated as the Saddle lineament and the Airport Mesa lineament) and along the trace of a mapped anticline.

The presence of a well-defined lineament, a well-preserved scarp (*i.e.*, a linear slope or cliff produced by faulting or erosion), and evidence of tilted and offset colluvial deposits, suggests possible recent activity along the Airport Mesa lineament. Therefore, although distinct evidence of Holocene activity was not documented along this feature, it is considered to be an active fault for purposes of developing appropriate mitigation measures. Similarly, there is evidence to suggest that the Saddle lineament may also have experienced recent (Holocene) movement and that minor normal faulting zone exists above the crest of the Airport Mesa Anticline as a result of deformation from compression within the anticline. (Seward, 2004a.)

Salt Creek Fault Zone. The north-northwest trending, steeply dipping Salt Creek fault traverses the western section of the Project area. North of Salt Canyon, the fault splays into two branches. No direct evidence of Holocene activity is known for the Salt Creek fault, and no tectonic geomorphic features are recognized as related to the fault. The Alquist-Priolo Special Studies Zones Map and the Safety Element of the Los Angeles County General Plan do not evaluate the Salt Creek fault; however, based on its possible association with the potentially active Del Valle fault or the active Santa Susana fault, a building setback for both splays of this fault and a tentative setback for a possible connection with the Del Valle fault to the north were designated in the initial Specific Plan by AESGI (1994). Subsequent investigations by Seward (in-progress work) have determined that the Salt Creek fault is not active per Alquist-Priolo criteria and that the possible connector fault does not exist. The original building setbacks for standard development along both branches of the fault and for the inferred connector fault will be eliminated.

Oak Ridge Fault. The mapped surface trace of the northern branch of the Oak Ridge fault ends approximately 0.6 mile west of the Specific Plan site in the Santa Clara River Valley. No surface expression of this fault segment is known to exist within the Project area and it may end before it reaches the surface, if it exists at all. The entire Oak Ridge fault is not classified as active under the Alquist-Priolo Act. However, the Fault Activity Map of California shows a small segment of Holocene activity on the Oak Ridge fault approximately 13 miles west of the Specific Plan area.

Ground Cracking in Potrero Canyon. Ground cracking was observed along the margins of Potrero Canyon following the 1994 Northridge earthquake. Initially, there was a concern that some of the cracking might represent surface ground rupture directly related to the causative fault. As discussed by the Project geologist at the initial EIR stages for the Specific Plan (Seward, 1994), studies completed up to that time indicated that the ground cracks were all the result of secondary distress (liquefaction, lateral spreading, seismic settlement) and differential materials response along the bedrock/alluvium contact. Additional studies were in progress to confirm these findings at the time of the 1994 report. Subsequent publications by the U.S. Geological Survey (USGS) (Rymer *et al.*, 1995; USGS & SCEC, 1994), the California Geologic Survey (Hart *et al.*, 1995), and others (Holzer *et al.*, 1996; Gomberg, 1997; Stewart *et al.*, 1996; Wald and Heaton, 1994; Hauksson *et al.*, 1995; Davis and Namson, 1994; Hudnut *et al.*, 1996;

Mori *et al.*, 1995; Tsutsumi and Yeats, 1999; Yeats and Huftile, 1995; Huftile and Yeats, 1996) concluded: (1) that there was no distinct evidence for ground rupture at Potrero Canyon (or elsewhere); (2) that the Northridge earthquake occurred along a "blind" thrust fault; and (3) that the cracking observed in Potrero Canyon was consistent with secondary ground failure mechanisms (as listed above). However, one article published four years later (Catchings, 1998) suggested that some of the ground cracking was related to shallow faulting based on a seismic reflection survey conducted across Potrero Canyon by the USGS. However, a detailed review of this article by the Project geologist (Seward; Swanson *et al.*, 2002) revealed fatal flaws in the seismic profile used by Catchings *et al.* (1998) as a basis for interpreting the presence of faults in Potrero Canyon. Based on the results of numerous geologic studies completed following the Northridge earthquake and the flawed seismic profile used by Catchings to interpret faulting, no surface fault rupture related to the Northridge earthquake is interpreted in Potrero Canyon at this time.

4.13.4.6 Geologic Hazards

The geologic hazards with the potential to affect proposed RMDP and SCP areas are described below.

4.13.4.6.1 Ground Rupture

A fault trace is a fracture in the earth's crust along which movement has occurred either suddenly during an earthquake or slowly resulting from a process known as "creep." Damage associated with fault-related ground rupture is normally confined to a fairly narrow band on either side of the fault trace. Structures are generally not able to withstand fault rupture and utilities that cross faults are at risk for damage if movement occurs along the fault.

Faults that have experienced movement during historical (the last 200 years) times or during the Holocene geologic epoch (the last approximately 11,000 years), are generally thought to present the greatest risk of future movement and, therefore, have the greatest potential to result in potential fault rupture hazards. Faults that are considered to be potentially active (the last fault movement was between 11,000 and 1.6 million years ago), or inactive (no evidence of fault movement during the past 1.6 million years), are generally considered to present a reduced ground rupture risk.

All of the faults noted in **Subsection 4.13.4.5.1** classify as potentially active per Alquist-Priolo criteria. The Del Valle fault and the faults of the Holser Structural Zone all offset late Quaternary deposits and Holocene activity has not been precluded. However, recent studies have demonstrated that the Salt Creek fault has not generated surface rupture in Holocene times. Therefore, this fault is not considered active per the Alquist-Priolo criteria. The locations of the faults in the Project area are depicted on **Figures 4.13-4**.

4.13.4.6.2 Ground Motion/Shaking

Ground motion is generated during an earthquake as two blocks of the earth's crust move relative to each other. In general, ground motion is greatest near the epicenter (the point on the ground surface directly above the focus of the earthquake), and decreases as the distance from the epicenter increases. Each

ground motion measurement is taken at a specific location and is influenced by a number of factors, including:

- Depth of the earthquake (earthquake focus);
- Proximity to fault rupture;
- Type of fault movement;
- Duration of ground motion;
- Local geologic and soil conditions;
- Topography; and
- Direction of shock wave propagation.

All of these variables make it difficult to accurately predict potential ground motions at a given location in the geologically and topographically complex region of Southern California.

There are a number of ways in which the strength of an earthquake and the measurement of ground motion associated with a seismic event can be expressed. Peak ground acceleration values are reported in units of gravity (g), as recorded from seismic stations. Peak ground acceleration values describe how hard the earth shakes in a given geographic area, where a larger number corresponds to more intense ground shaking. The Newhall Ranch Specific Plan Program EIR indicated the highest predicted peak acceleration on the Specific Plan site as 0.70g associated with movement along the San Cayetano fault, which is located west of the Project area. A more recent evaluation of ground shaking potential within the Project area has been prepared based on a probabilistic seismic hazard assessment associated with movement along the Santa Susana fault. That evaluation found that there is a 10 percent probability that a peak ground acceleration between 0.88g and 0.98g, for the alluvial portions of the Project area, would be exceeded in 50 years. (Seward, 2005a and 2007.) Unconsolidated alluvium deposits have the potential to amplify the effects of ground shaking.

The 1994 Northridge earthquake produced large ground acceleration values in the Santa Clarita Valley. Significant ground surface distress features, including shattered ridge effects, ground cracks and fissures, rock falls, activation and reactivation of landslides, and liquefaction were identified within the Project area. Subsequent investigation of these features determined they were generally attributed to strong ground motion generated by the earthquake. Ground cracks and fissures were common along the margins of Potrero Canyon. Most of the cracks found displayed normal offset, down dropped toward the center of the canyon, and are interpreted to be the result of dynamic compaction and lateral spreading of the canyon alluvium. Based on the degree of ground surface distress that occurred in the vicinity of Potrero Canyon, it is probable that the Project area experienced peak ground accelerations of 0.6g or greater during the Northridge earthquake. The duration of strong ground motion in the Santa Clarita Valley varied from 10 to 15 seconds. (Seward, 1994.)

4.13.4.6.3 Slope Failure/Landslides

Landslides result when driving forces acting on a slope (*e.g.*, the weight of the slope material, the weight of objects placed on it) are greater than the slope's natural resisting forces (the shear strength of the slope material). The down-slope movement of earth material, either as a landslide, debris flow, mudslide, or rockfall, is part of the continuous natural process of erosion. Slope instability may result from natural processes, such as the erosion of the toe of a slope by a stream, ground shaking caused by an earthquake, and/or the addition of water from rainstorms. Slopes also can be destabilized by human activities such as inappropriate grading, addition of water, and/or addition of structures.

Areas susceptible to landslides are typically characterized by steep, unstable slopes with a history of previous slope failure. Numerous landslides, ranging from shallow surficial failures to large landslides are present in the Project area. The larger landslides are depicted on **Figures 4.13-1** through **4.13-3**. Many of the larger identified landslides are on the south side of Salt Creek Canyon, which is designated as open space. There are numerous existing landslides located on the eastern, southern, and northwest portions of the Project area. A total of 112 landslides were mapped on the Homestead portion of the Specific Plan site, including 20 at the proposed Chiquito Business Park, 20 at the Chiquito Estate lots, 20 at Homestead Central, 17 at Homestead West, nine at Potrero Ridge, 15 at Long Canyon, and 11 at Mesa West. An additional 52 landslides were mapped on the Mission Village portion of the Specific Plan site. No landslides were found at the Landmark Village, WRP, or Onion Field areas of the Specific Plan site.

4.13.4.6.4 Liquefaction

Liquefaction is the process in which water-saturated, usually loose to moderately dense, fine- to medium-grained sands temporarily lose coherence due to strong ground motion, and behave as a viscous fluid. The loose sand grains then rearrange into an orientation that transfers the overburden pressure from grain-to-grain contacts to the viscous fluid. Because liquids cannot support shear stresses, the sediment/water mixture loses cohesion, resulting in damage to foundations and other structures. As the sand grains begin to settle out, the water is forced to the surface. When a buried sand zone is liquefied, the overburden pressure forces the excess water to the surface, commonly causing sand boils and sand volcanoes.

Nearly all of the Santa Clara River bed is mapped as a liquefaction hazard by the CGS Seismic Hazard Mapping Program (Val Verde and Newhall quadrangles). The Newhall Ranch Specific Plan Program EIR reported that sands associated with the Santa Clara River and adjacent sandy areas are generally dense and have a low potential for liquefaction, even assuming a conservative value for the bedrock acceleration of 0.6g. However, shallow liquefaction features occurred on the Project area during the Northridge earthquake, primarily in recent, shallow sand deposits in and around the Santa Clara River area. These relatively small sand boils were the result of shallow liquefaction. Further liquefaction features, such as sand boils and blows, were also observed in Potrero Canyon following the Northridge earthquake. Following the earthquake, the potential for future liquefaction along the Santa Clara River and at Potrero Canyon was evaluated by RTF&A (1994) for the original Specific Plan EIR (1996).

4.13.4.6.5 Lateral Spreading, Dynamic Compaction, and Differential Materials Response

Lateral spreading is a type of liquefaction where sediments/materials spread laterally down slope due to temporary loss of shear strength. Lateral spreading may occur on slopes as shallow as one to two degrees and was observed to have occurred in the soft sediments of Potrero Canyon within the Specific Plan site. Minor lateral spreading of the artificial fill placed on slopes, as a result of dynamic compaction, was observed on site after the Northridge earthquake.

Dynamic compaction refers to seismically induced settlement and permanent movement of poorly consolidated materials. Strong ground motion causes particles to reorganize into a more compact arrangement, which decreases void space and causes settlement at the ground surface. Where the consolidation or thickness of the material varies, differential settlement will occur. The manifestation of dynamic compaction may also be related to the ability of certain fine-grained soils to deform excessively under low stresses.

Differential materials response refers to the different responses various materials display when subjected to seismic waves. Materials with different density characteristics transmit seismic energy at different wavelengths. Where materials with different densities are in contact, differential response to the seismic energy may cause distress features along the contact. Differential materials response was observed along bedrock/fill and bedrock/alluvium contacts after the Northridge earthquake. The combination of dynamic compaction, differential settlement, and differential materials response is a potential hazard along cut/fill and bedrock/alluvium contacts. (Seward, 2005.)

4.13.4.6.6 Sympathetic Movement

Strong ground motion may cause sympathetic movement (*i.e.*, secondary movement not directly related or connected to the causative earthquake fault) along weak planes (*e.g.*, clay beds, fractures, or non-causative faults). Movement also may be related to flexual slip during folding of beds. Evidence of sympathetic slip along bedding planes of the Pico Formation was noted by the USGS during its investigation of Potrero Canyon after the Northridge earthquake. Other evidence of sympathetic movement has been found east of the Project area in the Santa Clarita Valley. The specific location and amount of potential slippage along weak planes has not been identified. (Seward, 1994.) Zones of restricted development are recommended between the Airport Mesa and Saddle lineaments, in the area between the Airport Mesa Anticline and the Airport Mesa lineament/fault, and for 100 feet beyond the recommended building setbacks.

4.13.4.6.7 Shattered Ridge Effects

Shattered ridge (ground lurching) features consist of fractures, fissures, and minor slumps that are concentrated on relatively narrow ridgelines. The features are most prominent on ridges tangent to the seismic wave movement. Current theory suggests that amplification of ground motion at ridge tops is frequency dependent and is most prominent for seismic waves with wave lengths approximately the same width as the ridge or mountain. Complex amplification and re-amplification of waves can occur, potentially leading to differential motion at the top of the ridge, which produces cracks and fissures at the crest.

The Northridge earthquake produced shattered ridge features on most of the steeper ridgelines within the Project area. These features were concentrated on east-west-trending ridgelines. The specific location and extent of shattered ridge effects, which may be produced in the Project area during future earthquakes, have not been identified. (Seward, 1994.) Although shattered ridge features have been associated with narrow ridgeline geomorphic conditions, there is no standard method that has been developed at this time to determine what slope height, geometry, and orientation will be subject to shattering during a given potential earthquake. Impacts to the proposed development are generally considered negligible because proposed grading to produce flat pads eliminates the narrow ridgeline conditions that are necessary to produce the effect. Minimal setback recommendations for tanks or structures proposed on steep ridgelines were provided by Seward (1994) for the Newhall Ranch Specific Plan Program EIR.

4.13.4.6.8 Expansive Soils

Expansive soils or soils with a high shrink-swell potential contain a high clay content that expands when wet and contracts when dried. Wetting of the soil may occur due to the absorption of moisture from the air, rainfall, groundwater fluctuations, and/or landscape watering, among other factors. Limited Expansion Index testing was performed on representative samples of bedrock and surficial soil materials. The expansion potential of some of the fine-grained deposits derived from the Pico Formation at Homestead West and WRP portions of the Specific Plan site classifies as high. Expansion potential of the fine-grained portions of the Pico and Saugus Formation generally classifies as medium to high. When structures are placed on expansive soils, foundations may move as the soils expand and contract. Expansive soil conditions can usually be mitigated by proper foundation preparation and design.

4.13.4.6.9 Corrosivity of Soils

Corrosivity of site soils to buried metals is generally moderately to severely corrosive. Corrosivity of site soils to concrete ranges from non-corrosive (negligible) to severely corrosive. Corrosivity to concrete of fine-grained soils associated with the Pico Formation bedrock and associated secondary deposits is generally classified as severely corrosive.[3]

4.13.4.6.10 Rippability

The alluvial and terrace at the Project area are generally uncemented and can be graded using standard equipment. Bedrock of the Saugus Formation can generally be graded with standard, heavy equipment (D-8R and larger dozers). Blasting may be needed in the deeper, indurated portions of the Pico Formation. This will most likely affect the Homestead West and Potrero Ridge portions of the Specific Plan site, including the WRP.

[3] The corrosive nature of some of the soils on the Specific Plan and Entrada sites are natural, existing conditions. Potential significant impacts to metal pipes are typically mitigated by protecting them from contact with the soils by the use of various coatings. Potential adverse impacts to concrete are typically mitigated by using an appropriate cement type that is resistant to corrosion. Detailed review and appropriate mitigation options are provided on a site-specific basis at the grading plan stage and the corrosivity of the soils is confirmed at pad grade prior to construction of concrete foundations or installation of metal pipes.

4.13.4.7 Mineral Resources

Both oil and aggregate mineral resources have been identified within the Project area and are briefly described below.

The Specific Plan area, in particular, historically has been used for the production of oil and natural gas. Numerous facilities related to this industry occur across the Specific Plan site. These include a natural gas processing plant that is being decommissioned, as well as oil wells, gathering lines, and other above-ground pipelines. There are still active oil wells in the Project area being operated by lessees to the applicant, which holds the mineral rights on all of its land holdings. These operations will be concluded as the area is developed consistent with the Specific Plan. A brief overview of the history of the oil and gas industry within the Specific Plan area is presented in **Section 4.17**, Hazards, Hazardous Materials, and Public Safety, of this EIS/EIR.

4.13.4.7.1 Oil and Gas Production

Oil wells also have been identified on the Entrada, Homestead, Landmark Village (formerly River Village), and Mission Village portions of the Project area. During past and/or current operations, oil wells and their associated pipelines, cellars, and catch basins have potentially contaminated local soils. The analysis of such soils is presented in **Section 4.17**, Hazards, Hazardous Materials, and Public Safety, of this EIS/EIR.

4.13.4.7.2 Aggregate Mineral Resources

In 1994, the Division of Mines and Geology evaluated the aggregate resources of the Newhall-Saugus area. The Santa Clara River is designated MRZ-2, which is an area where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence. (DMG, 1994.) There is no indication that formal extraction of aggregate materials has been conducted along the Santa Clara River through the Project area.

4.13.4.8 Existing Conditions within the VCC Site

The geotechnical information presented for the VCC site is based on the data from the geotechnical analysis found in the EIR certified by Los Angeles County for the VCC project (SCH No. 1987123005). A brief summary of the information presented in the VCC EIR is provided below.

The VCC site is located at the eastern end of the Ventura basin within the Transverse Ranges geomorphic province of California. The Ventura basin consists of a narrow, elongate sedimentary trough that generally coincides with the Santa Clara River Valley. The Ventura basin has been an area of subsidence and sediment accumulation since the beginning of the Tertiary period, with the present trough-like form developing near the beginning of the Miocene epoch (Winterer and Durham, 1962). The Hasley Canyon area, including the VCC site, has been deformed over the geologic past to produce a series of northwesterly trending anticlines and synclines. The VCC site is underlain by sedimentary bedrock of the Saugus Formation. This bedrock consists of sandstones, siltstones, and conglomerates. Overlying the bedrock are terrace deposits, alluvium, slopewash, and artificial fill. Terrace deposits, which consist of

slightly consolidated sandstones, siltstones, and conglomerates, form many of the flat-topped ridges. Alluvium consisting of silty sands, sands and gravels is located in canyon bottoms, Castaic Creek, and the alluvial flat east of Castaic Creek. Reddish-brown clayey siltstone lenses in the Saugus formation are potentially expansive. Alluvial soils are non-expansive and poorly to moderately consolidated to depths of 6-10 feet.

Portions of the site within the floodplains of Castaic Creek and Santa Clara River are designated by the Division of Mines and Geology as MRZ-2. Quarrying of this material (sand and gravel) in the past created erosion problems. As a result, the County's Road Department, Flood Control District, and Caltrans cited the area utilized as an aggregate mining resource for erosion dangers. Pursuit of these resources as a marketable product ended approximately 40 years ago.

The folded nature of the bedding planes on the VCC site has led to landslides, particularly where past stream erosion daylighted bedding planes. Landslides are known to occur on the greater VCC site. (See EIS/EIR, **Appendix 4.13** [VCC EIR, Geotechnical Information, Figure III-1A].)

One branch of the Holser Fault traverses the central portion of the site. The Holser Fault is classified as potentially active. Subsurface exploration on the Holser Fault conducted in association with the VCC EIR noted no offset of Holocene sediments. The site is subject to shaking and associated ground motions from earthquakes on nearby and distant faults, which is characteristic of all southern California.

4.13.4.9 Existing Conditions within the Entrada Site

The geotechnical information presented in this subsection for the Entrada planning area is based on a study entitled, *Report of 100-Scale Plan Review, Vesting Tentative Tract Map No. 53295*, Valencia, California, prepared by R.T. Frankian & Associates, dated March 18, 2005 (Frankian 2005). This study addressed the portion of the Entrada site analyzed in this EIS/EIR (located within Planning Areas 3 through 14 as described in the Frankian 2005 study) as well as a larger area including land located outside of the Project area. The Frankian 2005 study is found in **Appendix 4.13** of this EIS/EIR. A brief summary of the information presented in the Frankian 2005 study is provided below.

The Entrada site is located at the eastern end of the Ventura basin within the Transverse Ranges geomorphic province of California. The Ventura basin consists of a narrow, elongate sedimentary trough that generally coincides with the Santa Clara River Valley. The Ventura basin has been an area of subsidence and sediment accumulation since the beginning of the Tertiary period, with the present trough-like form developing near the beginning of the Miocene epoch (Winterer and Durham, 1962).

The south half of the site (the portion of the Entrada project area addressed in this EIS/EIR; Planning Areas 3 through 14) consists of two major north-draining canyons that divide mountainous areas of low relief. The middle of the site consists of an undissected, north-sloping, alluvial fan surface. The north half of the site consists of the Santa Clara River Valley and bordering fluvial terraces. Planning Areas 4 through 14 are crossed by dirt roads placed for oilrig access. Access road construction involved cuts up to 45 feet tall and placement of relatively large masses of undocumented fill. Maximum fill depth is estimated to be around 25 feet. The access roads lead to drill pads of various size and configuration. The

pads are generally flat and level and often consist of areas of cut and areas of fill. Buried sumps for the collection of wastewater or drilling spoils may be present, though not currently visible, at each drill pad.

Geologic materials observed within the greater Entrada site include the Saugus Formation, terrace deposits, alluvium, and engineered and non-engineered fill, slopewash and residual soil. The areal extent of the various geologic units are depicted on the geotechnical maps in the Frankian 2005 study (**Appendix 4.13**). Interpreted subsurface conditions are shown in the Frankian 2005 study on the Geotechnical Cross Sections (Figure 4). Surficial slope failures were mapped on the natural slopes in Planning Areas 4 through 14. These failures include weathered bedrock, terrace materials, and slopewash. They are limited in lateral extent and have a maximum thickness of 15 feet near the toe.

The active San Gabriel fault zone, located approximately 1.5 miles northeast of the Entrada site, and is described in **Subsection 4.13.4.5.1**, On-Site Faults, above. Also described is the Holser Fault, which consists of a south dipping, sharply folded reverse fault (Winterer and Durham, 1962) trending east-southeast from near Piru Creek to at least Castaic Junction, and possibly continuing farther southeastward. No other active faults have been identified on the Entrada site.

4.13.5 IMPACT SIGNIFICANCE CRITERIA

The significance criteria listed below are derived from Appendix G of the State CEQA Guidelines. The Corps has agreed to use the CEQA criteria presented below for purposes of this EIS/EIR, although significance conclusions are not expressly required under NEPA. The Corps also has applied additional federal requirements as appropriate in this EIS/EIR. For the purpose of this EIS/EIR, geologic hazard impacts would be significant if implementation of the proposed Project or the alternatives would:

1. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
    - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State geologist for the area, or based on other substantial evidence of a fault;
    - Strong seismic ground shaking;
    - Seismic-related ground failure, including liquefaction; or
    - Landslides.
2. Result in substantial soil erosion or the loss of topsoil.
3. Be located on a geologic unit or soil that is unstable, or would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.
4. Be located on expansive soils (defined in the Uniform Building Code Table 18-b, 1994), or corrosive soils creating substantial risks to life or property.
5. 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.

Criterion 5 regarding the presence of soils incapable of adequately supporting the use of septic tanks or alternative water disposal systems is not applicable to the proposed Project or the alternatives because the infrastructure improvements would not result in direct wastewater generation or disposal impacts. Additionally, subsequent development in the Project area that would be facilitated by the proposed Project, including VCC and portions of the Entrada planning area, would be served exclusively by public sewers. Given the above, Project implementation would not require the use of septic tanks or alternative wastewater disposal systems and no impact would occur, and no further discussion of this criterion is necessary or required.

For purposes of this analysis, the proposed Project and alternatives also would result in a significant mineral resource impact if it would:

6. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state; or
7. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use map.

4.13.6 IMPACTS OF THE PROPOSED PROJECT AND ALTERNATIVES

4.13.6.1 Impacts of Alternative 1 (No Action/No Project)

4.13.6.1.1 Direct Impacts

RMDP Direct Impacts. Under the No Action/No Project Alternative, none of the facilities proposed by the Project would be constructed. If the proposed RMDP infrastructure was not installed, portions of the area would continue to be subject to high erosion due to the steep slopes and gradients currently present across the Project area.

SCP Direct Impacts. Under the No Action/No Project Alternative, the proposed spineflower preserves would not be established and the existing spineflower preserves would remain in place. Therefore, there would be no changes to existing geologic conditions within the proposed SCP planning area and no geologic hazard impacts would occur.

4.13.6.1.2 Indirect Impacts

RMDP Indirect Impacts. Under the No Action/No Project Alternative, no RMDP infrastructure would be permitted and no indirect impacts associated with Specific Plan development facilitated by the RMDP would occur. Therefore, there would be no changes to existing geologic conditions on the Specific Plan area.

SCP Indirect Impacts. Under the No Action/No Project Alternative, no development on the Specific Plan site, the VCC planning area, or a portion of the Entrada planning area would be facilitated by the proposed SCP. Therefore, this alternative would not result in significant indirect geologic hazard impacts.

4.13.6.2 Impacts of Alternative 2 (Proposed Project)

Based on the significance criteria identified above, impacts would be significant if implementation of the proposed Project would expose people or structures to substantial adverse geologic effects. These could include the risk of loss, injury, or death involving rupture of a known earthquake fault. Known faults are those delineated on the most recent Alquist-Priolo Earthquake Zoning Map issued by the State geologist for the area, or based on other substantial evidence of a known fault and includes the Saddle lineament and Airport Mesa lineament. Ground shaking, landslide, erosion, and expansive and corrosive soils impacts would be significant if implementation of the proposed Project would expose people or structures to substantial adverse effects, including the risk of loss, injury, or death. In addition, impacts to mineral resources would be significant if implementation of the proposed Project would result in the loss of their availability. An evaluation of potential impacts related to geology and soils is provided below.

4.13.6.2.1 Direct Impacts

RMDP Direct Impacts. Under Alternative 2, the proposed Project includes the installation of buried bank stabilization along the Santa Clara River and other drainages located in the proposed Project area. Existing drainages would be converted to underground storm drains, 15 road crossings would be installed and three bridges would be constructed across the Santa Clara River at Potrero Canyon, Long Canyon, and Commerce Center Drive. Other proposed facilities would include the construction of the water quality control basins, roadway improvement to SR-126, WRP outfall construction, installation of building pads, and other infrastructure described in **Section 2.0**, Project Description, of this EIS/EIR.

Seismic-Related Ground Failure, Including Liquefaction. The effects of earthquake-related fault movement and ground shaking could include abrupt changes in the surface elevation, damage and possible destruction of structures, alteration of surface drainage patterns, changes in groundwater levels, misalignment of streets, and damage to utilities. Liquefaction is the process of loose soils becoming fluid during strong ground motion.

While the potential for damage to all types of structures may occur, structures that are linear, or that cross an extended expanse of the proposed Project area, have the greatest potential to cross a fault and to be affected by fault rupture and ground shaking. Significant ground rupture and shaking impacts to linear facilities proposed under the RMDP would have the potential to occur if the structures were located across or adjacent to an active fault. Proposed RMDP linear structures include:

- Bank protection along the Santa Clara River and its tributaries;
- Buried storm drains and partially lined drainage channels;
- The WRP outfall;
- Bridges; and
- Utility extensions that cross the Santa Clara River and its tributaries.

None of the proposed RMDP infrastructure is designed for human occupancy and, hence, are not subject to the requirements of the Alquist-Priolo Act. However, proposed RMDP infrastructure would potentially

sustain substantial damage from a surface rupture or significant ground shaking, resulting in adverse impacts to these facilities, and to nearby people. This is considered a potentially significant impact.

Within the Specific Plan project area, there are several locales where potentially active faults occur; although no faults designated as active per Alquist-Priolo criteria have been identified. These faults include the potentially active Del Valle and Salt Creek faults, which are located on the western one-half of the Project area, and faulting associated with the Holser Structural Zone, which are located in the northeast corner of the Project area currently known as Mission Village (*i.e.*, designated as the Saddle and Airport Mesa lineaments). Movement along these faults would have the potential to result in significant adverse impacts to RMDP infrastructure and people. These significant direct impacts would be reduced through the application of applicable mitigation measures previously adopted for the Specific Plan. The requirements of the Specific Plan mitigation measures are summarized in **Table 4.13-1** and are listed in **Subsection 4.13.7** of this EIS/EIR. These mitigation measures will reduce these significant geological impacts of the Specific Plan to a less-than-significant level because no structures for human occupancy would be permitted within a fault zone considered to be a potential ground rupture hazard pursuant to the State Alquist-Priolo Act. Bank protection, storm drains, drainage channels, and utility lines are not specifically excluded from fault zones pursuant to current codes. This infrastructure would be repaired if damaged by ground rupture or movement.

Structures including grade stabilization, drainage culverts, and water quality basins, are not linear structures that cross long expanses. However, they would be subject to fault rupture and/or ground shaking impacts that could be damaging if they were located near or astride a fault. This is considered a significant impact. As stated above, grade stabilization structures, drainage culverts, and water quality basins are not excluded from fault zones pursuant to current codes. Therefore, this infrastructure would be repaired if damaged. Geologic hazard impacts resulting from development on the Specific Plan site that is facilitated by proposed RMDP infrastructure would be reduced to a less-than-significant level under Significance Threshold 1 with implementation of previously adopted Specific Plan mitigation measures.

Other non-structural infrastructure, such as temporary haul roads and trails, could be repaired if damaged by strong ground shaking impacts; the use of temporary roads and trails that cross a fault would not result in significant safety impacts to the users of those facilities. Similarly, impacts resulting from maintenance and habitat restoration activities would be less-than-significant and would not result in significant fault rupture or ground shaking safety impacts.

Landslides. The effects of landslides may include abrupt changes in surface elevation, damage and possible destruction of structures, modification of surface drainage patterns, misalignment of streets and bridges, and damage to utilities. Structures located near steep or unstable slopes adjacent to, crossing over, or within a drainage area, have the greatest potential to be affected by landslides. Without mitigation, the proposed RMDP infrastructure would have the potential to sustain substantial damage from a landslide, resulting in impacts to infrastructure, drainages, or transportation routes. This is considered a significant impact. Mitigation measures recommended in the Newhall Ranch Specific Plan Program EIR (Seward, 1994) and subsequent Tentative Map reports (Seward, 2000, 2004, and 2005b), including removal, stabilization, and avoidance, would reduce the adverse geologic impacts to a less-than-

significant level in compliance with the Los Angeles County Department of Public Works codes and policies.

At least several hundred landslides have been mapped within the Specific Plan site. Numerous landslides were reactivated during the Northridge earthquake and during subsequent heavy winter rains. North of the River between the Project area's western boundary and Chiquito Canyon, extensive landslides have been mapped (**Figure 4.13-1**). These known landslide areas present a slope failure risk. This potential movement is considered a significant impact and would potentially result in damage to RMDP infrastructure, and people. These significant direct impacts would be reduced through the application of mitigation measures adopted for the Specific Plan because the landslides would be stabilized, removed, or avoided in compliance with Los Angeles County Department of Public Works codes and policies. The requirements of the Specific Plan mitigation measures are summarized in **Table 4.13-1** and presented in **Subsection 4.13.7** of this EIS/EIR. Therefore, landslide hazard impacts resulting from development on the Specific Plan site that is facilitated by proposed RMDP infrastructure improvements can be reduced to a less-than-significant level under Significance Threshold 1.

Soil Erosion/Loss of Top Soil. The effects of substantial soil erosion or loss of topsoil may include undermining of structures and slopes, alteration of surface drainage patterns, steepening of slopes, and loss of setback areas and safety zones. Steep slopes and steep creek gradients increase these effects. RMDP implementation would result in the alterations to existing drainage patterns and surface and sub-surface soils in the Specific Plan area, as described below.

The proposed RMDP infrastructure is designed to withstand or reduce future erosion that currently exists at the Specific Plan area. If the infrastructure is not installed, the area would continue to be subjected to high erosion due to the steep slopes and gradients currently present across the Project area. The proposed buried bank stabilization, ungrouted rip rap, grade control structures, and drainage facilities are designed specifically to control erosional effects by protecting banks from scour during a Capital Flood event, preventing long-term degradation of the channel, and transmitting storm flow through non-erodible structures. Therefore, the proposed infrastructure would result in less-than-significant impacts to soil erosion and no mitigation measures are proposed. Should a proposed RMDP structure fail, the movement of soil and debris would have the potential to cause substantial damage, with resulting significant impacts to infrastructure, drainages, or transportation routes. This movement would have the potential to result in damage to infrastructure, other improvements proposed by the RMDP, and harm to nearby people, resulting in a significant impact under Significance Threshold 2. The Specific Plan mitigation measures provided in **Subsection 4.13.7** would reduce potential long-term erosion-related impacts to a less-than-significant level. The proposed improvements would temporarily result in the loss of minor amounts of the topsoil during the installation and construction of the infrastructure. However, the infrastructure is mainly sub-subsurface and would not remove or result in the substantial loss of topsoil in the Specific Plan area. Compliance with existing regulatory requirements to implement erosion control Best Management Practices (see **Subsection 4.13.3**) would reduce impacts from the loss of topsoil to a less-than-significant level under Significance Threshold 2.

Unstable, Expansive and Corrosive Soils. The effects of unstable, expansive or corrosive soils would include land and structure subsidence, displacement or crushing of structures due to soil movement, loss

of foundation integrity, alteration of surface drainage patterns, steepening of slopes, and loss of setback and safety zones., resulting in substantial risks to life or property. These effects are increased by saturated soil conditions and even slight gradients. Structures that would be developed as part of the RMDP under Alternative 2 and potentially affected by expansive and/or corrosive soils include:

- Bank protection along the Santa Clara River and its tributaries;
- Buried storm drains and partially lined drainage channels;
- The WRP outfall;
- Bridges;
- Utility extensions that cross the Santa Clara River and its tributaries; and
- Nature trails.

Specific Plan Mitigation measures SP-4.1-6 and SP-4.1-7 and SP-5.0-2 include requirements for the removal of expansive/corrosive soils, if encountered during grading operations, and would reduce impacts to a less-than-significant level under Significance Thresholds 3 and 4.

Mineral Resources. Based on the significance thresholds identified above in **Subsection 4.13.5**, the impacts of Alternative 2 would be significant if implementation of the proposed Project would result in the loss of availability of a known mineral resource.

The Santa Clara River bed has been designated a MRZ-2 aggregate resource by the California Geologic Survey. Construction of the proposed RMDP components, including stabilization and drainage infrastructure, would not affect the ability to pursue mineral extraction activities along the Santa Clara River because these improvements are not in the riverbed where the resource is present. To the extent that some of the infrastructure involves construction in a tributary drainage (*e.g.*, drop structures), the footprint of that infrastructure would not be extensive, and would not preclude the extraction of minerals. Therefore, direct impacts are considered less-than-significant under Significance Thresholds 6 and 7.

SCP Direct Impacts. Under Alternative 2, the SCP would result in the establishment of spineflower preserves totaling approximately 167.6 acres. Other than installing protective fencing, the SCP would not involve any grading or earthwork.

Fault Rupture/Seismic Ground Shaking/Liquefaction. Implementing the SCP would not result in substantial physical changes to the existing environment and would not directly introduce structures or people to the SCP planning area. Therefore, the proposed SCP would not result in fault rupture, seismic ground shaking, or liquefaction impacts in the SCP planning area. No impact would occur under Significance Threshold 1.

Soil Erosion. Implementing the SCP would not result in substantial physical changes to the existing environment. Therefore, the SCP would not result in soil erosion impacts in the SCP planning area. No impact would occur under Significance Threshold 2.

Expansive Soils. Implementing the SCP would not result in substantial physical changes to the existing environment. Therefore, the proposed SCP would not result in expansive or corrosive soils impacts in the SCP planning area. No impact would occur under Significance Thresholds 3 and 4.

Mineral Resources. Under Alternative 2, the proposed SCP preserves would preclude any mineral extraction activities within their boundaries. This would affect the ability to access any minerals that may be available within the preserves. However, the Specific Plan zoning designation allows for the development of a mixed-use planned community, with sand and gravel extraction activities allowed during tract grading and construction phases on the sites to be developed; and, thus, other areas exist within the Project area as a whole for such activities on an interim basis. (Specific Plan, Table 3.4-2, p. 3-22.) Additionally, extraction activities are permitted in the Visitor Serving and Open Area land use designations under a Conditional Use Permit. Furthermore, the majority of mineral resources of value are expected to be located in the River Corridor and High Country; however, Los Angeles County already has determined that sand and gravel extraction/removal activities are not to be permitted uses in those portions of the Specific Plan site. (Specific Plan, Table 3.4-2, p. 3-20.) Therefore, the continued availability of these resources has been precluded by Los Angeles County within the Specific Plan site since May 2003 (the date the County approved the Specific Plan). Accordingly, implementation of the proposed SCP preserves would not result in a significant impact relative to the loss of availability of a known mineral resource or a locally important mineral resource recovery site because Los Angeles County already has made the local policy-level decision to preclude sand and gravel extraction/removal activities from the two primary areas within the Specific Plan site. Based on the above analysis, the proposed SCP preserves would not result in a significant impact under Significance Thresholds 6 and 7.

4.13.6.2.2 Indirect Impacts

RMDP Indirect Impacts. Under Alternative 2, the proposed RMDP infrastructure would facilitate build-out of the previously approved Specific Plan that includes residential and commercial uses, public facilities, open space, and recreation facilities. The development of these land uses would occur throughout much of the approved Specific Plan area, and have the potential to be impacted by several categories of geologic hazards, which are described below.

Fault Rupture/Seismic Ground Shaking/Liquefaction. The potentially active Del Valle and Salt Creek faults are not designated as Alquist-Priolo Earthquake Fault Zones by the State, and thus present a reduced ground rupture risk to the residential, commercial, infrastructure and support land uses that would be developed on the Specific Plan area. This movement would have the potential to result in moderate adverse impacts to Specific Plan infrastructure and other improvements.

Within the Specific Plan area, there are several locales where potentially active faults occur; although no faults designated as active per Alquist-Priolo criteria have been identified. These faults include the potentially active Del Valle and Salt Creek faults, which are located on the western one-half of the Project area, and faulting associated with the Holser Structural Zone, which are located in the northeast corner of the Project area currently known as Mission Village (*i.e.*, designated as the Saddle and Airport Mesa lineaments). Movement along these faults would have the potential to result in significant adverse impacts to RMDP infrastructure and people. These significant direct impacts would be reduced through the application of mitigation measures previously adopted for the Specific Plan. The requirements of the

Specific Plan mitigation measures are summarized in **Table 4.13-1** and are provided in **Subsection 4.13.7** of this EIS/EIR. These mitigation measures will reduce the significant ground rupture impacts of the Specific Plan to a less-than-significant level under Significance Threshold 1 because Specific Plan Mitigation Measures SP-4.1-51, 52, 53 and 54 require site investigations to locate fault-related features and to avoid placing structures on or near faults.

Soil Erosion/Loss of Topsoil. Construction activities could result in the potential loss of topsoil and the creation of erosional impacts from development on the Specific Plan site. Absent mitigation, such impacts are considered significant. However, topsoil loss and erosional impacts would be reduced with implementation of NPDES requirements and the mitigation measures from the Newhall Ranch Specific Plan Program EIR. The requirements of the Specific Plan mitigation measures are summarized in **Table 4.13-1** and are presented in **Subsection 4.13.7** of this EIS/EIR. These development standards and mitigation measures would remove unstable soils, stabilize potential landslide areas, and compact the soil to meet County of Los Angeles soil compaction requirements, resulting in the reduction of these adverse geological impacts of Alternative 2 to a less-than-significant level.

Unstable, Expansive and Corrosive Soils. Under Alternative 2, potentially unstable, expansive and/or corrosive soils would have a significant impact, presenting a risk to the residential, commercial, infrastructure, and land uses that would be developed on the Specific Plan site. Structures on the Specific Plan site would be designed to minimize unstable, expansive or corrosive soil effects consistent with adopted mitigation measures and implementation of the building restrictions and construction requirements by the County of Los Angeles Building Code. The Specific Plan mitigation measures are summarized in **Table 4.13-1** and are provided in **Subsection 4.13.7** of this EIS/EIR. These mitigation measures would remove unstable and expansive or corrosive soils prior to installation of the proposed improvements, thereby reducing these adverse geological impacts of Alternative 2 to a less-than-significant level under Significance Thresholds 3 and 4.

Mineral Resources. Proposed RMDP infrastructure would facilitate build-out of the previously approved Specific Plan to residential, commercial, and non-residential land uses, public facilities, infrastructure, open space, and recreation facilities. The development of these land uses would occur throughout much of the Specific Plan area.

The Specific Plan zoning designation allows for the development of a mixed-use planned community, with sand and gravel extraction activities allowed during tract grading and construction phases on the sites to be developed; and, thus, other areas exist within the Project area as a whole for such activities on an interim basis. (Specific Plan, Table 3.4-2, p. 3-22.) Additionally, extraction activities are permitted in the Visitor Serving and Open Area land use designations under a Conditional Use Permit. Furthermore, the majority of mineral resources of value are expected to be located in the River Corridor and High Country; however, Los Angeles County already has determined that sand and gravel extraction/removal activities are not to be permitted uses in those portions of the Specific Plan site. (Specific Plan, Table 3.4-2, p. 3-20.) Therefore, the continued availability of these resources has been precluded by Los Angeles County within the Specific Plan site since May 2003 (the date the County approved the Specific Plan). Accordingly, implementation of the proposed Project would not result in a significant impact relative to the loss of availability of a known mineral resource or a locally important mineral resource recovery site

because Los Angeles County has already made the local policy-level decision to preclude sand and gravel extraction/removal activities from the two primary areas within the Specific Plan site. Therefore, the loss of access to mineral resources is not considered a significant impact resulting from the proposed Project under Significance Thresholds 6 and 7.

Oil and natural gas resources known to underlie the proposed Project area are generally believed to be nearly fully exploited, with a very short production window remaining. Many wells have been shut down or plugged and abandoned because production levels dropped to a point where it was no longer economically feasible to continue operations. Consequently, the impacts to oil and gas production would be less than significant.

SCP Indirect Impacts. Establishment of the proposed SCP spineflower preserves included in Alternative 2 would facilitate development on the Specific Plan, VCC, and a portion of the Entrada planning area. The Specific Plan, VCC and Entrada developments have the potential to be adversely affected by geological hazards that have the potential to occur in the Project area. Potential geologic hazard impacts of implementing the Specific Plan are evaluated above.

Valencia Commerce Center Impacts. The geotechnical analysis of the VCC site addresses several factors that could result in significant impacts to future development. Such factors include:

- Debris Flow Hazard
- Ground Rupture
- Seismic Shaking
- Slope Stability (including Landslides)
- Bedding Planes Shear Strength
- Erosion Potential, and
- Liquefaction Potential

Reddish-brown clayey siltstone lenses in the Saugus Formation are potentially expansive and alluvial soils are poorly to moderately consolidated. Hazards resulting from the expansive and poorly consolidated materials would result in a significant adverse impact without mitigation. However, after implementation of the mitigation measures similar to those adopted as part of the Specific Plan (SP-4.1-1 through SP-4.1-56), the impacts would be less than significant. Natural slopes with unsupported bedding planes and landslides also have been identified on the VCC site.

During a seismic event, there are three common forms of geologic hazards that are related to the earthquake, including ground rupture or displacement, ground failure (liquefaction, landslides, *etc.*), and ground shaking. Ground rupture, ground failure, and ground shaking are considered significant impacts and would potentially result in damage to RMDP infrastructure and people.

The Holser Fault is a potentially active fault. However, the project geologist has recommended that habitable structures not be constructed over the Holser Fault because the fault may have a recurrence

interval slightly longer than Holocene time; there is the potential for sympathetic movement associated with seismic events on other faults; and, there is one period of deformation (probably caused by compression and displacement of a saturated sandy zone directly at the fault) recorded in the Holocene stratigraphic record over the Holser Fault; and, consequently, depending on the magnitude of the event, significant impacts would occur with regard to Significance Threshold 1 resulting from earthquake, strong seismic shaking, ground rupture, or displacement. With mitigation, impacts under Significance Threshold 1 would be less than significant.

The potential for liquefaction has been reviewed and evaluated by the project soils engineer (R.T. Frankian and Associates). Studies have shown that the liquefaction potential both east and west of Castaic Creek is low to non-existent at the subject site. Extensive subsurface testing of soils revealed that the types of soils at the VCC site are not conducive to liquefaction and impacts would be less than significant under Significance Threshold 3.

Based on the results of the geotechnical investigation, the VCC site may be adversely affected by hazards such as ground shaking, ground rupture, landslide, settlement, and slippage. The VCC project would not adversely affect adjacent properties in compliance with the Los Angeles County Code, provided recommendations of the project geologist/soils engineer, and the provisions of the Los Angeles County Code, are followed. Potential geologic hazard impacts would be less than significant under Significance Threshold 1-4 after implementation of mitigation measures similar to those outlined in **Table 4.13-1**. Mitigation would be imposed by Los Angeles County in conjunction with the proposed tract map required for build-out of the VCC project.

Entrada Impacts. The geotechnical analysis prepared for the Entrada site addresses several factors that could result in significant impacts to future development. Such factors include:

- Debris Flow Hazard
- Ground Rupture
- Seismic Shaking
- Slope Stability (including Landslides)
- Bedding Planes
- Shear Strength
- Erosion Potential, and
- Liquefaction Potential

Reddish-brown clayey siltstone lenses in the Saugus Formation are potentially expansive and alluvial soils are poorly to moderately consolidated. Hazards resulting from the expansive and poorly consolidated materials would result in a significant impact without mitigation. However, after implementation of the mitigation measures similar to those adopted as part of the Specific Plan (SP-4.1-1 through SP-4.1-56), the impacts would be less than significant.

During a seismic event, there are three common forms of geologic hazards that are related to the earthquake, including ground rupture or displacement, ground failure (liquefaction, landslides, *etc.*), and ground shaking. Ground rupture, ground failure, and ground shaking are considered significant impacts and would potentially result in damage to RMDP infrastructure and people. As previously indicted, the Holser Fault is a potentially active fault. The Holser Fault may have a recurrence interval slightly longer than Holocene time. There is the potential for sympathetic movement associated with seismic events on other faults; there is one period of deformation (probably caused by compression and displacement of a saturated sandy zone directly at the fault) recorded in the Holocene stratigraphic record over the Holser Fault; and, consequently, depending on the magnitude of the event, significant impacts would occur with regard to Significance Threshold 1 resulting from earthquake, strong seismic shaking, ground rupture or displacement. With mitigation, impacts under Significance Threshold 1 would be less than significant.

The potential for liquefaction has been reviewed and evaluated. The liquefaction potential of the Entrada site (Planning Areas 2 through 15) and evaluation of earthquake induced settlements performed by AES is presented in the Frankian 2005 study, Appendix E (see, **Appendix 4.13**). It has been concluded that some isolated liquefaction-prone soils exist at the site at various depths. However, the thickness of the liquefiable soils below the water table are considered to be very thin layers. Nonetheless, the potential for significant liquefaction impacts exist prior to mitigation. After mitigation, however, impacts would be less than significant.

Based on the results of the geotechnical investigation, the Entrada site may be adversely affected by hazards such as landslide, settlement, and slippage. The Entrada project would not adversely affect adjacent properties in compliance with the Los Angeles County Code, provided recommendations of the project geologist/soils engineer, and the provisions of the Los Angeles County Code, are followed.

With implementation of regulatory requirements and mitigation measures identified by subsequent environmental review of the Entrada project, it is reasonable to expect that the potential geologic hazard impacts of the Entrada project would be reduced to a less-than-significant level under Significance Thresholds 1-4.

4.13.6.2.3 Secondary Impacts

RMDP Secondary Impacts. Implementation of the RMDP would not facilitate new development located beyond the Specific Plan area boundary. Therefore, the RMDP would not result in seismic or soil-related geologic impacts to any off-site location. Erosion impacts that could result from the development of new urban uses on the Specific Plan site would be reduced by implementing regulatory requirements and appropriate erosion control Best Management Practices. Therefore, the potential for off-site erosion impacts resulting from development facilitated by the RMDP would not be significant.

SCP Secondary Impacts. Implementation of this alternative would not facilitate new development located beyond the boundaries of the Specific Plan, VCC and Entrada planning areas; and, therefore, it would not result in seismic or soil-related geologic impacts to any off-site location. Erosion impacts that could result from the development of new urban uses on the Specific Plan, VCC, and Entrada project sites would be reduced by implementing regulatory

requirements and appropriate erosion control Best Management Practices. Therefore, the potential for off-site erosion impacts resulting from facilitated development would not be significant.

4.13.6.3 Impacts of Alternative 3 (Elimination of Planned Potrero Bridge and Additional Spineflower Preserves)

As described in **Section 3.0**, Description of Alternatives, Alternative 3 would result in the elimination of some of the proposed RMDP infrastructure for the Specific Plan area when compared to the proposed Project, and increase the size of proposed spineflower preserves from 167.6 to 221.8 acres. Subsequent development on the Specific Plan site, and the VCC and Entrada planning areas also would be reduced, as Alternative 3 would facilitate the development of a total of 21,558 residential dwelling units and approximately 9.333 msf of nonresidential uses. Additional information regarding this alternative is provided in **Section 3.0**, Description of Alternatives, of this EIS/EIR.

4.13.6.3.1 Direct Impacts

RMDP Direct Impacts. The RMDP component of Alternative 3 would result in the construction of 15 road crossings and two bridges across the Santa Clara River. The amount of buried bank stabilization would be reduced when compared to the proposed Project. Additional information regarding RMDP improvements that would be provided under this alternative is provided in **Section 3.0** of this EIS/EIR. While the potential for impacts resulting from geologic hazards would be incrementally reduced when compared to the proposed Project, Alternative 3 would result in significant direct geologic hazard impacts that are similar to those of the proposed Project identified in **Subsection 4.13.6.2.1**, above. Like the findings for the proposed Project, with the implementation of construction-related mitigation measures included in the adopted Newhall Ranch Specific Plan Program EIR, potential geologic hazard impacts resulting from the development of proposed infrastructure facilities would be reduced to a less-than-significant level under Significance Thresholds 1-4.

SCP Direct Impacts. Under Alternative 3, the SCP component of the proposed Project would result in the establishment of spineflower preserves totaling 221.8 acres. As described in **Subsection 4.13.6.2.1**, above, because the SCP component does not involve any grading or earthwork, no direct impacts related to geologic hazards (*i.e.*, seismic hazards, unstable soils, landslides, and liquefaction) would occur. In addition, no significant impacts would arise under Significance Thresholds 6 and 7 for the reasons provided in **Subsection 4.13.6.2.1**, above.

4.13.6.3.2 Indirect Impacts

RMDP Indirect Impacts. The RMDP component of Alternative 3 would indirectly facilitate build-out of the Specific Plan. Alternative 3 would result in a reduction in the RMDP infrastructure and an associated amount of Specific Plan-related development that would be exposed to geological hazards such as seismic ground shaking, fault rupture, and liquefaction, and a reduction in erosion potential resulting from facility development when compared to the proposed Project. However, Alternative 3 would still result in significant indirect impacts that are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.2**, above. With implementation of mitigation measures included in the adopted Newhall Ranch Specific Plan Program EIR, potential geologic hazard impacts resulting

from the development of Specific Plan structures and improvements would be reduced to a less-than-significant level under Significance Thresholds 1-4. Similar to the proposed Project, Alternative 3 would not result in a significant impact under Significance Thresholds 6-7 relative to future sand and gravel mining operations of resources located in and adjacent to the Santa Clara River for the reasons provided in **Subsection 4.13.6.2.2**, above.

SCP Indirect Impacts. Establishment of the spineflower preserves included in Alternative 3 would facilitate development on the Specific Plan, VCC and Entrada planning areas. Potential geologic hazards associated with development of the Specific Plan are evaluated above. Under Alternative 3, the number of residential units on the Entrada site would be reduced from 1,725 to 1,125. Implementation of this Alternative would result in a reduction in the amount of Specific Plan and Entrada-related development that would be exposed to geological hazards such as ground shaking, and a reduction in erosion potential resulting from facility development. However, Alternative 3 would still result in indirect impacts that are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.2**, above.

Valencia Commerce Center Impacts. The geotechnical analysis of the VCC site addresses several factors that could result in significant impacts to future development. Such factors include:

- Debris Flow Hazard
- Ground Rupture
- Seismic Shaking
- Slope Stability (including Landslides)
- Bedding Planes Shear Strength
- Erosion Potential, and
- Liquefaction Potential

Reddish-brown clayey siltstone lenses in the Saugus Formation are potentially expansive and alluvial soils are poorly to moderately consolidated. Hazards resulting from the expansive and poorly consolidated materials would result in a significant adverse impact without mitigation. However, after implementation of the mitigation measures similar to those adopted as part of the Specific Plan (SP-4.1-1 through SP-4.1-56), the impacts would be less than significant. Natural slopes with unsupported bedding planes and landslides also have been identified on the VCC site.

During a seismic event, there are three common forms of geologic hazards that are related to the earthquake, including ground rupture or displacement, ground failure (liquefaction, landslides, *etc*.), and ground shaking. Ground rupture, ground failure, and ground shaking are considered significant impacts and would potentially result in damage to RMDP infrastructure and people.

The Holser Fault is a potentially active fault. However, the project geologist has recommended that habitable structures not be constructed over the Holser Fault because the fault may have a recurrence interval slightly longer than Holocene time; there is the potential for sympathetic movement associated

with seismic events on other faults; and, there is one period of deformation (probably caused by compression and displacement of a saturated sandy zone directly at the fault) recorded in the Holocene stratigraphic record over the Holser Fault; and, consequently, there is a potential for significant impacts resulting from earthquake, strong seismic shaking, ground rupture, or displacement. With mitigation, impacts under Significance Threshold 1 would be less than significant.

The potential for liquefaction has been reviewed and evaluated by the project soils engineer (R.T. Frankian and Associates). Studies have shown that the liquefaction potential both east and west of Castaic Creek is low to non-existent at the subject site. Extensive subsurface testing of soils revealed that the types of soils at the VCC site are not conducive to liquefaction. And impacts would be less than significant under Significance Threshold 3.

Based on the results of the geotechnical investigation, the VCC site may be adversely affected by hazards such as ground shaking, ground rupture, landslide, settlement, and slippage. The VCC project would not adversely affect adjacent properties in compliance with the Los Angeles County Code, provided recommendations of the project geologist/soils engineer and the provisions of the Los Angeles County Code, are followed. Potential geologic hazard impacts would be less-than-significant under Significance Threshold 1-4 after implementation of mitigation measures similar to those adopted for the Specific Plan. Mitigation would be imposed by Los Angeles County in conjunction with the proposed tract map required for build-out of the VCC project.

Entrada Impacts. The geotechnical analysis prepared for the Entrada site addresses several factors that could result in significant impacts to future development. Such factors include:

- Debris Flow Hazard
- Ground Rupture
- Seismic Shaking
- Slope Stability (including Landslides)
- Bedding Planes
- Shear Strength
- Erosion Potential, and
- Liquefaction Potential

Reddish-brown clayey siltstone lenses in the Saugus Formation are potentially expansive and alluvial soils are poorly to moderately consolidated. Hazards resulting from the expansive and poorly consolidated materials would result in a significant adverse impact without mitigation. However, after implementation of the mitigation measures similar to those adopted as part of the Specific Plan (SP-4.1-1 through SP-4.1-56), the impacts would be less than significant.

During a seismic event, there are three common forms of geologic hazards that are related to the earthquake, including ground rupture or displacement, ground failure (liquefaction, landslides, *etc.*), and ground

shaking. Ground rupture, ground failure, and ground shaking are considered significant impacts and would potentially result in damage to RMDP infrastructure and people. As previously indicted, the Holser Fault is a potentially active fault. The Holser Fault may have a recurrence interval slightly longer than Holocene time. There is the potential for sympathetic movement associated with seismic events on other faults. There is one period of deformation (probably caused by compression and displacement of a saturated sandy zone directly at the fault) recorded in the Holocene stratigraphic record over the Holser Fault; and, consequently, there is a potential for significant impacts resulting from earthquake, strong seismic shaking, ground rupture or displacement. With mitigation, impacts under Significance Threshold 1 would be less than significant.

The potential for liquefaction has been reviewed and evaluated. The liquefaction potential of the Entrada site (Planning Areas 2 through 15) and evaluation of earthquake induced settlements performed by AES is presented in the Frankian 2005 study, Appendix E, see **Appendix 4.13**. It has been concluded that some isolated liquefaction-prone soils exist at the site at various depths. However, the thickness of the liquefiable soils below the water table are considered to be very thin layers. Nonetheless, the potential for significant liquefaction impacts exist prior to mitigation. After mitigation, however, impacts would be less than significant.

Based on the results of the geotechnical investigation, the Entrada site may be adversely affected by hazards such as landslide, settlement, and slippage. The Entrada project would not adversely affect adjacent properties in compliance with the Los Angeles County Code, provided recommendations of the project geologist/soils engineer, and the provisions of the Los Angeles County Code, are followed.

With implementation of regulatory requirements and mitigation measures identified by subsequent environmental review of the Entrada project, it is reasonable to expect that the potential geologic hazard impacts of the Entrada project would be reduced to a less-than-significant level under Significance Thresholds 1-4.

4.13.6.3.3 Secondary Impacts

RMDP Secondary Impacts. Implementation of the RMDP would not facilitate new development located beyond the Specific Plan area boundary. Therefore, the RMDP would not result in seismic or soil-related geologic impacts to any off-site location. Erosion impacts that could result from the development of new urban uses on the Specific Plan site would be reduced by implementing regulatory requirements and appropriate erosion control Best Management Practices. Therefore, the potential for off-site erosion impacts resulting from development facilitated by the RMDP would not be significant.

SCP Secondary Impacts. Implementation of this alternative would not facilitate new development located beyond the boundaries of the Specific Plan, VCC and Entrada planning areas; and, therefore, it would not result in seismic or soil-related geologic impacts to any off-site location. Erosion impacts that could result from the development of new urban uses on the Specific Plan, VCC, and Entrada project sites would be reduced by implementing regulatory requirements and appropriate erosion control Best Management Practices. Therefore, the potential for off-site erosion impacts resulting from facilitated development would not be significant.

4.13.6.4 Impacts of Alternative 4 (Elimination of Planned Potrero Bridge and Addition of VCC Spineflower Preserve)

As described in **Section 3.0**, Description of Alternatives, Alternative 4 would result in the elimination of additional RMDP infrastructure for the Specific Plan, and increase the size of proposed spineflower preserves from 167.6 to 259.9 acres. As explained in **Section 3.0**, Description of Alternatives, the RMDP component of Alternative 4 would result in the construction of 93,277 lf of bank stabilization along the east and west banks of the River and tributaries (versus 105,207 lf for the proposed Project), and 15 tributary bridges/road crossings (same as the proposed Project). In addition, the Potrero Canyon bridge across the Santa Clara River proposed under Alternative 2 would not be constructed under this alternative. Alternative 4 would include a suite of mitigation measures similar to those proposed for Alternative 2, which are provided in **Subsection 4.13.7.1**. Under this alternative, no additional development would be facilitated on the VCC planning area, and subsequent development on the Specific Plan site would be reduced. In total, Alternative 4 would facilitate the development of 21,846 residential dwelling units and approximately 5.933 msf of nonresidential uses on the Specific Plan and on a portion of the Entrada planning area. Additional information regarding this alternative is provided in **Section 3.0**, Description of Alternatives, of this EIS/EIR.

4.13.6.4.1 Direct Impacts

RMDP Direct Impacts. The RMDP component of Alternative 4 would result in the construction of 15 tributary road crossings and two bridges across the Santa Clara River. The amount of buried bank stabilization would be reduced when compared to the proposed Project. Additional information regarding proposed RMDP improvements that would be provided under this alternative is provided in **Section 3.0** of this EIS/EIR. While the potential for impacts resulting from geologic hazards would be incrementally reduced when compared to the proposed Project, Alternative 4 would result in significant direct geologic hazard impacts that are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.1**, above. With implementation of construction-related mitigation measures included in the adopted Newhall Ranch Specific Plan Program EIR, geologic hazard impacts resulting from the development of proposed infrastructure facilities would be reduced to a less-than-significant level under Significance Thresholds 1-4.

SCP Direct Impacts. Under Alternative 4, spineflower preserves would be created, including a preserve on the VCC site. A total of approximately 259.9 acres of spineflower preserve would be provided under this alternative. As described in **Subsection 4.13.6.2.1**, above, because the SCP component does not involve any grading or earthwork, no direct impacts related to geologic hazards (*i.e.*, seismic hazards, unstable soils, landslides, and liquefaction) would occur. In addition, no significant impacts would arise under Significance Thresholds 6 and 7 for the reasons provided in **Subsection 4.13.6.2.1**, above.

4.13.6.4.2 Indirect Impacts

RMDP Indirect Impacts. The RMDP component of Alternative 4 would indirectly facilitate partial build-out of the Specific Plan. Alternative 4 would result in a further reduction in RMDP infrastructure and an associated reduction in the amount of Specific Plan-related development that would be exposed to geological hazards such as seismic ground shaking, fault rupture, and liquefaction, and a reduction in

erosion potential resulting from facility development when compared to the proposed Project. However, Alternative 4 would still result in indirect impacts that are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.2**, above. With implementation of mitigation measures included in the adopted Newhall Ranch Specific Plan Program EIR, potential geologic hazard impacts resulting from the development of Specific Plan structures and improvements would be reduced to a less-than-significant level under Significance Thresholds 1-4. Similar to the proposed Project, Alternative 4 would not result in a significant impact under Significance Thresholds 6-7 relative to future sand and gravel mining operations of resources located in and adjacent to the Santa Clara River for the reasons provided in **Subsection 4.13.6.2.2**, above.

SCP Indirect Impacts. Establishment of the spineflower preserves included in Alternative 4 would facilitate development on the Specific Plan and Entrada planning areas. Geologic hazards associated with the development of the Specific Plan are evaluated above. Under Alternative 4, the number of residential units on the Entrada site would be reduced from 1,725 to 1,125, and development in the VCC planning area would not be facilitated because this alternative, if implemented, would establish a spineflower preserve on VCC that would preclude build-out of the remaining portion of the VCC project due to grading constraints. Implementation of this alternative would result in a reduction in the amount of Specific Plan and Entrada-related development that could be exposed to geological hazards such as ground shaking, and a reduction in erosion potential resulting from facility development. However, Alternative 4 would still result in indirect geological impacts that are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.2**, above.

Entrada Impacts. The geotechnical analysis prepared for the Entrada site addresses several factors that could result in significant impacts to future development. Such factors include:

- Debris Flow Hazard
- Ground Rupture
- Seismic Shaking
- Slope Stability (including Landslides)
- Bedding Planes
- Shear Strength
- Erosion Potential, and
- Liquefaction Potential

Reddish-brown clayey siltstone lenses in the Saugus Formation are potentially expansive and alluvial soils are poorly to moderately consolidated. Hazards resulting from the expansive and poorly consolidated materials would result in a potentially significant impact without mitigation. However, after implementation of appropriate mitigation measures adopted as part of the Specific Plan approval (SP-4.1-1 through 56) impacts would be less than significant.

During a seismic event, there are three common forms of geologic hazards that are related to the earthquake, including ground rupture or displacement, Ground failure (liquefaction, landslides, *etc.*), and ground shaking. Ground rupture, ground failure and ground shaking are considered significant impacts and would potentially result in damage to infrastructure and people. Within the Project area, one strand of the Holser fault is mapped within the VCC planning area. The Holser Fault may have a recurrence interval slightly longer than Holocene time. There is the potential for sympathetic movement associated with seismic events on other faults. There is one period of deformation (probably caused by compression and displacement of a saturated sandy zone directly at the fault) recorded in the Holocene stratigraphic record over the Holser Fault; and, consequently, there is a potential for significant impacts resulting from earthquake, strong seismic shaking, ground rupture or displacement. With mitigation, impacts under Significance Threshold 1 would be less than significant.

The potential for liquefaction has been reviewed and evaluated. The liquefaction potential of the Entrada site (Planning Areas 2 through 15) and evaluation of earthquake induced settlements performed by AES is presented in the Frankian 2005 study Appendix E, see **Appendix 4.13**. It has been concluded that some isolated liquefaction-prone soils exist at the site at various depths. However, the thickness of the liquefiable soils below the water table are considered to be very thin layers. Nonetheless, the potential for significant liquefaction impacts exist prior to mitigation. After mitigation, however, impacts would be less than significant.

Based on the results of the geotechnical investigation, the Entrada site may be adversely affected by hazards such as landslide, settlement, and slippage. The Entrada project would not adversely affect adjacent properties in compliance with the Los Angeles County Code, provided recommendations of the project geologist/soils engineer and the provisions of the Los Angeles County Code, are followed.

With implementation of regulatory requirements and mitigation measures identified by subsequent environmental review of the Entrada project, it is reasonable to expect that the potential geologic hazard impacts of the Entrada project would be reduced to a less-than-significant level under Significance Thresholds 1-4.

4.13.6.4.3 Secondary Impacts

RMDP Secondary Impacts. Implementation of the RMDP would not facilitate new development located beyond the Specific Plan area boundary. Therefore, the RMDP would not result in seismic or soil-related geologic impacts to any off-site location. Erosion impacts that could result from the development of new urban uses on the Specific Plan site would be reduced by implementing regulatory requirements and appropriate erosion control Best Management Practices. Therefore, the potential for off-site erosion impacts resulting from development facilitated by the RMDP would not be significant.

SCP Secondary Impacts. Implementation of this alternative would not facilitate new development located beyond the boundaries of the Specific Plan, or Entrada planning areas; and, therefore, it would not result in seismic or soil-related geologic impacts to any off-site location. Erosion impacts that could result from the development of new urban uses on the Specific Plan and Entrada project sites would be reduced by implementing regulatory requirements and appropriate

erosion control Best Management Practices. Therefore, the potential for off-site erosion impacts resulting from facilitated development would not be significant.

4.13.6.5 Impacts of Alternative 5 (Widen Tributary Drainages and Addition of VCC Spineflower Preserve)

As described in **Section 3.0**, Description of Alternatives, Alternative 5 would result in the elimination of some of the RMDP infrastructure for the Specific Plan, and increase the size of proposed spineflower preserves from 167.6 to 338.6 acres. As explained in **Section 3.0**, Description of Alternatives, of this EIS/EIR, the RMDP component of Alternative 5 would result in the construction of 89,658 lf of bank stabilization along the east and west banks of the River and tributaries (versus 105,207 lf for the proposed Project), and 15 bridges/road crossings (same as the proposed Project). Under this alternative, no additional development would be facilitated on the VCC planning area, and subsequent development on the Specific Plan site would be reduced. In total, Alternative 5 would facilitate the development of 21,155 residential dwelling units and approximately 5.865 million square feet of nonresidential uses on the Specific Plan site and on a portion of the Entrada planning area. Additional information regarding this alternative is provided in **Section 3.0**, Description of Alternatives of this EIS/EIR.

4.13.6.5.1 Direct Impacts

RMDP Direct Impacts. The RMDP component of Alternative 5 would result in the construction of 15 tributary road crossings and three bridges across the Santa Clara River. As discussed above, the RMDP component of Alternative 5 would result in the construction of 89,658 lf of bank stabilization along the east and west banks of the River and tributaries (versus 105,207 lf for the proposed Project). Additional information regarding proposed RMDP improvements that would be provided under this alternative is provided in **Section 3.0** of this EIS/EIR. While the potential impacts resulting from geologic hazards (*i.e.*, seismic hazards, unstable soils, landslides, and liquefaction) would be incrementally reduced when compared to the proposed Project, Alternative 5 would result in significant direct impacts from geologic hazards (*i.e.*, seismic hazards, unstable soils, landslides, and liquefaction. These direct impacts are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.1**, above. With implementation of construction-related mitigation measures included in the adopted Newhall Ranch Specific Plan Program EIR, potential geologic hazard impacts resulting from the development of proposed infrastructure facilities would be reduced to a less-than-significant level under Significance Thresholds 1-4.

SCP Direct Impacts. Alternative 5 would result in the creation of new spineflower preserves, including a preserve on the VCC site. A total of approximately 338.6 acres of spineflower preserve would be provided under this alternative. As described in **Subsection 4.13.6.2.1**, above, because the SCP component does not involve any grading or earthwork, no direct impacts related to geologic hazards would occur. In addition, no significant impacts would arise under Significance Thresholds 6 and 7 for the reasons provided in **Subsection 4.13.6.2.1**, above.

4.13.6.5.2 Indirect Impacts

RMDP Indirect Impacts. The RMDP component of Alternative 5 would indirectly facilitate partial build-out of the Specific Plan. Alternative 5 would result in a reduction in the RMDP infrastructure and an associated reduction in the amount of Specific Plan-related development that would be exposed to geological hazards such as seismic ground shaking, fault rupture, and liquefaction, and a reduction in erosion potential resulting from facility development when compared to the proposed Project (Alternative 2). However, Alternative 5 would still result in indirect impacts that are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.2**, above. With implementation of mitigation measures included in the adopted Newhall Ranch Specific Plan Program EIR, potential geologic hazard impacts resulting from the development of Specific Plan structures and improvements would be reduced to a less-than-significant level under Significance Thresholds 1-4. Similar to the proposed Project, Alternative 5 would not result in a significant impact under Significance Thresholds 6-7 relative to future sand and gravel mining operations of resources located in and adjacent to the Santa Clara River for the reasons provided in **Subsection 4.13.6.2.2**, above.

SCP Indirect Impacts. Establishment of the spineflower preserves included in Alternative 5 would facilitate development on the Specific Plan and Entrada planning areas. Geologic hazards associated with the development of the Specific Plan are evaluated above. Under Alternative 5, the number of residential units on the Entrada site would be reduced from 1,725 to 959, and development on the VCC planning area would not be facilitated because this alternative, if implemented, would establish a spineflower preserve on VCC that would preclude build-out of the remaining portion of the VCC project due to grading constraints. Implementation of this alternative would result in a reduction in the amount of Specific Plan and Entrada-related development that could be exposed to geological hazards such as ground shaking, and a reduction in erosion potential resulting from facility development. However, Alternative 5 would still result in indirect geological impacts (*i.e.*, seismic hazards, unstable soils, landslides, and liquefaction) that are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.2**, above.

Entrada Impacts. The geotechnical analysis prepared for the Entrada site addresses several factors that could result in significant impacts to future development. Such factors include:

- Debris Flow Hazard
- Ground Rupture
- Seismic Shaking
- Slope Stability (including Landslides)
- Bedding Planes
- Shear Strength
- Erosion Potential, and
- Liquefaction Potential

Reddish-brown clayey siltstone lenses in the Saugus Formation are potentially expansive and alluvial soils are poorly to moderately consolidated. Hazards resulting from the expansive and poorly consolidated materials would result in a potentially significant impact without mitigation. However, after implementation of appropriate mitigation measures adopted as part of the Specific Plan approval (SP-4.1-1 through 56) impacts will be less than significant.

During a seismic event, there are three common forms of geologic hazards that are related to the earthquake, including ground rupture or displacement, ground failure (liquefaction, landslides, *etc.*), and ground shaking. Ground rupture, ground failure and ground shaking are considered significant impacts and would potentially result in damage to infrastructure and people. Within the Project area, one strand of the Holser fault is mapped within the VCC planning area. The Holser Fault may have a recurrence interval slightly longer than Holocene time. There is the potential for sympathetic movement associated with seismic events on other faults. There is one period of deformation (probably caused by compression and displacement of a saturated sandy zone directly at the fault) recorded in the Holocene stratigraphic record over the Holser Fault; and, consequently, there is a potential for significant impacts resulting from earthquake, strong seismic shaking, ground rupture or displacement. With mitigation, impacts under Significance Threshold 1 will be less than significant.

The potential for liquefaction has been reviewed and evaluated. The liquefaction potential of the Entrada site (Planning Areas 2 through 15) and evaluation of earthquake induced settlements performed by AES is presented in the Frankian 2005 study, Appendix E (see **Appendix 4.13**). It has been concluded that some isolated liquefaction-prone soils exist at the site at various depths. However, the thickness of the liquefiable soils below the water table are considered to be very thin layers. Nonetheless, the potential for significant liquefaction impacts exist prior to mitigation. After mitigation, however, impacts would be less than significant.

Based on the results of the geotechnical investigation, the Entrada site may be adversely affected by hazards such as landslide, settlement, and slippage. The Entrada project would not adversely affect adjacent properties in compliance with the Los Angeles County Code, provided recommendations of the project geologist/soils engineer, and the provisions of the Los Angeles County Code, are followed.

With implementation of regulatory requirements and mitigation measures identified by subsequent environmental review of the Entrada project, it is reasonable to expect that the potential geologic hazard impacts of the Entrada project would be reduced to a less-than-significant level under Significance Thresholds 1-4.

4.13.6.5.3 Secondary Impacts

RMDP Secondary Impacts. Implementation of the RMDP would not facilitate new development located beyond the Specific Plan area boundary. Therefore, the RMDP would not result in seismic or soil-related geologic impacts to any off-site location. Erosion impacts that could result from the development of new urban uses on the Specific Plan site would be reduced by implementing regulatory requirements and appropriate erosion control Best Management Practices. Therefore, the potential for off-site erosion impacts resulting from development facilitated by the RMDP would not be significant.

SCP Secondary Impacts. Implementation of this alternative would not facilitate new development located beyond the boundaries of the Specific Plan, or Entrada planning areas; and, therefore, it would not result in seismic or soil-related geologic impacts to off-site location. Erosion impacts that could result from the development of new urban uses on the Specific Plan and Entrada project sites would be reduced by implementing regulatory requirements and appropriate erosion control Best Management Practices. Therefore, the potential for off-site erosion impacts resulting from facilitated development would not be significant.

4.13.6.6 Impacts of Alternative 6 (Elimination of Planned Commerce Center Drive Bridge and Maximum Spineflower Expansion/Connectivity)

As described in **Section 3.0**, Description of Alternatives, Alternative 6 would result in the elimination of some of the RMDP infrastructure for the Specific Plan, and increase the size of proposed spineflower preserves from 167.6 to 891.2 acres. As explained in **Section 3.0**, Description of Alternatives, of this EIS/EIR, the RMDP component of Alternative 6 would result in the construction of 101,479 lf of bank stabilization along the east and west banks of the River and tributaries (versus 105,207 lf for the proposed Project), and 17 tributary bridges/road crossings (2 more than the proposed Project). In addition, the previously permitted bridge across the river at Commerce Center Drive would not need to be constructed under this alternative. Because adoption of this alternative would involve the construction of more bridges and bank stabilization than the proposed Project. Under this alternative, no additional development would be facilitated on the VCC planning area, and subsequent development on the Specific Plan site would be reduced. In total, Alternative 6 would facilitate the development of 20,212 residential dwelling units and approximately 5.784 million square feet of nonresidential uses on the Specific Plan site and on a portion of the Entrada planning area. Additional information regarding this alternative is provided in **Section 3.0**, Description of Alternatives, of this EIS/EIR.

4.13.6.6.1 Direct Impacts

RMDP Direct Impacts. The RMDP component of Alternative 6 would result in the construction of 17 tributary road crossings and two bridges across the Santa Clara River. The amount of buried bank stabilization would be increased (101,479 lf of bank stabilization along the east and west banks of the River and tributaries (versus 105,207 lf for the proposed Project). Additional information regarding proposed RMDP improvements provided under this alternative is provided in **Section 3.0** of this EIS/EIR. The infrastructure facilities provided by Alternative 6 would result in significant direct impacts from geologic hazards (*i.e.*, seismic hazards, unstable soils, landslides, and liquefaction). These direct impacts would be similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.1**, above. With implementation of construction-related mitigation measures included in the adopted Newhall Ranch Specific Plan Program EIR, potential geologic hazard impacts resulting from the development of proposed infrastructure facilities would be reduced to a less-than-significant level under Significance Thresholds 1-4.

SCP Direct Impacts. Alternative 6 would result in the creation of new spineflower preserves, including a preserve on the VCC site. A total of approximately 891.2 acres of spineflower preserve area would be provided under this alternative. As described in **Subsection 4.13.6.2.1**, above, because the SCP component does not involve any grading or earthwork, no direct impacts related to geologic hazards

would occur. In addition, no significant impacts would arise under Significance Thresholds 6 and 7 for the reasons provided in **Subsection 4.13.6.2.1**, above.

4.13.6.6.2 Indirect Impacts

RMDP Indirect Impacts. The RMDP component of Alternative 6 would indirectly facilitate partial build-out of the Specific Plan. Alternative 6 would result in a reduction in the RMDP infrastructure and an associated reduction in the amount of Specific Plan-related development that would be exposed to geological hazards such as seismic ground shaking, fault rupture, and liquefaction, and a reduction in erosion potential resulting from facility development when compared to the proposed Project (Alternative 2). However, Alternative 6 would still result in indirect impacts that are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.2**, above. With implementation of mitigation measures included in the adopted Newhall Ranch Specific Plan Program EIR, potential geologic hazard impacts resulting from the development of Specific Plan structures and improvements would be reduced to a less-than-significant level under Significance Thresholds 1-4. Similar to the proposed Project, Alternative 6 would not result in a significant impact under Significance Thresholds 6-7 relative to future sand and gravel mining operations of resources located in and adjacent to the Santa Clara River for the reasons provided in **Subsection 4.13.6.2.2**, above.

SCP Indirect Impacts. Establishment of the spineflower preserves included in Alternative 6 would facilitate development on the Specific Plan and Entrada planning areas. Geologic hazards associated with the development of the Specific Plan are evaluated above. Under Alternative 6, the number of residential units on the Entrada site would be reduced from 1,725 to 425, and development on the VCC planning area would not be facilitated because this alternative, if implemented, would establish a spineflower preserve on VCC that would preclude build-out of the remaining portion of the VCC project due to grading constraints. Implementation of this alternative would result in a reduction in the amount of Specific Plan and Entrada-related development that could be exposed to geological hazards such as ground shaking, and a reduction in erosion potential resulting from facility development. However, Alternative 6 would still result in indirect geological impacts that are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.2**, above.

Entrada Impacts. The geotechnical analysis prepared for the Entrada site addresses several factors that could result in significant impacts to future development. Such factors include:

- Debris Flow Hazard
- Ground Rupture
- Seismic Shaking
- Slope Stability (including Landslides)
- Bedding Planes
- Shear Strength
- Erosion Potential, and
- Liquefaction Potential

Reddish-brown clayey siltstone lenses in the Saugus Formation are potentially expansive and alluvial soils are poorly to moderately consolidated. Hazards resulting from the expansive and poorly consolidated materials would result in a potentially significant impact without mitigation. However, after implementation of appropriate mitigation measures adopted as part of the Specific Plan approval (SP-4.1-1 through 56) impacts would be less than significant.

During a seismic event, there are three common forms of geologic hazards that are related to the earthquake, including ground rupture or displacement, Ground failure (liquefaction, landslides, *etc.*), and ground shaking. Ground rupture, ground failure and ground shaking are considered significant impacts and would potentially result in damage to infrastructure and people. Within the Project area, one strand of the Holser fault is mapped within the VCC planning area. The Holser Fault may have a recurrence interval slightly longer than Holocene time. There is the potential for sympathetic movement associated with seismic events on other faults. There is one period of deformation (probably caused by compression and displacement of a saturated sandy zone directly at the fault) recorded in the Holocene stratigraphic record over the Holser Fault; and, consequently, there is a potential for significant impacts resulting from earthquake, strong seismic shaking, ground rupture or displacement. With mitigation, impacts under Significance Threshold 1 would be less than significant.

The potential for liquefaction has been reviewed and evaluated. The liquefaction potential of the Entrada site (Planning Areas 2 through 15) and evaluation of earthquake induced settlements performed by AES is presented in the Frankian 2005 study, Appendix E (see **Appendix 4.13**). It has been concluded that some isolated liquefaction-prone soils exist at the site at various depths. However, the thickness of the liquefiable soils below the water table are considered to be very thin layers. Nonetheless, the potential for significant liquefaction impacts exist prior to mitigation. After mitigation, however, impacts would be less than significant.

Based on the results of the geotechnical investigation, the Entrada site may be adversely affected by hazards such as landslide, settlement, and slippage. The Entrada project would not adversely affect adjacent properties in compliance with the Los Angeles County Code, provided recommendations of the project geologist/soils engineer, and the provisions of the Los Angeles County Code, are followed.

With implementation of regulatory requirements and mitigation measures identified by subsequent environmental review of the Entrada project, it is reasonable to expect that the potential geologic hazard impacts of the Entrada project would be reduced to a less-than-significant level under Significance Thresholds 1-4.

4.13.6.6.3 Secondary Impacts

RMDP Secondary Impacts. Implementation of the RMDP would not facilitate new development located beyond the Specific Plan area boundary. Therefore, the RMDP would not result in seismic or soil-related geologic impacts to any off-site location. Erosion impacts that could result from the development of new urban uses on the Specific Plan site would be reduced by implementing regulatory requirements and appropriate erosion control Best Management Practices. Therefore, the potential for off-site erosion impacts resulting from development facilitated by the RMDP would not be significant.

SCP Secondary Impacts. Implementation of this alternative would not facilitate new development located beyond the boundaries of the Specific Plan, or Entrada planning areas; and, therefore, it would not result in seismic or soil-related geologic impacts to off-site location. Erosion impacts that could result from the development of new urban uses on the Specific Plan and Entrada project sites would be reduced by implementing regulatory requirements and appropriate erosion control Best Management Practices. Therefore, the potential for off-site erosion impacts resulting from facilitated development would not be significant.

4.13.6.7 Impacts of Alternative 7 (Avoidance of 100-Year Floodplain, Elimination of Two Planned Bridges, and Avoidance of Spineflower)

Alternative 7 would result in the elimination of some of the RMDP infrastructure for the Specific Plan, and increase the size of proposed spineflower preserves from 167.6 to 660.6 acres. As explained in **Section 3.0**, Description of Alternatives, of this EIS/EIR, the RMDP component of Alternative 7 would result in the construction of 144,911 lf of bank stabilization along the east and west banks of the River and tributaries (versus 105,207 lf for the proposed Project), and 19 tributary bridges/road crossings (4 more than the proposed Project). The proposed bridge crossing the river at Potrero Canyon Road would not be constructed under this alternative. In addition, the previously permitted bridge across the river at Commerce Center Drive would not be needed under this alternative. Under this alternative, no additional development would be facilitated on the VCC planning area, and subsequent development on the Specific Plan site would be reduced. In total, Alternative 7 would facilitate the development of 17,323 residential dwelling units and approximately 3.815 million square feet of nonresidential uses on the Specific Plan site and on a portion of the Entrada planning area. Additional information regarding this alternative is provided in **Section 3.0**, Description of Alternatives, of this EIS/EIR.

4.13.6.7.1 Direct Impacts

RMDP Direct Impacts. The RMDP component of Alternative 7 would result in the construction of 19 tributary road crossings and one bridge across the Santa Clara River. The amount of buried bank stabilization would be decreased when compared to the proposed Project. Additional information regarding proposed RMDP improvements that would be provided under this alternative is provided in **Section 3.0** of this EIS/EIR. While the potential for impacts resulting from geologic hazards would be incrementally reduced when compared to the proposed Project, Alternative 7 would still result in significant direct impacts that are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.1**, above. With implementation of construction-related mitigation measures included in the adopted Newhall Ranch Specific Plan Program EIR, potential geologic hazard impacts resulting from the development of proposed infrastructure facilities would be reduced to a less-than-significant level under Significance Thresholds 1-4.

SCP Direct Impacts. Alternative 7 would result in the creation of new spineflower preserves, including a preserve on the VCC site. A total of approximately 660.6 acres of spineflower preserve area would be provided under this alternative. As described in **Subsection 4.13.6.2.1**, above, because the SCP component does not involve any grading or earthwork, no direct impacts related to geologic hazards would occur. In addition, no significant impacts would arise under Significance Thresholds 6 and 7 for the reasons provided in **Subsection 4.13.6.2.1**, above.

4.13.6.7.2 Indirect Impacts

RMDP Indirect Impacts. The RMDP component of Alternative 7 would indirectly facilitate partial build-out of the Specific Plan. Alternative 7 would result in a reduction in the RMDP infrastructure and an associated reduction in the amount of Specific Plan-related development that would be exposed to geological hazards such as seismic ground shaking, fault rupture, and liquefaction, and a reduction in erosion potential resulting from facility development when compared to the proposed Project (Alternative 2). However, Alternative 7 would still result in indirect impacts that are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.2**, above. With implementation of mitigation measures included in the adopted Newhall Ranch Specific Plan Program EIR, potential geologic hazard impacts resulting from the development of Specific Plan structures and improvements would be reduced to a less-than-significant level under Significance Thresholds 1-4. Similar to the proposed Project, Alternative 7 would not result in a significant impact under Significance Thresholds 6-7 relative to future sand and gravel mining operations of resources located in and adjacent to the Santa Clara River for the reasons provided in **Subsection 4.13.6.2.2**, above.

SCP Indirect Impacts. Establishment of the spineflower preserves included in Alternative 7 would facilitate development on the Specific Plan and Entrada planning areas. Geologic hazards associated with the development of the Specific Plan are evaluated above. Under Alternative 7, the number of residential units on the Entrada site would be reduced from 1,725 to 852, and development on the VCC planning area would not be facilitated because this alternative, if implemented, would establish a spineflower preserve on VCC that would preclude build-out of the remaining, portion of the VCC project due to grading constraints. Implementation of this alternative would result in a reduction in the amount of Specific Plan and Entrada-related development that could be exposed to geological hazards such as ground shaking, and a reduction in erosion potential resulting from facility development. However, Alternative 7 would still result in indirect geological impacts that are similar to and treated the same as those of the proposed Project identified in **Subsection 4.13.6.2.2**, above.

Entrada Impacts. The geotechnical analysis prepared for the Entrada site addresses several factors that could result in significant impacts to future development. Such factors include:

- Debris Flow Hazard
- Ground Rupture
- Seismic Shaking
- Slope Stability (including Landslides)
- Bedding Planes
- Shear Strength
- Erosion Potential, and
- Liquefaction Potential

Reddish-brown clayey siltstone lenses in the Saugus Formation are potentially expansive and alluvial soils are poorly to moderately consolidated. Hazards resulting from the expansive and poorly consolidated materials would result in a potentially significant impact without mitigation. However, after implementation of appropriate mitigation measures adopted as part of the Specific Plan approval (SP-4.1-1 through 56) impacts would be less than significant.

During a seismic event, there are three common forms of geologic hazards that are related to the earthquake, including ground rupture or displacement, ground failure (liquefaction, landslides, *etc*.), and ground shaking. Ground rupture, ground failure and ground shaking are considered significant impacts and would potentially result in damage to infrastructure and people. Within the Project area, one strand of the Holser fault is mapped within the VCC planning area. The Holser Fault may have a recurrence interval slightly longer than Holocene time. There is the potential for sympathetic movement associated with seismic events on other faults. There is one period of deformation (probably caused by compression and displacement of a saturated sandy zone directly at the fault) recorded in the Holocene stratigraphic record over the Holser Fault; and, consequently, there is a potential for significant impacts resulting from earthquake, strong seismic shaking, ground rupture or displacement. With mitigation, impacts under Significance Threshold 1 would be less than significant.

The potential for liquefaction has been reviewed and evaluated. The liquefaction potential of the Entrada site (Planning Areas 2 through 15) and evaluation of earthquake induced settlements performed by AES is presented in the Frankian 2005 study, Appendix E (see **Appendix 4.13**). It has been concluded that some isolated liquefaction-prone soils exist at the site at various depths. However, the thickness of the liquefiable soils below the water table are considered to be very thin layers. Nonetheless, the potential for significant liquefaction impacts exist prior to mitigation. After mitigation, however, impacts would be less than significant.

Based on the results of the geotechnical investigation, the Entrada site may be adversely affected by hazards such as landslide, settlement, and slippage. The Entrada project would not adversely affect adjacent properties in compliance with the Los Angeles County Code, provided recommendations of the project geologist/soils engineer, and the provisions of the Los Angeles County Code are followed.

With implementation of regulatory requirements and mitigation measures identified by subsequent environmental review of the Entrada project, it is reasonable to expect that the potential geologic hazard impacts of the Entrada project would be reduced to a less-than-significant level under Significance Thresholds 1-4.

4.13.6.7.3 Secondary Impacts

RMDP Secondary Impacts. Implementation of the RMDP would not facilitate new development located beyond the Specific Plan area boundary. Therefore, the RMDP would not result in seismic or soil-related geologic impacts to any off-site location. Erosion impacts that could result from the development of new urban uses on the Specific Plan site would be reduced by implementing regulatory requirements and appropriate erosion control Best Management Practices. Therefore, the potential for off-site erosion impacts resulting from development facilitated by the RMDP would not be significant.

SCP Secondary Impacts. Implementation of this alternative would not facilitate new development located beyond the boundaries of the Specific Plan, or Entrada planning areas; and, therefore, it would not result in seismic or soil-related geologic impacts to any off-site location. Erosion impacts that could result from the development of new urban uses on the Specific Plan and Entrada project sites would be reduced by implementing regulatory requirements and appropriate erosion control Best Management Practices. Therefore, the potential for off-site erosion impacts resulting from facilitated development would not be significant.

4.13.7 MITIGATION MEASURES

The Newhall Ranch Specific Plan Program EIR recommended implementation of Mitigation Measures SP-4.1-1 through SP-4.1-56 to ensure compliance with all plan, regulatory, and other requirements. In addition, to ensure avoidance of geology and geologic hazards impacts resulting from construction and operation of the approved WRP, the Newhall Ranch Specific Plan Program EIR recommended implementation of Mitigation Measures SP-5.0-1 through 5.0-13. The Los Angeles County Board of Supervisors found that adoption of all recommended measures would ensure compliance with all plan, regulatory, and other geology-related impacts and requirements. The Newhall Ranch mitigation program was adopted by Los Angeles County in findings and in the revised Mitigation Monitoring Plans for the Specific Plan and WRP.

4.13.7.1 Mitigation Measures Already Required by the Adopted Newhall Ranch Specific Plan EIR

Los Angeles County previously adopted mitigation measures to minimize geologic hazard impacts within the Specific Plan area as part of its approval of the Specific Plan and WRP. These measures are contained in the previously certified Newhall Ranch Specific Plan Program EIR and the adopted Mitigation Monitoring Plans for the Specific Plan and WRP (May 2003), and are summarized in **Table 4.13-1**, above. In addition, these mitigation measures are set forth in full below, and preceded by "SP," which stands for Specific Plan.

SP-4.1-1 The standard building setbacks from ascending and descending man-made slopes are to be followed in accordance with Section 1806.4 of the Los Angeles County Building Code, unless superseded by specific geologic and/or soils engineering evaluations. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 44)

SP-4.1-2 The existing Grading Ordinance for planting and irrigation of cut-slopes and fill slopes is to be adhered to for grading operations within the project site. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 44)

SP-4.1-3 In order to safeguard against major seismic-related structural failures, all buildings within the project boundaries are to be constructed in conformance with the Los Angeles County Uniform Building Code, as applicable.

SP-4.1-4 The location and dimensions of the exploratory trenches and borings undertaken by Allan E. Seward Engineering Geology, Inc. and R.T. Frankian & Associates are to be noted on all grading plans relative to future building plans, unless the trenches and/or borings are

removed by future grading operations. If future foundations traverse the trenches or borings, they are to be reviewed and approved by the project Geotechnical Engineer. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 45)

SP-4.1-5 Wherever the Pacoima Formation is exposed, it may be potentially expansive; therefore, it is to be tested by the project Soils Engineer at the grading plan stage to determine its engineering characteristics and mitigation requirements, as necessary.

SP-4.1-6 Should any expansive soils be encountered during grading operations, they are not to be placed nearer the finished surface than 8 feet below the bottom of the subgrade elevation. This depth is subject to revision depending upon the expansive potential measured during grading. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-7 If expansive materials are encountered at subgrade elevation in cut areas, the soils are to be removed to a depth of 8 feet below the "finished" or "subgrade" surface and the excavated area backfilled with nonexpansive, properly compacted soils. This depth is subject to revision depending upon the expansive potential measured during grading. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-8 At the time of subdivision, which allows construction, areas subject to liquefaction are to be mitigated to the satisfaction of the project Geotechnical Engineer prior to site development. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-9 Subdrains are to be placed in areas of high ground water conditions (Potrero Canyon, in particular) or wherever extensive irrigation is planned. The systems are to be designed to the specifications of the Newhall Ranch Specific Plan Geotechnical Engineer.

SP-4.1-10 Subdrains are to be placed in the major and minor canyon fills, behind stabilization blankets, buttress fills, and retaining walls, and as required by the Geotechnical Engineer during grading operations. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-11 Canyon subdrains may be installed in "V"-ditches or in a rectangular trench excavated to expose competent material or bedrock as approved by the Geotechnical Engineer.

SP-4.1-12 The vertical spacing of subdrains behind buttress fills, stabilization blankets, *etc.*, are to be a maximum of 15 feet. The gradient is to be at least 2 percent to the discharge end. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-13 Geological materials subject to hydroconsolidation (containing significant void space) are to be removed prior to the placement of fill. Specific recommendations relative to hydroconsolidation are to be provided by the project Geotechnical Engineer at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 44)

SP-4.1-14 Proposed structures on ridgelines will have a minimum 20-foot horizontal setback from the margin of the bedrocks to prevent perched or ground water levels where relatively impermeable materials can block downward migration.

SP-4.1-15 Subsurface exploration is required to delineate the depth and lateral extent of the landslides shown on the geologic map. This work shall be undertaken at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 15) Landslides must be mitigated through stabilization, removal, and/or building setbacks as determined by the Newhall Ranch Specific Plan Geotechnical Engineer, and to the satisfaction of the Los Angeles County Department of Public Works.

SP-4.1-16 At the subdivision stage, the existence of landslides designated with "3" on Figure 4.1-2, Existing Landslide Areas, and within or adjacent to the development area is to be confirmed. (Allan E. Seward Engineering Geology, Inc., 19 September 1994,p. 15) If landslides are confirmed in these areas, they are to be mitigated through stabilization, removal, and/or building setbacks as determined by the Newhall Ranch Specific Plan Geotechnical Engineer.

SP-4.1-17 The existence, or lack thereof, of landslides on or adjacent to the roadway alignments for the extension of Magic Mountain Parkway and Valencia Boulevard will be evaluated by subsurface investigations at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 13 December 1995, p. 11) If landslides are confirmed in these areas, they are to be mitigated through stabilization, removal, and/or building setbacks as determined by the Newhall Ranch Specific Plan Geotechnical Engineer.

SP-4.1-18 The potential hazards associated with debris flow scars and other possible surficial failures located in proximity to the roadway alignments for the extension of Magic Mountain Parkway and Valencia Boulevard will be evaluated at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 13 December 1995, p. 11) These areas are to be mitigated as determined by the Newhall Ranch Specific Plan Geotechnical Engineer.

SP-4.1-19 Remove debris from surficial failures during grading operations prior to the placement of fill. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 16)

SP-4.1-20 All soils and/or unconsolidated slopewash and landslide debris is to be removed prior to the placement of compacted fills. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 45)

SP-4.1-21 Cut-slopes, which will expose landslide material, are to undergo geologic and geotechnical evaluation at the subdivision stage to determine their stability and degree of consolidation. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 15) Several options are available to mitigate potential landslide failure in the proposed cut-slopes. Landslides may be stabilized with buttress fills or shear keys designed by the Newhall Ranch Specific Plan Geotechnical Engineer; landslide material can be entirely removed and replaced with a stability fill; or the slope can be redesigned to avoid the landslide. Landslides underlying cut pad or road areas may be removed or partially removed if the Newhall Ranch Specific Plan Geologist and Geotechnical Engineer conclude that the landslide is stable and sufficiently consolidated to build on. Landslides located on ascending natural slopes above proposed graded areas will also require

evaluation for stability. Unstable landslides on natural slopes above graded areas will either require stabilization, removal or building setbacks to mitigate potential hazards.

SP-4.1-22 Additional geologic investigations are required prior to approval of future tentative maps which allow construction, or grading plans to determine the geologic and geotechnical feasibility of the fifteen (15) lots proposed in the High Country SMA.

SP-4.1-23 Prior to construction of the road embankment located within landslide Qls II, a compacted fill shear key will be constructed at the property boundary. (R.T. Frankian & Associates, 19 September 1994, p. 6)

SP-4.1-24 Landslides, which will not affect the proposed grading concept, are to be placed in Restricted Use Areas on the Final Maps. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 43)

SP-4.1-25 Surficial stability of cut-slopes designated with a "G" are to be fully evaluated at the subdivision stage, due to the possibility of wedge failures or surficial material in the slope. Corrective grading measures are to be presented in detail as mitigation at both the subdivision and Grading Plan stages of development. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, pp. 17, 43)

SP-4.1-26 Cut slopes designated as "P" are potentially unstable and are to be fully evaluated at the subdivision stage to ascertain whether they are stable as designed. Corrective grading measures are to be presented in detail as mitigation at both the subdivision and Grading Plan stages of development. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, pp. 17, 43)

SP-4.1-27 Cut-slopes designated with a "U" are to be further investigated at the subdivision stage to confirm underlying geologic conditions and slope stability. Corrective grading measures are to be presented in detail as mitigation at both the subdivision and Grading Plan stages of development. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, pp. 17, 43)

SP-4.1-28 Cut-slopes associated with the construction of the proposed extensions of Magic Mountain Parkway and Valencia Boulevard are to be further investigated at the subdivision stage to confirm the underlying geologic conditions and slope stability. Corrective measures are to be required if it is determined that the cut-slopes will not be stable. (Allan E. Seward Engineering Geology, Inc., 13 December 1995, pp. 11 & 12)

SP-4.1-29 Orientations of the bedrock attitudes are to be evaluated by the Newhall Ranch Specific Plan Engineering Geologist to identify locations of required buttress fills. Buttress fill design and recommendations, if necessary, are to be presented as mitigation during the grading plan stage. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-30 All fills, unless otherwise specifically designed, are to be compacted to at least 90 percent of the maximum dry unit weight as determined by ASTM Designation D 1557-91 Method of Soil Compaction. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-31 No fill is to be placed until the area to receive the fill has been adequately prepared and approved by the Geotechnical Engineer. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-32 Fill soils are to be kept free of all debris and organic material. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-33 Rocks or hard fragments larger than 8 inches are not to be placed in the fill without approval of the Geotechnical Engineer, and in a manner specified for each occurrence. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-34 Rock fragments larger than 8 inches are not to be placed within 10 feet of finished pad grade or the subgrade of roadways or within 15 feet of a slope face. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-35 Rock fragments larger than 8 inches may be placed in windrows, below the limits given above, provided the windrows are spaced at least 5 feet vertically and 15 feet horizontally. Granular soil must be flooded around windrows to fill voids between the rock fragments. The granular soil is to be wheel rolled to assure compaction. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-36 The fill material is to be placed in layers which, when compacted, is not to exceed 8 inches per layer. Each layer is to be spread evenly and is to be thoroughly mixed during the spreading to insure uniformity of material and moisture. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-37 When moisture content of the fill material is too low to obtain adequate compaction, water is to be added and thoroughly dispersed until the soil is approximately 2 percent over optimum moisture content. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-38 When the moisture content of the fill material is too high to obtain adequate compaction, the fill material is to be aerated by blading or other satisfactory methods until the soil is approximately two percent over optimum moisture content. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-39 Where fills toe out on a natural slope or surface, a keyway, with a minimum width of 16 feet and extending at least 3 feet into firm, natural soil, is to be cut at the toe of the fill. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-40 Where the fills toe out on a natural or cut slope and the natural or cut slope is steeper than 5 horizontal to 1 vertical, a drainage bench with a width of at least 8 feet is to be established at the toe of the fill. Fills may be placed over cut slopes if the visible contact between the fill and cut is steeper than 45 degrees. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-41 When placing fills over slopes, sidewall benching is to extend into competent material, approved by the Geotechnical Engineer, with vertical benches not less than 4 feet. (R.T.

Frankian & Associates, 19 September 1994, Appendix I) Competent material is defined as being free of loose soil, heavy fracturing or compressive soils.

SP-4.1-42 When constructing fill slopes, the grading contractor is to avoid spillage of loose material down the face of the slope during the dumping and compacting operations. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-43 The outer faces of fill slopes are to be compacted by backing a sheepsfoot compactor over the top of the slope, and thoroughly covering all of the slope surface with overlapping passes of the compactor. Compaction of the slope is to be repeated after each 4 feet of fill has been placed. The required compaction must be obtained prior to placement of additional fill. As an alternate, the slope can be overbuilt and cut back to expose a compacted core. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-4.1-44 All artificial fill associated with past petroleum activities as well as other existing artificial fill, are to be evaluated by the Newhall Ranch Specific Plan Geotechnical Engineer at the subdivision and/or Grading Plan Stage. (Allan E. Seward Engineering Geology, 19 September 1994, Inc., p. 45) Unstable fills are to be mitigated through removal, stabilization, or other means as determined by the Newhall Ranch Specific Plan Geotechnical Engineer.

SP-4.1-45 Surface runoff from the future graded areas is not to run over any natural, cut, or fill slopes. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 20)

SP-4.1-46 Runoff from future pads and structures is to be collected and channeled to the street and/or natural drainage courses via non-erosive drainage devices. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 20)

SP-4.1-47 Water is not to stand or pond anywhere on the graded pads. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 20)

SP-4.1-48 Oil and water wells that might occur on site are to be abandoned in accordance with State and local regulations. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 45)

SP-4.1-49 If any leaking or undocumented oil wells are encountered during grading operations, their locations are to be surveyed and the current well conditions evaluated immediately. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 21) Measures are to be taken to document the wells, abandonment, and remediate the well sites (if necessary) in accordance with State and local regulations.)

SP-4.1-50 The exact status and location of the Exxon (Newhall Land & Farming) oil well #31 will be evaluated at the subdivision stage. If necessary, the well will be abandoned in accordance with State and local regulations. (Allan E. Seward Engineering Geology, Inc., 13 December 1995, p. 12)

SP-4.1-51 Survey control will be required to precisely locate the Salt Creek and Del Valle Faults at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 33)

SP-4.1-52 Additional subsurface trenching will be performed within the Holser Structural Zone on Newhall Ranch during the subdivision stage to evaluate its existence. Within Potrero Canyon, additional subsurface evaluation will be performed during the subdivision stage to confirm that nontectonic alluvial movement was the cause of surface ground cracking during the January 17, 1994 earthquake, and to evaluate the potential for shallow-depth faults. (Allan E. Seward Engineering Geology, Inc. 19 September 1994, p. 42, as revised above)

No distinct evidence for Holocene activity on any of the faults traversing the Newhall Ranch Specific Plan site was observed during Allan E. Seward Engineering Geology, Inc.'s investigation; however, based on the distinct nature of faulting, the possible association of minor seismic activity, and compatible orientation of the faulting in relation to the current stress regime of the Transverse Ranges, preliminary Building Setback Zones have been designated around the mapped fault zones (*See,* Figure 4.1-4).

SP-4.1-53 Precise Building Setback Zones for the Newhall Ranch Specific Plan site are to be defined at the subdivision stage.

SP-4.1-54 Due to the potential activity of the Salt Creek and Del Valle Faults, site development is to remain outside of Building Setback Zones around fault traces, and the possible fault zone connecting them (*See,* Figure 4.1-4). (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 42)

SP-4.1-55 To minimize potential hazards from shattered ridge effects, structures and storage tanks proposed on ridgelines are to have a minimum 20-foot setback from the margins of the bedrock. Designation of specific building setbacks will require evaluation at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 19 September 1994, p. 40) Building setback zones are to be identified on all site plans and tract maps for the site.

SP-4.1-56 The potential for ground motion and ground failure associated with a seismic event in proximity to the planned roadway alignments of Magic Mountain Parkway and Valencia Boulevard will be evaluated at the subdivision stage. (Allan E. Seward Engineering Geology, Inc., 13 December 1995, p. 11) Mitigation to reduce associated significant impacts will also be identified at that time.

Water Reclamation Plant

SP-5.0-1 Prior to construction of the water reclamation plant, prepare a detailed geotechnical report that will outline the geotechnical performance requirements for placing and compacting the fill at the water reclamation plant site and along on-site sewer line alignments to ensure that none of the wastewater conveyance or treatment facilities would be subject to hazards caused by expansive soils. Construction of wastewater conveyance and treatment facilities shall comply with the requirements identified in the report.

SP-5.0-2 Should any expansive soils be encountered during grading operations, they shall not be placed nearer the finished surface than 8 feet below the bottom of the subgrade elevation.

If expansive materials are encountered at subgrade elevation in cut areas, the soils shall be removed to a depth of 8 feet below the subgrade surface and the excavated area backfilled with nonexpansive, properly compacted soils. These depths are subject to revision depending upon the expansive potential measured during grading.

SP-5.0-3 Prior to grading of the WRP site and the associated sewer lines, a detailed geotechnical performance report is to be prepared and approved by the WRP Operator, which will assess liquefaction potential along sewer line alignments, and which will identify design measures for potential liquefaction hazards. WRP collection and treatment facilities construction is to comply with the measures identified in the performance report.

SP-5.0-4 All water reclamation plant structures and facilities are to be constructed according to Uniform Building Code standards for the appropriate Seismic Risk Zone (Zone 4).

SP-5.0-5 If the height of the fill exceeds the shear strength of such saturated soils, settlement and ground failure could occur, resulting in damage to structures and/or injury to people. Potentially consolidatible materials are to be properly removed and the fill material is to be properly compacted and protected against the erosive effects of storm and River flows.

SP-5.0-6 All fills, unless otherwise specifically designed, are to be compacted to at least 90 percent of the maximum dry unit weight as determined by ASTM Designation D 1557-91 Method of Soil Compaction. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-5.0-7 No fill is to be placed until the area to receive the fill has been adequately prepared and approved by the Geotechnical Engineer. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-5.0-8 Fill soils are to be kept free of all debris and organic material. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-5.0-9 Rocks or hard fragments larger than 8 inches are not to be placed in the fill without approval of the Geotechnical Engineer, and in a manner specified for each occurrence. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-5.0-10 Rock fragments larger than 8 inches are not to be placed within 10 feet of finished pad grade or the subgrade of roadways or within 15 feet of a slope face. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-5.0-11 When moisture content of the fill material is too low to obtain adequate compaction, water is to be added and thoroughly dispersed until the soil is approximately 2 percent over optimum moisture content. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-5.0-12 When the moisture content of the fill material is too high to obtain adequate compaction, the fill material is to be aerated by blading or other satisfactory methods until the soil is approximately two percent over optimum moisture content. (R.T. Frankian & Associates, 19 September 1994, Appendix I)

SP-5.0-13 Surface runoff from the future graded areas is not to run over any natural, cut, or fill slopes. (Allan E. Seward Engineering Geology, 19 September 1994, Inc., p. 20)

4.13.7.2 Mitigation Measures Already Required by the Adopted VCC EIR

Los Angeles County also adopted mitigation measures to minimize geologic hazard impacts within the VCC planning area as part of its approval of the VCC project (SCH No. 1987123005). These measures are found in the previously certified VCC EIR (April 1990), and are summarized above in **Table 4.13-2.** In addition, these measures are set forth in full below, and are preceded by "VCC-GEO," which stands for Valencia Commerce Center - Geology.

While these mitigation measures are several years old, they represented the best available mitigation at that time by Los Angeles County. Moreover, as noted in **Subsection 4.13.1.2.1**, above, additional environmental review will be conducted by the County with respect to the VCC planning area, because the applicant recently submitted the last tentative parcel map for build-out of the VCC planning area. Implementation of the VCC mitigation measures and additional mitigation requirements (*e.g.*, measures similar to those previously adopted for the Specific Plan area) would ensure that potential geologic hazard impacts are reduced to the extent feasible.

VCC-GEO-1 A minimum 60-80 foot setback over the Holser Fault is part of the project design. Potential impacts from ground shaking will be mitigated by compliance with Section 2312(d) of the Los Angeles County Building Code.

VCC-GEO-2 All cut slopes will be designed at 2:1 gradients. If cut slopes are steeper than the bedding, then buttresses, retaining wells and/or stability equivalents will be provided.

VCC-GEO-3 Landslides will be stabilized with shear keys and/or removal and compaction.

VCC-GEO-4 Expansive bedrock will be removed and replaced with certified fill or special foundations will be designed. Fills will be designed at 2:1 gradients.

VCC-GEO-5 All major canyon fills, buttresses, stability fills, sheer keys, and retaining walls will require subdrains.

4.13.7.3 Mitigation Measures Relating to the Entrada Planning Area

Los Angeles County has not yet prepared a draft EIR for the proposed development within the portion of the Entrada planning area that would be facilitated by approval of the SCP component of the proposed Project. As a result, there are no previously adopted mitigation measures for the Entrada planning area. However, the adoption and implementation of measures similar to those previously adopted for the Specific Plan area would ensure that potential impacts related to geology and geologic hazards within the Entrada planning area are reduced to the extent feasible.

4.13.7.4 Additional Mitigation Measures Proposed by this EIS/EIR

The proposed Project and the "build" alternatives would not result in significant geologic hazard impacts with implementation of the previously adopted mitigation measures referenced above. Therefore, no additional mitigation measures are recommended or required.

4.13.8 SUMMARY OF SIGNIFICANCE FINDINGS

Table 4.13-4 presents a summary of the significance criteria relating to each of the Project alternatives, and the reduced level of impact that would be achieved for each alternative by applying the above mitigation measures.

Table 4.13-4
Summary of Significant Geology Impacts - Pre- and Post-Mitigation

Significance Criteria	Applicable Mitigation Measures	Planning Area	Impact of Alternatives - Pre/Post-Mitigation						
			Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Exposure of People or Structures to Substantial Adverse Effects Involving Rupture of a Known Earthquake Fault	Appropriate Specific Plan Mitigation Measures. No additional measures required	NRSP	NI	SI/M	SI/M	SI/M	SI/M	SI/M	SI/M
		VCC	NI	SI/M	SI/M	NI	NI	NI	NI
		Entrada	NI	SI/M	SI/M	SI/M	SI/M	SI/M	SI/M
Exposure of People or Structures to Potential Substantial Adverse Effects Involving Strong Seismic Ground Shaking	Appropriate Specific Plan Mitigation Measures. No additional measures required	NRSP	NI	SI/M	SI/M	SI/M	SI/M	SI/M	SI/M
		VCC	NI	SI/M	SI/M	NI	NI	NI	NI
		Entrada	NI	SI/M	SI/M	SI/M	SI/M	SI/M	SI/M
Exposure of People or Structures to Potential Substantial Adverse Effects Involving Landslides	Appropriate Specific Plan Mitigation Measures. No additional measures required	NRSP	NI	SI/M	SI/M	SI/M	SI/M	SI/M	SI/M
		VCC	NI	SI/M	SI/M	NI	NI	NI	NI
		Entrada	NI	SI/M	SI/M	SI/M	SI/M	SI/M	SI/M
Substantial Soil Erosion or the Loss of Topsoil	Appropriate Specific Plan Mitigation Measures. No additional measures required	NRSP	NI	SI/M	SI/M	SI/M	SI/M	SI/M	SI/M
		VCC	NI	SI/M	SI/M	NI	NI	NI	NI
		Entrada	NI	SI/M	SI/M	SI/M	SI/M	SI/M	SI/M

Table 4.13-4
Summary of Significant Geology Impacts - Pre- and Post-Mitigation

Significance Criteria	Applicable Mitigation Measures	Planning Area	Impact of Alternatives - Pre/Post-Mitigation						
			Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7
Project Location on a Geologic Unit or Soil that is Unstable or Expansive, or that Would Become Unstable as a Result of the Project, and Potentially Result in Lateral Spreading, Subsidence, Liquefaction, or Collapse	Appropriate Specific Plan Mitigation Measures. No additional measures required	NRSP	NI	SI/M	SI/M	SI/M	SI/M	SI/M	SI/M
		VCC	NI	SI/M	SI/M	NI	NI	NI	NI
		Entrada	NI	SI/M	SI/M	SI/M	SI/M	SI/M	SI/M
Result in the Loss of Availability of a Known Mineral Resource That Would Be of Value to the Region And the Residents of the State	None required	NRSP	NI	NI	NI	NI	NI	NI	NI
		VCC	NI	NI	NI	NI	NI	NI	NI
		Entrada	NI	NI	NI	NI	NI	NI	NI
Result in the Loss of Availability of a Locally Important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan, or Other Land Use Map	None required	NRSP	NI	NI	NI	NI	NI	NI	NI
		VCC	NI	NI	NI	NI	NI	NI	NI
		Entrada	NI	NI	NI	NI	NI	NI	NI

SI/M = Significant impact, but mitigated to less-than-significant level

NI = No impact, and no mitigation required

4.13.9 SIGNIFICANT UNAVOIDABLE IMPACTS

With implementation of the identified mitigation measures, the geology and geologic hazard impacts of the proposed Project and the "build" alternatives would be reduced to less-than-significant levels. Therefore, the proposed Project and alternatives would not result in any significant unavoidable impacts to geology and geologic hazards.