Issue	Less Than Significant or No Impact	Potential Significant Impact Adequately Addressed in MEIR	MEIR Required Additional Review: No Significant Impact	Less Than Significant Impact Due to Mitigation Measures in Project Description	New Additional Significant Impact Not Addressed in MEIR	New Additional Mitigation Measures Required
5.6 Geology and Soils. Would the project:						
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:						
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	■	❒	❒	❒	❒	❒
ii) Strong seismic ground shaking?	❒	■[1]	❒	❒	❒	❒
iii) Seismic-related ground failure, including liquefaction?	❒	■	❒	■	❒	❒
iv) Landslides?	■	❒	❒	❒	❒	❒
b) Result in substantial soil erosion or the loss of topsoil?	❒	❒	❒	■	❒	❒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	❒	■	❒	■	❒	❒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	❒	❒	❒	■	❒	❒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	■	❒	❒	❒	❒	❒

Setting

Topography

The Specific Plan II area, which includes Neighborhoods I and J, is relatively flat, sloping gently (less than 2 percent) northeast toward Old River. Elevation ranges within Neighborhoods I and J are shown in Table 5.6-1.

[1] Remains significant and unavoidable as stated in the 1994 MEIR.

Table 5.6-1
ELEVATION RANGES AND SOIL CHARACTERISTICS IN THE SPECIFIC PLAN II AREA

Neighborhood	Elevation Range (Feet above MSL)	Expansion Potential	Depth of Potentially Liquefiable Deposits	Thickness of Confining Soils (Non-Liquefiable)
I	0-40	moderate to high	3 - 35 ft bgs	2 - 10 ft
J	12-40	moderate to high	6 - 35 ft bgs	7 - 16 ft

Notes: ft = feet; bgs = below ground surface; MSL = mean sea level.

Source: Condor 2004b, 2004c.

Regional Geology

The project site, located in the upper San Joaquin Valley, is considered part of the Great Valley geomorphic province of California. The Great Valley is a relatively flat alluvial plain that is infilled with as much as six vertical miles of alluvial and marine sediment. The Great Valley is bounded to the west by the Coast Ranges and to the east by the Sierra Nevada. The Sacramento and San Joaquin Rivers drain the Great Valley through the San Francisco Bay.

Regional geologic maps indicate that the geology in the vicinity of the project site is dominated by sediments that were deposited by streams draining the eastern slopes of the Altamont Hills to the west. These unconsolidated sedimentary deposits are of Holocene age (less than 11,000 years old) and comprise the surface and near-surface soils across the Mountain House community.

Seismicity

The San Joaquin Valley is a seismically active region of California, subject to occasional earthquakes. The seismicity of this region is concentrated near the boundary between the Coast Ranges and the Great Valley, two diverse geographic and geologic provinces. No known active nor potentially active faults have been mapped across the project site and the site is not located in a Fault Rupture Hazard Zone as established by the Alquist-Priolo Earthquake Fault Zoning Act. The California Geologic Survey has defined active faults as faults that have had surface displacement within Holocene time (within the last 11,000 years). Potentially active faults are faults that show evidence of surface displacement during Quaternary time (within the past 1.6 million years). The active and potentially active faults in the vicinity of the Specific Plan II area are listed in Table 5.6-2.

The Great Valley Thrust fault is the nearest active fault to the project site. The United States Geological Survey (USGS) Working Group on California Earthquakes has mapped the surface rupture of the nearest segment of the Great Valley Thrust fault zone beneath the eastern foothills of the Diablo Range, approximately 5 miles southeast of the project site. Since rupture of the Great

Table 5.6-2
ACTIVE AND POTENTIALLY ACTIVE FAULTS IN THE VICINITY OF THE SPECIFIC PLAN II AREA

Fault	Status	Distance to Project Area (Miles)	Estimated Maximum Earthquake (Moment Magnitude)[a]	Estimated Peak Horizontal Acceleration (%g)[b]
Great Valley Thrust (Segment 7)	Active	4	6.7	0.59
Greenville	Potentially Active	8	6.6	0.27
Concord-Green Valley	Active	25	6.2	0.12
Calaveras	Potentially Active	21	6.8	0.13
Hayward	Active	26	6.4	0.13
San Andreas	Active	46	7.9	0.13

[a] The moment magnitude is related to the physical size of fault rupture, the movement across the fault, and the strength of the rock that is faulted. Earthquakes with magnitudes of 6 or greater are capable of causing widespread damage.

[b] Peak horizontal acceleration is defined as the speed at which the ground moves with respect to the force of gravity (g). An upward vertical ground acceleration of 1.0 g would throw loose objects into the air.

Source: Condor, 2004a, 2004b, 2004c, 2004d; Levine-Fricke, 2001.

Valley fault zone does not usually extend to the ground surface, this fault system has only recently been recognized as a potential source of earthquakes.

Site Soils

Under the San Joaquin County Development Title and Chapter 4 Article 7 of the California Subdivision Act, the project applicant is required to prepare preliminary soils reports (i.e., geotechnical studies) prior to the submittal of each tentative map area within the Mountain House community. Geotechnical engineering studies were conducted in March 2004 for Neighborhoods I and J and included subsurface explorations and laboratory soil testing. The purpose of the completed studies was to characterize geotechnical conditions that might affect design or construction of proposed development and to provide geotechnical recommendations and design criteria to mitigate any identified impacts.

Subsurface explorations were conducted throughout Neighborhoods I and J to depths ranging from 21.5 to 51.5 feet below the ground surface (bgs). The explorations indicate that the neighborhoods are underlain by decomposed or highly weathered rock that behaves like soil and unconsolidated alluvium generally composed of lean clays and silts with varying percentages of silts and sands. The results of the soils analysis are presented in Table 5.6-1.

Soil expansion is a phenomenon in which clayey soils expand in volume as a result of an increase in moisture content, and shrink in volume upon drying. Changes in soil volume as a result of changes in moisture content can cause stress and result in damage to foundations. Expansive soils are commonly identified with an expansion index test that evaluates the percentage of clays and liquid limit. It is generally accepted that soils with an expansion index greater than 50 are susceptible to soil expansion. Surface residual soils at Neighborhoods I and J were characterized as having a moderate to high expansion potential. Neighborhood I had an expansion index of 68 to 92, and Neighborhood J had an expansion index of 52 to 89.

Another issue is liquefaction potential. Liquefaction hazards are most common in loose to medium dense, granular and saturated soils; such soils include sands and silts in which the space between individual particles is completely filled with water. Liquefaction occurs when soil with little or no cohesion loses strength when saturated and starts to flow. This is triggered by shaking, such as that caused by an earthquake, or could be due to any significant ground vibration. Liquefaction can occur when the strength and density of a soil is decreased by seismic shaking. Liquefaction is caused by four main factors: depth of groundwater, soil type, soil density, and the seismicity of the area. Liquefaction can be responsible for widespread structural failure, lateral spreading of liquefied deposits and overlying soils, and localized settlement of the ground surface.

The liquefiable potential of site soils was determined using the Cone Penetration Test (CPT) method, a peak ground acceleration (PGA) of 0.4g, and an earthquake magnitude of 6.7. The results of the analysis indicate that potentially thin, discontinuous deposits of liquefiable materials exist in Neighborhoods I and J at depths of 3 to 35 feet bgs. However, the geotechnical engineering studies also suggest that a sufficiently thick cap of non-liquefiable soils exists above potentially liquefiable deposits, making liquefaction-induced ground disturbance in the project area unlikely.

Lateral spreading is defined as the lateral movement of earth materials and overlying structures during an earthquake as a result of pore pressure build-up or liquefaction. The variable depth and discontinuous lateral extent of potentially liquefiable deposits suggest the potential magnitude of lateral spreading in Neighborhoods I and J is not likely to exceed a few inches in the event of a major earthquake.

Groundwater

Generally, groundwater is a reflection of the surface topography. In the project area depth to groundwater is expected to fluctuate in response to both seasonal rainfall and irrigation of surrounding farmland. During subsurface investigations conducted in March 2004, groundwater was encountered in all soil borings in Neighborhoods I at depths of 5 to 9 feet below ground surface (bgs) and in Neighborhood J at 6 to 11 feet bgs.

Significant Impacts Identified in 1994 MEIR

The 1994 MEIR identified a significant and potentially significant geology and soils impact of the Master Plan, as:

1) Strong ground shaking during an earthquake could cause structural damage and injuries to residents of the proposed project.

Findings Related to Significant Impacts Identified in 1994 MEIR

The Master Plan required the preparation and distribution of a Community Earthquake Preparedness Plan to reduce project impacts associated with strong ground shaking during an earthquake (Policy 6.8.3a). Structures will be designed and constructed in accordance with recommendations listed in the geotechnical engineering study for each neighborhood. Despite mitigation efforts, this remains a significant, unavoidable impact and findings related to this fact were adopted for the 1994 MEIR certification.

Discussion Regarding Neighborhoods I and J

a) *Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:*

  i) *Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.*

No Alquist-Priolo Earthquake Fault Zones have been mapped in San Joaquin County. No active faults have been identified within the Mountain House community project area. Therefore, surface ground rupture from faulting is not considered a significant hazard in the project area. No impact related to fault rupture is expected to occur as a result of project development. No mitigation measures are necessary.

  ii) *Strong seismic ground shaking?*

San Joaquin Valley is a seismically active region of California. Strong ground shaking resulting from earthquakes along nearby or distant faults represents the greatest seismic hazard at the Mountain House community. Active and potentially active faults in the vicinity of the project site are listed in Table 5.6-2.

The intensity of ground shaking at any particular site is a function of many factors including (1) earthquake magnitude, (2) the site's distance from the epicenter, (3) the duration of strong ground motion, (4) local geologic conditions (soil characteristics and topography), and (5) depth to bedrock. As indicated in Table 5.6-2, the project site may be susceptible to earthquake magnitudes of 6.7 or higher. During an earthquake, structural damage at the project site may include damage to buildings and infrastructure (roads, bridges, utilities).

The project would be required to comply with all California laws designed to minimize the potential adverse effects of an earthquake. These laws include the

Hospital Seismic Safety Act of 1972, the Essential Services Buildings Seismic Safety Act of 1986, the Field Act of 1933, and the requirements of the latest California Building Code (CBC), Mountain House Community Services District (MHCSD) standards, and the Uniform Building Code (UBC) of 1997.

The 1994 MEIR identified Mitigation M4.6-1 (preparation of a Community Earthquake Preparedness Plan) to promote public awareness and education on earthquake hazards. This plan has been completed and is currently being implemented by the MHCSD.

Existing mitigation measures and policies related to strong seismic ground shaking can be found in the 1994 MEIR (Mitigation M4.6-1) and the Master Plan (Policies 6.5.I(b) [Emergency Preparedness] and 6.8.3 [Soils, Geologic, and Seismic Hazards]).

Despite project compliance with California laws related to earthquake hazards and the implementation of mitigation measures called for in the Master Plan and 1994 MEIR, impacts on Neighborhoods I and J related to ground shaking would be <u>significant and unavoidable</u> and could not be mitigated to a less-than-significant level. No additional mitigation measures are available. This impact was addressed in the 1994 MEIR, and no new impacts related to ground shaking have been identified for the neighborhoods I and J development.

iii) Seismic-related ground failure, including liquefaction?

Laboratory soil testing conducted and summarized in geotechnical engineering studies for Neighborhoods I and J indicate that thin, discontinuous, potentially liquefiable deposits are present in the project area. These deposits create the potential for hazards to people or structures, such as damage to structural foundations, lateral spreading, and/or localized settlement of ground surfaces. Although the reports also suggest that overlying non-liquefiable soils make liquefaction in the area unlikely, recommendations to mitigate potential liquefaction hazards in the project area were provided in the reports.

Liquefaction hazards at Neighborhoods I and J were evaluated using Standard Penetration Test (SPT) blow counts or Cone Penetration Test (CPT) data, a peak ground acceleration (PGA) of 0.4g, and an earthquake magnitude of 6.7. The results of the analysis indicate that potentially thin, discontinuous deposits of liquefiable materials exist in Neighborhood I and J (as discussed earlier). However, the geotechnical engineering studies also suggest that a sufficiently thick cap of non-liquefiable soils exists above potentially liquefiable deposits, making liquefaction-induced ground disturbance on the project site unlikely.

With respect to seismic-related ground failure, the proposed project would result in less than significant impacts with mitigation incorporated. The geotechnical engineering studies for these neighborhoods identified a number of ways to minimize such impacts. These measures would be integrated into the design of structures for Neighborhoods I and J to mitigate impacts to less than significant levels.

iv) Landslides?

Neighborhoods I and J are located on flat terrain (less than 1-percent slopes). The 1994 MEIR indicated that the project area is located outside areas of southwest San Joaquin County identified as susceptible to landsliding. Evidence of slope failures and/or landslides has not been mapped within or immediately adjacent to Neighborhoods I or J or the greater Mountain House community area. Therefore, no significant landslide impacts are expected, and no mitigation is necessary.

b) Result in substantial soil erosion or the loss of topsoil?

Excessive soil erosion is not expected to occur within Neighborhoods I or J because average slopes at these sites are less than one percent. However, project grading for cuts and fills made for building pads, roadbeds, and surface drainage would require the stripping of such areas of all vegetation, debris, organic topsoil, or any existing fill or other unsuitable material or soil.

Project construction would be required to comply with National Pollutant Discharge Elimination System (NPDES) program requirements. The Phase I NPDES storm water program, administered by the State Water Resources Control Board (SWRCB) Division of Water Quality, regulates storm water discharges from major industrial facilities, large and medium-sized municipal separate storm sewer systems (those serving more than 100,000 people), and construction sites that disturb five or more acres of land. Under the program, all land disturbances of five acres or more are required to implement Best Management Practices (BMPs) to prevent soil erosion and the off-site migration of sediment-laden runoff during construction. The site-specific plan that includes erosion control BMPs is called the Storm Water Pollution Prevention Plan (SWPPP). Additionally, Master Plan Policy 6.8.3(b) and the County Development Title require that adequate efforts be implemented during construction to control or eliminate soil erosion and sedimentation associated with construction activities.

Once construction is completed and project topsoil has become stabilized with hardscape and vegetation, soil erosion in the project area would be greatly reduced. Additionally, all urban runoff from the project area would flow to online water quality basins within the Mountain House Creek corridor and adjacent to the Dry Creek corridor that would help to remove sediment and soil particles from site runoff. These basins would require periodic maintenance, including desilting and vegetative clearing to ensure proper functionality. Sedimentation and soil erosion water quality issues are further addressed in Section 5.8, Hydrology and Water Quality, of this Initial Study.

Soil erosion and sedimentation were also addressed by Policies 4.2.2.P.a and 4.2.2.P.d (Grading Standards) and Policy 6.8.3.P.b (Soils, Geologic, and Seismic Hazards of the Master Plan). No additional mitigation measures are required to reduce project impacts related to soil erosion and loss of topsoil to less than significant levels.

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

See responses under (a-iii) and (a-iv) above. The geotechnical engineering studies for these neighborhoods identified a number of ways to minimize such impacts. These measures would be integrated into the design of structures for Neighborhoods I and J as to mitigate impacts to a less than significant levels.

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (UBC) (1994), creating substantial risks to life or property?

The UBC classifies the expansive nature of soils based on an expansion index. It is generally accepted that soils with an expansion index greater than 50 are susceptible to soil expansion. Soil expansion was also addressed in Master Plan Policy 6.8.3.O.a (Soils, Geologic, and Seismic Hazards).

Laboratory testing indicates that soils in Neighborhoods I and J have a medium to high expansion potential, creating the potential for substantial risks to life or property. Unless properly mitigated, soil expansion has the potential to damage foundations; cause large cracks in exterior walls, floors, and ceilings; and cause wavy “roller coaster” surfaces along driveways, sidewalks, and streets. Some techniques to mitigate these problems are moisture conditioning, lime treatment, or the replacement of expansive soils with engineered fill. Site preparation and structural design in Neighborhoods I and J would be completed in accordance with geotechnical engineering studies for these neighborhoods to mitigate the impacts. Therefore the impacts would be less than significant.

e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

No septic tanks or alternative waste disposal systems are proposed for the project area. All wastewater would be collected in a piping system connected to the proposed wastewater treatment plant located within the Specific Plan II area of the Mountain House community. The wastewater treatment plant is further discussed in Section 5.16 of this Initial Study. The project would have no impact on septic systems or alternative wastewater disposal systems. Thus, no mitigation is necessary.

Sources of Information

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